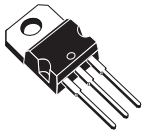
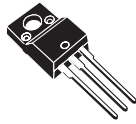


## Precision 500 mA regulators



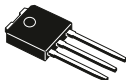
TO-220



TO-220FP



DPAK



IPAK

### Features

- Output current to 0.5 A
- Output voltages of 5; 6; 8; 9; 10; 12; 15; 24 V
- Thermal overload protection
- Short circuit protection
- Output transition SOA protection
- Output voltage tolerance: 2 % (AB and AC versions) or 4 % (C version)
- Guaranteed in extended temperature range

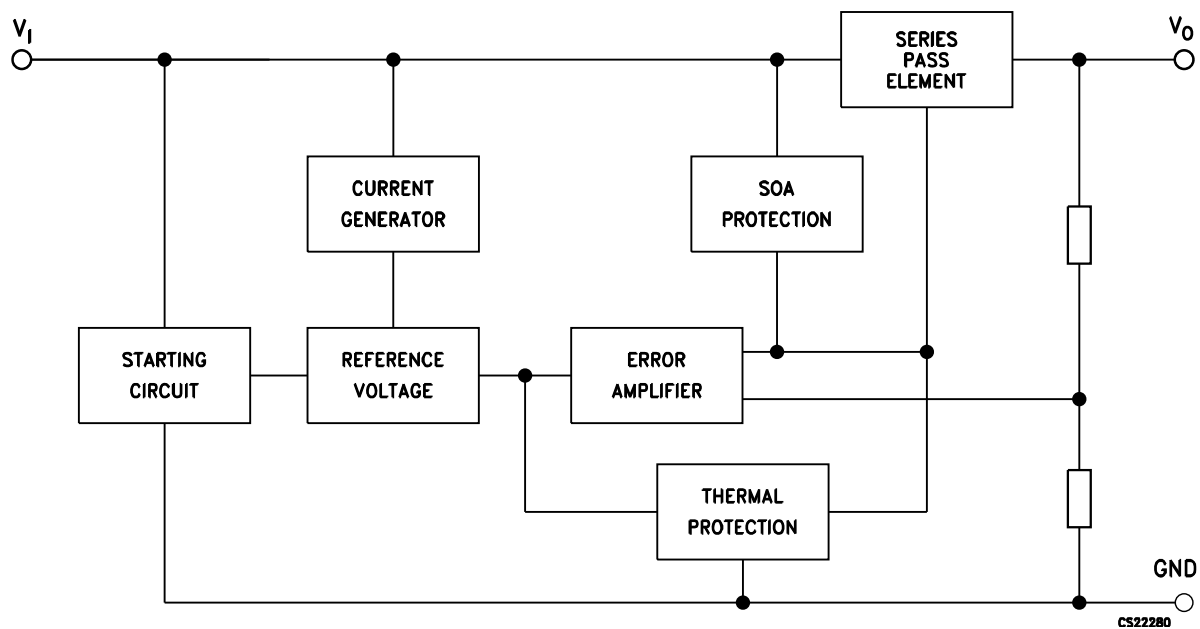
### Description

The **L78M** series of three-terminal positive regulators is available in TO-220, TO-220FP, DPAK and IPAK packages and with several fixed output voltages, making it useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation. Each type employs internal current limiting, thermal shutdown and safe area protection, resulting it essentially indestructible. If adequate heat sinking is provided, they can deliver over 0.5 A output current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.

[Maturity status link](#)[L78M](#)

# 1 Diagram

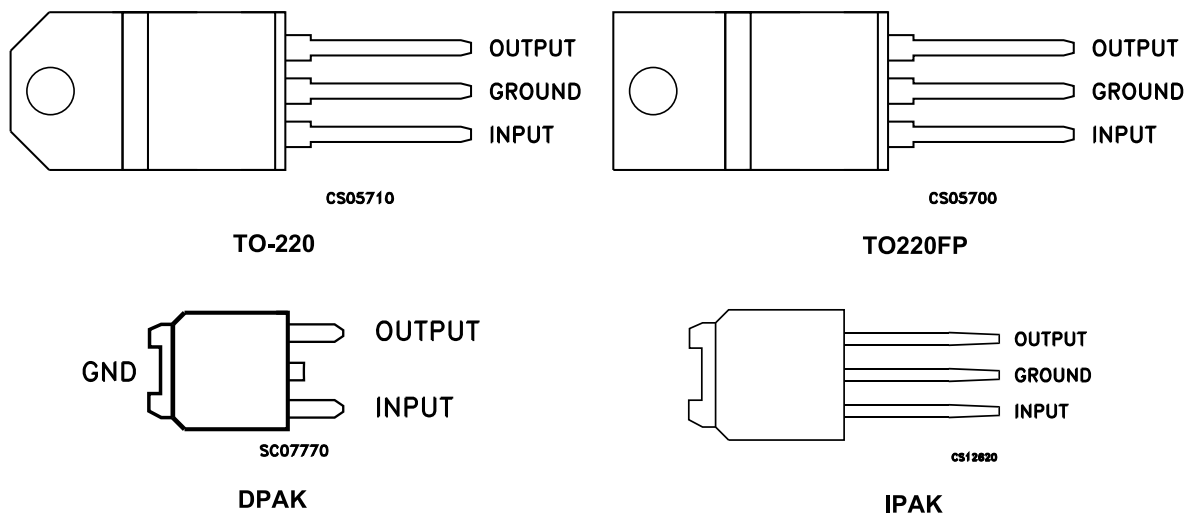
Figure 1. Block diagram



AMG080320171800MT

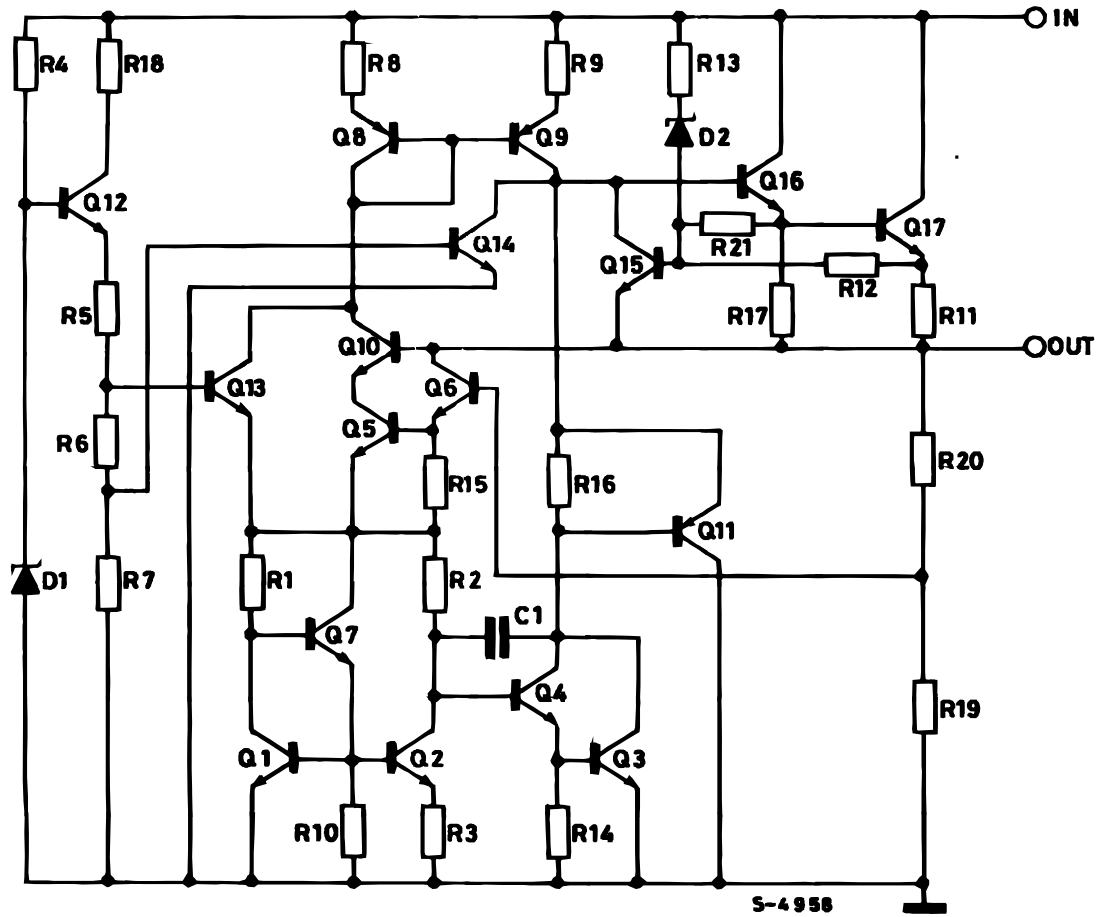
## 2 Pin configuration

Figure 2. Pin connections (top view)



AMG080320171801MT

Figure 3. Schematic diagram



AMG080320171802MT

### 3 Maximum ratings

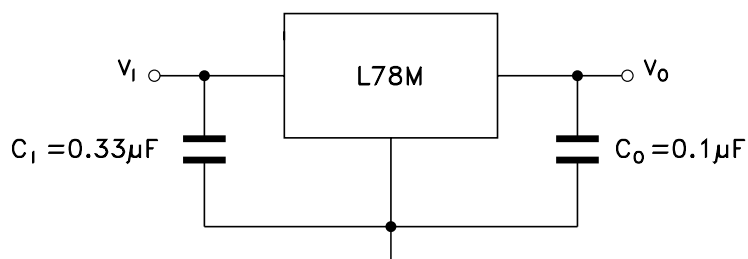
**Table 1. Absolute maximum ratings**

| Symbol    | Parameter                            |                       | Value              | Unit |
|-----------|--------------------------------------|-----------------------|--------------------|------|
| $V_I$     | DC input voltage                     | for $V_O = 5$ to 18 V | 35                 | V    |
|           |                                      | for $V_O = 20, 24$ V  | 40                 |      |
| $I_O$     | Output current                       |                       | Internally limited | mA   |
| $P_D$     | Power dissipation                    |                       | Internally limited | mW   |
| $T_{STG}$ | Storage temperature range            |                       | - 65 to 150        | °C   |
| $T_{OP}$  | Operating junction temperature range | for L78MxxAC          | 0 to 125           | °C   |
|           |                                      | for L78MxxAB          | -40 to 125         |      |
|           |                                      | for L78MxxC           | 0 to 150           |      |

**Note:** Absolute maximum ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

**Table 2. Thermal data**

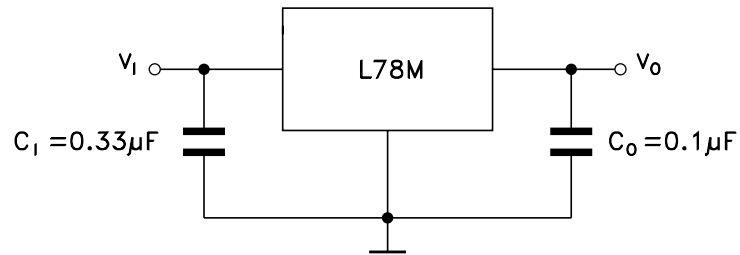
| Symbol     | Parameter                           | TO-220 | TO-220FP | DPAK | IPAK | Unit |
|------------|-------------------------------------|--------|----------|------|------|------|
| $R_{thJC}$ | Thermal resistance junction-case    | 5      | 5        | 8    | 8    | °C/W |
| $R_{thJA}$ | Thermal resistance junction-ambient | 50     | 60       | 100  | 100  | °C/W |

**Figure 4. Application circuit**


AMG080320171803MT

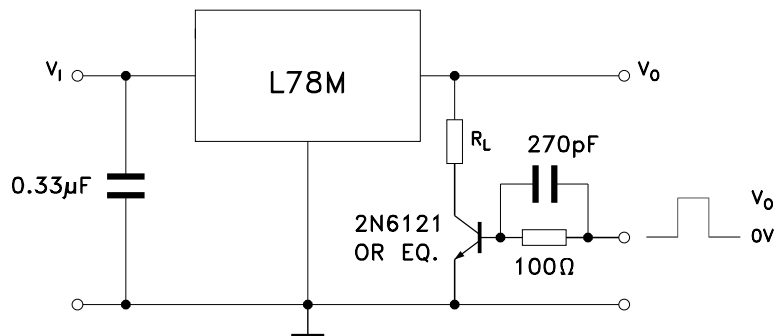
## 4 Test circuits

Figure 5. DC parameter



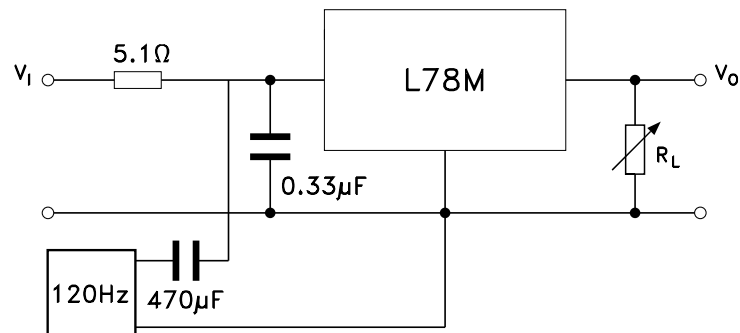
AMG080320171804MT

Figure 6. Load regulation



AMG080320171805MT

Figure 7. Ripple rejection



AMG080320171806MT

## 5 Electrical characteristics

Refer to the test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $V_I = 10\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified.

