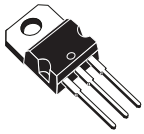
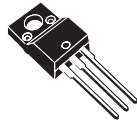


Precision 500 mA regulators



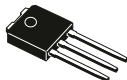
TO-220



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

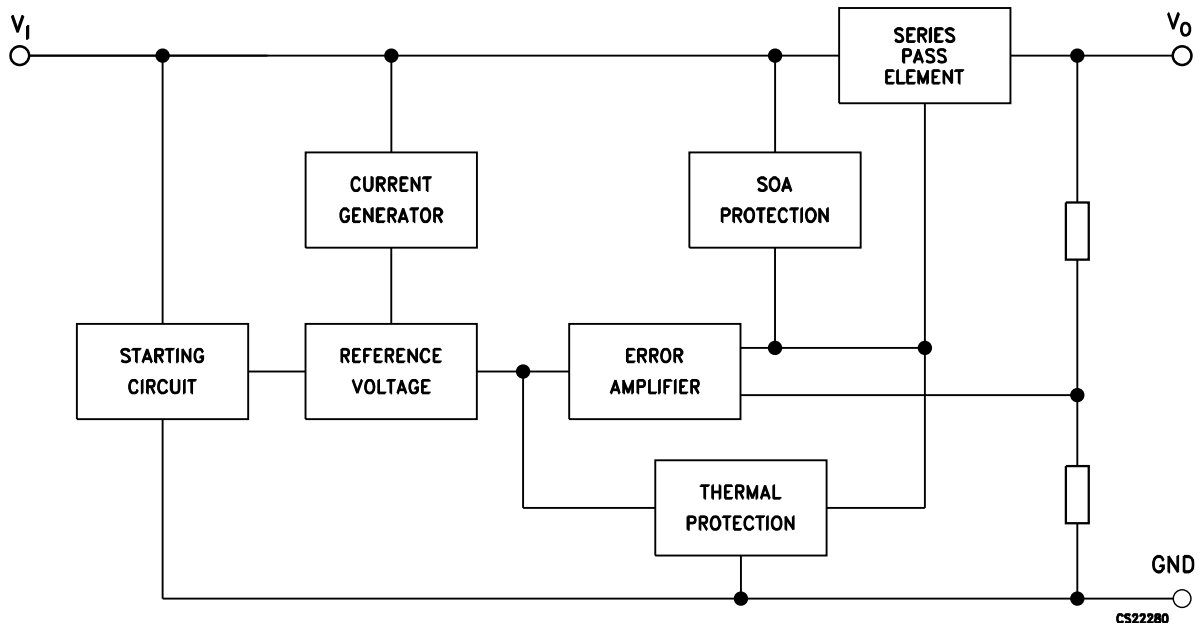
The **L78M** series of three-terminal positive regulators is available in TO-220, TO-220FP, DPAK and IPAK packages and with several fixed output voltages, making it useful in a wide range of applications. These regulators can provide local on-card regulation, eliminating the distribution problems associated 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

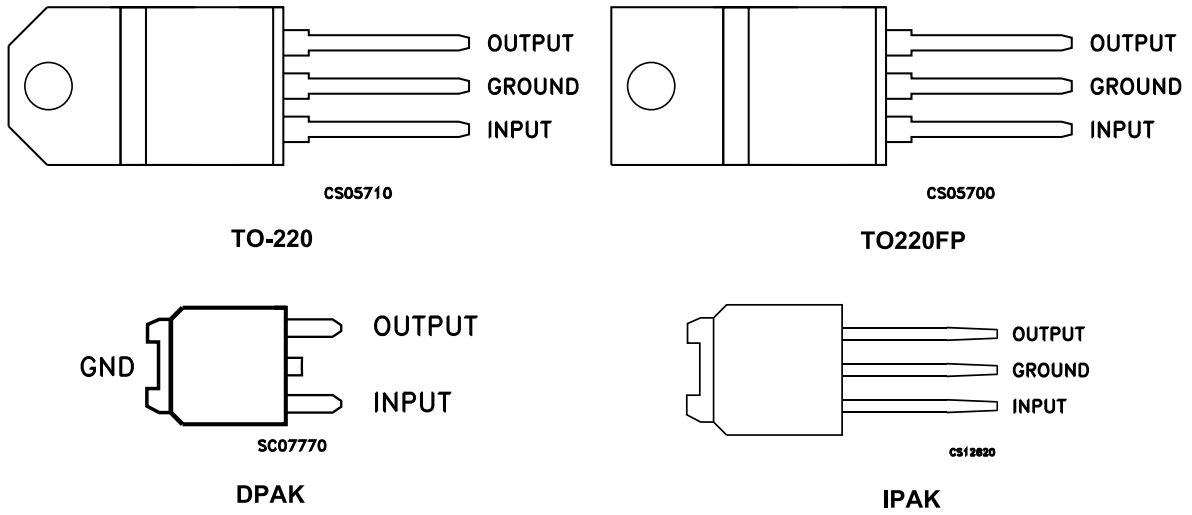
Figure 1. Block diagram



CS22280
AMG080320171800MT

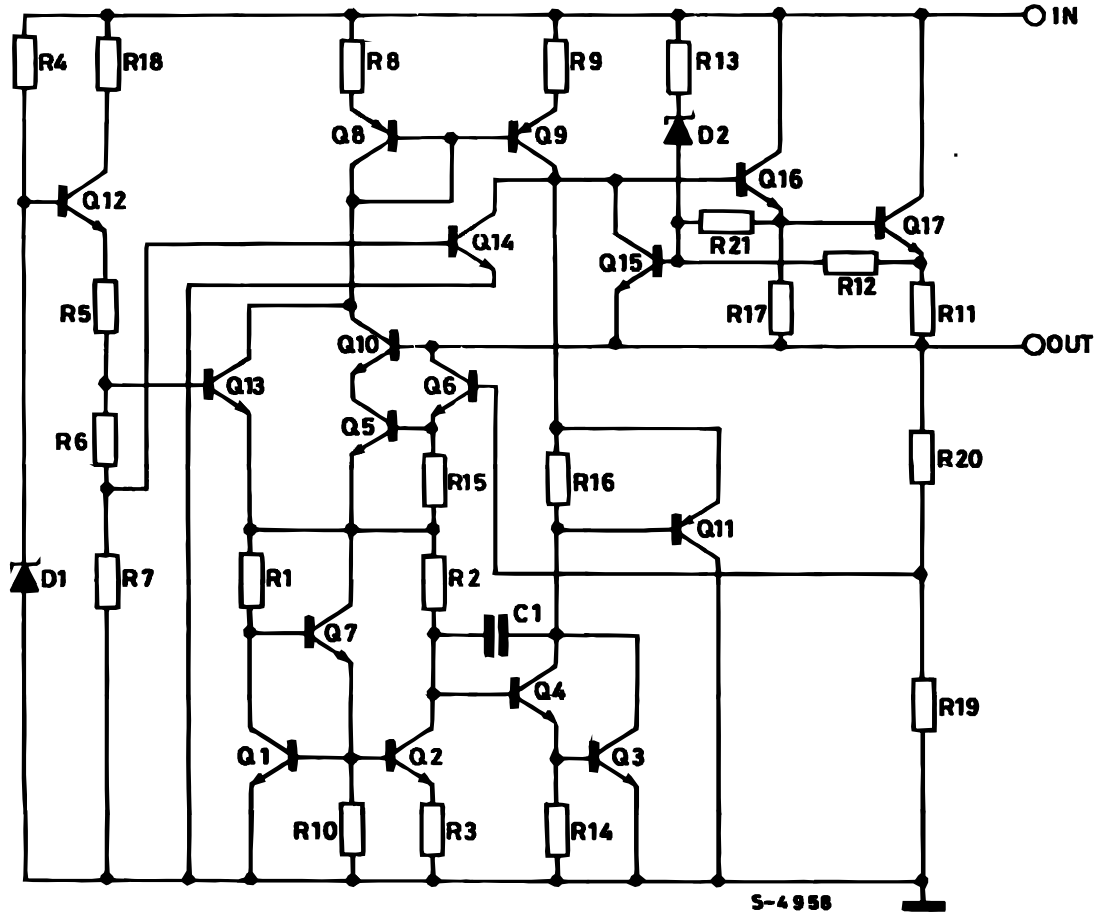
2 Pin configuration

Figure 2. Pin connections (top view)



AMG080320171801MT

Figure 3. Schematic diagram



AMG080320171802MT

3 Maximum ratings

Table 1. Absolute maximum ratings

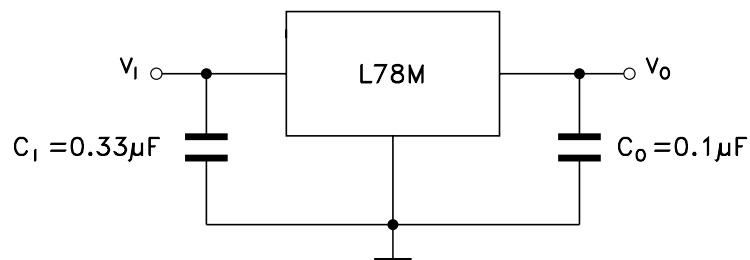
| Symbol | Parameter | Value | Unit |
|-----------|--------------------------------------|-------------------------|------------|
| V_I | DC input voltage | for $V_O = 5$ to 18 V | 35 |
| | | for $V_O = 20, 24$ V | 40 |
| I_O | Output current | Internally limited | mA |
| P_D | Power dissipation | Internally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

