

#### Features

- Center amplifying gate
- Hermetic metal case with ceramic insulator  
(Also available with glass-metal seal up to 1200V)
- International standard case TO-209AB (TO-93)
- Compression Bonded Encapsulation for heavy duty operations such as severe thermal cycling

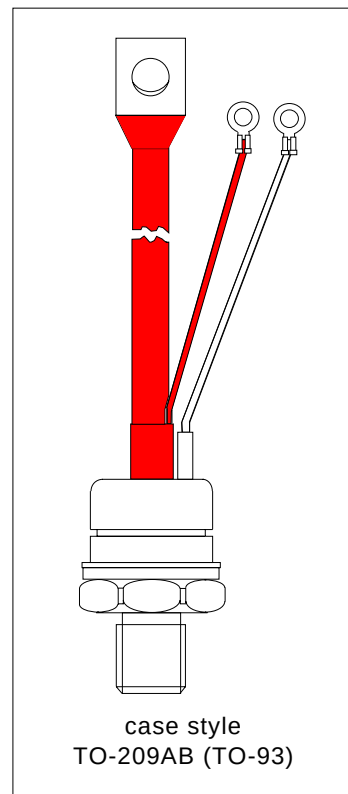
200A

#### Typical Applications

- DC motor controls
- Controlled DC power supplies
- AC controllers

#### Major Ratings and Characteristics

| Parameters        | ST180S      | Units             |
|-------------------|-------------|-------------------|
| $I_{T(AV)}$       | 200         | A                 |
| @ $T_C$           | 85          | °C                |
| $I_{T(RMS)}$      | 314         | A                 |
| $I_{TSM}$ @ 50Hz  | 5000        | A                 |
| @ 60Hz            | 5230        | A                 |
| $I^2t$ @ 50Hz     | 125         | KA <sup>2</sup> s |
| @ 60Hz            | 114         | KA <sup>2</sup> s |
| $V_{DRM}/V_{RRM}$ | 400 to 2000 | V                 |
| $t_q$ typical     | 100         | μs                |
| $T_J$             | - 40 to 125 | °C                |



## ST180S Series

Bulletin I25165 rev. C 03/03

International  
IRF Rectifier

### ELECTRICAL SPECIFICATIONS

#### Voltage Ratings

| Type number | Voltage Code | $V_{DRM}/V_{RRM}$ , max. repetitive peak and off-state voltage V | $V_{RSM}$ , maximum non-repetitive peak voltage V | $I_{DRM}/I_{RRM}$ max. @ $T_J = T_J \text{ max}$ mA |
|-------------|--------------|------------------------------------------------------------------|---------------------------------------------------|-----------------------------------------------------|
| ST180S      | 04           | 400                                                              | 500                                               | 30                                                  |
|             | 08           | 800                                                              | 900                                               |                                                     |
|             | 12           | 1200                                                             | 1300                                              |                                                     |
|             | 16           | 1600                                                             | 1700                                              |                                                     |
|             | 20           | 2000                                                             | 2100                                              |                                                     |