**Table 3. Electrical characteristics of L78M05C**

| Symbol                | Parameter                | Test conditions                                                               | Min. | Typ. | Max. | Unit                   |
|-----------------------|--------------------------|-------------------------------------------------------------------------------|------|------|------|------------------------|
| $V_O$                 | Output voltage           |                                                                               | 4.8  | 5    | 5.2  | V                      |
| $V_O$                 | Output voltage           | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 7\text{ to }20\text{ V}$           | 4.75 | 5    | 5.25 | V                      |
| $\Delta V_O$          | Line regulation          | $V_I = 7\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$                       |      |      | 100  | mV                     |
|                       |                          | $V_I = 8\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$                       |      |      | 50   |                        |
| $\Delta V_O$          | Load regulation          | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$        |      |      | 100  | mV                     |
|                       |                          | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$        |      |      | 50   |                        |
| $I_d$                 | Quiescent current        |                                                                               |      |      | 6    | mA                     |
| $\Delta I_d$          | Quiescent current change | $I_O = 5\text{ to }350\text{ mA}$                                             |      |      | 0.5  | mA                     |
|                       |                          | $I_O = 200\text{ mA}$ , $V_I = 8\text{ to }25\text{ V}$                       |      |      | 0.8  |                        |
| $\Delta V_O/\Delta T$ | Output voltage drift     | $I_O = 5\text{ mA}$ , $T_J = 0\text{ to }125\text{ }^{\circ}\text{C}$         |      | -0.5 |      | mV/ $^{\circ}\text{C}$ |
| SVR                   | Supply voltage rejection | $V_I = 8\text{ to }18\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ | 62   |      |      | dB                     |
| eN                    | Output noise voltage     | $B = 10\text{ Hz to }100\text{ kHz}$                                          |      | 40   |      | $\mu\text{V}$          |
| $V_d$                 | Dropout voltage          |                                                                               |      | 2    |      | V                      |
| $I_{sc}$              | Short circuit current    | $V_I = 35\text{ V}$                                                           |      | 300  |      | mA                     |

Refer to the test circuits,  $V_I = 10\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (AC) unless otherwise specified.

**Table 4. Electrical characteristics of L78M05A**

| Symbol                | Parameter                  | Test conditions                                                                                                  | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|------------------------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25\text{ }^\circ\text{C}$                                                                                 | 4.9  | 5    | 5.1  | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 7\text{ to }20\text{ V}$                                              | 4.8  | 5    | 5.2  | V                    |
| $\Delta V_O$          | Line regulation            | $V_I = 7\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                       |      |      | 100  | mV                   |
|                       |                            | $V_I = 8\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                       |      |      | 50   |                      |
| $\Delta V_O$          | Load regulation            | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                                             |      |      | 100  | mV                   |
|                       |                            | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                                             |      |      | 50   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25\text{ }^\circ\text{C}$                                                                                 |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ to }350\text{ mA}$                                                                                |      |      | 0.5  | mA                   |
|                       |                            | $I_O = 200\text{ mA}$ , $V_I = 8\text{ to }25\text{ V}$                                                          |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                                                              |      | -0.5 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection   | $V_I = 8\text{ to }18\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$ | 62   |      |      | dB                   |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$ , $T_J = 25\text{ }^\circ\text{C}$                                          |      | 40   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage            | $T_J = 25\text{ }^\circ\text{C}$                                                                                 |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current      | $T_J = 25\text{ }^\circ\text{C}$ , $V_I = 35\text{ V}$                                                           |      | 300  |      | mA                   |
| $I_{scp}$             | Short circuit peak current | $T_J = 25\text{ }^\circ\text{C}$                                                                                 |      | 700  |      | mA                   |

Refer to the test circuits,  $T_J = 25\text{ }^\circ\text{C}$ ,  $V_I = 11\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified.

**Table 5. Electrical characteristics of L78M06C**

| Symbol                | Parameter                | Test conditions                                                               | Min. | Typ. | Max. | Unit                 |
|-----------------------|--------------------------|-------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage           |                                                                               | 5.75 | 6    | 6.25 | V                    |
| $V_O$                 | Output voltage           | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 8\text{ to }21\text{ V}$           | 5.7  | 6    | 6.3  | V                    |
| $\Delta V_O$          | Line regulation          | $V_I = 8\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$                       |      |      | 100  | mV                   |
|                       |                          | $V_I = 9\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$                       |      |      | 50   |                      |
| $\Delta V_O$          | Load regulation          | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$          |      |      | 120  | mV                   |
|                       |                          | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$          |      |      | 60   |                      |
| $I_d$                 | Quiescent current        |                                                                               |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change | $I_O = 5\text{ to }350\text{ mA}$                                             |      |      | 0.5  | mA                   |
|                       |                          | $I_O = 200\text{ mA}$ , $V_I = 9\text{ to }25\text{ V}$                       |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift     | $I_O = 5\text{ mA}$ , $T_J = 0\text{ to }125\text{ }^\circ\text{C}$           |      | -0.5 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection | $V_I = 9\text{ to }19\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ | 59   |      |      | dB                   |
| eN                    | Output noise voltage     | $B = 10\text{ Hz to }100\text{ kHz}$                                          |      | 45   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage          |                                                                               |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current    | $V_I = 35\text{ V}$                                                           |      | 270  |      | mA                   |

Refer to the test circuits,  $V_I = 11\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (AC) unless otherwise specified.

**Table 6. Electrical characteristics of L78M06A**

| Symbol                | Parameter                  | Test conditions                                                                                                  | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|------------------------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25\text{ }^\circ\text{C}$                                                                                 | 5.88 | 6    | 6.12 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 8\text{ to }21\text{ V}$                                              | 5.75 | 6    | 6.3  | V                    |
| $DV_O$                | Line regulation            | $V_I = 8\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                       |      |      | 100  | mV                   |
|                       |                            | $V_I = 9\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                       |      |      | 30   |                      |
| $\Delta V_O$          | Load regulation            | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                                             |      |      | 120  | mV                   |
|                       |                            | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                                             |      |      | 60   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25\text{ }^\circ\text{C}$                                                                                 |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ to }350\text{ mA}$                                                                                |      |      | 0.5  | mA                   |
|                       |                            | $I_O = 200\text{ mA}$ , $V_I = 9\text{ to }25\text{ V}$                                                          |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                                                              |      | -0.5 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection   | $V_I = 9\text{ to }19\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$ | 59   |      |      | dB                   |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$                                                                             |      | 45   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage            | $T_J = 25\text{ }^\circ\text{C}$                                                                                 |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current      | $T_J = 25\text{ }^\circ\text{C}$ , $V_I = 35\text{ V}$                                                           |      | 270  |      | mA                   |
| $I_{scp}$             | Short circuit peak current | $T_J = 25\text{ }^\circ\text{C}$                                                                                 |      | 700  |      | mA                   |

Refer to the test circuits,  $T_J = 25\text{ }^\circ\text{C}$ ,  $V_I = 14\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified.

**Table 7. Electrical characteristics of L78M08C**

| Symbol                | Parameter                | Test conditions                                                                    | Min. | Typ. | Max. | Unit                 |
|-----------------------|--------------------------|------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage           |                                                                                    | 7.7  | 8    | 8.3  | V                    |
| $V_O$                 | Output voltage           | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 10.5\text{ to }23\text{ V}$             | 7.6  | 8    | 8.4  | V                    |
| $\Delta V_O$          | Line regulation          | $V_I = 10.5\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$                         |      |      | 100  | mV                   |
|                       |                          | $V_I = 11\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$                           |      |      | 50   |                      |
| $\Delta V_O$          | Load regulation          | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$               |      |      | 160  | mV                   |
|                       |                          | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$               |      |      | 80   |                      |
| $I_d$                 | Quiescent current        |                                                                                    |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change | $I_O = 5\text{ to }350\text{ mA}$                                                  |      |      | 0.5  | mA                   |
|                       |                          | $I_O = 200\text{ mA}$ , $V_I = 10.5\text{ to }25\text{ V}$                         |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift     | $I_O = 5\text{ mA}$ , $T_J = 0\text{ to }125\text{ }^\circ\text{C}$                |      | -0.5 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection | $V_I = 11.5\text{ to }21.5\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ | 56   |      |      | dB                   |
| eN                    | Output noise voltage     | $B = 10\text{ Hz to }100\text{ kHz}$                                               |      | 52   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage          |                                                                                    |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current    | $V_I = 35\text{ V}$                                                                |      | 250  |      | mA                   |

Refer to the test circuits,  $V_I = 14\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (AC) unless otherwise specified.

**Table 8. Electrical characteristics of L78M08A**

| Symbol                | Parameter                  | Test conditions                                                                                                       | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25\text{ }^\circ\text{C}$                                                                                      | 7.84 | 8    | 8.16 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 10.5\text{ to }23\text{ V}$                                                | 7.7  | 8    | 8.3  | V                    |
| $\Delta V_O$          | Line regulation            | $V_I = 10.5\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                         |      |      | 100  | mV                   |
|                       |                            | $V_I = 11\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                           |      |      | 30   |                      |
| $\Delta V_O$          | Load regulation            | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                                                  |      |      | 160  | mV                   |
|                       |                            | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                                                  |      |      | 80   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25\text{ }^\circ\text{C}$                                                                                      |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ to }350\text{ mA}$                                                                                     |      |      | 0.5  | mA                   |
|                       |                            | $I_O = 200\text{ mA}$ , $V_I = 10.5\text{ to }25\text{ V}$                                                            |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                                                                   |      | -0.5 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection   | $V_I = 11.5\text{ to }21.5\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$ | 56   |      |      | dB                   |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$ , $T_J = 25\text{ }^\circ\text{C}$                                               |      | 52   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage            | $T_J = 25\text{ }^\circ\text{C}$                                                                                      |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current      | $T_J = 25\text{ }^\circ\text{C}$ , $V_I = 35\text{ V}$                                                                |      | 250  |      | mA                   |
| $I_{scp}$             | Short circuit peak current | $T_J = 25\text{ }^\circ\text{C}$                                                                                      |      | 700  |      | mA                   |

Refer to the test circuits,  $T_J = 25\text{ }^\circ\text{C}$ ,  $V_I = 15\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified.

**Table 9. Electrical characteristics of L78M09C**

| Symbol                | Parameter                | Test conditions                                                                  | Min. | Typ. | Max. | Unit                 |
|-----------------------|--------------------------|----------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage           |                                                                                  | 8.65 | 9    | 9.35 | V                    |
| $V_O$                 | Output voltage           | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 11.5\text{ to }24\text{ V}$           | 8.55 | 9    | 9.45 | V                    |
| $\Delta V_O$          | Line regulation          | $V_I = 11.5\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$                       |      |      | 100  | mV                   |
|                       |                          | $V_I = 12\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$                         |      |      | 50   |                      |
| $\Delta V_O$          | Load regulation          | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$             |      |      | 180  | mV                   |
|                       |                          | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$             |      |      | 90   |                      |
| $I_d$                 | Quiescent current        |                                                                                  |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change | $I_O = 5\text{ to }350\text{ mA}$                                                |      |      | 0.5  | mA                   |
|                       |                          | $I_O = 200\text{ mA}$ , $V_I = 11.5\text{ to }25\text{ V}$                       |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift     | $I_O = 5\text{ mA}$ , $T_J = 0\text{ to }125\text{ }^\circ\text{C}$              |      | -0.5 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection | $V_I = 12.5\text{ to }23\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ | 56   |      |      | dB                   |
| eN                    | Output noise voltage     | $B = 10\text{ Hz to }100\text{ kHz}$                                             |      | 58   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage          |                                                                                  |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current    | $V_I = 35\text{ V}$                                                              |      | 250  |      | mA                   |

Refer to the test circuits,  $V_I = 15\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (AC) unless otherwise specified.

**Table 10. Electrical characteristics of L78M09A**

| Symbol                | Parameter                  | Test conditions                                                                                                     | Min. | Typ. | Max. | Unit                 |
|-----------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage             | $T_J = 25\text{ }^\circ\text{C}$                                                                                    | 8.82 | 9    | 9.18 | V                    |
| $V_O$                 | Output voltage             | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 11.5\text{ to }24\text{ V}$                                              | 8.64 | 9    | 9.36 | V                    |
| $\Delta V_O$          | Line regulation            | $V_I = 11.5\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                       |      |      | 100  | mV                   |
|                       |                            | $V_I = 12\text{ to }25\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                         |      |      | 30   |                      |
| $\Delta V_O$          | Load regulation            | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                                                |      |      | 180  | mV                   |
|                       |                            | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                                                |      |      | 90   |                      |
| $I_d$                 | Quiescent current          | $T_J = 25\text{ }^\circ\text{C}$                                                                                    |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change   | $I_O = 5\text{ to }350\text{ mA}$                                                                                   |      |      | 0.5  | mA                   |
|                       |                            | $I_O = 200\text{ mA}$ , $V_I = 11.5\text{ to }25\text{ V}$                                                          |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5\text{ mA}$                                                                                                 |      | -0.5 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection   | $V_I = 12.5\text{ to }23\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$ | 56   |      |      | dB                   |
| eN                    | Output noise voltage       | $B = 10\text{ Hz to }100\text{ kHz}$ , $T_J = 25\text{ }^\circ\text{C}$                                             |      | 52   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage            | $T_J = 25\text{ }^\circ\text{C}$                                                                                    |      | 2    |      | V                    |
| $I_{sc}$              | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25\text{ }^\circ\text{C}$                                                              |      | 250  |      | mA                   |
| $I_{scp}$             | Short circuit peak current | $T_J = 25\text{ }^\circ\text{C}$                                                                                    |      | 700  |      | mA                   |

Refer to the test circuits,  $V_I = 16\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^\circ\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^\circ\text{C}$  (AC) unless otherwise specified.

**Table 11. Electrical characteristics of L78M10A**

| Symbol                | Parameter                | Test conditions                                                                                                     | Min. | Typ. | Max. | Unit                 |
|-----------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_O$                 | Output voltage           | $T_J = 25\text{ }^\circ\text{C}$                                                                                    | 9.8  | 10   | 10.2 | V                    |
| $V_O$                 | Output voltage           | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 12.5\text{ to }25\text{ V}$                                              | 9.6  | 10   | 10.4 | V                    |
| $\Delta V_O$          | Line regulation          | $V_I = 12.5\text{ to }30\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                       |      |      | 100  | mV                   |
|                       |                          | $V_I = 13\text{ to }30\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                         |      |      | 30   |                      |
| $\Delta V_O$          | Load regulation          | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                                                |      |      | 200  | mV                   |
|                       |                          | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$                                                |      |      | 100  |                      |
| $I_d$                 | Quiescent current        | $T_J = 25\text{ }^\circ\text{C}$                                                                                    |      |      | 6    | mA                   |
| $\Delta I_d$          | Quiescent current change | $I_O = 5\text{ to }350\text{ mA}$                                                                                   |      |      | 0.5  | mA                   |
|                       |                          | $I_O = 200\text{ mA}$ , $V_I = 12.5\text{ to }30\text{ V}$                                                          |      |      | 0.8  |                      |
| $\Delta V_O/\Delta T$ | Output voltage drift     | $I_O = 5\text{ mA}$                                                                                                 |      | -0.5 |      | mV/ $^\circ\text{C}$ |
| SVR                   | Supply voltage rejection | $V_I = 13.5\text{ to }24\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ , $T_J = 25\text{ }^\circ\text{C}$ | 56   |      |      | dB                   |
| eN                    | Output noise voltage     | $B = 10\text{ Hz to }100\text{ kHz}$ , $T_J = 25\text{ }^\circ\text{C}$                                             |      | 64   |      | $\mu\text{V}$        |
| $V_d$                 | Dropout voltage          | $T_J = 25\text{ }^\circ\text{C}$                                                                                    |      | 2    |      | V                    |

| Symbol    | Parameter                  | Test conditions                                       | Min. | Typ. | Max. | Unit |
|-----------|----------------------------|-------------------------------------------------------|------|------|------|------|
| $I_{sc}$  | Short circuit current      | $V_I = 35\text{ V}, T_J = 25\text{ }^{\circ}\text{C}$ |      | 245  |      | mA   |
| $I_{scp}$ | Short circuit peak current | $T_J = 25\text{ }^{\circ}\text{C}$                    |      | 700  |      | mA   |

Refer to the test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $V_I = 19\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified.