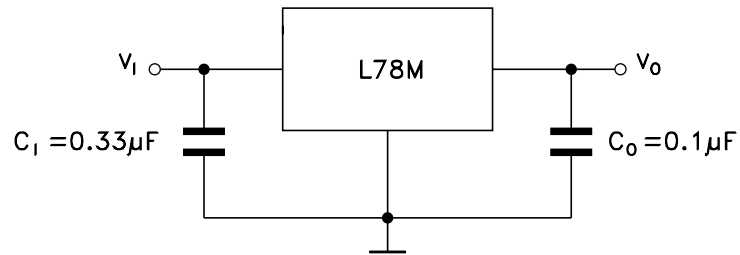
Figure 4. Application circuit



AMG080320171803MT

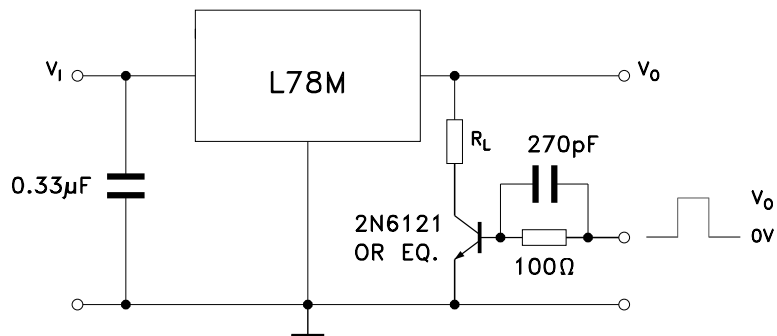
4 Test circuits

Figure 5. DC parameter



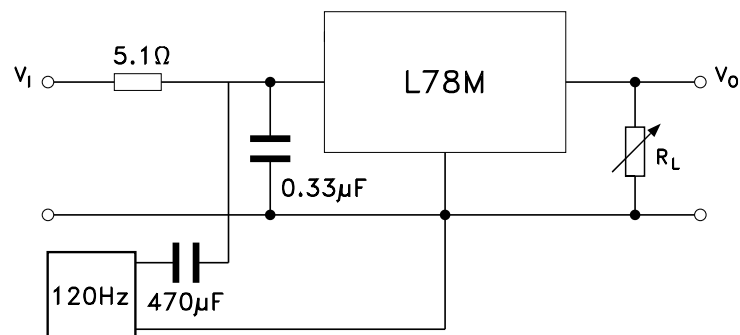
AMG080320171804MT

Figure 6. Load regulation



AMG080320171805MT

Figure 7. Ripple rejection



AMG080320171806MT

5 Electrical characteristics

Refer to the test circuits, $T_J = 25\text{ °C}$, $V_I = 10\text{ V}$, $I_O = 350\text{ mA}$, $C_I = 0.33\text{ }\mu\text{F}$, $C_O = 0.1\text{ }\mu\text{F}$ 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 |
| ΔV_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 | |
| ΔV_O | Load regulation | $I_O = 5\text{ to }500\text{ mA}$, $T_J = 25\text{ °C}$ | | | 100 | mV |
| | | $I_O = 5\text{ to }200\text{ mA}$, $T_J = 25\text{ °C}$ | | | 50 | |
| I_d | Quiescent current | | | | 6 | mA |
| ΔI_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 | $I_O = 5\text{ mA}$, $T_J = 0\text{ to }125\text{ °C}$ | | -0.5 | | mV/°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 | | μV |
| 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 |
| ΔV_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 | |
| ΔV_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 |
| ΔI_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/°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 | | μV |
| 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 |
| ΔV_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 | |
| ΔV_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 |
| ΔI_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/°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 | | μV |
| 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 | |
| ΔV_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 |
| ΔI_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 | | μV |
| 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 |
| ΔV_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 | |
| ΔV_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 |
| ΔI_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 | | μV |
| 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 |
| ΔV_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 | |
| ΔV_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 |
| ΔI_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/°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 | | μV |
| 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 |
| ΔV_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 | |
| ΔV_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 |
| ΔI_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/°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 | | μV |
| 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 |
| ΔV_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 | |
| ΔV_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 |
| ΔI_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 | | μV |
| 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 |
| ΔV_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 | |
| ΔV_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 |
| ΔI_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 | | μV |
| 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 |
| ΔV_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 | |
| ΔV_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 |
| ΔI_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/°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 | | μV |
| 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 |
| ΔV_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 | |
| ΔV_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 |
| ΔI_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/°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 °C | | 75 | | 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 |

Refer to the test circuits, T_J = 25 °C, V_I = 23 V, I_O = 350 mA, C_I = 0.33 μF, C_O = 0.1 μF 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 to 350 mA, V _I = 17.5 to 30 V | 14.25 | 15 | 15.75 | V |
| ΔV _O | Line regulation | V _I = 17.5 to 30 V, I _O = 200 mA | | | 100 | mV |
| | | V _I = 20 to 30 V, I _O = 200 mA | | | 50 | |
| ΔV _O | Load regulation | I _O = 5 to 500 mA, T _J = 25 °C | | | 300 | mV |
| | | I _O = 5 to 200 mA, T _J = 25 °C | | | 150 | |
| I _d | Quiescent current | | | | 6 | mA |
| ΔI _d | Quiescent current change | I _O = 5 to 350 mA | | | 0.5 | mA |
| | | I _O = 200 mA, V _I = 17.5 to 30 V | | | 0.8 | |
| ΔV _O /ΔT | Output voltage drift | I _O = 5 mA, T _J = 0 to 125 °C | | -1 | | mV/°C |
| SVR | Supply voltage rejection | V _I = 18.5 to 28.5 V, f = 120 Hz, I _O = 300 mA | 54 | | | dB |
| eN | Output noise voltage | B = 10 Hz to 100 kHz | | 90 | | μV |
| V _d | Dropout voltage | | | 2 | | V |
| I _{sc} | Short circuit current | V _I = 35 V | | 240 | | mA |

Refer to the test circuits, V_I = 23 V, I_O = 350 mA, C_I = 0.33 μF, C_O = 0.1 μF, T_J = -40 to 125 °C (AB), T_J = 0 to 125 °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 °C | 14.7 | 15 | 15.3 | V |
| V _O | Output voltage | I _O = 5 to 350 mA, V _I = 17.5 to 30 V | 14.4 | 15 | 15.6 | V |
| ΔV _O | Line regulation | V _I = 17.5 to 30 V, I _O = 200 mA, T _J = 25 °C | | | 100 | mV |
| | | V _I = 20 to 30 V, I _O = 200 mA, T _J = 25 °C | | | 30 | |
| ΔV _O | Load regulation | I _O = 5 to 500 mA, T _J = 25 °C | | | 300 | mV |
| | | I _O = 5 to 200 mA, T _J = 25 °C | | | 150 | |
| I _d | Quiescent current | T _J = 25 °C | | | 6 | mA |
| ΔI _d | Quiescent current change | I _O = 5 to 350 mA | | | 0.5 | mA |
| | | I _O = 200 mA, V _I = 17.5 to 30 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 | $V_I = 18.5 \text{ to } 28.5 \text{ V}$, $f = 120 \text{ Hz}$, $I_O = 300 \text{ mA}$, $T_J = 25 \text{ °C}$ | 54 | | | dB |
| eN | Output noise voltage | $B = 10 \text{ Hz to } 100 \text{ kHz}$, $T_J = 25 \text{ °C}$ | | 90 | | μV |
| V_d | Dropout voltage | $T_J = 25 \text{ °C}$ | | 2 | | V |
| I_{sc} | Short circuit current | $V_I = 35 \text{ V}$, $T_J = 25 \text{ °C}$ | | 240 | | mA |
| I_{scp} | Short circuit peak current | $T_J = 25 \text{ °C}$ | | 700 | | mA |

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

Table 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 |
| ΔV_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 | |
| ΔV_O | Load regulation | $I_O = 5 \text{ to } 500 \text{ mA}$, $T_J = 25 \text{ °C}$ | | | 480 | mV |
| | | $I_O = 5 \text{ to } 200 \text{ mA}$, $T_J = 25 \text{ °C}$ | | | 240 | |
| I_d | Quiescent current | | | | 6 | mA |
| ΔI_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 | $I_O = 5 \text{ mA}$, $T_J = 0 \text{ to } 125 \text{ °C}$ | | -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 | | μV |
| V_d | Dropout voltage | | | 2 | | V |
| I_{sc} | Short circuit current | $V_I = 35 \text{ V}$ | | 240 | | mA |

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

Table 17. Electrical characteristics of L78M24A

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

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|-----------------------|----------------------------|-------------------------------------------------------------------|------|------|------|---------|
| ΔI_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 | | μ V |
| 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.