#### On-state Conduction

| Parameter                                                    | ST180S                       | Units              | Conditions                                                                                                                                                      |
|--------------------------------------------------------------|------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_{T(AV)}$ Max. average on-state current @ Case temperature | 200<br>85                    | A<br>°C            | 180° conduction, half sine wave                                                                                                                                 |
| $I_{T(RMS)}$ Max. RMS on-state current                       | 314                          | A                  | DC @ 76°C case temperature                                                                                                                                      |
| $I_{TSM}$ Max. peak, one-cycle non-repetitive surge current  | 5000<br>5230<br>4200<br>4400 | A                  | t = 10ms<br>t = 8.3ms<br>t = 10ms<br>t = 8.3ms<br>No voltage reappplied<br>100% $V_{RRM}$ reappplied                                                            |
| $I^2t$ Maximum $I^2t$ for fusing                             | 125<br>114<br>88<br>81       | KA <sup>2</sup> s  | t = 10ms<br>t = 8.3ms<br>t = 10ms<br>t = 8.3ms<br>No voltage reappplied<br>100% $V_{RRM}$ reappplied<br>Sinusoidal half wave, Initial $T_J = T_J \text{ max}$ . |
| $I^2/t$ Maximum $I^2/t$ for fusing                           | 1250                         | KA <sup>2</sup> /s | t = 0.1 to 10ms, no voltage reappplied                                                                                                                          |
| $V_{T(TO)1}$ Low level value of threshold voltage            | 1.08                         | V                  | ( $16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$ ), $T_J = T_J \text{ max}$ .                                                                  |
| $V_{T(TO)2}$ High level value of threshold voltage           | 1.14                         |                    | ( $I > \pi \times I_{T(AV)}$ ), $T_J = T_J \text{ max}$ .                                                                                                       |
| $r_{t1}$ Low level value of on-state slope resistance        | 1.18                         | mΩ                 | ( $16.7\% \times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$ ), $T_J = T_J \text{ max}$ .                                                                  |
| $r_{t2}$ High level value of on-state slope resistance       | 1.14                         |                    | ( $I > \pi \times I_{T(AV)}$ ), $T_J = T_J \text{ max}$ .                                                                                                       |
| $V_{TM}$ Max. on-state voltage                               | 1.75                         | V                  | $I_{pk} = 570A$ , $T_J = 125^\circ C$ , $t_p = 10ms$ sine pulse                                                                                                 |
| $I_H$ Maximum holding current                                | 600                          | mA                 | $T_J = T_J \text{ max}$ , anode supply 12V resistive load                                                                                                       |
| $I_L$ Max. (typical) latching current                        | 1000 (300)                   |                    |                                                                                                                                                                 |

#### Switching

| Parameter                                                     | ST180S | Units | Conditions                                                                                                                            |
|---------------------------------------------------------------|--------|-------|---------------------------------------------------------------------------------------------------------------------------------------|
| $di/dt$ Max. non-repetitive rate of rise of turned-on current | 1000   | A/μs  | Gate drive 20V, 20Ω, $t_r \leq 1\mu s$<br>$T_J = T_J \text{ max}$ , anode voltage $\leq 80\% V_{DRM}$                                 |
| $t_d$ Typical delay time                                      | 1.0    | μs    | Gate current 1A, $di_g/dt = 1A/\mu s$<br>$V_d = 0.67\% V_{DRM}$ , $T_J = 25^\circ C$                                                  |
| $t_q$ Typical turn-off time                                   | 100    |       | $I_{TM} = 300A$ , $T_J = T_J \text{ max}$ , $di/dt = 20A/\mu s$ , $V_R = 50V$<br>$dv/dt = 20V/\mu s$ , Gate 0V 100Ω, $t_p = 500\mu s$ |

### Blocking

| Parameter                                                              | ST180S | Units      | Conditions                                       |
|------------------------------------------------------------------------|--------|------------|--------------------------------------------------|
| $dv/dt$ Maximum critical rate of rise of off-state voltage             | 500    | V/ $\mu$ s | $T_J = T_J$ max linear to 80% rated $V_{DRM}$    |
| $I_{DRM}$<br>$I_{RRM}$ Max. peak reverse and off-state leakage current | 30     | mA         | $T_J = T_J$ max, rated $V_{DRM}/V_{RRM}$ applied |