**Table 12. Electrical characteristics of L78M12C**

| Symbol                | Parameter                | Test conditions                                                          | Min. | Typ. | Max. | Unit                   |
|-----------------------|--------------------------|--------------------------------------------------------------------------|------|------|------|------------------------|
| $V_O$                 | Output voltage           |                                                                          | 11.5 | 12   | 12.5 | V                      |
| $V_O$                 | Output voltage           | $I_O = 5\text{ to }350\text{ mA}, V_I = 14.5\text{ to }27\text{ V}$      | 11.4 | 12   | 12.6 | V                      |
| $\Delta V_O$          | Line regulation          | $V_I = 14.5\text{ to }30\text{ V}, I_O = 200\text{ mA}$                  |      |      | 100  | mV                     |
|                       |                          | $V_I = 16\text{ to }30\text{ V}, I_O = 200\text{ mA}$                    |      |      | 50   |                        |
| $\Delta V_O$          | Load regulation          | $I_O = 5\text{ to }500\text{ mA}, T_J = 25\text{ }^{\circ}\text{C}$      |      |      | 240  | mV                     |
|                       |                          | $I_O = 5\text{ to }200\text{ mA}, T_J = 25\text{ }^{\circ}\text{C}$      |      |      | 120  |                        |
| $I_d$                 | Quiescent current        |                                                                          |      |      | 6    | mA                     |
| $\Delta I_d$          | Quiescent current change | $I_O = 5\text{ to }350\text{ mA}$                                        |      |      | 0.5  | mA                     |
|                       |                          | $I_O = 200\text{ mA}, V_I = 14.5\text{ to }30\text{ V}$                  |      |      | 0.8  |                        |
| $\Delta V_O/\Delta T$ | Output voltage drift     | $I_O = 5\text{ mA}, T_J = 0\text{ to }125\text{ }^{\circ}\text{C}$       |      | -1   |      | mV/ $^{\circ}\text{C}$ |
| SVR                   | Supply voltage rejection | $V_I = 15\text{ to }25\text{ V}, f = 120\text{ Hz}, I_O = 300\text{ mA}$ | 55   |      |      | dB                     |
| eN                    | Output noise voltage     | $B = 10\text{ Hz to }100\text{ kHz}$                                     |      | 75   |      | $\mu\text{V}$          |
| $V_d$                 | Dropout voltage          |                                                                          |      | 2    |      | V                      |
| $I_{sc}$              | Short circuit current    | $V_I = 35\text{ V}$                                                      |      | 240  |      | mA                     |

Refer to the test circuits,  $V_I = 19\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^{\circ}\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^{\circ}\text{C}$  (AC) unless otherwise specified.

**Table 13. Electrical characteristics of L78M12A**

| Symbol                | Parameter                | Test conditions                                                                                            | Min.  | Typ. | Max.  | Unit                   |
|-----------------------|--------------------------|------------------------------------------------------------------------------------------------------------|-------|------|-------|------------------------|
| $V_O$                 | Output voltage           | $T_J = 25\text{ }^{\circ}\text{C}$                                                                         | 11.75 | 12   | 12.25 | V                      |
| $V_O$                 | Output voltage           | $I_O = 5\text{ to }350\text{ mA}, V_I = 14.5\text{ to }27\text{ V}$                                        | 11.5  | 12   | 12.5  | V                      |
| $\Delta V_O$          | Line regulation          | $V_I = 14.5\text{ to }30\text{ V}, I_O = 200\text{ mA}, T_J = 25\text{ }^{\circ}\text{C}$                  |       |      | 100   | mV                     |
|                       |                          | $V_I = 16\text{ to }30\text{ V}, I_O = 200\text{ mA}, T_J = 25\text{ }^{\circ}\text{C}$                    |       |      | 30    |                        |
| $\Delta V_O$          | Load regulation          | $I_O = 5\text{ to }500\text{ mA}, T_J = 25\text{ }^{\circ}\text{C}$                                        |       |      | 240   | mV                     |
|                       |                          | $I_O = 5\text{ to }200\text{ mA}, T_J = 25\text{ }^{\circ}\text{C}$                                        |       |      | 120   |                        |
| $I_d$                 | Quiescent current        | $T_J = 25\text{ }^{\circ}\text{C}$                                                                         |       |      | 6     | mA                     |
| $\Delta I_d$          | Quiescent current change | $I_O = 5\text{ to }350\text{ mA}$                                                                          |       |      | 0.5   | mA                     |
|                       |                          | $I_O = 200\text{ mA}, V_I = 14.5\text{ to }30\text{ V}$                                                    |       |      | 0.8   |                        |
| $\Delta V_O/\Delta T$ | Output voltage drift     | $I_O = 5\text{ mA}$                                                                                        |       | -1   |       | mV/ $^{\circ}\text{C}$ |
| SVR                   | Supply voltage rejection | $V_I = 15\text{ to }25\text{ V}, f = 120\text{ Hz}, I_O = 300\text{ mA}, T_J = 25\text{ }^{\circ}\text{C}$ | 55    |      |       | dB                     |

| Symbol    | Parameter                  | Test conditions                                          | Min. | Typ. | Max. | Unit          |
|-----------|----------------------------|----------------------------------------------------------|------|------|------|---------------|
| eN        | Output noise voltage       | B = 10 Hz to 100 kHz, $T_J = 25\text{ }^{\circ}\text{C}$ |      | 75   |      | $\mu\text{V}$ |
| $V_d$     | Dropout voltage            | $T_J = 25\text{ }^{\circ}\text{C}$                       |      | 2    |      | V             |
| $I_{sc}$  | Short circuit current      | $V_I = 35\text{ V}$ , $T_J = 25\text{ }^{\circ}\text{C}$ |      | 240  |      | mA            |
| $I_{scp}$ | Short circuit peak current | $T_J = 25\text{ }^{\circ}\text{C}$                       |      | 700  |      | mA            |

Refer to the test circuits,  $T_J = 25\text{ }^{\circ}\text{C}$ ,  $V_I = 23\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$  unless otherwise specified.

**Table 14. Electrical characteristics of L78M15C**

| Symbol                | Parameter                | Test conditions                                                                    | Min.  | Typ. | Max.  | Unit                   |
|-----------------------|--------------------------|------------------------------------------------------------------------------------|-------|------|-------|------------------------|
| $V_O$                 | Output voltage           |                                                                                    | 14.4  | 15   | 15.6  | V                      |
| $V_O$                 | Output voltage           | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 17.5\text{ to }30\text{ V}$             | 14.25 | 15   | 15.75 | V                      |
| $\Delta V_O$          | Line regulation          | $V_I = 17.5\text{ to }30\text{ V}$ , $I_O = 200\text{ mA}$                         |       |      | 100   | mV                     |
|                       |                          | $V_I = 20\text{ to }30\text{ V}$ , $I_O = 200\text{ mA}$                           |       |      | 50    |                        |
| $\Delta V_O$          | Load regulation          | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$             |       |      | 300   | mV                     |
|                       |                          | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$             |       |      | 150   |                        |
| $I_d$                 | Quiescent current        |                                                                                    |       |      | 6     | mA                     |
| $\Delta I_d$          | Quiescent current change | $I_O = 5\text{ to }350\text{ mA}$                                                  |       |      | 0.5   | mA                     |
|                       |                          | $I_O = 200\text{ mA}$ , $V_I = 17.5\text{ to }30\text{ V}$                         |       |      | 0.8   |                        |
| $\Delta V_O/\Delta T$ | Output voltage drift     | $I_O = 5\text{ mA}$ , $T_J = 0\text{ to }125\text{ }^{\circ}\text{C}$              |       | -1   |       | mV/ $^{\circ}\text{C}$ |
| SVR                   | Supply voltage rejection | $V_I = 18.5\text{ to }28.5\text{ V}$ , $f = 120\text{ Hz}$ , $I_O = 300\text{ mA}$ | 54    |      |       | dB                     |
| eN                    | Output noise voltage     | B = 10 Hz to 100 kHz                                                               |       | 90   |       | $\mu\text{V}$          |
| $V_d$                 | Dropout voltage          |                                                                                    |       | 2    |       | V                      |
| $I_{sc}$              | Short circuit current    | $V_I = 35\text{ V}$                                                                |       | 240  |       | mA                     |

Refer to the test circuits,  $V_I = 23\text{ V}$ ,  $I_O = 350\text{ mA}$ ,  $C_I = 0.33\text{ }\mu\text{F}$ ,  $C_O = 0.1\text{ }\mu\text{F}$ ,  $T_J = -40\text{ to }125\text{ }^{\circ}\text{C}$  (AB),  $T_J = 0\text{ to }125\text{ }^{\circ}\text{C}$  (AC) unless otherwise specified.

**Table 15. Electrical characteristics of L78M15A**

| Symbol       | Parameter                | Test conditions                                                                                 | Min. | Typ. | Max. | Unit |
|--------------|--------------------------|-------------------------------------------------------------------------------------------------|------|------|------|------|
| $V_O$        | Output voltage           | $T_J = 25\text{ }^{\circ}\text{C}$                                                              | 14.7 | 15   | 15.3 | V    |
| $V_O$        | Output voltage           | $I_O = 5\text{ to }350\text{ mA}$ , $V_I = 17.5\text{ to }30\text{ V}$                          | 14.4 | 15   | 15.6 | V    |
| $\Delta V_O$ | Line regulation          | $V_I = 17.5\text{ to }30\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$ |      |      | 100  | mV   |
|              |                          | $V_I = 20\text{ to }30\text{ V}$ , $I_O = 200\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$   |      |      | 30   |      |
| $\Delta V_O$ | Load regulation          | $I_O = 5\text{ to }500\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                          |      |      | 300  | mV   |
|              |                          | $I_O = 5\text{ to }200\text{ mA}$ , $T_J = 25\text{ }^{\circ}\text{C}$                          |      |      | 150  |      |
| $I_d$        | Quiescent current        | $T_J = 25\text{ }^{\circ}\text{C}$                                                              |      |      | 6    | mA   |
| $\Delta I_d$ | Quiescent current change | $I_O = 5\text{ to }350\text{ mA}$                                                               |      |      | 0.5  | mA   |
|              |                          | $I_O = 200\text{ mA}$ , $V_I = 17.5\text{ to }30\text{ V}$                                      |      |      | 0.8  |      |

| Symbol                | Parameter                  | Test conditions                                                                                                    | Min. | Typ. | Max. | Unit          |
|-----------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5 \text{ mA}$                                                                                               |      | -1   |      | mV/°C         |
| SVR                   | Supply voltage rejection   | $V_I = 18.5 \text{ to } 28.5 \text{ V}$ , $f = 120 \text{ Hz}$ , $I_O = 300 \text{ mA}$ , $T_J = 25^\circ\text{C}$ | 54   |      |      | dB            |
| eN                    | Output noise voltage       | $B = 10 \text{ Hz to } 100 \text{ kHz}$ , $T_J = 25^\circ\text{C}$                                                 |      | 90   |      | $\mu\text{V}$ |
| $V_d$                 | Dropout voltage            | $T_J = 25^\circ\text{C}$                                                                                           |      | 2    |      | V             |
| $I_{sc}$              | Short circuit current      | $V_I = 35 \text{ V}$ , $T_J = 25^\circ\text{C}$                                                                    |      | 240  |      | mA            |
| $I_{scp}$             | Short circuit peak current | $T_J = 25^\circ\text{C}$                                                                                           |      | 700  |      | mA            |

Refer to the test circuits,  $T_J = 25^\circ\text{C}$ ,  $V_I = 33 \text{ V}$ ,  $I_O = 350 \text{ mA}$ ,  $C_I = 0.33 \mu\text{F}$ ,  $C_O = 0.1 \mu\text{F}$  unless otherwise specified.

**Table 16. Electrical characteristics of L78M24C**

| Symbol                | Parameter                | Test conditions                                                                     | Min. | Typ. | Max. | Unit          |
|-----------------------|--------------------------|-------------------------------------------------------------------------------------|------|------|------|---------------|
| $V_O$                 | Output voltage           |                                                                                     | 23   | 24   | 25   | V             |
| $V_O$                 | Output voltage           | $I_O = 5 \text{ to } 350 \text{ mA}$ , $V_I = 27 \text{ to } 38 \text{ V}$          | 22.8 | 24   | 25.2 | V             |
| $\Delta V_O$          | Line regulation          | $V_I = 27 \text{ to } 38 \text{ V}$ , $I_O = 200 \text{ mA}$                        |      |      | 100  | mV            |
|                       |                          | $V_I = 28 \text{ to } 38 \text{ V}$ , $I_O = 200 \text{ mA}$                        |      |      | 50   |               |
| $\Delta V_O$          | Load regulation          | $I_O = 5 \text{ to } 500 \text{ mA}$ , $T_J = 25^\circ\text{C}$                     |      |      | 480  | mV            |
|                       |                          | $I_O = 5 \text{ to } 200 \text{ mA}$ , $T_J = 25^\circ\text{C}$                     |      |      | 240  |               |
| $I_d$                 | Quiescent current        |                                                                                     |      |      | 6    | mA            |
| $\Delta I_d$          | Quiescent current change | $I_O = 5 \text{ to } 350 \text{ mA}$                                                |      |      | 0.5  | mA            |
|                       |                          | $I_O = 200 \text{ mA}$ , $V_I = 27 \text{ to } 38 \text{ V}$                        |      |      | 0.8  |               |
| $\Delta V_O/\Delta T$ | Output voltage drift     | $I_O = 5 \text{ mA}$ , $T_J = 0 \text{ to } 125^\circ\text{C}$                      |      | -1.2 |      | mV/°C         |
| SVR                   | Supply voltage rejection | $V_I = 28 \text{ to } 38 \text{ V}$ , $f = 120 \text{ Hz}$ , $I_O = 300 \text{ mA}$ | 50   |      |      | dB            |
| eN                    | Output noise voltage     | $B = 10 \text{ Hz to } 100 \text{ kHz}$                                             |      | 170  |      | $\mu\text{V}$ |
| $V_d$                 | Dropout voltage          |                                                                                     |      | 2    |      | V             |
| $I_{sc}$              | Short circuit current    | $V_I = 35 \text{ V}$                                                                |      | 240  |      | mA            |

Refer to the test circuits,  $V_I = 33 \text{ V}$ ,  $I_O = 350 \text{ mA}$ ,  $C_I = 0.33 \mu\text{F}$ ,  $C_O = 0.1 \mu\text{F}$ ,  $T_J = -40 \text{ to } 125^\circ\text{C}$  (AB),  $T_J = 0 \text{ to } 125^\circ\text{C}$  (AC) unless otherwise specified.