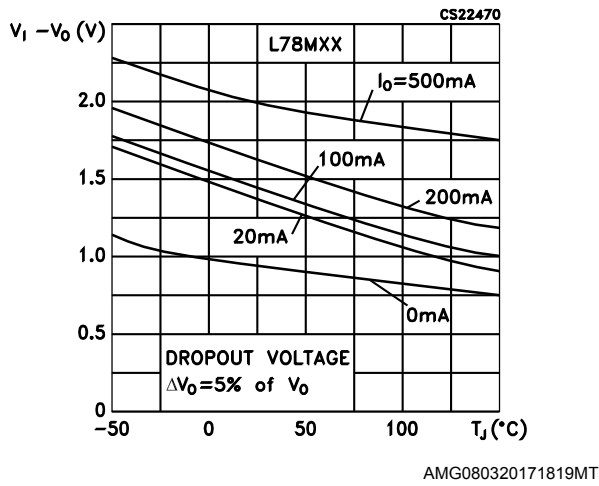


Figure 9. Dropout characteristics

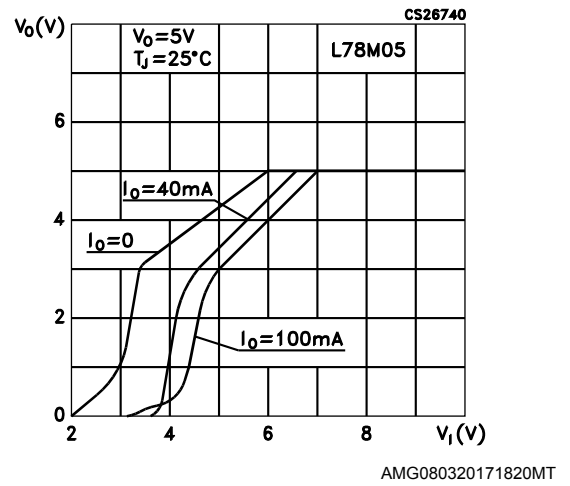


Figure 10. Peak output current vs input-output differential voltage

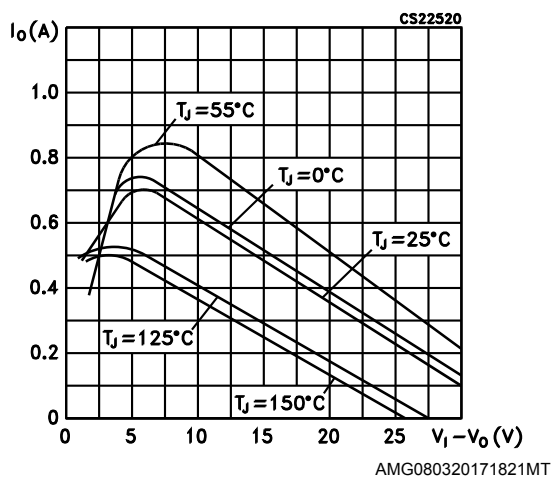


Figure 11. Output voltage vs junction temperature

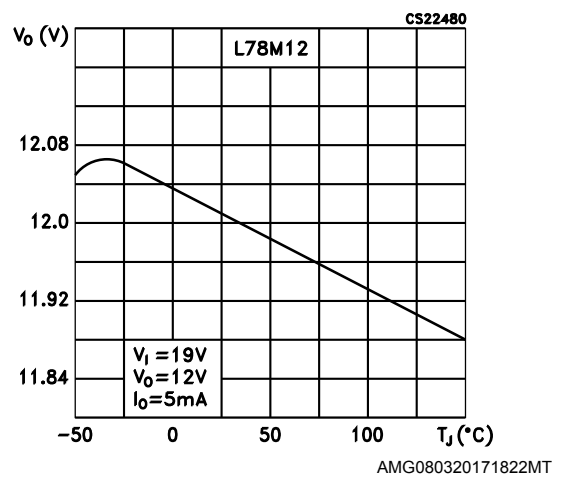


Figure 12. Supply voltage rejection vs frequency

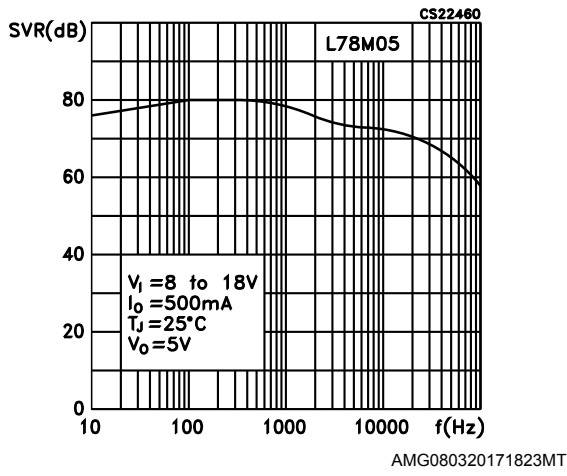


Figure 13. Quiescent current vs junction temperature

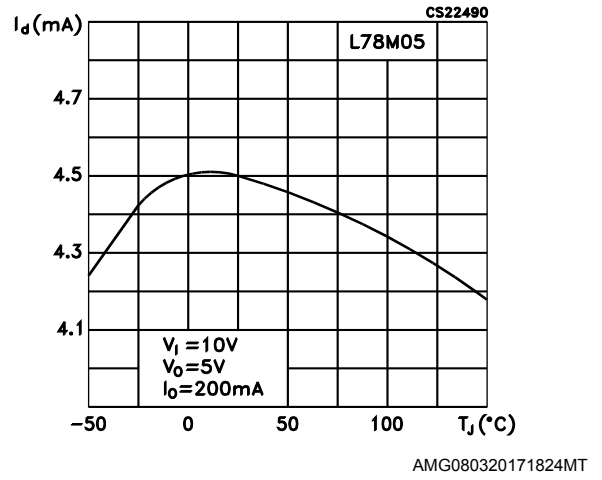


Figure 14. Load transient response

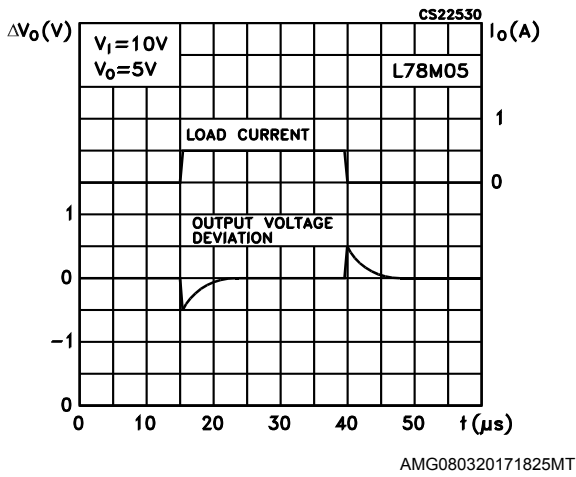


Figure 15. Line transient response

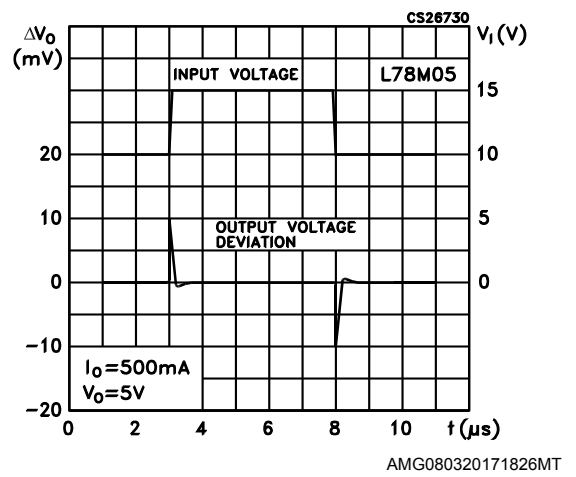
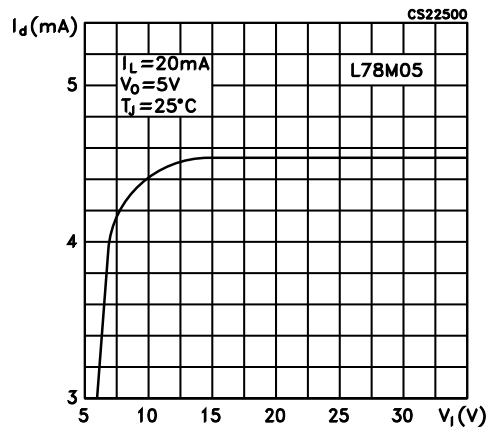


Figure 16. Quiescent current vs input voltage

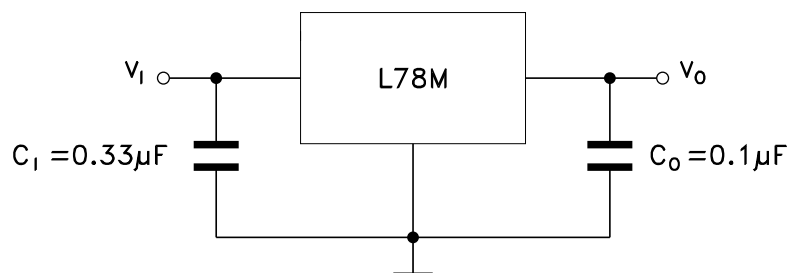


7 Applications information

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 μF 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.

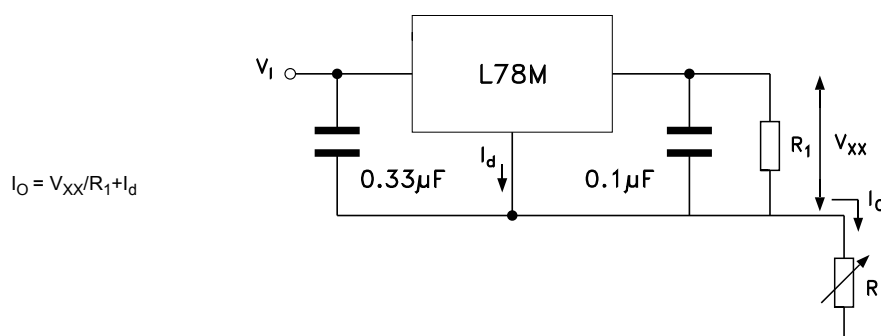
Figure 17. Fixed output regulator



AMG080320171807MT

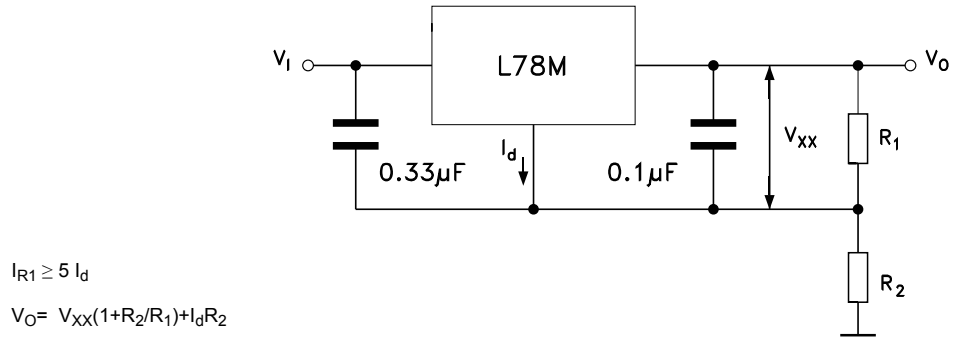
Note: Although no output capacitor is need for stability, C_O improve transient response if present. C_I is required if regulator is located an appreciable distance from power supply filter.