### Triggering

| Parameter                                    | ST180S | Units | Conditions                                                                                                                                                                                                        |
|----------------------------------------------|--------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $P_{GM}$ Maximum peak gate power             | 10     | W     | $T_J = T_J$ max, $t_p \leq 5$ ms                                                                                                                                                                                  |
| $P_{G(AV)}$ Maximum average gate power       | 2.0    |       | $T_J = T_J$ max, $f = 50$ Hz, $d\% = 50$                                                                                                                                                                          |
| $I_{GM}$ Max. peak positive gate current     | 3.0    | A     | $T_J = T_J$ max, $t_p \leq 5$ ms                                                                                                                                                                                  |
| $+V_{GM}$ Maximum peak positive gate voltage | 20     | V     | $T_J = T_J$ max, $t_p \leq 5$ ms                                                                                                                                                                                  |
| $-V_{GM}$ Maximum peak negative gate voltage | 5.0    |       |                                                                                                                                                                                                                   |
| $I_{GT}$ DC gate current required to trigger | TYP.   | MAX.  | $T_J = -40^\circ\text{C}$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$<br>Max. required gate trigger/ current/ voltage are the lowest value which will trigger all units 12V anode-to-cathode applied |
|                                              | 180    | -     |                                                                                                                                                                                                                   |
|                                              | 90     | 150   |                                                                                                                                                                                                                   |
|                                              | 40     | -     |                                                                                                                                                                                                                   |
| $V_{GT}$ DC gate voltage required to trigger | 2.9    | -     | $T_J = -40^\circ\text{C}$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$                                                                                                                                |
|                                              | 1.8    | 3.0   |                                                                                                                                                                                                                   |
|                                              | 1.2    | -     |                                                                                                                                                                                                                   |
|                                              |        |       |                                                                                                                                                                                                                   |
| $I_{GD}$ DC gate current not to trigger      | 10     | mA    | $T_J = T_J$ max<br>Max. gate current/ voltage not to trigger is the max. value which will not trigger any unit with rated $V_{DRM}$ anode-to-cathode applied                                                      |
| $V_{GD}$ DC gate voltage not to trigger      | 0.25   | V     |                                                                                                                                                                                                                   |

### Thermal and Mechanical Specification

| Parameter                                            | ST180S             | Units            | Conditions                                 |
|------------------------------------------------------|--------------------|------------------|--------------------------------------------|
| $T_J$ Max. operating temperature range               | -40 to 125         | $^\circ\text{C}$ |                                            |
| $T_{stg}$ Max. storage temperature range             | -40 to 150         |                  |                                            |
| $R_{thJC}$ Max. thermal resistance, junction to case | 0.105              | K/W              | DC operation                               |
| $R_{thCS}$ Max. thermal resistance, case to heatsink | 0.04               |                  | Mounting surface, smooth, flat and greased |
| T Mounting torque, $\pm 10\%$                        | 31                 | Nm<br>(lbf-in)   | Non lubricated threads                     |
|                                                      | (275)              |                  |                                            |
|                                                      | 24.5<br>(210)      |                  | Lubricated threads                         |
| wt Approximate weight                                | 280                | g                |                                            |
| Case style                                           | TO - 209AB (TO-93) |                  | See Outline Table                          |

ST180S Series

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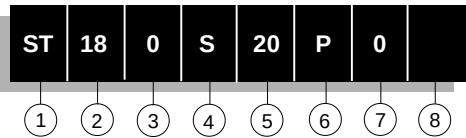
$\Delta R_{thJC}$  Conduction

(The following table shows the increment of thermal resistance  $R_{thJC}$  when devices operate at different conduction angles than DC)

| Conduction angle | Sinusoidal conduction | Rectangular conduction | Units | Conditions               |
|------------------|-----------------------|------------------------|-------|--------------------------|
| 180°             | 0.015                 | 0.012                  | K/W   | $T_J = T_J \text{ max.}$ |
| 120°             | 0.019                 | 0.020                  |       |                          |
| 90°              | 0.025                 | 0.027                  |       |                          |
| 60°              | 0.036                 | 0.037                  |       |                          |
| 30°              | 0.060                 | 0.060                  |       |                          |

