

## “HALF-BRIDGE” IGBT

### Features

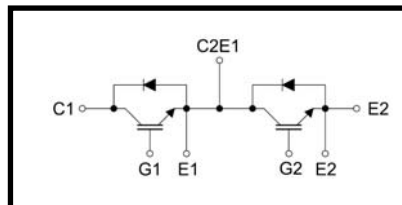
- IGBT NPT Technology
- 10μs Short circuit capability
- Low turn-off losses
- Short tail current
- Positive  $V_{CE(on)}$  temperature coefficient

### Applications

- AC & DC Motor controls
- General purpose inverters
- Optimized for high current inverter (AC TIG Welding machines)
- Servo Controls
- UPS, Robotics



$V_{CES} = 1200V$   
 $I_c = 200A$   
 $V_{CE(ON)}$  typ. = 3.2V  
 @  $I_c = 200A$



### Absolute Maximum Ratings @ $T_j=25^\circ C$ (per leg)

| Symbol    | Parameter                        | Condition                       | Ratings   | Unit |
|-----------|----------------------------------|---------------------------------|-----------|------|
| $V_{CES}$ | Collector-to-Emitter Voltage     | $V_{GE} = 0V, I_c = 1.0mA$      | 1200      | V    |
| $V_{GES}$ | Gate emitter voltage             |                                 | ± 20      | V    |
| $I_c$     | Continuous Collector Current     | $T_c = 70^\circ C (25^\circ C)$ | 200 (260) | A    |
| $I_{CM}$  | Pulsed collector current         | $T_c = 70^\circ C (25^\circ C)$ | 400 (520) | A    |
| $I_F$     | Diode Continuous Forward Current | $T_c = 70^\circ C (25^\circ C)$ | 200 (260) | A    |
| $I_{FM}$  | Diode Maximum Forward Current    |                                 | 520       | A    |
| $T_{SC}$  | Short Circuit Withstand Time     | $T_c = 100^\circ C$             | 10        | μs   |
| $V_{iso}$ | Isolation Voltage test           | AC 1 minute                     | 2500      | V    |
| $T_j$     | Junction Temperature             |                                 | -40 ~ 150 | °C   |
| $T_{stg}$ | Storage Temperature              |                                 | -40 ~ 125 | °C   |
| Weight    | Weight of Module                 |                                 | 360       | g    |
| Mounting  | Power Terminal Screw : M5        |                                 | 3.5       | Nm   |
| Torque    | Terminal connection Screw : M5   |                                 | 3.5       | Nm   |

### Electrical Characteristics @ $T_j = 25^\circ C$ (unless otherwise specified)

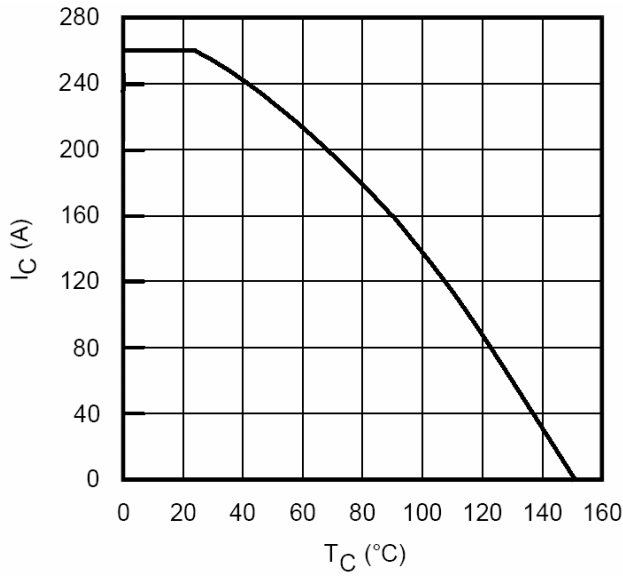
| Symbol        | Parameters                              | Min  | Typ | Max   | Unit | Test conditions                   |
|---------------|---|------|-----|-------|------|-----------------------------------|
| $V_{(BR)CES}$ | Collector-to-Emitter Breakdown Voltage  | 1200 | -   | -     | V    | $V_{GE} = 0V, I_c = 1.0mA$        |
| $V_{CE(ON)}$  | Collector-to-Emitter Saturation Voltage | -    | 3.2 | 3.5   |      | $I_c = 200A, V_{GE} = 15V$        |
| $V_{GE(th)}$  | Gate Threshold Voltage                  | 4.0  | 5.0 | 6.0   |      | $V_{CE} = V_{GE}, I_c = 500\mu A$ |
| $I_{CES}$     | Zero Gate Voltage Collector Current     | -    | -   | 1.0   | mA   | $V_{GE} = 0V, V_{CE} = 1200V$     |
| $I_{GES}$     | Gate-to-Emitter Leakage Current         | -    | -   | ± 200 | nA   | $V_{CE} = 0V, V_{GE} = \pm 20V$   |
| $V_{FM}$      | Diode Forward Voltage Drop              | -    | 2.4 | 2.7   | V    | $I_c = 200A$                      |

