

PTDC75120BY

1200V 75A Si IGBT Discrete

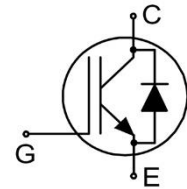
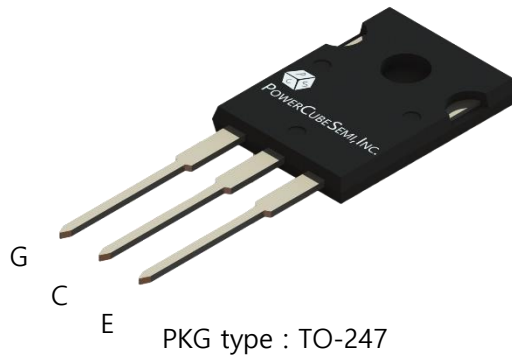
Features

Si IGBT Discrete

- Rated to 1200V at 75Amps @ $T_C = 100^\circ\text{C}$
- $V_{CE(sat)} = 1.85\text{V}$ @ $I_C = 75\text{A}$
- High breakdown voltage to 1200V for improved reliability
- Maximum Junction Temperature 175°C
- Positive temperature coefficient
- Including fast & soft recovery anti-parallel FWD
- High short circuit capability (10us)

Application

- Inverter for motor drive
- Three-level solar string inverter
- Motor controller



Absolute Maximum Ratings

| Symbol | Parameter | Value | Unit | |
|----------------|--------------------------------------|---------------------------|------------------|---|
| BV_{CES} | Collector-Emitter Breakdown Voltage | 1200 | V | |
| I_C | DC Collector Current | $T_C = 25^\circ\text{C}$ | 150 | A |
| | | $T_C = 100^\circ\text{C}$ | 75 | |
| $I_{C, Pulse}$ | Pulsed Collector Current | 300 | A | |
| I_F | Diode Forward Current | $T_C = 25^\circ\text{C}$ | 120 | A |
| | | $T_C = 100^\circ\text{C}$ | 75 | |
| $I_{F, Pulse}$ | Diode Pulsed Current | 300 | A | |
| V_{GE} | Continuous Gate-Emitter Voltage | ± 20 | V | |
| V_{GE} | Transient Gate-Emitter Voltage | ± 30 | | |
| P_D | Power Dissipation | $T_C = 25^\circ\text{C}$ | 750 | W |
| t_{SC} | Short circuit withstand time | 10 | μs | |
| T_{vj} | Operating Junction Temperature Range | -40 to 175 | $^\circ\text{C}$ | |
| T_{stg} | Storage Temperature Range | -55 to 150 | | |

Package Marking and Ordering Information

| Device Marking | Device | Package | Packing Method | Tape width | Quantity |
|----------------|-----------|---------|----------------|------------|----------|
| PTDC75120BY | PTDC75120 | TO-247 | TUBE | - | 30 |

Electrical Characteristics $T_j=25^\circ\text{C}$ Unless Otherwise Specified

Static Characteristics

| Symbol | Parameter | Test Condition | Numerical | | | Unit | |
|---------------|--------------------------------------|---|-------------------------|------|------|------|----|
| | | | Min | Typ | Max | | |
| BV_{CES} | Collector-Emitter Breakdown Voltage | $I_C=250\mu\text{A}$, $V_{GE}=0\text{V}$ | 1200 | - | - | V | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C=75\text{A}$, $V_{GE}=15\text{V}$ | $T_j=25^\circ\text{C}$ | 1.50 | 1.85 | 2.20 | V |
| | | | $T_j=125^\circ\text{C}$ | - | 2.20 | - | |
| | | | $T_j=150^\circ\text{C}$ | - | 2.30 | - | |
| $V_{GE(TH)}$ | Gate-Emitter Threshold Voltage | $V_{CE}=V_{GE}$, $I_C=2.6\text{mA}$ | 5.2 | 5.8 | 6.5 | V | |
| I_{CES} | Zero Gate Voltage Collector Current | $V_{CE}=1200\text{V}$, $V_{GE}=0\text{V}$ | $T_j=25^\circ\text{C}$ | - | - | 0.25 | mA |
| | | | $T_j=150^\circ\text{C}$ | - | - | 5.00 | |
| I_{GES} | Gate-Emitter Leakage Current | $V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$ | - | - | 100 | nA | |

Dynamic Characteristics

| Symbol | Parameter | Test Condition | Numerical | | | Unit | |
|-----------|------------------------------|--|-------------------------|------|------|---------------|---|
| | | | Min | Typ | Max | | |
| Q_G | Total Gate Charge | $V_{CC}=960\text{V}$, $I_C=75\text{A}$, $V_{GE}=15\text{V}$ | - | 0.55 | - | μC | |
| V_F | Diode Forward Voltage | $I_F=75\text{A}$ | $T_j=25^\circ\text{C}$ | - | 2.20 | 2.70 | V |
| | | | $T_j=125^\circ\text{C}$ | - | 1.95 | - | |
| | | | $T_j=150^\circ\text{C}$ | - | 1.85 | - | |
| C_{IES} | Input Capacitance | $V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=1\text{MHz}$ | - | 5.29 | - | nF | |
| C_{RES} | Reverse Transfer Capacitance | | - | 0.27 | - | | |