Figure 18. Constant current regulator



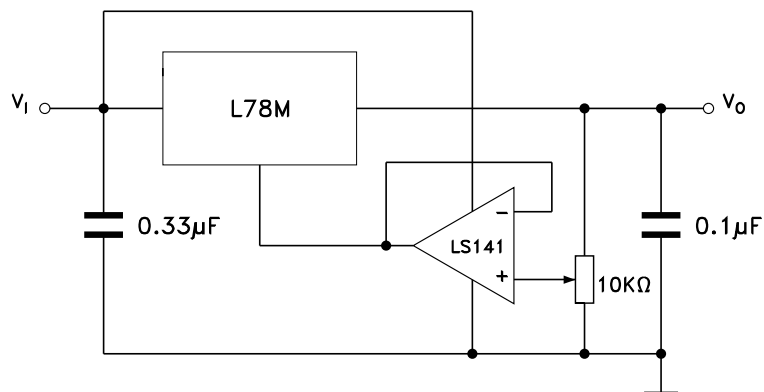
AMG080320171808MT

Figure 19. Circuit for increasing output voltage



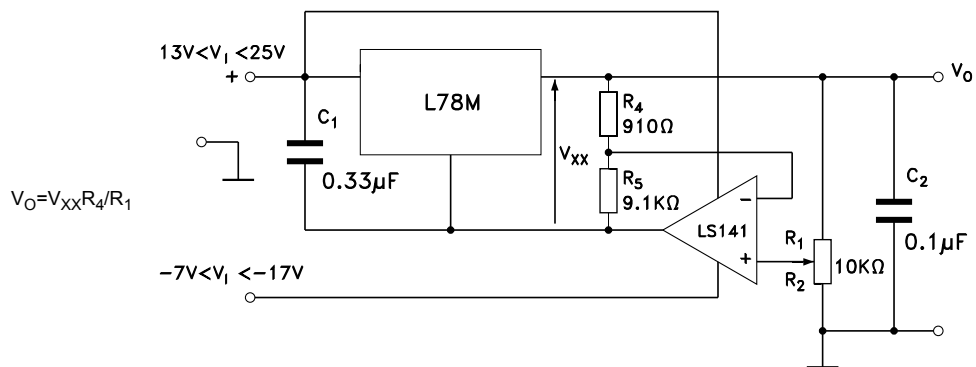
AMG080320171809MT

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

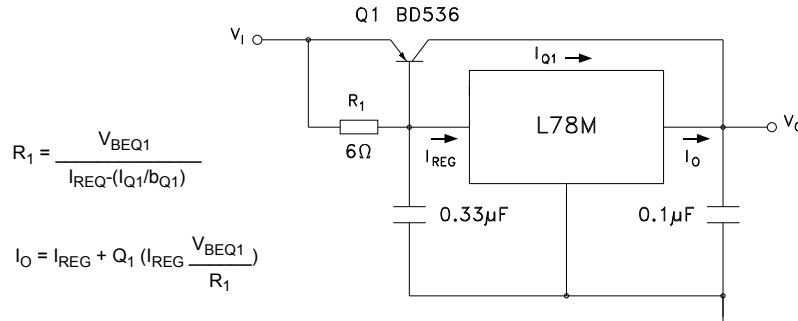
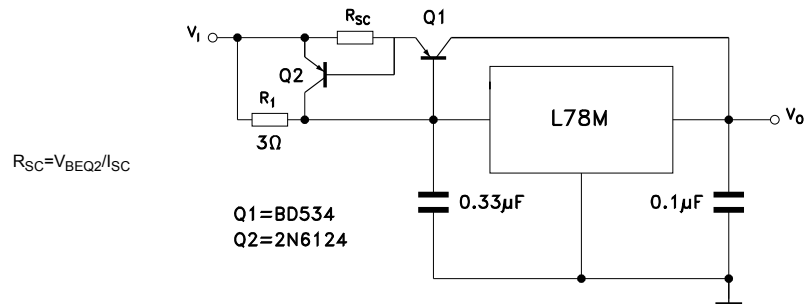
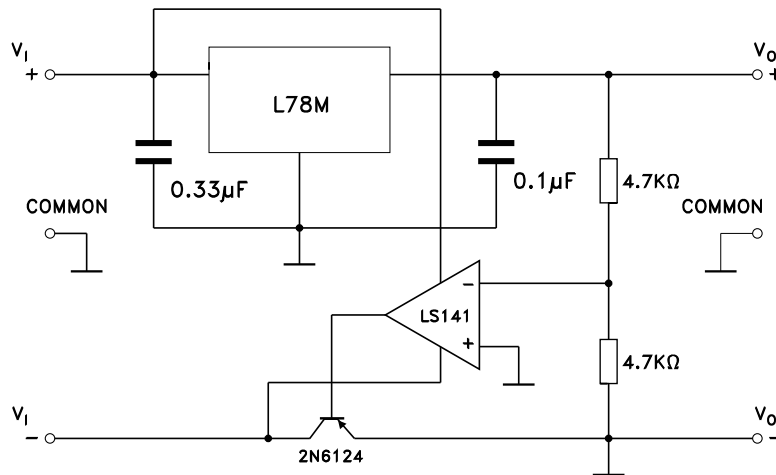


Figure 23. High output current with short circuit protection



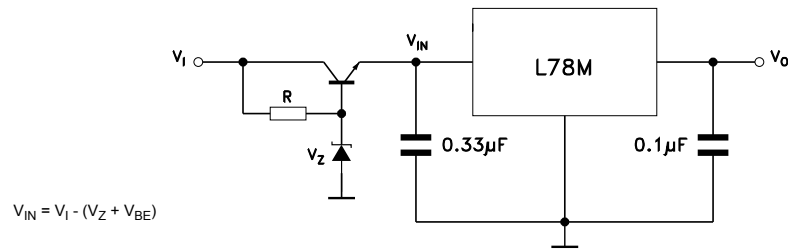
AMG080320171828MT

Figure 24. Tracking voltage regulator



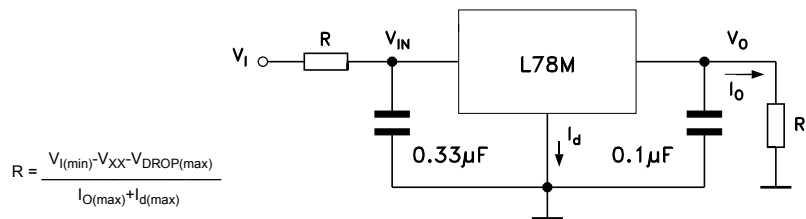
AMG080320171814MT

Figure 25. High input voltage circuit



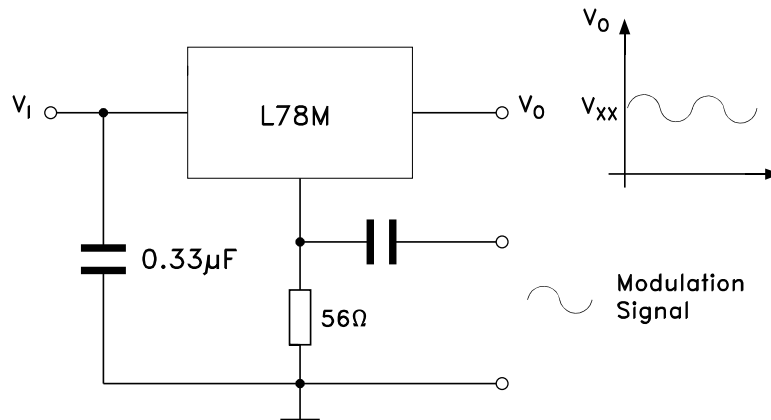
AMG080320171815MT

Figure 26. Reducing power dissipation with dropping resistor



AMG080320171816MT

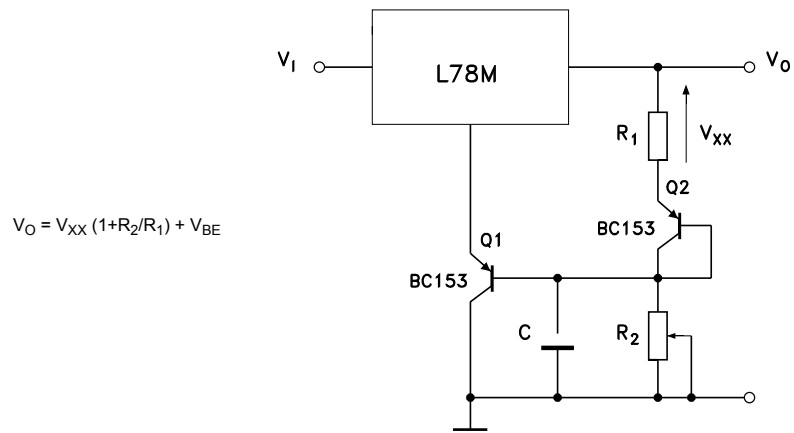
Figure 27. Power AM modulator (unity voltage gain, $I_O \leq 0.5$)



AMG080320171817MT

Note: The circuit performs well up to 100 kHz.