Ordering Information Table

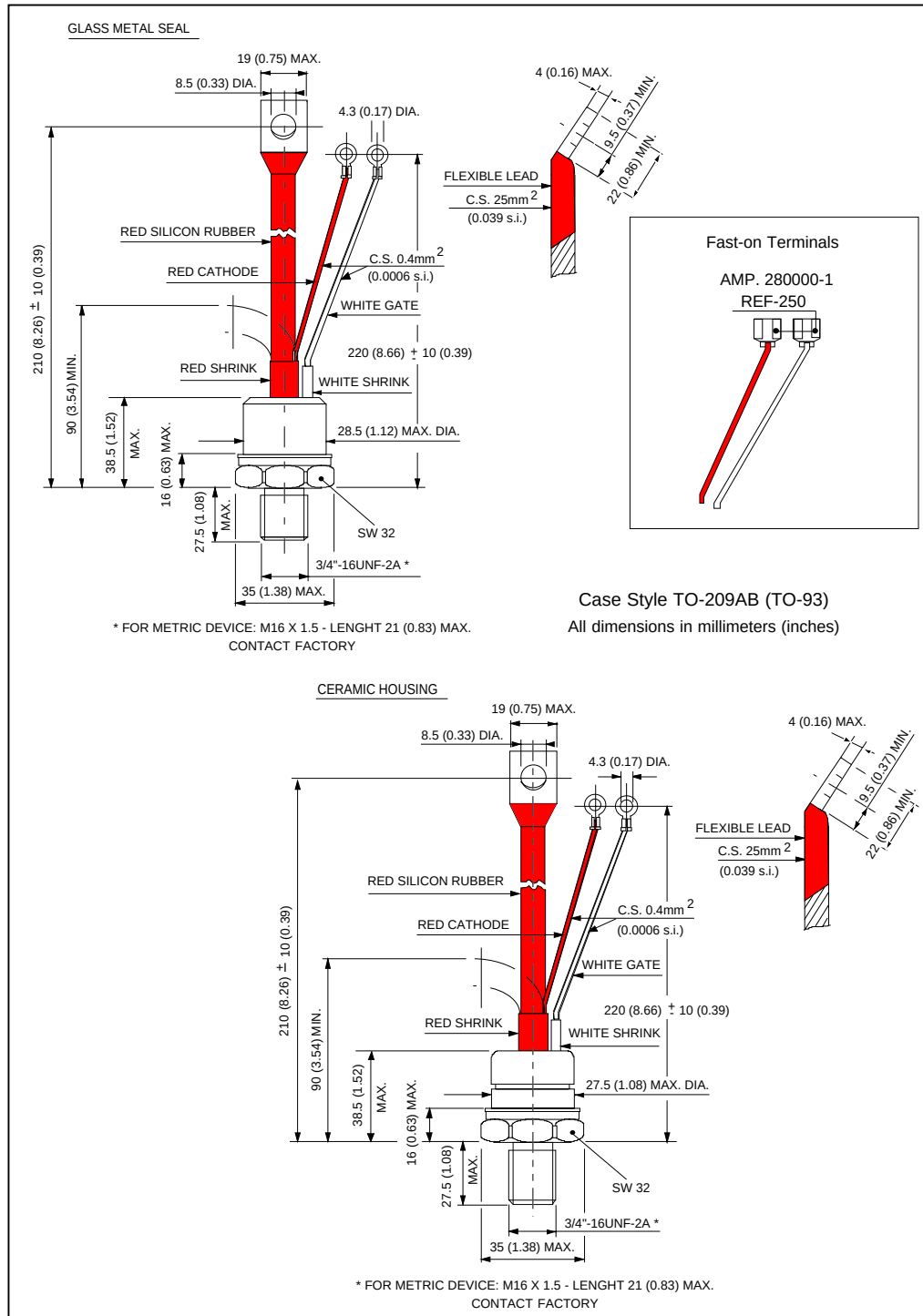
Device Code



- 1** - Thyristor
- 2** - Essential part number
- 3** - 0 = Converter grade
- 4** - S = Compression bonding Stud
- 5** - Voltage code: Code x 100 =  $V_{RRM}$  (See Voltage Rating Table)
- 6** - P = Stud base 3/4"-16UNF2A threads
- 7** - 0 = Eyelet terminals (Gate and Auxiliary Cathode Leads)  
1 = Fast - on terminals (Gate and Auxiliary Cathode Leads)
- 8** - V = Glass-metal seal (only up to 1200V)  
None = Ceramic housing (over 1200V)