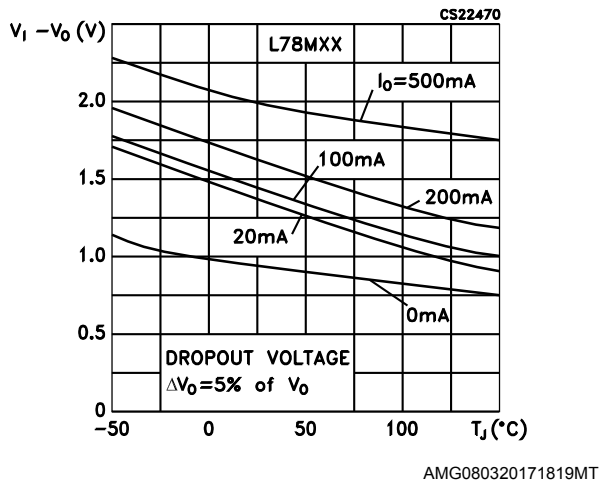
**Table 17. Electrical characteristics of L78M24A**

| Symbol       | Parameter         | Test conditions                                                                         | Min. | Typ. | Max. | Unit |
|--------------|-------------------|-----------------------------------------------------------------------------------------|------|------|------|------|
| $V_O$        | Output voltage    | $T_J = 25^\circ\text{C}$                                                                | 23.5 | 24   | 24.5 | V    |
| $V_O$        | Output voltage    | $I_O = 5 \text{ to } 350 \text{ mA}$ , $V_I = 27 \text{ to } 38 \text{ V}$              | 23   | 24   | 25   | V    |
| $\Delta V_O$ | Line regulation   | $V_I = 27 \text{ to } 38 \text{ V}$ , $I_O = 200 \text{ mA}$ , $T_J = 25^\circ\text{C}$ |      |      | 100  | mV   |
|              |                   | $V_I = 28 \text{ to } 38 \text{ V}$ , $I_O = 200 \text{ mA}$ , $T_J = 25^\circ\text{C}$ |      |      | 30   |      |
| $\Delta V_O$ | Load regulation   | $I_O = 5 \text{ to } 500 \text{ mA}$ , $T_J = 25^\circ\text{C}$                         |      |      | 480  | mV   |
|              |                   | $I_O = 5 \text{ to } 200 \text{ mA}$ , $T_J = 25^\circ\text{C}$                         |      |      | 240  |      |
| $I_d$        | Quiescent current | $T_J = 25^\circ\text{C}$                                                                |      |      | 6    | mA   |

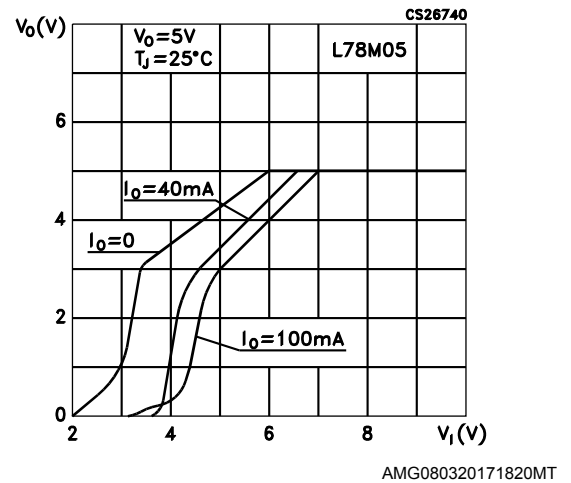
| Symbol                | Parameter                  | Test conditions                                                   | Min. | Typ. | Max. | Unit  |
|-----------------------|----------------------------|-------------------------------------------------------------------|------|------|------|-------|
| $\Delta I_d$          | Quiescent current change   | $I_O = 5$ to $350$ mA                                             |      |      | 0.5  | mA    |
|                       |                            | $I_O = 200$ mA, $V_I = 27$ to $38$ V                              |      |      | 0.8  |       |
| $\Delta V_O/\Delta T$ | Output voltage drift       | $I_O = 5$ mA                                                      |      | -1.2 |      | mV/°C |
| SVR                   | Supply voltage rejection   | $V_I = 28$ to $38$ V, $f = 120$ Hz, $I_O = 300$ mA, $T_J = 25$ °C | 50   |      |      | dB    |
| eN                    | Output noise voltage       | $B = 10$ Hz to $100$ kHz, $T_J = 25$ °C                           |      | 170  |      | μV    |
| $V_d$                 | Dropout voltage            | $T_J = 25$ °C                                                     |      | 2    |      | V     |
| $I_{sc}$              | Short circuit current      | $V_I = 35$ V, $T_J = 25$ °C                                       |      | 240  |      | mA    |
| $I_{scp}$             | Short circuit peak current | $T_J = 25$ °C                                                     |      | 700  |      | mA    |

## 6 Typical performance

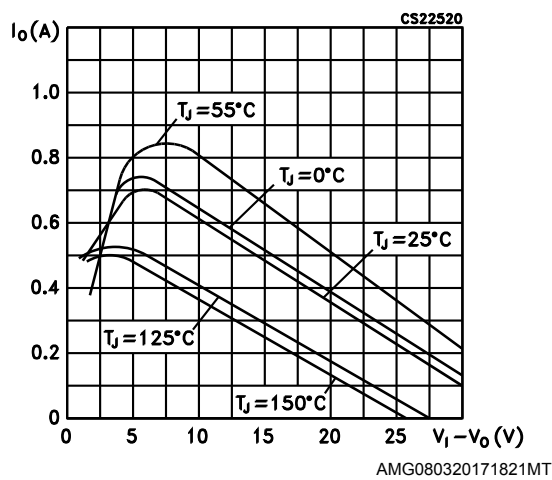
**Figure 8. Dropout voltage vs junction temp.**



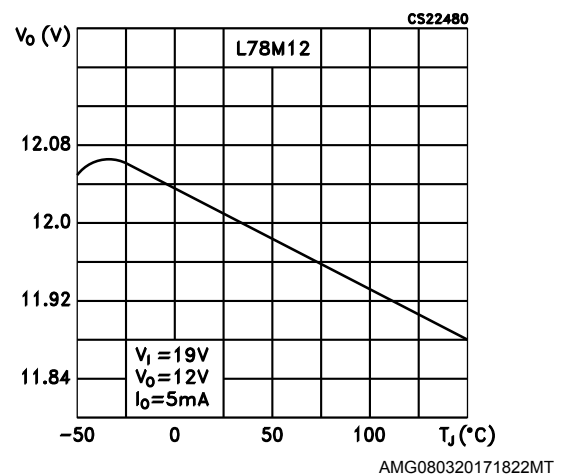
**Figure 9. Dropout characteristics**



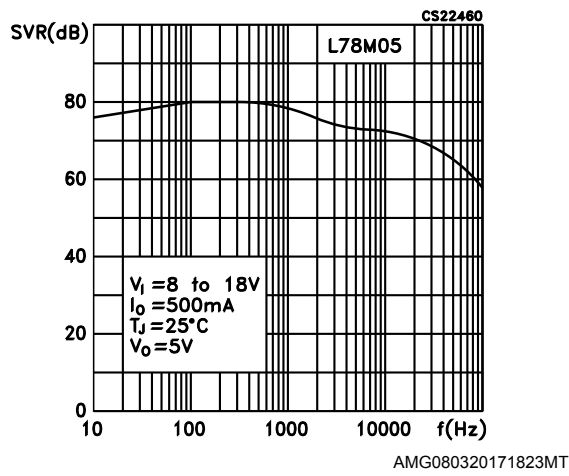
**Figure 10. Peak output current vs input-output differential voltage**



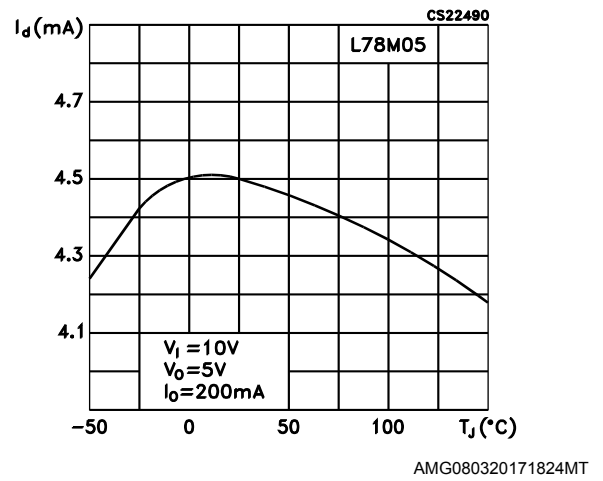
**Figure 11. Output voltage vs junction temperature**



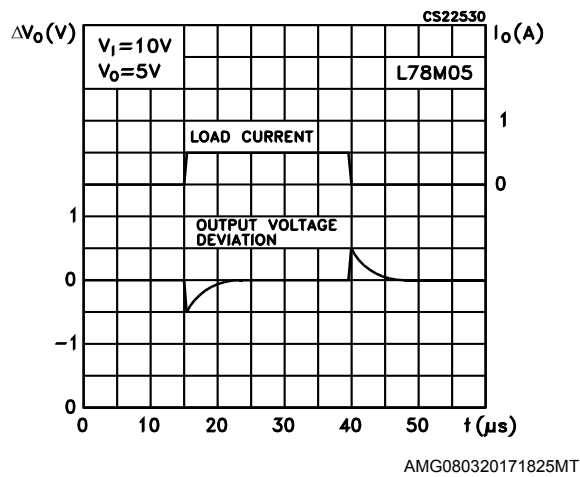
**Figure 12. Supply voltage rejection vs frequency**



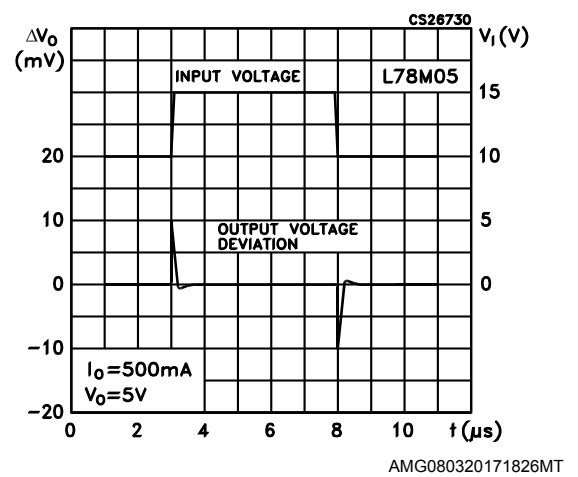
**Figure 13. Quiescent current vs junction temperature**



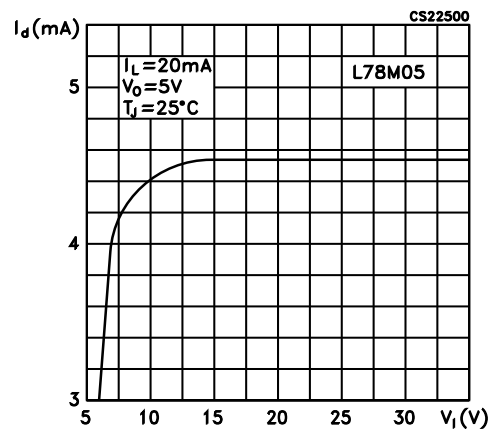
**Figure 14. Load transient response**



**Figure 15. Line transient response**



**Figure 16. Quiescent current vs input voltage**

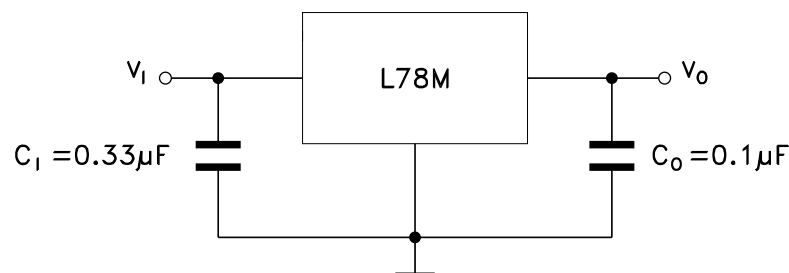


## 7 Applications information

### 7.1 Design considerations

The L78M series of fixed voltage regulators are designed with thermal overload protection that shuts down the circuit when subjected to an excessive power overload condition, internal short-circuit protection that limits the maximum current the circuit will pass, and output transistor safe-area compensation that reduces the output short-circuit as the voltage across the pass transistor is increased. In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long wire lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high-frequency characteristics to insure stable operation under all load conditions. A  $0.33\ \mu\text{F}$  or larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulators input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.