Figure 28. Adjustable output voltage with temperature compensation



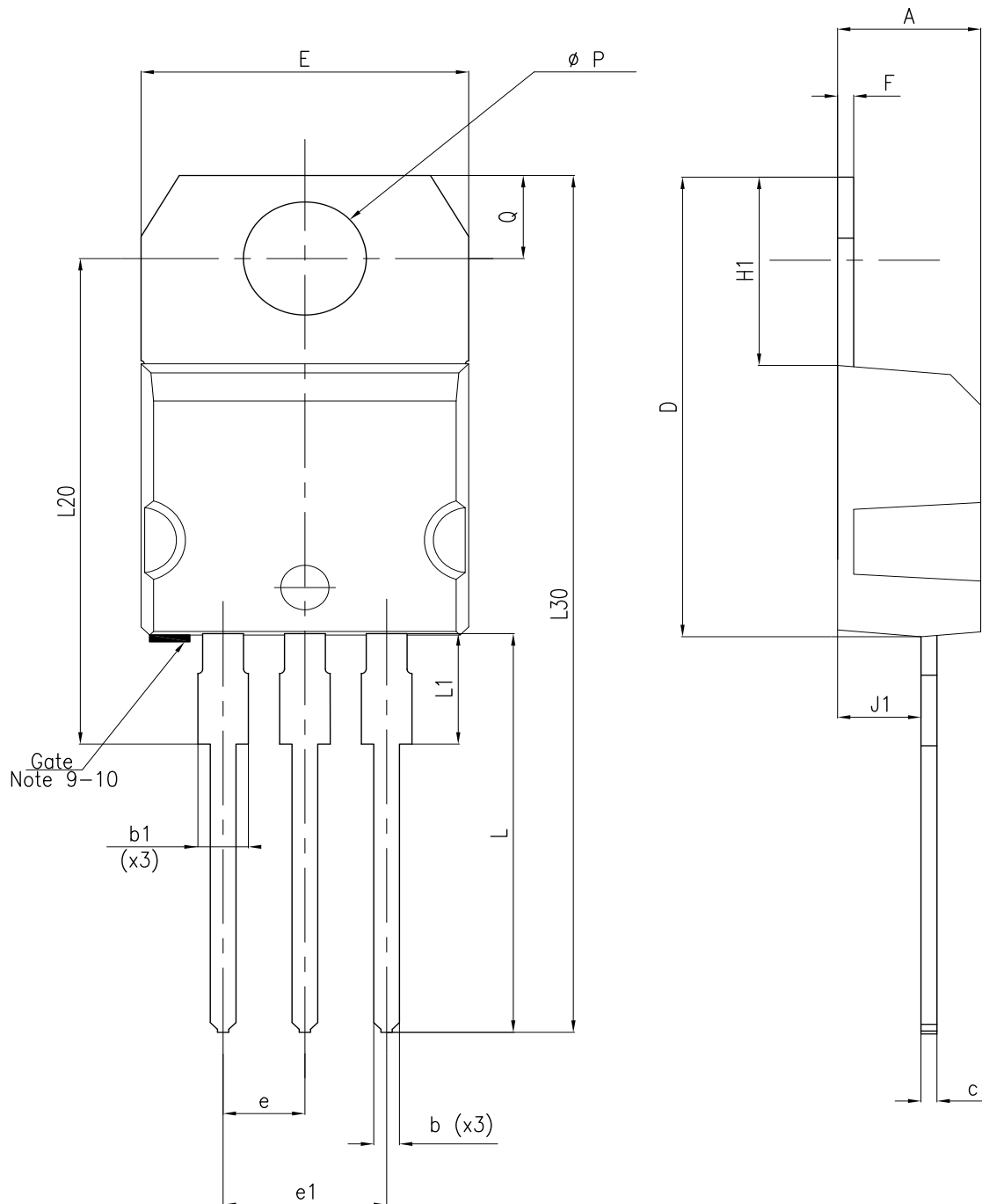
Note: Q_2 is connected as a diode in order to compensate the variation of the Q_1 V_{BE} with the temperature. C allows a slow rise time of the V_O .

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. ECOPACK is an ST trademark.