NOTE: For Metric device M16 x 1.5 Contact factory

Outline Table



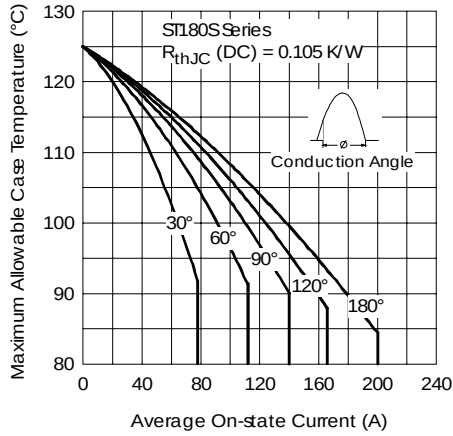


Fig. 1 - Current Ratings Characteristics

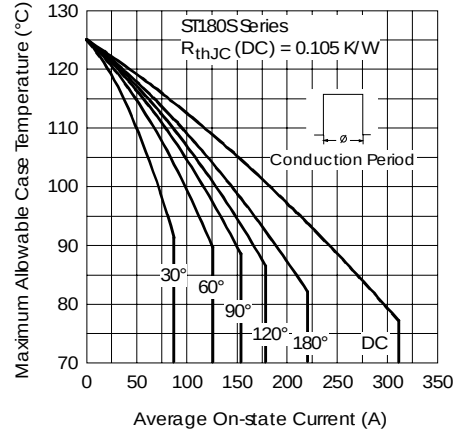


Fig. 2 - Current Ratings Characteristics

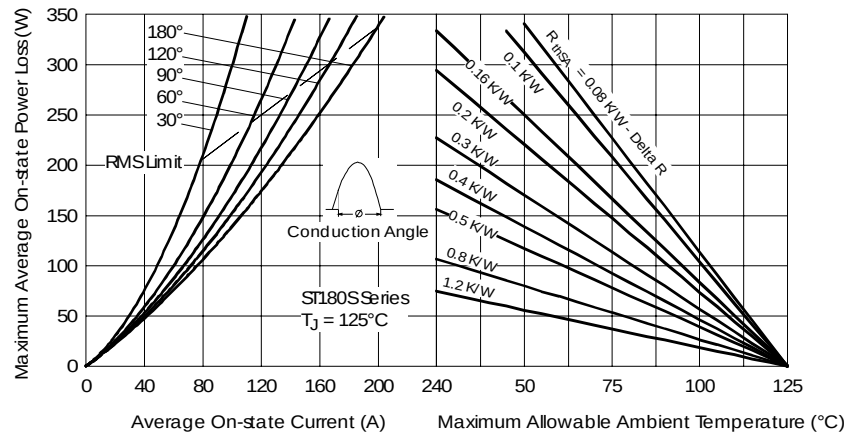


Fig. 3 - On-state Power Loss Characteristics

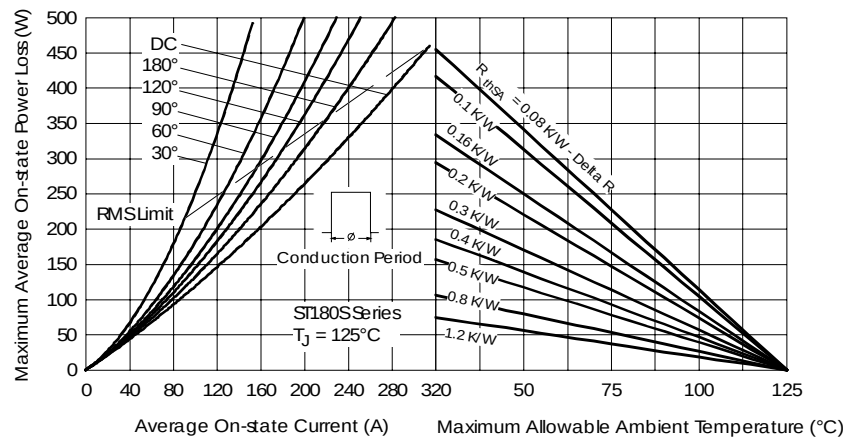


Fig. 4 - On-state Power Loss Characteristics

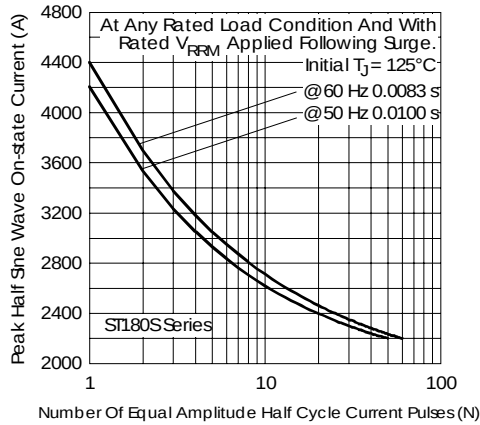


Fig. 5 - Maximum Non-Repetitive Surge Current

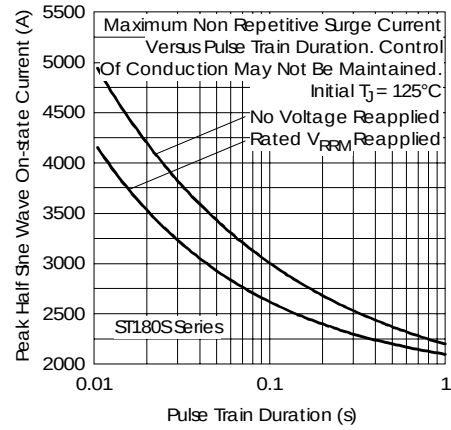


Fig. 6 - Maximum Non-Repetitive Surge Current

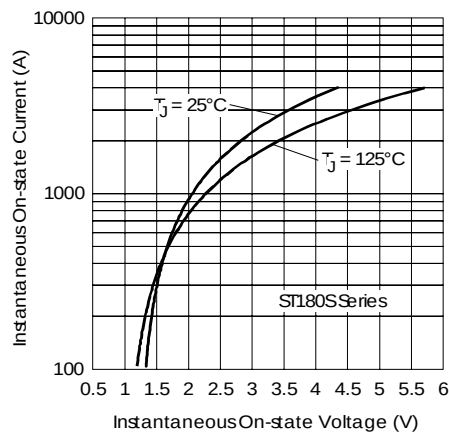