**Switching Characteristic @  $T_j = 25^\circ\text{C}$  (unless otherwise specified)**

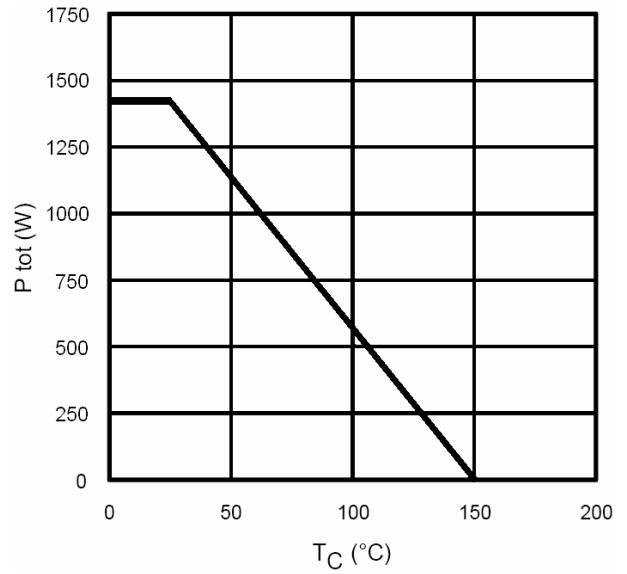
| Symbol       | Parameters                          | Min | Typ  | Max | Unit | Test conditions   |
|--------------|-------------------------------------|-----|------|-----|------|---|
| $C_{ies}$    | Input capacitance                   | -   | 8600 | -   | pF   | $V_{CC} = 30V, V_{GE} = 0V$<br>$f = 1.0MHz$   |
| $C_{oss}$    | Output capacitance                  | -   | 790  | -   |      |   |
| $C_{res}$    | Reverse transfer capacitance        | -   | 320  | -   |      |   |
| $t_{d(on)}$  | Turn-on delay time                  | -   | 72   | 94  | ns   | $T_j = 125^\circ\text{C}, V_{CC} = 600V$<br>$I_C = 200A, V_{GE} = 15V$<br>$R_G = 4.7\Omega$ |
| $t_r$        | Rise time                           | -   | 32   | 45  |      |   |
| $t_{d(off)}$ | Turn-off delay time                 | -   | 366  | 400 |      |   |
| $t_f$        | Fall time                           | -   | 45   | 58  |      |   |
| $I_{rr}$     | Diode Peak Reverse Recovery current | -   | 50   | -   | A    | $T_j = 125^\circ\text{C}, V_{CC} = 600V$<br>$I_F = 120A, V_{GE} = 15V$<br>$R_G = 4.7\Omega$ |
| $t_{rr}$     | Diode Reverse Recovery time         | -   | 180  | -   | ns   |   |

**Thermal Characteristic Values**

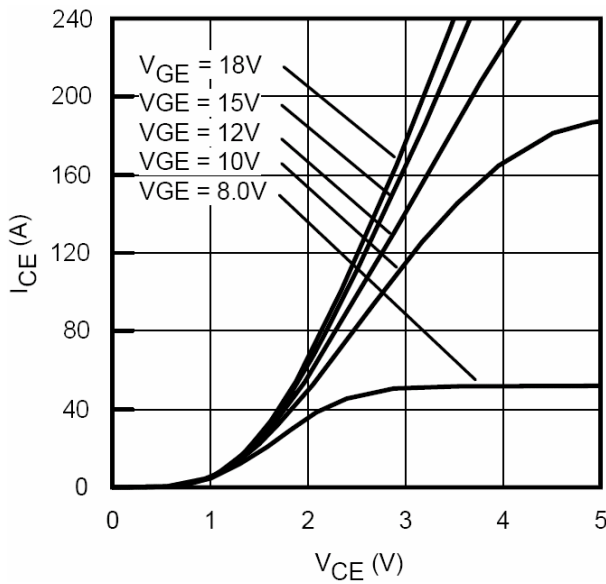
| Symbol          | Parameters                                    | Min | Typ  | Max  | Unit                      |
|-----------------|---|-----|------|------|---------------------------|
| $R_{\theta JC}$ | Junction-to-Case (IGBT Part, Per 1/2 Module)  | -   | -    | 0.10 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JC}$ | Junction-to-Case (Diode Part, Per 1/2 Module) | -   | -    | 0.20 |                           |
| $R_{\theta CS}$ | Case-to-Heat Sink (Conductive grease applied) | -   | 0.04 | -    |                           |