8.1 TO-220 (single gauge) package information

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



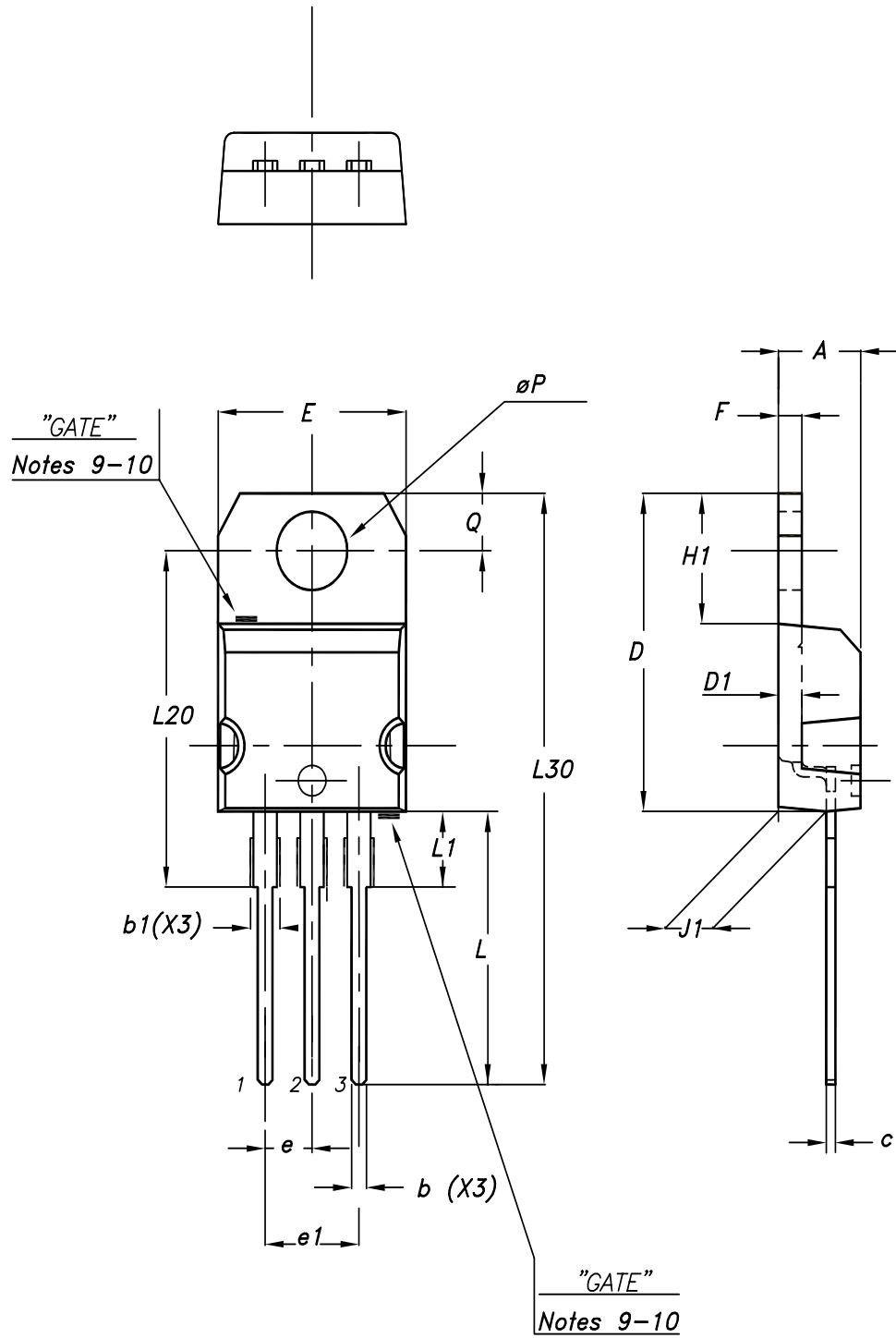
8174627_5

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

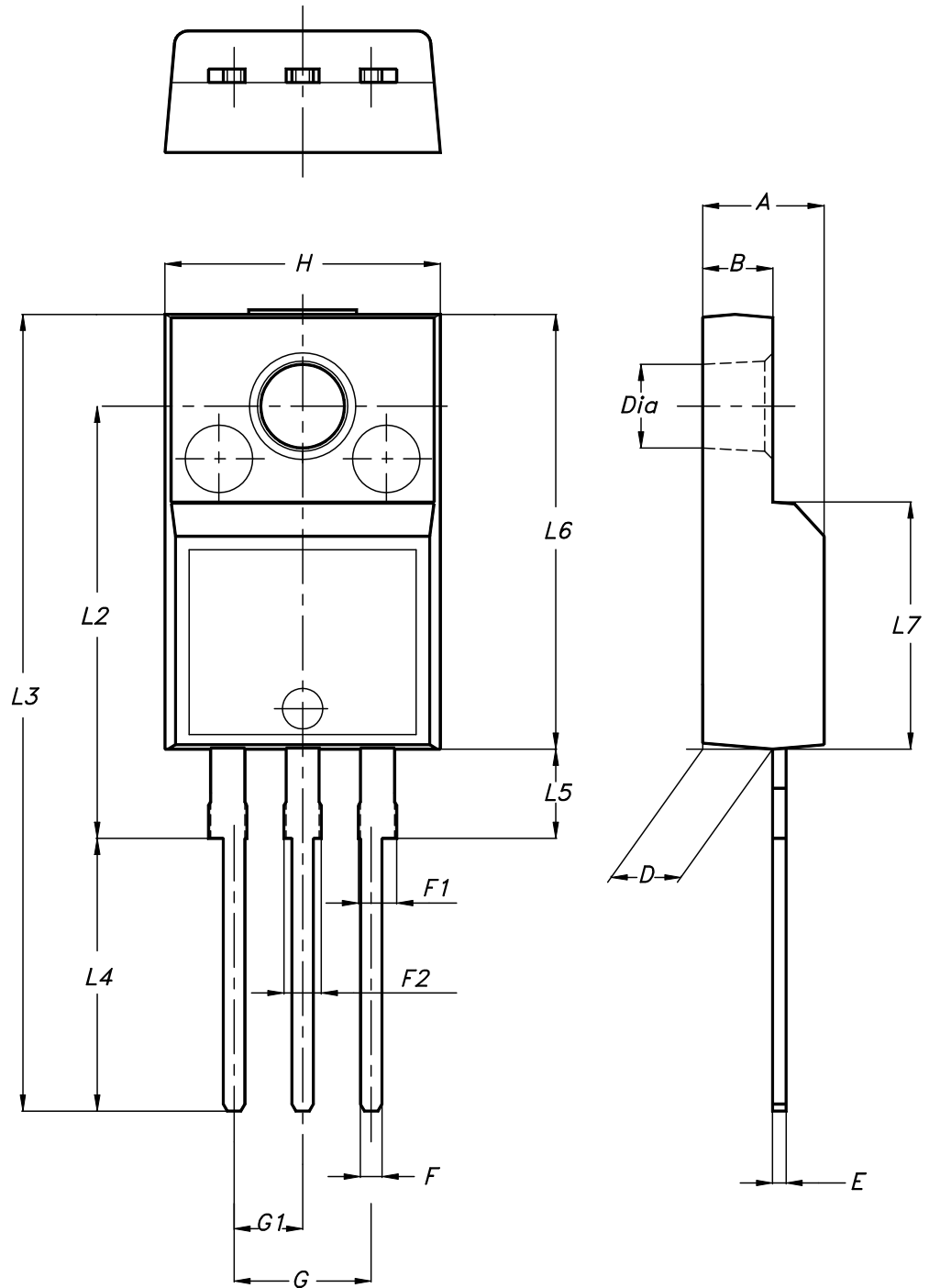
Figure 30. TO-220 (dual gauge) package outline



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

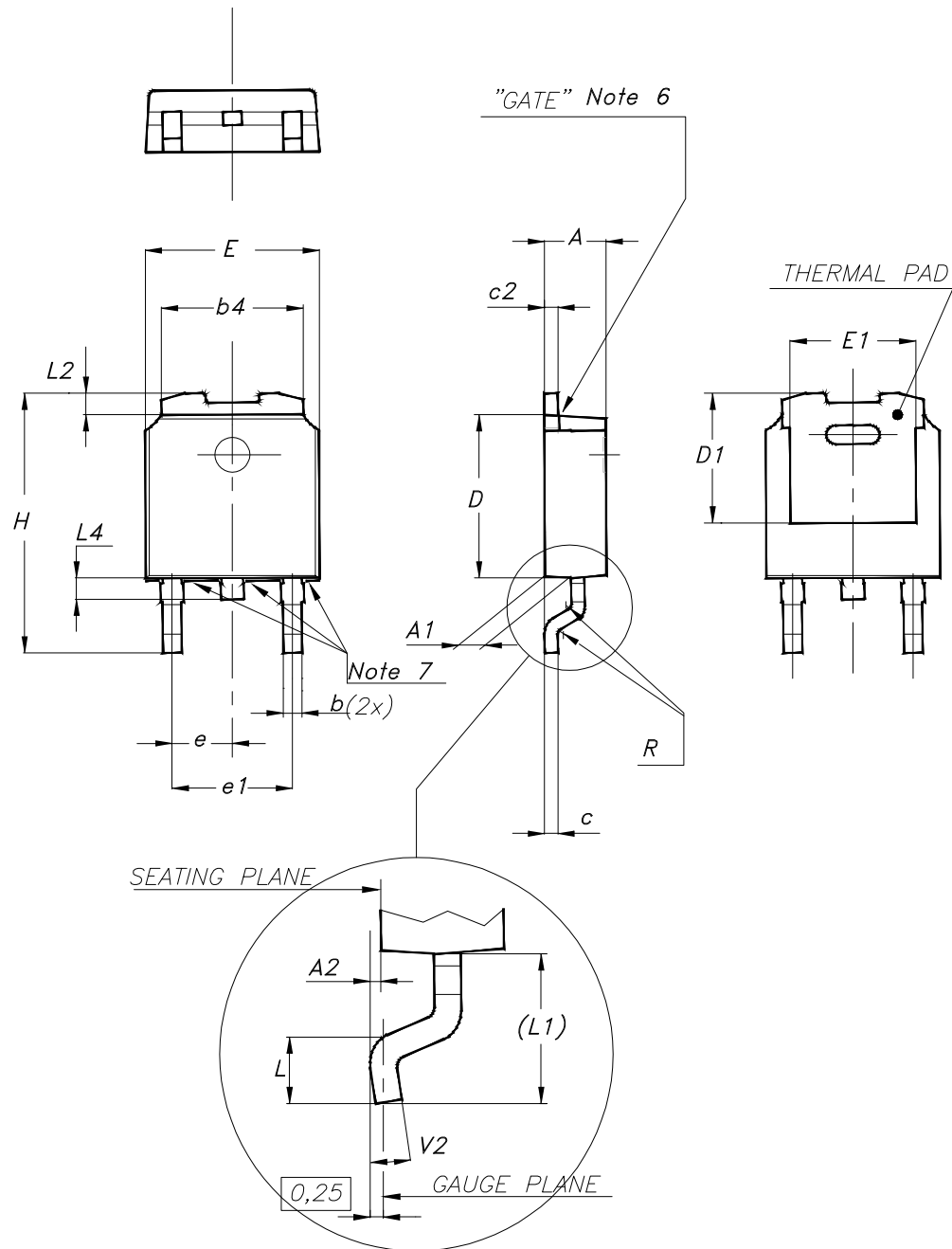


Table 22. DPAK(TO-252) mechanical data (type E)