Fig. 7 - On-state Voltage Drop Characteristics

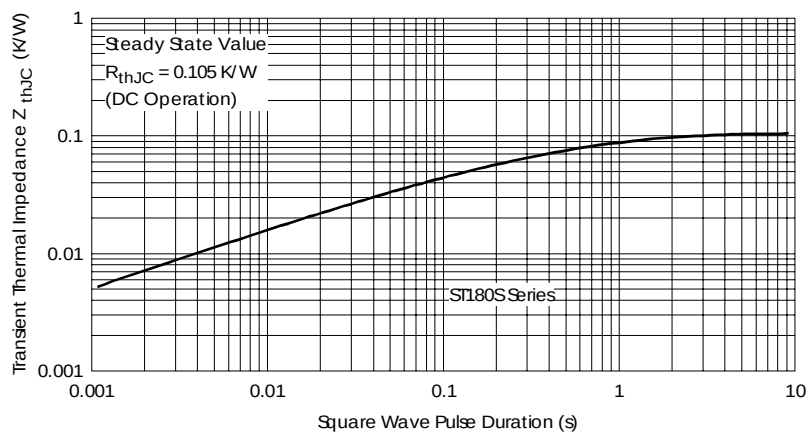


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristic

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International  
**IR** Rectifier

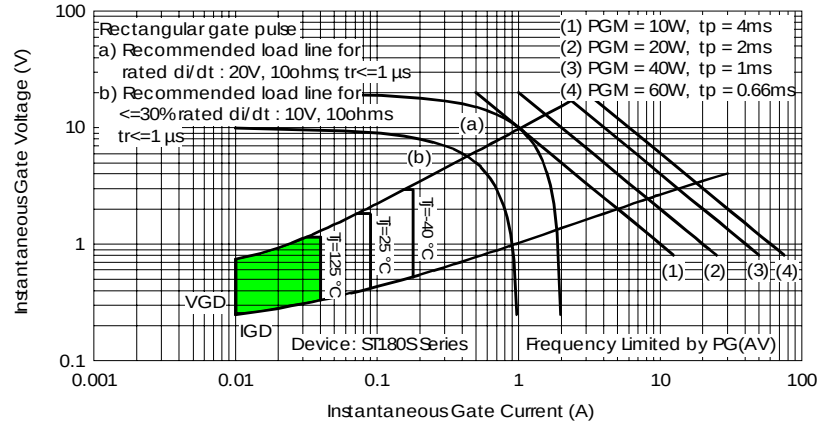


Fig. 9 - Gate Characteristics

Data and specifications subject to change without notice.  
This product has been designed and qualified for Industrial Level.  
Qualification Standards can be found on IR's Web site.

International  
**IR** Rectifier

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Электрон  
Связь**

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