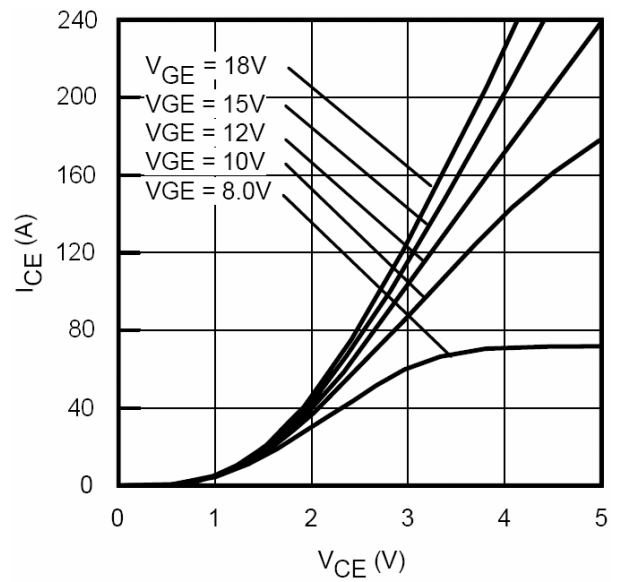
**Fig 1. Maximum DC Collector Current vs. Case Temperature**



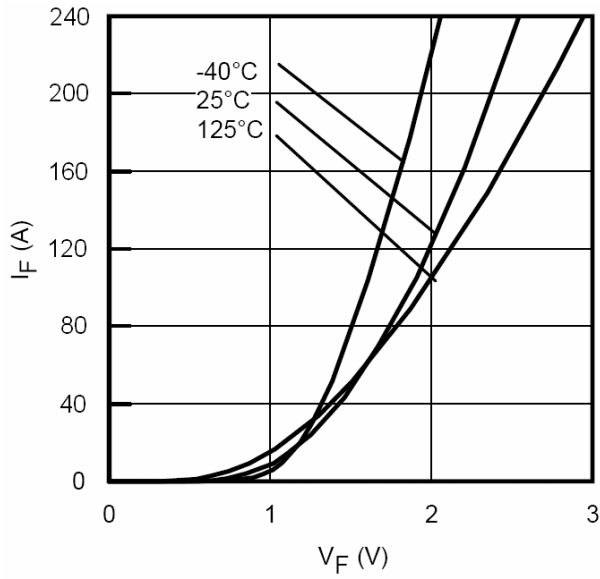
**Fig 2. Power Dissipation vs. Case Temperature**



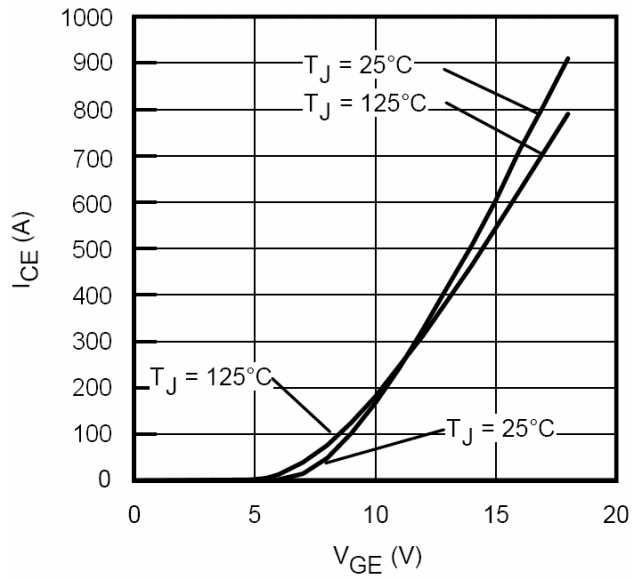
**Fig 3. Typ. IGBT Output Characteristics**  
 $T_J = 25^\circ\text{C}; t_p = 80\mu\text{s}$