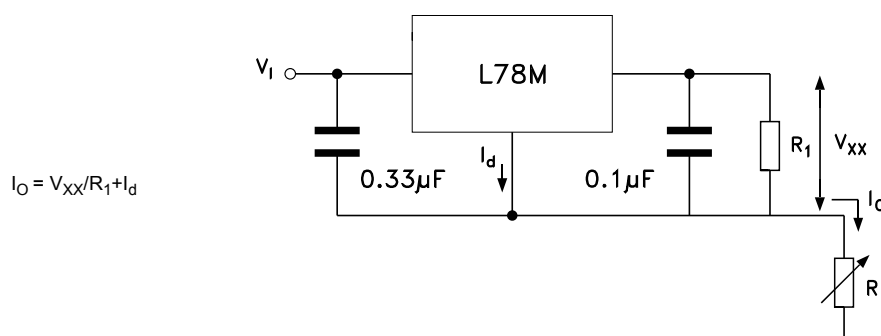
**Figure 17. Fixed output regulator**



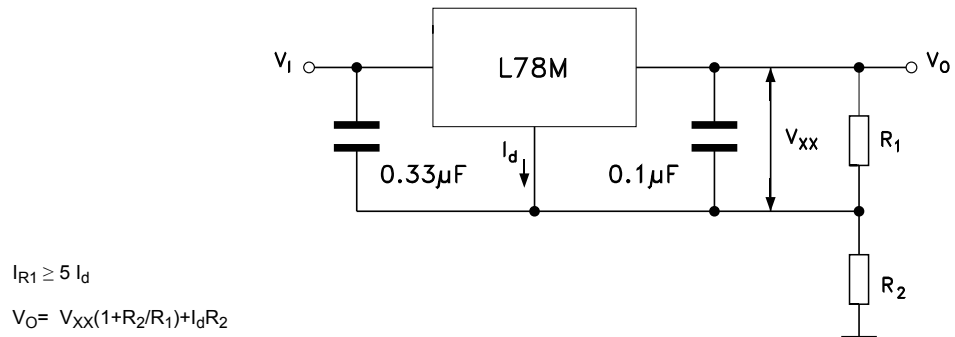
AMG080320171807MT

**Note:** Although no output capacitor is need for stability,  $C_O$  improve transient response if present.  $C_I$  is required if regulator is located an appreciable distance from power supply filter.

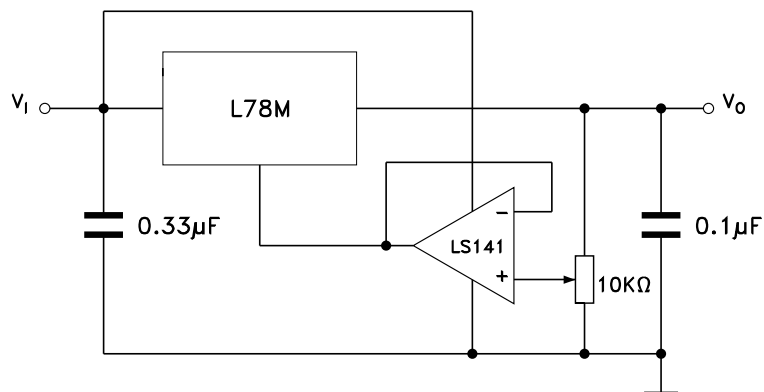
**Figure 18. Constant current regulator**



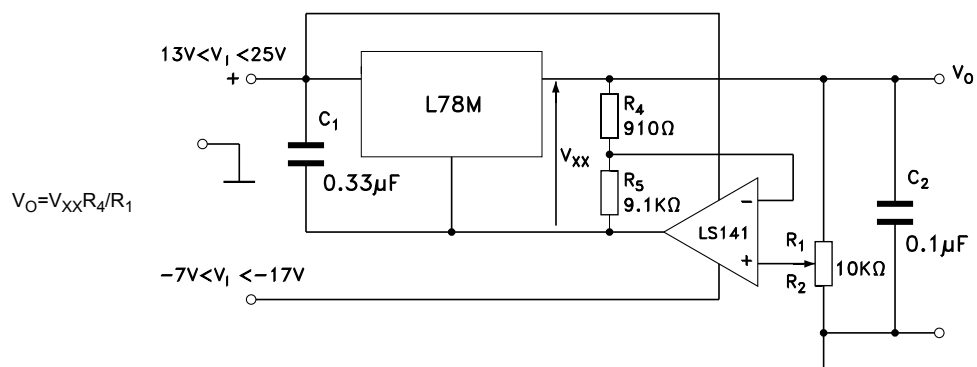
AMG080320171808MT

**Figure 19. Circuit for increasing output voltage**


AMG080320171809MT

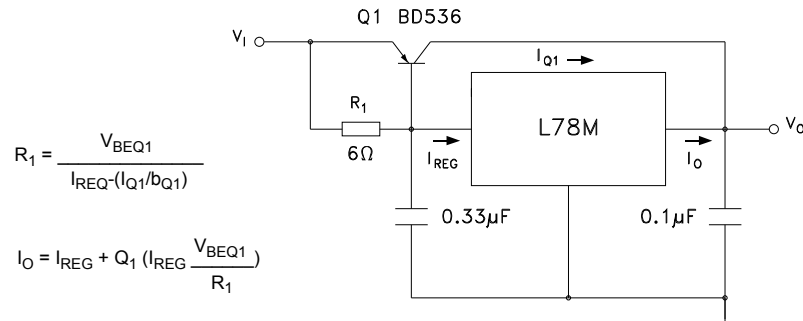
**Figure 20. Adjustable output regulator (7 to 30 V)**


AMG080320171811MT

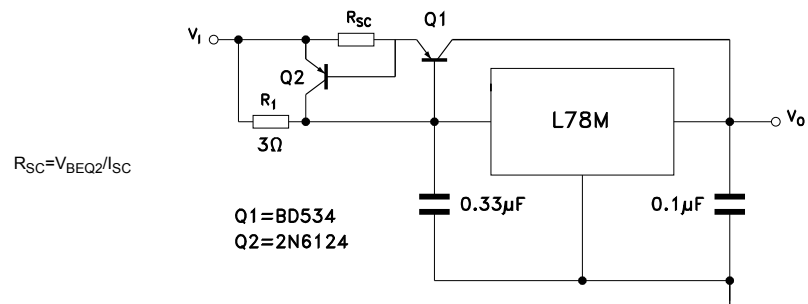
**Figure 21. 0.5 to 10 V regulator**


AMG080320171812MT

**Figure 22. High current voltage regulator**

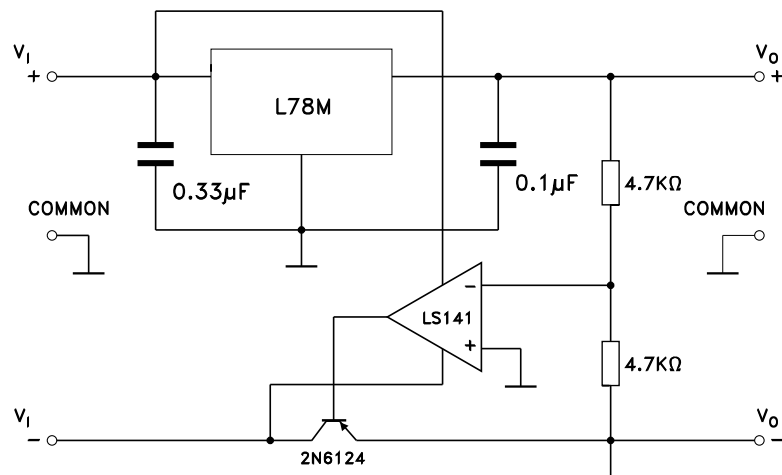


**Figure 23. High output current with short circuit protection**



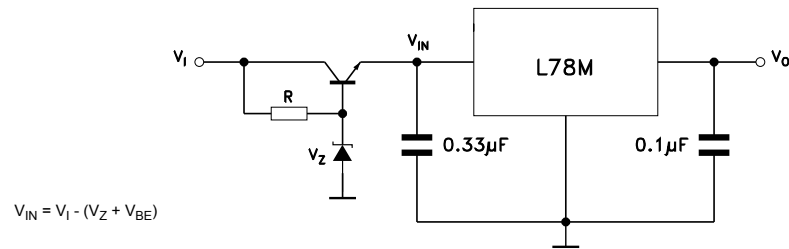
AMG080320171828MT

**Figure 24. Tracking voltage regulator**



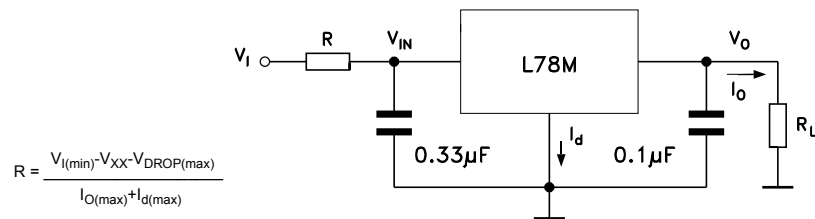
AMG080320171814MT

**Figure 25. High input voltage circuit**



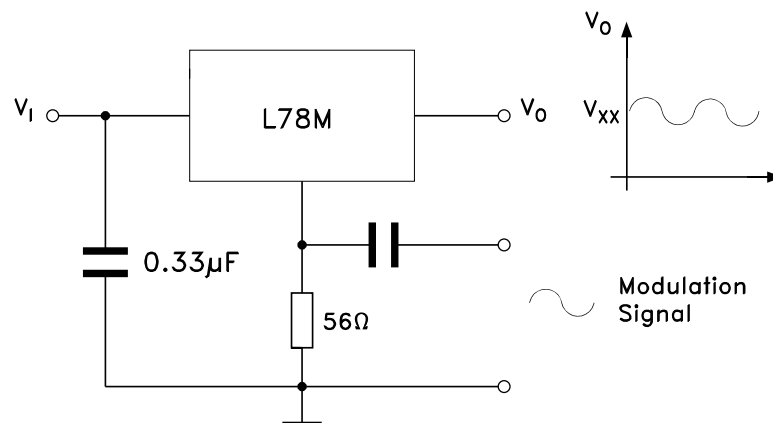
AMG080320171815MT

**Figure 26. Reducing power dissipation with dropping resistor**



AMG080320171816MT

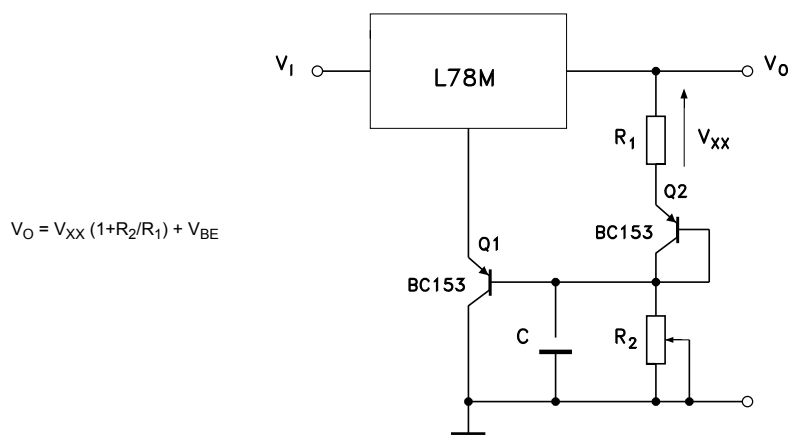
**Figure 27. Power AM modulator (unity voltage gain,  $I_O \leq 0.5$ )**



AMG080320171817MT

*Note:* The circuit performs well up to 100 kHz.

**Figure 28. Adjustable output voltage with temperature compensation**



AMG080320171818MT

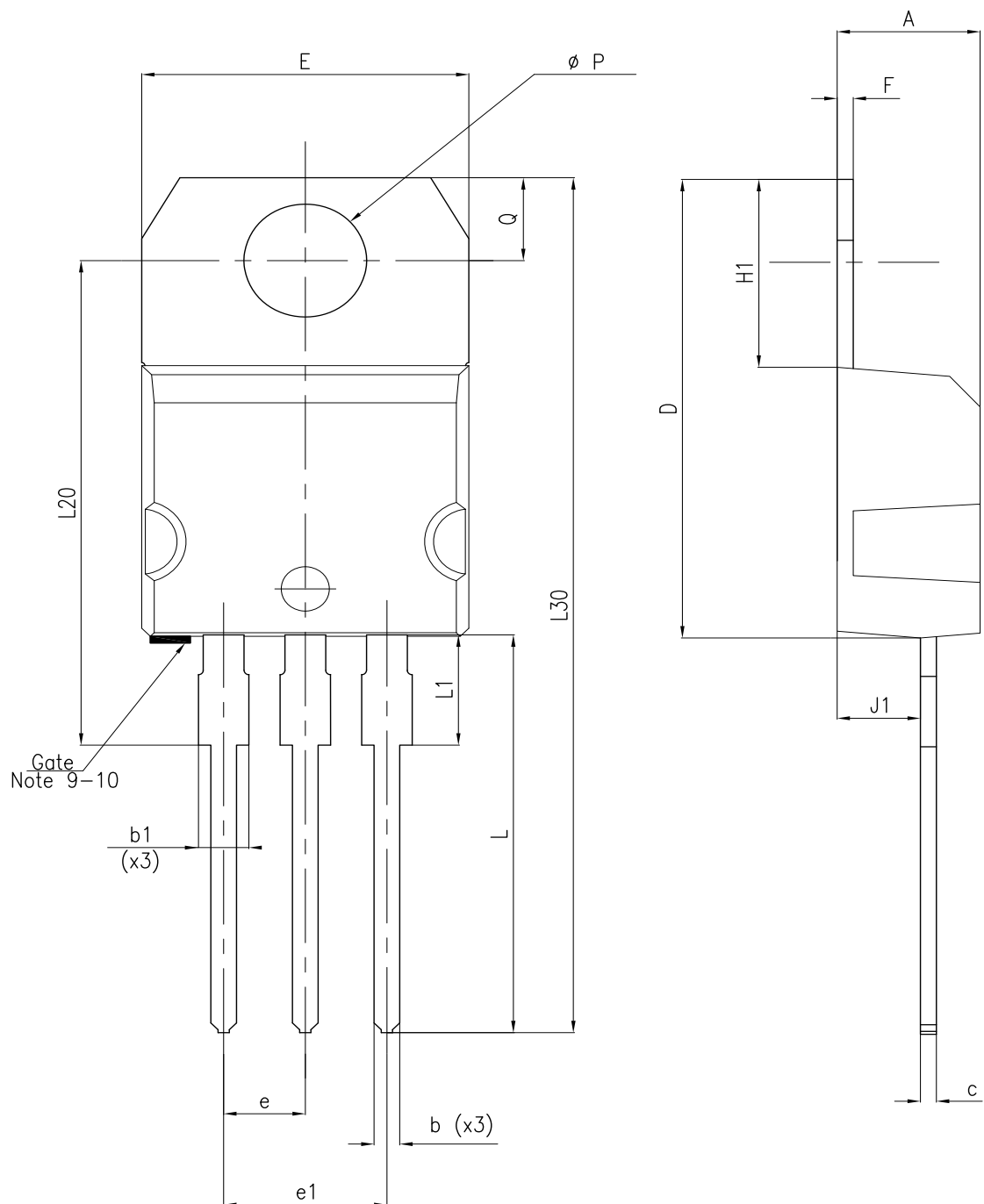
**Note:**  $Q_2$  is connected as a diode in order to compensate the variation of the  $Q_1$   $V_{BE}$  with the temperature.  $C$  allows a slow rise time of the  $V_O$ .