| 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

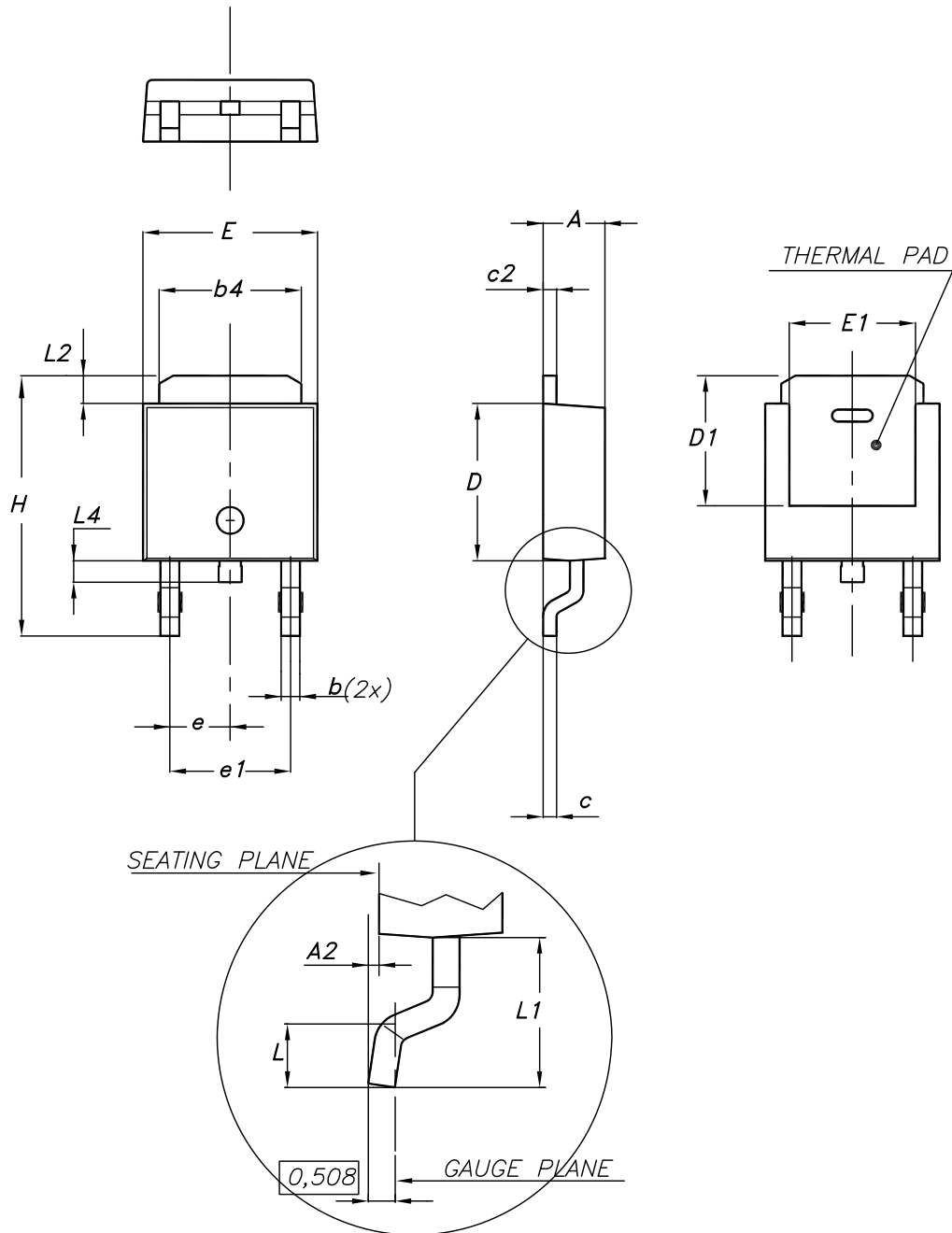


Table 23. DPAK (TO-252) mechanical data type I

| 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

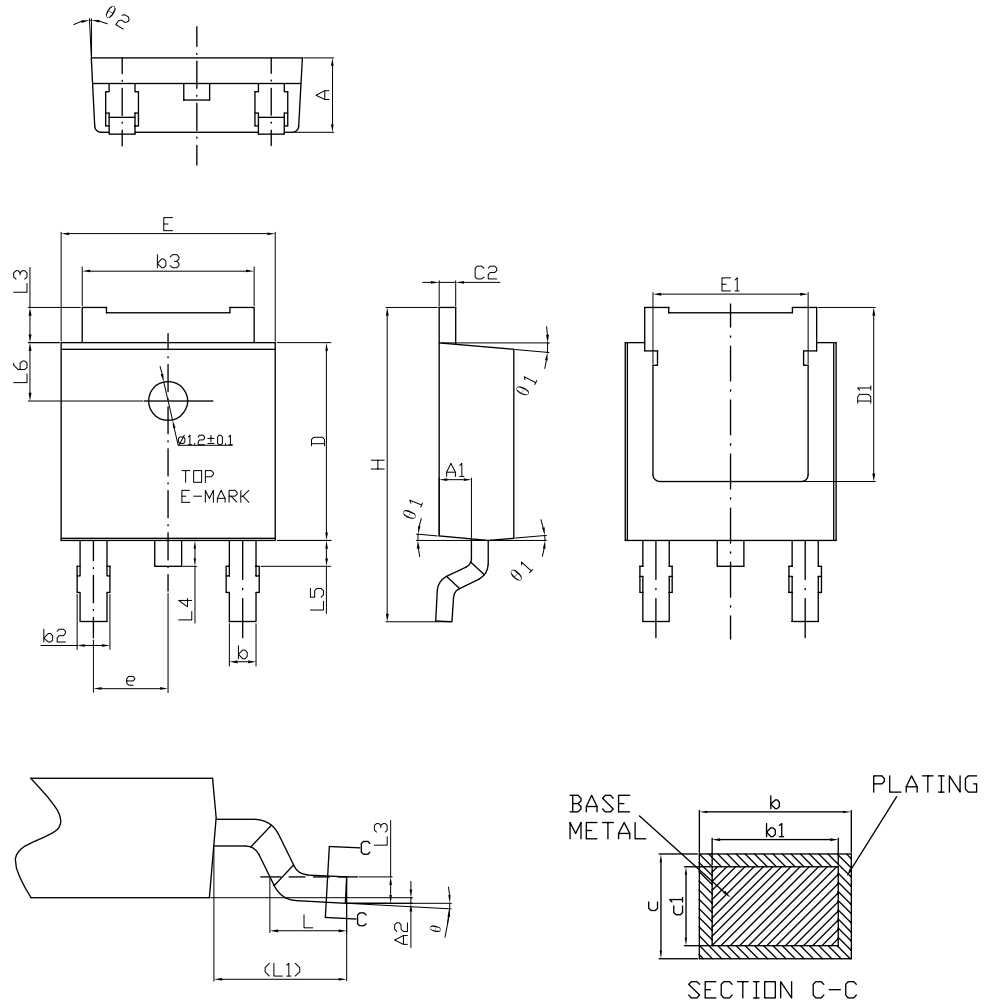
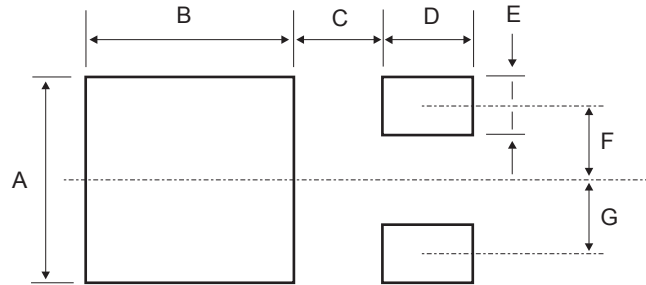


Table 24. DPAK footprint data

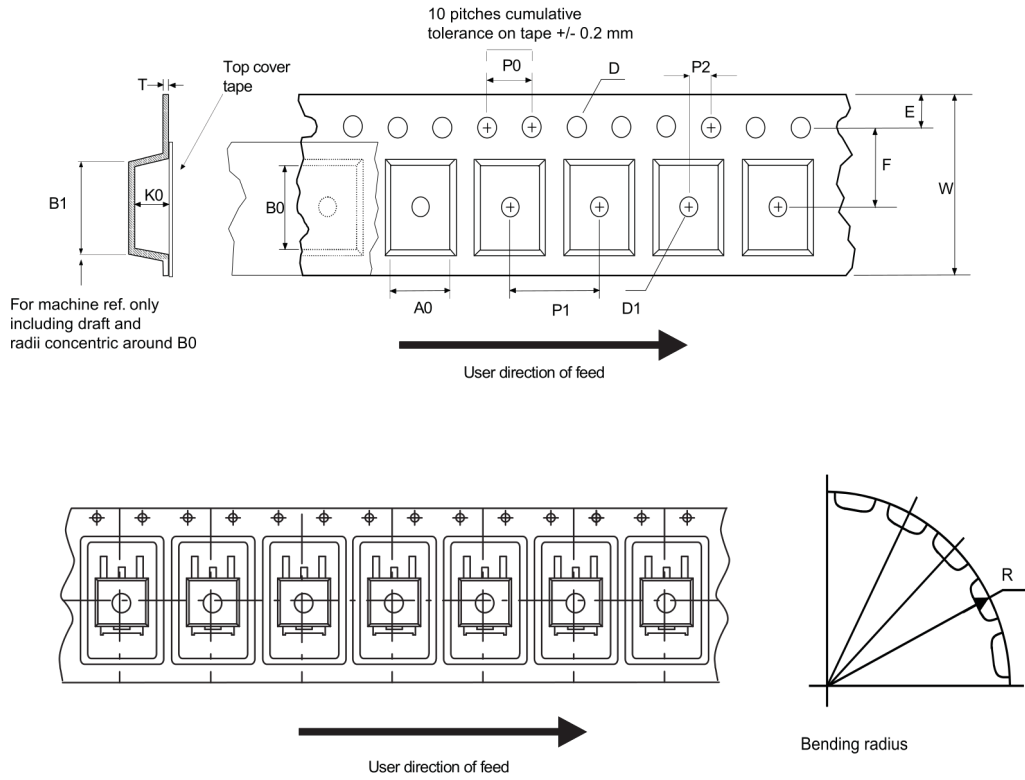
| | Values | |
|---|--------|-------|
| | mm. | inch. |
| A | 6.70 | 0.264 |
| B | 6.70 | 0.64 |
| C | 1.80 | 0.070 |
| D | 3.00 | 0.118 |
| E | 1.60 | 0.063 |
| F | 2.30 | 0.091 |
| G | 2.30 | 0.091 |