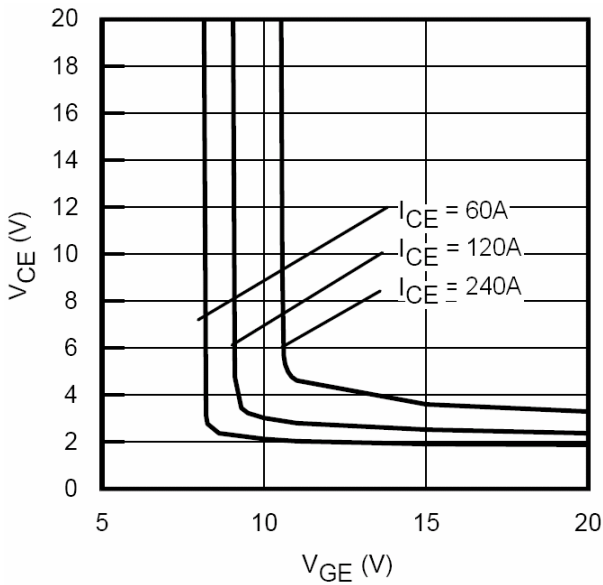
**Fig 4. Typ. IGBT Output Characteristics**  
 $T_J = 125^\circ\text{C}; t_p = 80\mu\text{s}$



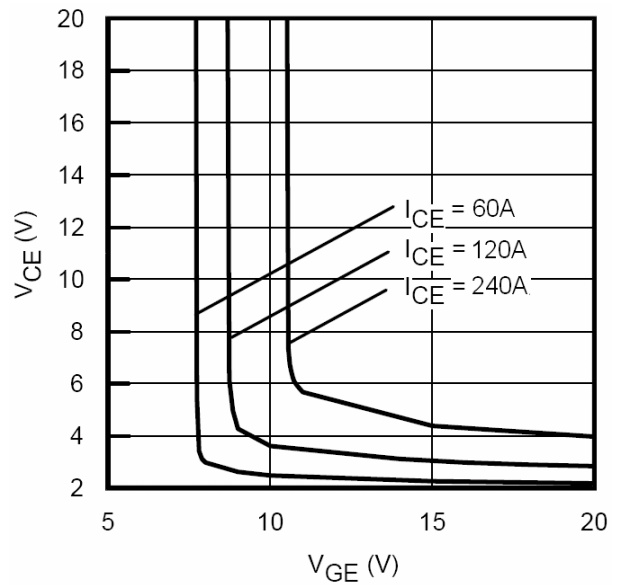
**Fig 5. Typ. Diode Forward Characteristics**  
 $t_p = 80\mu s$