## 8 Package information

In order to meet environmental requirements, ST offers these devices in different grades of **ECOPACK** packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK is an ST trademark.

### 8.1 TO-220 (single gauge) package information

**Figure 29. TO-220 (single gauge) package outline**



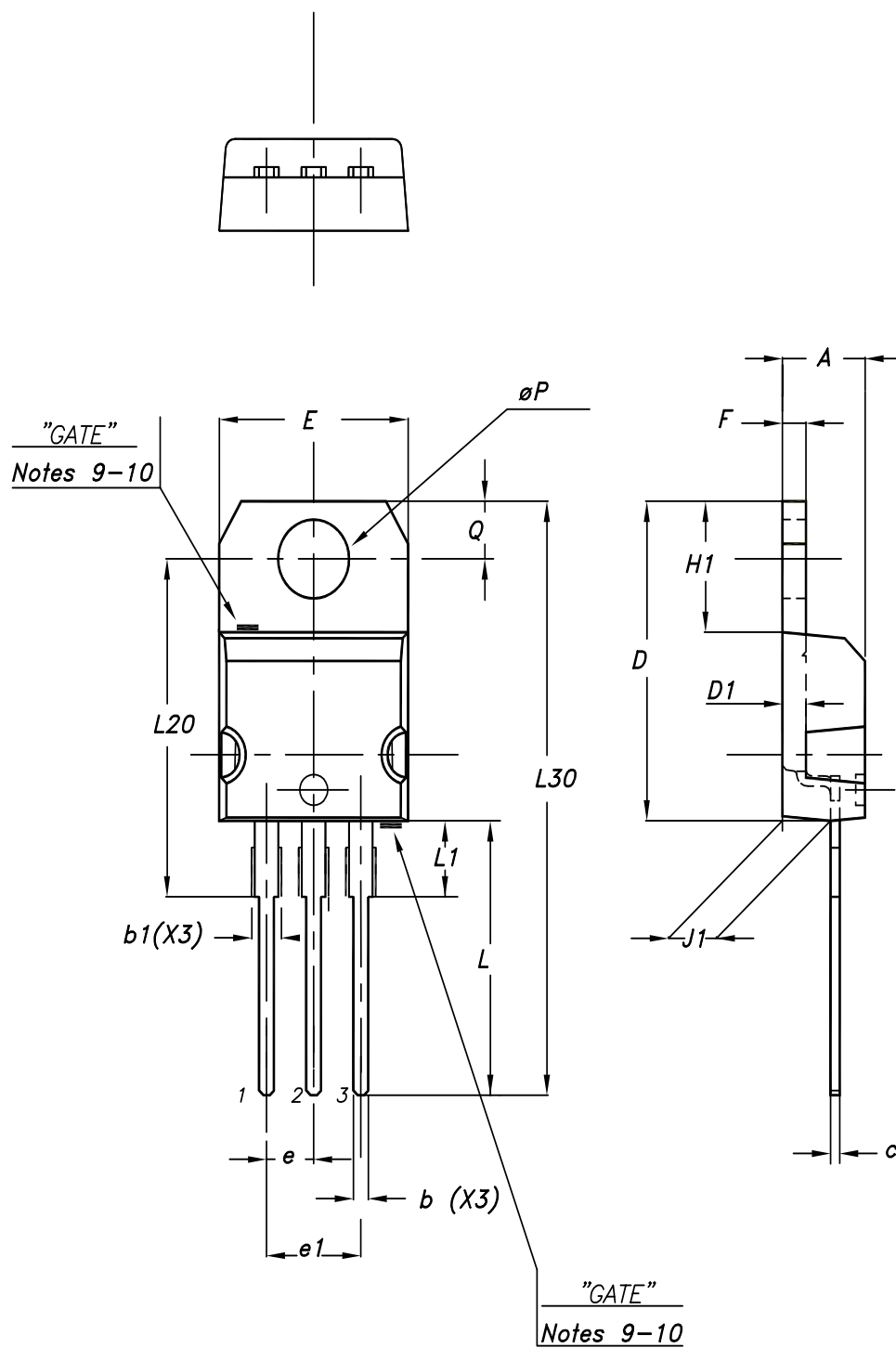
8174627\_5

**Table 18. TO-220 (single gauge) mechanical data**

| Dim. | mm    |       |       |
|------|-------|-------|-------|
|      | Min.  | Typ.  | Max.  |
| A    | 4.40  |       | 4.60  |
| b    | 0.61  |       | 0.88  |
| b1   | 1.14  |       | 1.70  |
| c    | 0.48  |       | 0.70  |
| D    | 15.25 |       | 15.75 |
| E    | 10.00 |       | 10.40 |
| e    | 2.40  |       | 2.70  |
| e1   | 4.95  |       | 5.15  |
| F    | 0.51  |       | 0.60  |
| H1   | 6.20  |       | 6.60  |
| J1   | 2.40  |       | 2.72  |
| L    | 13.00 |       | 14.00 |
| L1   | 3.50  |       | 3.93  |
| L20  |       | 16.40 |       |
| L30  |       | 28.90 |       |
| ØP   | 3.75  |       | 3.85  |
| Q    | 2.65  |       | 2.95  |

## 8.2 TO-220 (dual gauge) package information

Figure 30. TO-220 (dual gauge) package outline



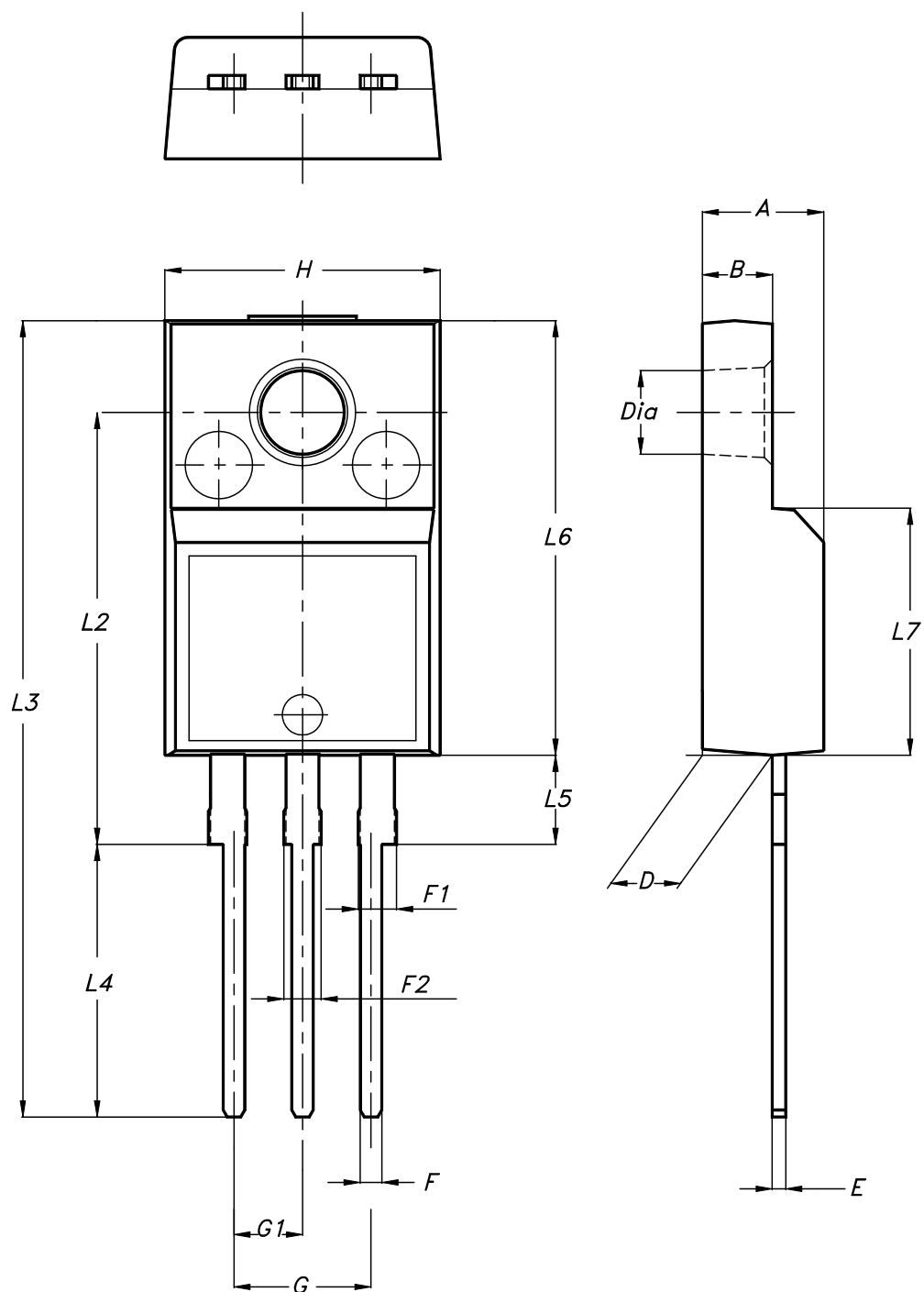
0015988\_21\_Type A

**Table 19. TO-220 (dual gauge) mechanical data**

| Dim. | mm    |       |       |
|------|-------|-------|-------|
|      | Min.  | Typ.  | Max.  |
| A    | 4.40  |       | 4.60  |
| b    | 0.61  |       | 0.88  |
| b1   | 1.14  |       | 1.70  |
| c    | 0.48  |       | 0.70  |
| D    | 15.25 |       | 15.75 |
| D1   |       | 1.27  |       |
| E    | 10    |       | 10.40 |
| e    | 2.40  |       | 2.70  |
| e1   | 4.95  |       | 5.15  |
| F    | 1.23  |       | 1.32  |
| H1   | 6.20  |       | 6.60  |
| J1   | 2.40  |       | 2.72  |
| L    | 13    |       | 14    |
| L1   | 3.50  |       | 3.93  |
| L20  |       | 16.40 |       |
| L30  |       | 28.90 |       |
| ØP   | 3.75  |       | 3.85  |
| Q    | 2.65  |       | 2.95  |

### 8.3 TO-220FP type A package information

Figure 31. TO-220FP package outline



7012510\_type\_A

**Table 20.** TO-220FP package mechanical data

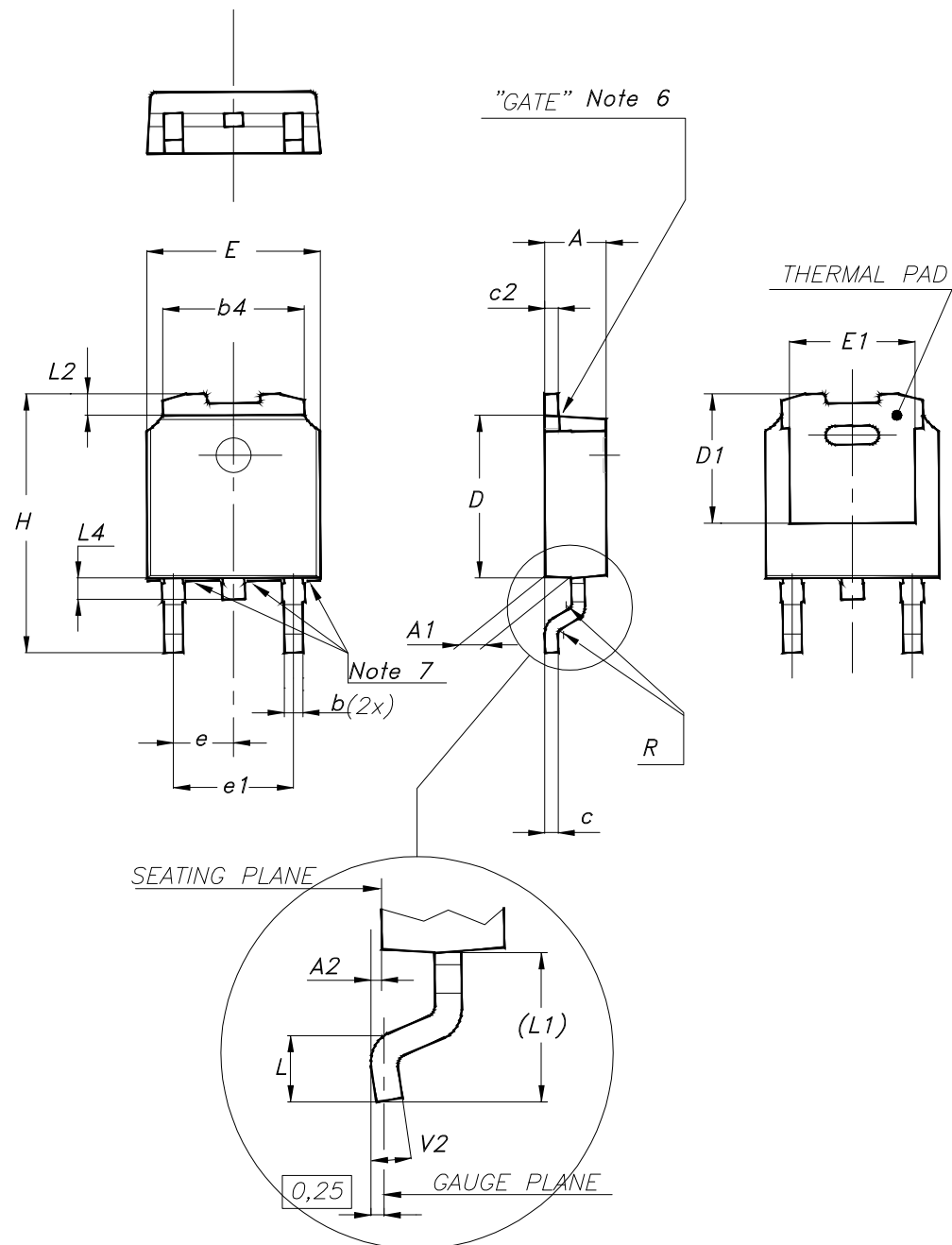
| Dim. | mm   |      |      |
|------|------|------|------|
|      | Min. | Typ. | Max. |
| A    | 4.4  |      | 4.6  |
| B    | 2.5  |      | 2.7  |
| D    | 2.5  |      | 2.75 |
| E    | 0.45 |      | 0.7  |
| F    | 0.75 |      | 1    |
| F1   | 1.15 |      | 1.70 |
| F2   | 1.15 |      | 1.70 |
| G    | 4.95 |      | 5.2  |
| G1   | 2.4  |      | 2.7  |
| H    | 10   |      | 10.4 |
| L2   |      | 16   |      |
| L3   | 28.6 |      | 30.6 |
| L4   | 9.8  |      | 10.6 |
| L5   | 2.9  |      | 3.6  |
| L6   | 15.9 |      | 16.4 |
| L7   | 9    |      | 9.3  |
| Dia  | 3    |      | 3.2  |