Figure 35. DPAK footprint recommended data



8.5 DPAK packing information

Figure 36. DPAK tape



AM08852v1

Figure 37. DPAK reel

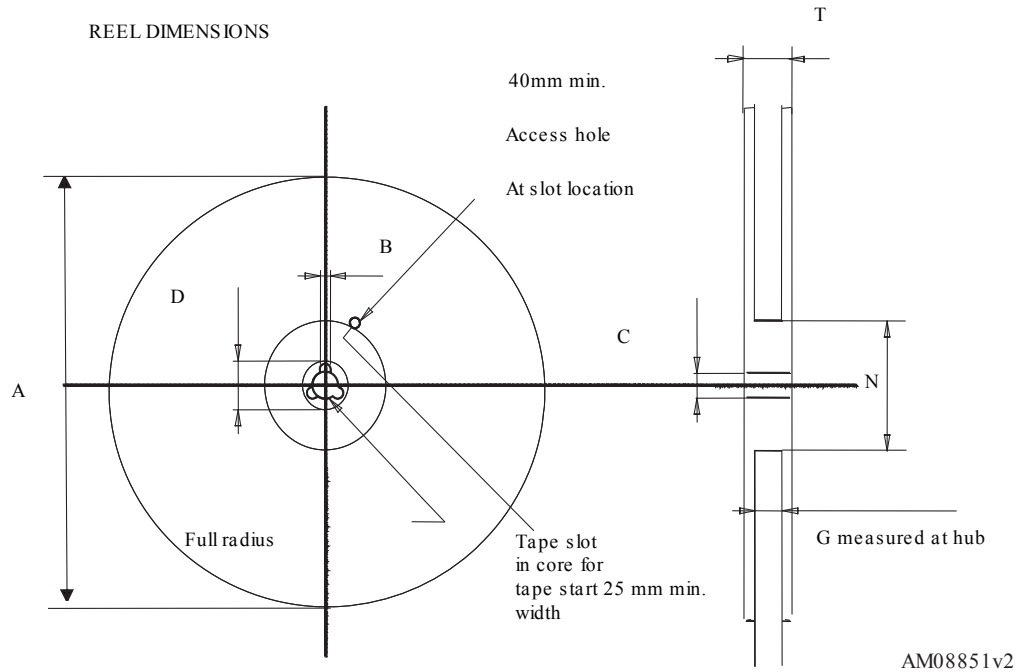
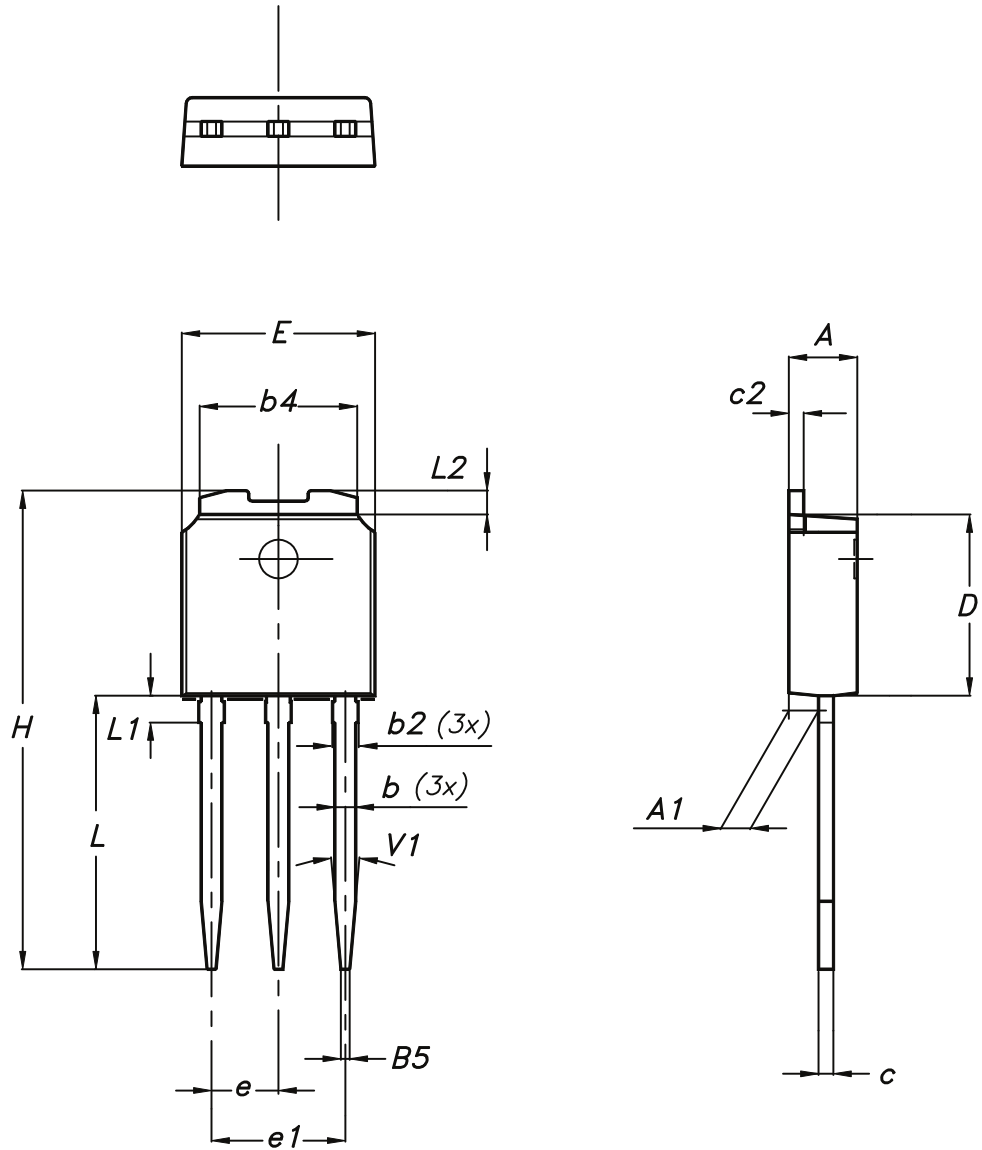


Table 25. DPAK tape and reel mechanical data

| Dim. | Tape | | Dim. | Reel | |
|------|------|------|------|-----------|------|
| | mm | | | 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> |

Contents

| | | |
|----------|-----------------------------------------------------|-----------|
| 1 | Diagram | 2 |
| 2 | Pin configuration | 3 |
| 3 | Maximum ratings | 5 |
| 4 | Test circuits | 6 |
| 5 | Electrical characteristics | 7 |
| 6 | Typical performance | 16 |
| 7 | Applications information | 18 |
| | 7.1 Design considerations | 18 |
| 8 | Package information | 23 |
| | 8.1 TO-220 (single gauge) package information | 23 |
| | 8.2 TO-220 (dual gauge) package information | 24 |
| | 8.3 TO-220FP package information | 26 |
| | 8.4 DPAK (TO-252) package information | 29 |
| | 8.5 DPAK packing information | 36 |
| | 8.6 IPAK package information | 37 |
| 9 | Ordering information | 40 |
| | Revision history | 41 |
| | Contents | 42 |
| | List of tables | 43 |
| | List of figures | 44 |

List of tables

| | | |
|------------------|--------------------------------------------------|----|
| Table 1. | Absolute maximum ratings | 5 |
| Table 2. | Thermal data | 5 |
| Table 3. | Electrical characteristics of L78M05C | 7 |
| Table 4. | Electrical characteristics of L78M05A | 8 |
| Table 5. | Electrical characteristics of L78M06C | 8 |
| Table 6. | Electrical characteristics of L78M06A | 9 |
| Table 7. | Electrical characteristics of L78M08C | 9 |
| Table 8. | Electrical characteristics of L78M08A | 10 |
| Table 9. | Electrical characteristics of L78M09C | 10 |
| Table 10. | Electrical characteristics of L78M09A | 11 |
| Table 11. | Electrical characteristics of L78M10A | 11 |
| Table 12. | Electrical characteristics of L78M12C | 12 |
| Table 13. | Electrical characteristics of L78M12A | 12 |
| Table 14. | Electrical characteristics of L78M15C | 13 |
| Table 15. | Electrical characteristics of L78M15A | 13 |
| Table 16. | Electrical characteristics of L78M24C | 14 |
| Table 17. | Electrical characteristics of L78M24A | 14 |
| Table 18. | TO-220 (single gauge) mechanical data | 24 |
| Table 19. | TO-220 (dual gauge) mechanical data | 26 |
| Table 20. | TO-220FP package mechanical data | 28 |
| Table 21. | DPAK (TO-252) mechanical data (type A) | 29 |
| Table 22. | DPAK(TO-252) mechanical data (type E) | 31 |
| Table 23. | DPAK (TO-252) mechanical data type I | 33 |
| Table 24. | DPAK footprint data | 34 |
| Table 25. | DPAK tape and reel mechanical data | 37 |
| Table 26. | IPAK mechanical data | 39 |
| Table 27. | Order code | 40 |
| Table 28. | Document revision history | 41 |

List of figures

| | | |
|-------------------|--------------------------------------------------------------------|----|
| Figure 1. | Block diagram | 2 |
| Figure 2. | Pin connections (top view) | 3 |
| Figure 3. | Schematic diagram | 4 |
| Figure 4. | Application circuit | 5 |
| Figure 5. | DC parameter. | 6 |
| Figure 6. | Load regulation. | 6 |
| Figure 7. | Ripple rejection. | 6 |
| Figure 8. | Dropout voltage vs junction temp. | 16 |
| Figure 9. | Dropout characteristics | 16 |
| Figure 10. | Peak output current vs input-output differential voltage | 16 |
| Figure 11. | Output voltage vs junction temperature | 16 |
| Figure 12. | Supply voltage rejection vs frequency | 17 |
| Figure 13. | Quiescent current vs junction temperature | 17 |
| Figure 14. | Load transient response | 17 |
| Figure 15. | Line transient response | 17 |
| Figure 16. | Quiescent current vs input voltage | 17 |
| Figure 17. | Fixed output regulator | 18 |
| Figure 18. | Constant current regulator | 18 |
| Figure 19. | Circuit for increasing output voltage. | 19 |
| Figure 20. | Adjustable output regulator (7 to 30 V). | 19 |
| Figure 21. | 0.5 to 10 V regulator | 19 |
| Figure 22. | High current voltage regulator. | 20 |
| Figure 23. | High output current with short circuit protection. | 20 |
| Figure 24. | Tracking voltage regulator | 20 |
| Figure 25. | High input voltage circuit | 21 |
| Figure 26. | Reducing power dissipation with dropping resistor. | 21 |
| Figure 27. | Power AM modulator (unity voltage gain, $I_O \leq 0.5$). | 21 |
| Figure 28. | Adjustable output voltage with temperature compensation | 22 |
| Figure 29. | TO-220 (single gauge) package outline | 23 |
| Figure 30. | TO-220 (dual gauge) package outline | 25 |
| Figure 31. | TO-220FP package outline. | 27 |
| Figure 32. | DPAK (TO-252) package outline A | 30 |
| Figure 33. | DPAK (TO-252) package outline E | 32 |
| Figure 34. | DPAK (TO-252) package outline I | 34 |
| Figure 35. | DPAK footprint recommended data | 35 |
| Figure 36. | DPAK tape | 36 |
| Figure 37. | DPAK reel | 37 |
| Figure 38. | IPAK package outline | 38 |

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, please refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2019 STMicroelectronics – All rights reserved



**Стандарт
Электрон
Связь**

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

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