**Fig 6. Typ. Transfer Characteristics**  
 $V_{CE} = 50V; t_p = 10\mu s$



**Fig 7. Typical  $V_{CE}$  vs.  $V_{GE}$**   
 $T_J = 25^\circ C$



**Fig 8. Typical  $V_{CE}$  vs.  $V_{GE}$**   
 $T_J = 125^\circ C$

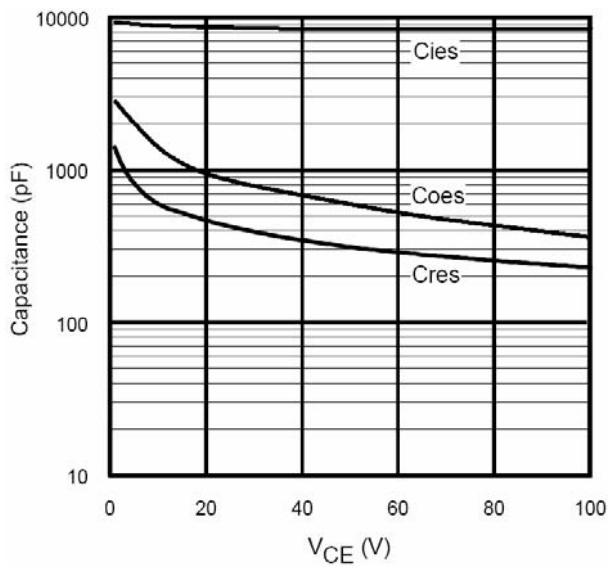


Fig 9. Typ. Capacitance vs. V<sub>ce</sub>  
V<sub>GE</sub> = 0V; f = 1Mhz

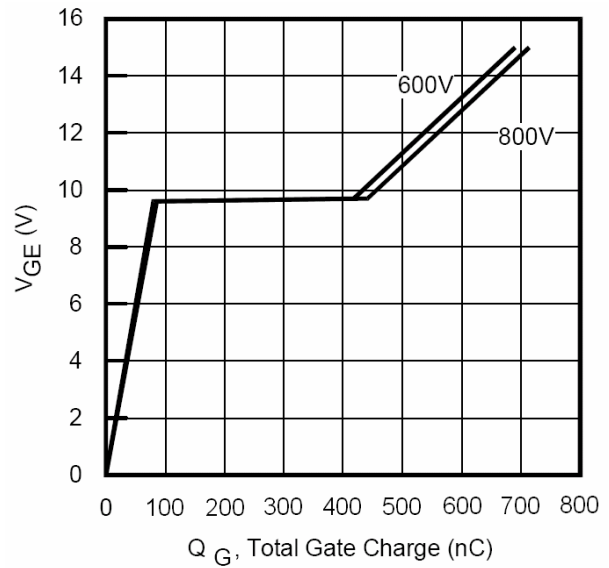


Fig 10. Typical Gate Charge vs. V<sub>ge</sub>  
I<sub>CE</sub> = 120A; L = 600μH

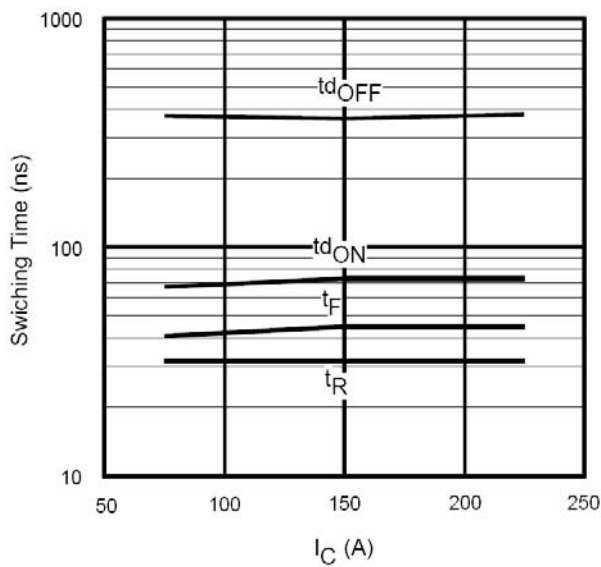


Fig 11. Typ. Switching Time vs. I<sub>c</sub>  
T<sub>J</sub> = 125°C; L = 200μH; V<sub>CE</sub> = 600V  
R<sub>G</sub> = 4.7Ω; V<sub>GE</sub> = 15V

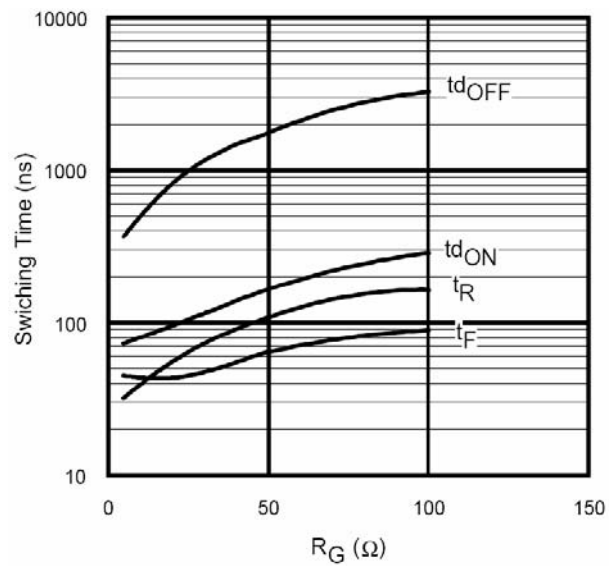


Fig 12. Typ. Switching Time vs. R<sub>g</sub>  
T<sub>J</sub> = 125°C; L = 200μH; V<sub>CE</sub> = 600V  
I<sub>CE</sub> = 200A; V<sub>GE</sub> = 15V