## 8.4 DPAK (TO-252) package information

**Table 21. DPAK (TO-252) mechanical data (type A)**

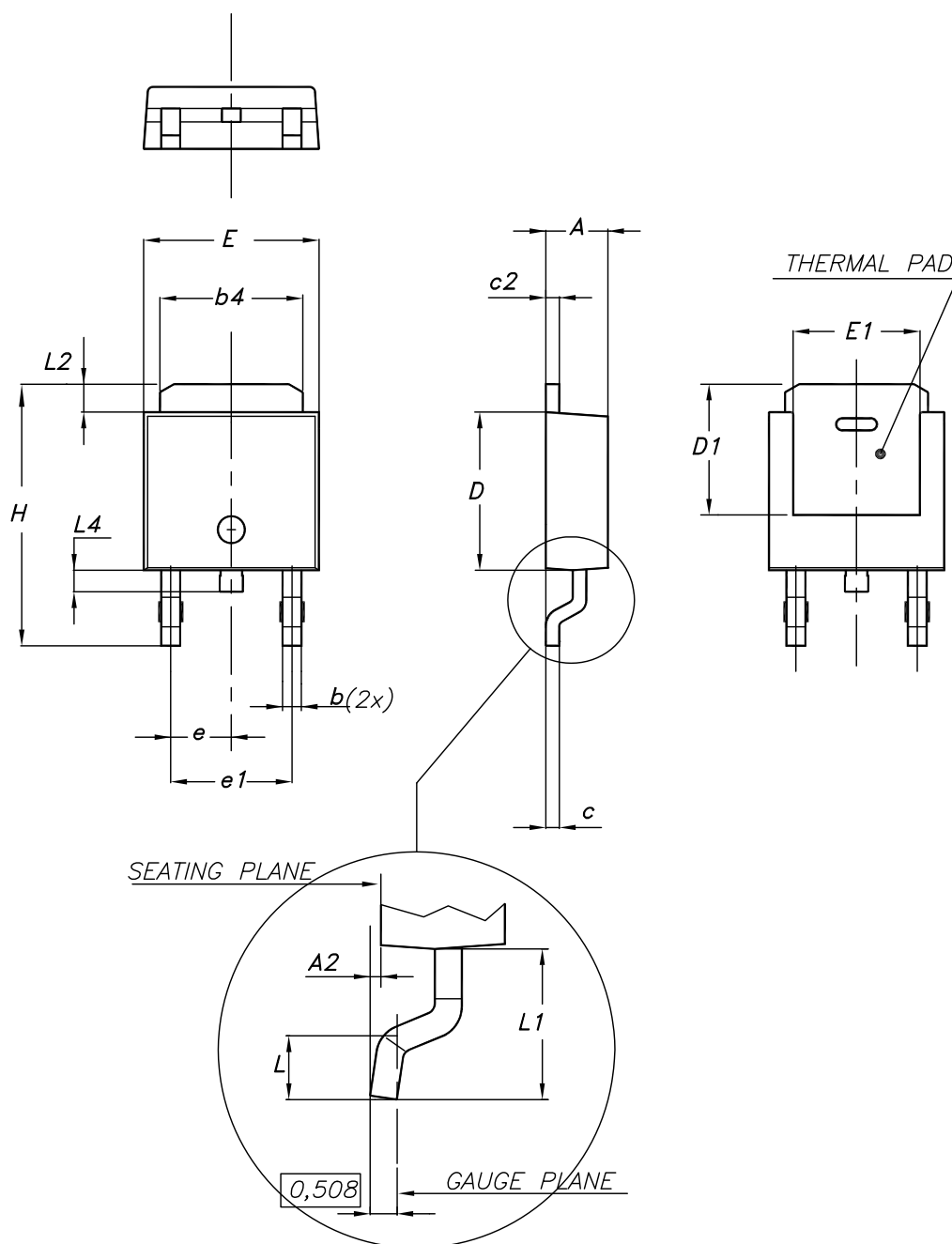
| Dim. | mm    |       |       |
|------|-------|-------|-------|
|      | Min.  | Typ.  | Max.  |
| A    | 2.20  |       | 2.40  |
| A1   | 0.90  |       | 1.10  |
| A2   | 0.03  |       | 0.23  |
| b    | 0.64  |       | 0.90  |
| b4   | 5.20  |       | 5.40  |
| c    | 0.45  |       | 0.60  |
| c2   | 0.48  |       | 0.60  |
| D    | 6.00  |       | 6.20  |
| D1   | 4.95  | 5.10  | 5.25  |
| E    | 6.40  |       | 6.60  |
| E1   | 4.60  | 4.70  | 4.80  |
| e    | 2.159 | 2.286 | 2.143 |
| e1   | 4.445 | 4.572 | 4.699 |
| H    | 9.35  |       | 10.10 |
| L    | 1.00  |       | 1.50  |
| L1   | 2.60  | 2.80  | 1.50  |
| L2   |       |       | 3.00  |
| L4   | 0.60  |       | 1.00  |
| R    |       | 0.20  |       |
| V2   | 0°    |       | 8°    |

**Figure 32. DPAK (TO-252) package outline A**



**Table 22. DPAK(TO-252) mechanical data (type E)**

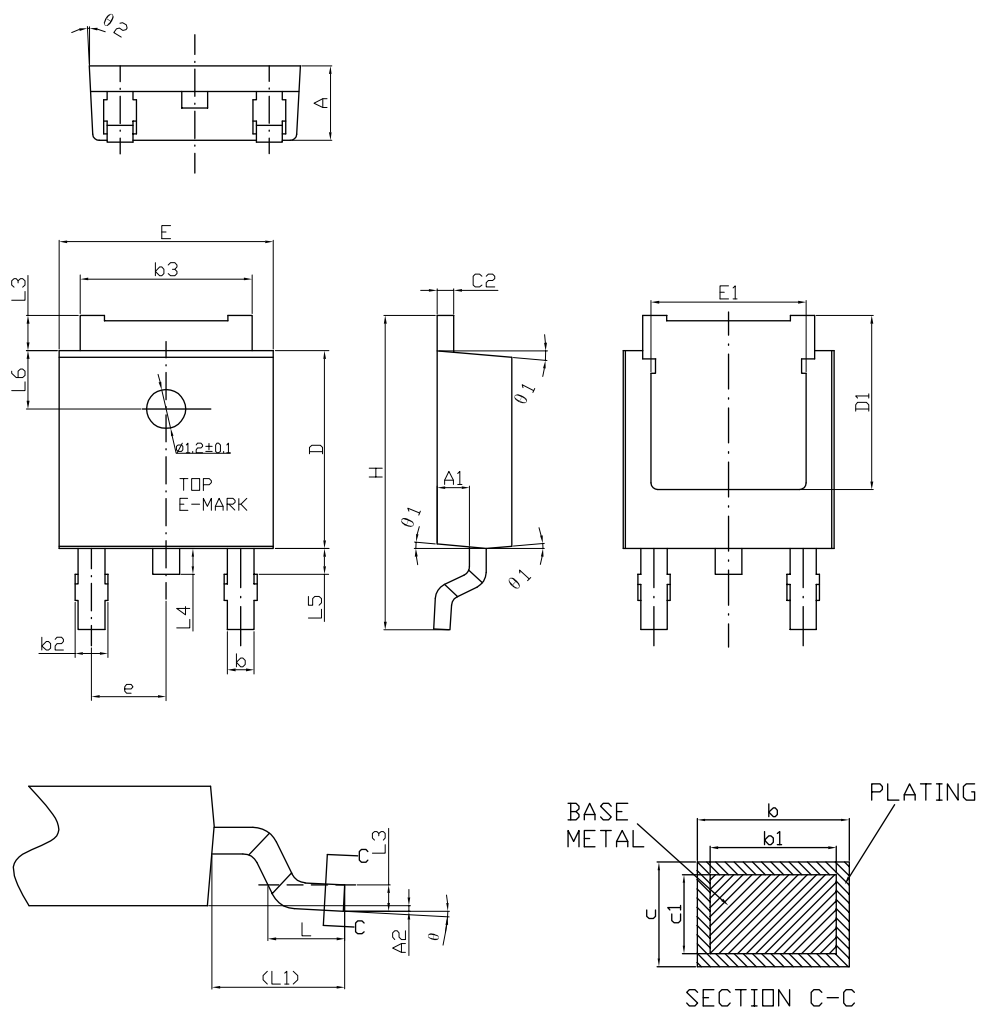
| Dim. | mm   |       |       |
|------|------|-------|-------|
|      | Min. | Typ.  | Max.  |
| A    | 2.18 |       | 2.39  |
| A2   |      |       | 0.13  |
| b    | 0.65 |       | 0.884 |
| b4   | 4.95 |       | 5.46  |
| c    | 0.46 |       | 0.61  |
| c2   | 0.46 |       | 0.60  |
| D    | 5.97 |       | 6.22  |
| D1   | 5.21 |       |       |
| E    | 6.35 |       | 6.73  |
| E1   | 4.32 |       |       |
| e    |      | 2.286 |       |
| e1   |      | 4.572 |       |
| H    | 9.94 |       | 10.34 |
| L    | 1.50 |       | 1.78  |
| L1   |      | 2.74  |       |
| L2   | 0.89 |       | 1.27  |
| L4   |      |       | 1.02  |

**Figure 33. DPAK (TO-252) package outline E**


**Table 23. DPAK (TO-252) mechanical data type I**

| Dim. | mm        |       |       |
|------|-----------|-------|-------|
|      | Min.      | Typ.  | Max.  |
| A    | 2.20      | 2.30  | 2.38  |
| A1   | 0.90      | 1.01  | 1.10  |
| A2   | 0.00      | -     | 0.10  |
| b    | 0.77      | -     | 0.89  |
| b1   | 0.76      | 0.81  | 0.86  |
| b2   | 0.77      | -     | 1.10  |
| b3   | 5.23      | 5.33  | 5.43  |
| c    | 0.47      | -     | 0.60  |
| c1   | 0.46      | 0.51  | 0.56  |
| c2   | 0.47      | -     | 0.60  |
| D    | 6.00      | 6.10  | 6.20  |
| D1   | 5.25      | 5.40  | 5.60  |
| E    | 6.50      | 6.60  | 6.70  |
| E1   | 4.70      | 4.85  | 5.00  |
| e    | 2.286 BSC |       |       |
| H    | 9.80      | 10.10 | 10.40 |
| L    | 1.40      | 1.50  | 1.70  |
| L1   | 2.90 REF  |       |       |
| L2   | 0.90      | -     | 1.25  |
| L3   | 0.51 BSC  |       |       |
| L4   | 0.60      | 0.80  | 1.00  |
| L5   | 0.90      | -     | 1.50  |
| L6   | 1.80 BSC  |       |       |
| Θ    | 0°        | -     | 8°    |
| Θ1   | 3°        | 5°    | 7°    |
| Θ2   | 1°        | 3°    | 5°    |

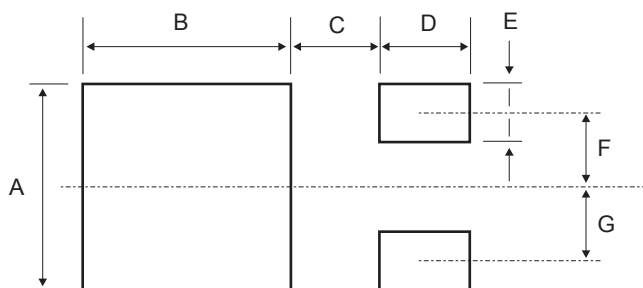
**Figure 34. DPAK (TO-252) package outline I**



### Table 24. DPAK footprint data

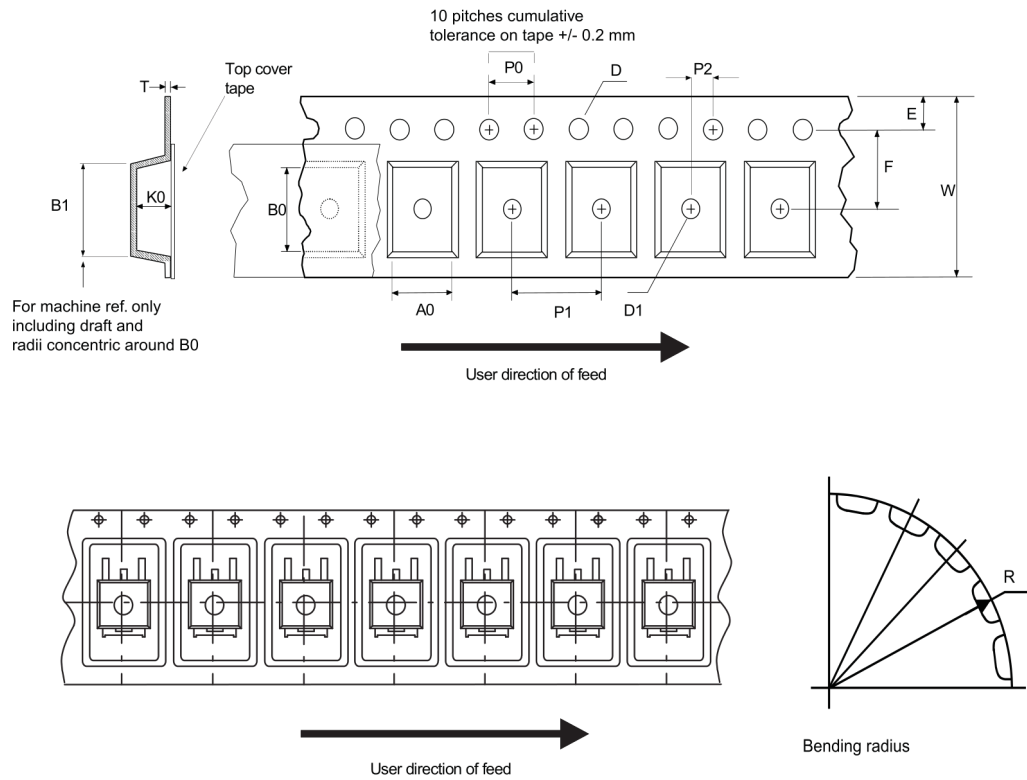
| Values |      |       |
|--------|------|-------|
|        | mm.  | inch. |
| A      | 6.70 | 0.264 |
| B      | 6.70 | 0.64  |
| C      | 1.80 | 0.070 |
| D      | 3.00 | 0.118 |
| E      | 1.60 | 0.063 |
| F      | 2.30 | 0.091 |
| G      | 2.30 | 0.091 |

**Figure 35. DPAK footprint recommended data**



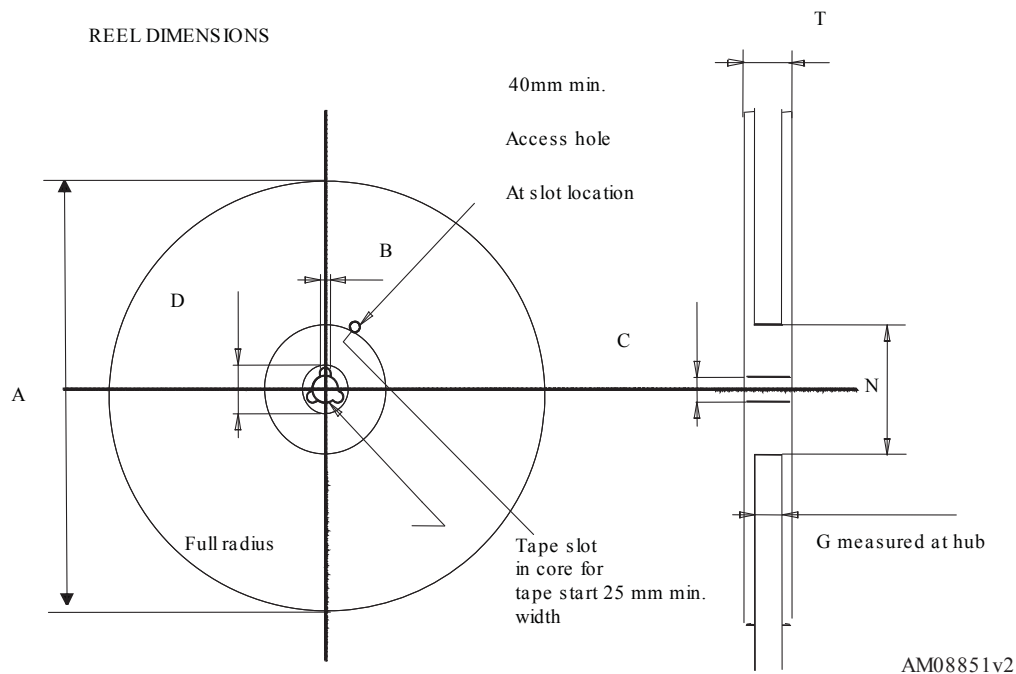
## 8.5 DPAK packing information

**Figure 36. DPAK tape**



AM08852v1

**Figure 37. DPAK reel**

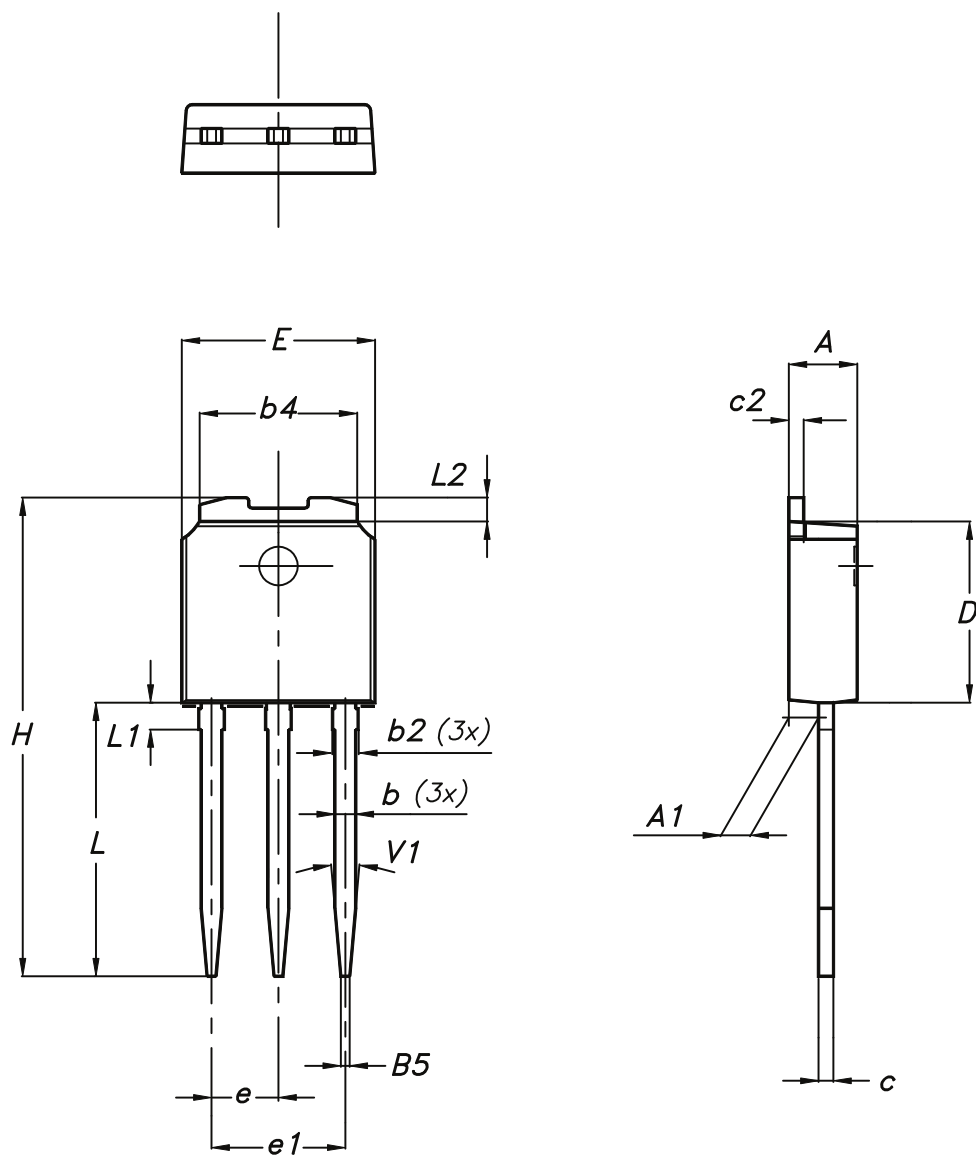


**Table 25. DPAK tape and reel mechanical data**

| Tape |      |      | Reel      |      |      |
|------|------|------|-----------|------|------|
| Dim. | mm   |      | Dim.      | mm   |      |
|      | Min. | Max. |           | Min. | Max. |
| A0   | 6.8  | 7    | A         |      | 330  |
| B0   | 10.4 | 10.6 | B         | 1.5  |      |
| B1   |      | 12.1 | C         | 12.8 | 13.2 |
| D    | 1.5  | 1.6  | D         | 20.2 |      |
| D1   | 1.5  |      | G         | 16.4 | 18.4 |
| E    | 1.65 | 1.85 | N         | 50   |      |
| F    | 7.4  | 7.6  | T         |      | 22.4 |
| K0   | 2.55 | 2.75 |           |      |      |
| P0   | 3.9  | 4.1  | Base qty. |      | 2500 |
| P1   | 7.9  | 8.1  | Bulk qty. |      | 2500 |
| P2   | 1.9  | 2.1  |           |      |      |
| R    | 40   |      |           |      |      |
| T    | 0.25 | 0.35 |           |      |      |
| W    | 15.7 | 16.3 |           |      |      |

## 8.6 IPAK package information

Figure 38. IPAK package outline



0068771\_K

**Table 26. IPAK mechanical data**

| Dim. | mm   |       |      |
|------|------|-------|------|
|      | Min. | Typ.  | Max. |
| A    | 2.20 |       | 2.40 |
| A1   | 0.90 |       | 1.10 |
| b    | 0.64 |       | 0.90 |
| b2   |      |       | 0.95 |
| b4   | 5.20 |       | 5.40 |
| B5   |      | 0.30  |      |
| c    | 0.45 |       | 0.60 |
| c2   | 0.48 |       | 0.60 |
| D    | 6.00 |       | 6.20 |
| E    | 6.40 |       | 6.60 |
| e    |      | 2.28  |      |
| e1   | 4.40 |       | 4.60 |
| H    |      | 16.10 |      |
| L    | 9.00 |       | 9.40 |
| L1   | 0.80 |       | 1.20 |
| L2   |      | 0.80  | 1.00 |
| V1   |      | 10°   |      |

## 9 Ordering information

Table 27. Order code

| Order codes           |                     |          |               |             | Output voltages |
|-----------------------|---------------------|----------|---------------|-------------|-----------------|
| TO-220 (single gauge) | TO-220 (dual gauge) | TO-220FP | DPAK          | IPAK        |                 |
| L78M05ABV             | L78M05ABV-DG        |          | L78M05ABDT-TR |             | 5 V             |
|                       |                     |          | L78M05ACDT-TR |             |                 |
| L78M05CV              | L78M05CV-DG         | L78M05CP | L78M05CDT-TR  | L78M05CDT-1 | 5 V             |
|                       |                     |          | L78M06ABDT-TR |             | 6 V             |
|                       |                     |          | L78M06CDT-TR  |             | 6 V             |
|                       |                     |          | L78M08ABDT-TR |             | 8 V             |
| L78M08CV              | L78M08CV-DG         |          | L78M08CDT-TR  |             | 8 V             |
|                       |                     |          | L78M09ABDT-TR |             | 9 V             |
| L78M09CV              | L78M09CV-DG         |          | L78M09CDT-TR  |             | 9 V             |
|                       |                     |          | L78M10ABDT-TR |             | 10 V            |
|                       |                     |          | L78M12ABDT-TR |             | 12 V            |
|                       |                     |          | L78M12ACDT-TR |             | 12 V            |
| L78M12CV              | L78M12CV-DG         |          | L78M12CDT-TR  |             | 12 V            |
| L78M15ABV             | L78M15ABV-DG        |          | L78M15ABDT-TR |             | 15 V            |
| L78M15CV              | L78M15CV-DG         |          | L78M15CDT-TR  |             | 15 V            |
|                       |                     |          | L78M24ABDT-TR |             | 24 V            |
|                       |                     |          | L78M24ACDT-TR |             | 24 V            |
| L78M24CV              | L78M24CV-DG         |          | L78M24CDT-TR  |             | 24 V            |

## Revision history

**Table 28. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 21-Jun-2004 | 6        | Document updating.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 30-Aug-2006 | 7        | Order codes updated.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 29-Nov-2006 | 8        | DPAK mechanical data updated and add footprint data.                                                                                                                                                                                                                                                                                                                                                                                                 |
| 06-Jun-2007 | 9        | Order codes updated.                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 10-Dec-2007 | 10       | Added Table 25.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 19-Feb-2008 | 11       | Modified: Table 25 on page 44.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 15-Jul-2008 | 12       | Modified: Table 25 on page 44 and Table 26 on page 45.                                                                                                                                                                                                                                                                                                                                                                                               |
| 07-Apr-2009 | 13       | Modified: Figure 9 on page 22 and Figure 15 on page 23.                                                                                                                                                                                                                                                                                                                                                                                              |
| 14-Jun-2010 | 14       | Added: Table 18 on page 26, Figure 29 on page 27, Figure 30 on page 28, Figure 31 and Figure 32 on page 29.                                                                                                                                                                                                                                                                                                                                          |
| 11-Nov-2010 | 15       | Modified: $R_{thJC}$ value for TO-220 Table 2 on page 5.                                                                                                                                                                                                                                                                                                                                                                                             |
| 08-Feb-2012 | 16       | Added: order codes L78M05CV-DG, L78M12CV-DG and L78M15CV-DG Table 25 on page 44.                                                                                                                                                                                                                                                                                                                                                                     |
| 09-Mar-2012 | 17       | Added: order codes L78M08CV-DG and L78M09CV-DG Table 25 on page 44.                                                                                                                                                                                                                                                                                                                                                                                  |
| 15-May-2012 | 18       | Added: order codes L78M24CV-DG Table 25 on page 44.                                                                                                                                                                                                                                                                                                                                                                                                  |
| 19-Apr-2013 | 19       | Removed: Available on request footnote 2 Table 25 on page 44.                                                                                                                                                                                                                                                                                                                                                                                        |
| 04-Jun-2014 | 20       | <p>Part numbers L78MxxAB, L78MxxAC and L78MxxC changed to L78M.</p> <p>Updated the title and the features in cover page.</p> <p>Canceled Table 1. Device summary.</p> <p>Updated Section 3: Maximum ratings, Section 5: Electrical characteristics, Section 6: Typical performance and Section 8: Package mechanical data.</p> <p>Added Section 7: Applications information and Section 9: Packaging mechanical data.</p> <p>Minor text changes.</p> |
| 21-Mar-2017 | 21       | <p>Updated Section 8: "Package information" (DPAK package information changed from type F to type I).</p> <p>Minor text changes.</p>                                                                                                                                                                                                                                                                                                                 |
| 12-Jun-2019 | 22       | Updated Section 8.4 DPAK (TO-252) package information.                                                                                                                                                                                                                                                                                                                                                                                               |
| 26-Nov-2019 | 23       | <p>Added Table 21. DPAK (TO-252) mechanical data (type A), Table 22. DPAK (TO-252) mechanical data (type E) and Table 23. DPAK (TO-252) mechanical data type I</p> <p>Updated Figure 34. DPAK (TO-252) package outline I.</p>                                                                                                                                                                                                                        |

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**Адрес:** 198099, Санкт-Петербург,  
Промышленная ул, дом № 19, литера Н,  
помещение 100-Н Офис 331