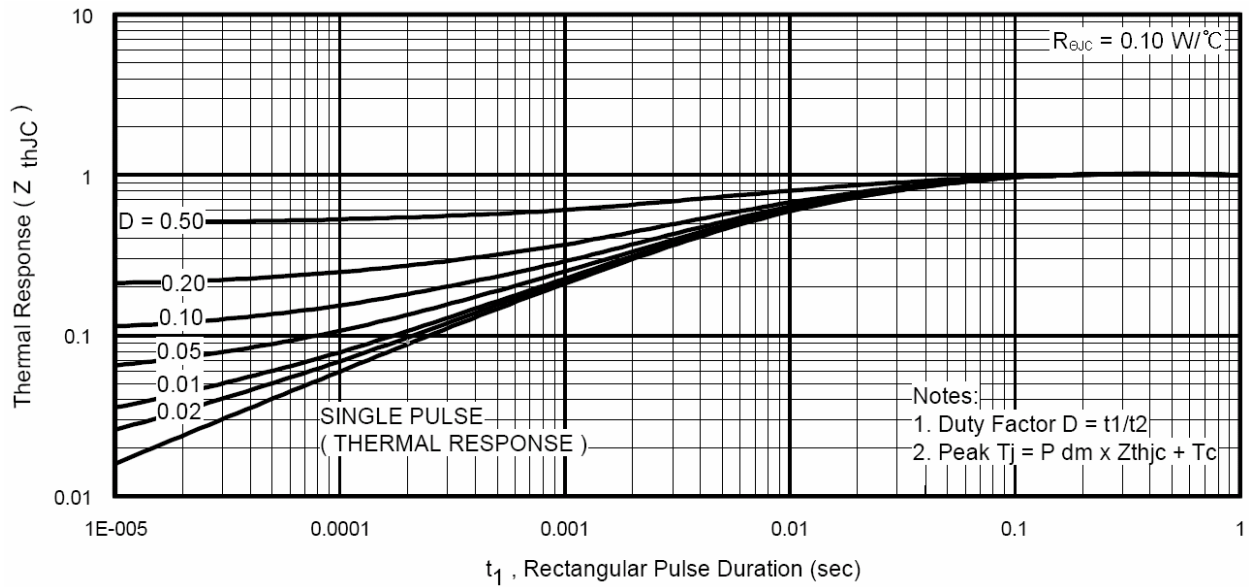


Fig 13. Normalized Transient Thermal Impedance, Junction-to-Case (IGBT)

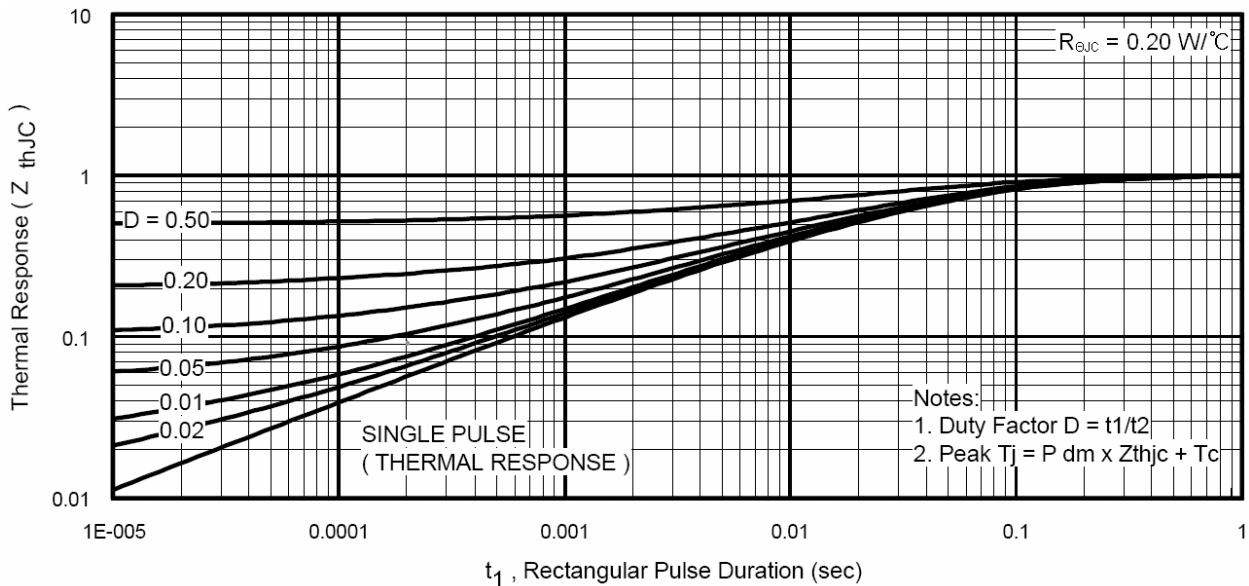


Fig 14. Normalized Transient Thermal Impedance, Junction-to-Case (DIODE)

**Package Outline** (dimensions in mm)