Electrical Characteristics

Switching Characteristics

| Symbol | Parameter | Test Condition | Numerical | | | Unit |
|--------------|---------------------------|--|-----------|------|-----|------|
| | | | Min | Typ | Max | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{GE} = -5 \sim 15V,$ $V_{CC} = 600V,$ $I_C = 75A, R_G = 10\Omega$ | - | 20 | - | ns |
| t_r | Turn-On Rise Time | | - | 21 | - | |
| | | | - | 21 | - | |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 102 | - | mJ |
| | | | - | 93 | - | |
| | | | - | 91 | - | |
| t_f | Turn-Off Fall Time | | - | 264 | - | |
| | | - | 325 | - | | |
| | | - | 357 | - | | |
| E_{on} | Turn-On Switching Energy | - | 128 | - | mJ | |
| | | - | 212 | - | | |
| | | - | 264 | - | | |
| E_{off} | Turn-Off Switching Energy | - | 9.9 | - | mJ | |
| | | - | 10.1 | - | | |
| | | - | 10.2 | - | | |
| E_{rec} | Reverse Recovery Energy | - | 3.9 | - | mJ | |
| | | - | 5.8 | - | | |
| | | - | 6.6 | - | | |
| I_{rr} | Reverse Recovery Current | $I_F = 75A, V_R = 600V,$ $di/dt = -500A/\mu s$ | - | 1.75 | - | mJ |
| | | | - | 3.18 | - | |
| | | | - | 3.73 | - | |
| Q_{rr} | Reverse Recovery Charge | | - | 9 | - | A |
| | | | - | 12 | - | |
| | | | - | 14 | - | |
| T_{rr} | Reverse Recovery Time | | - | 3.42 | - | uC |
| | | - | 6.58 | - | | |
| | | - | 9.45 | - | | |
| T_{rr} | Reverse Recovery Time | - | 268 | - | ns | |
| | | - | 337 | - | | |
| | | - | 375 | - | | |

Thermal Characteristics

| Symbol | Parameter | Numerical | Unit |
|-------------------|---|-----------|------|
| $R_{\theta(J-A)}$ | Thermal Resistance Junction-to-Ambient | 40 | K/W |
| $R_{\theta(J-C)}$ | Thermal Resistance Junction-to-Case for IGBT | 0.20 | |
| $R_{\theta(J-C)}$ | Thermal Resistance Junction-to-Case for Diode | 0.35 | |

Typical Characteristics

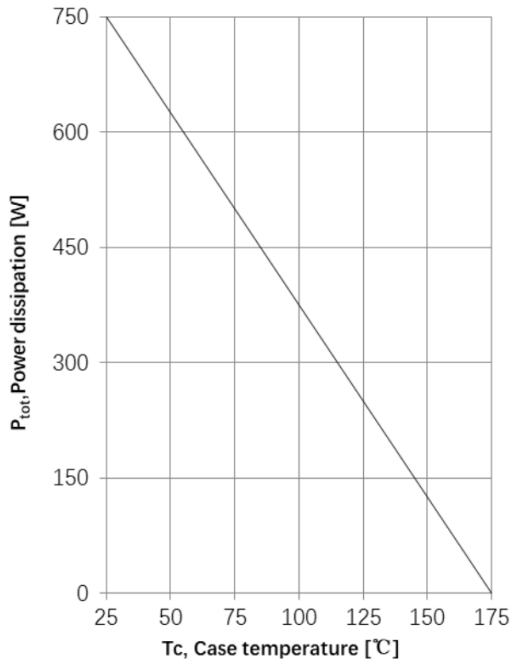


Figure 1. Power dissipation as a function of case temperature ($T_J \leq 175^\circ\text{C}$)

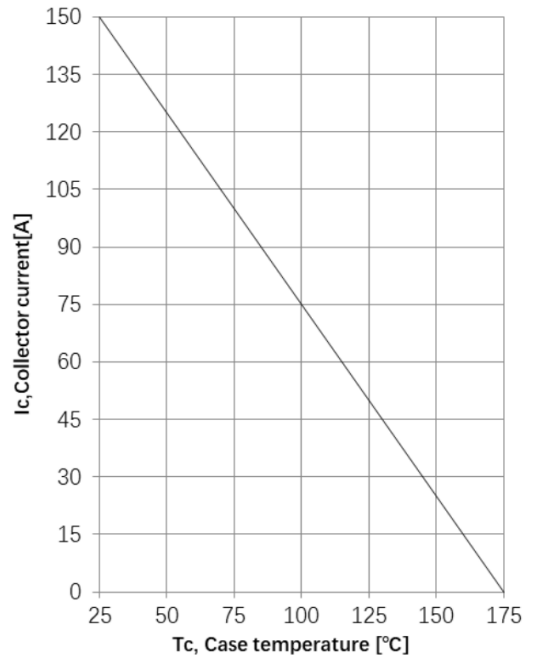


Figure 2. Collector current as a function of case temperature ($V_{GE} \geq 15\text{V}$, $T_J \leq 175^\circ\text{C}$)

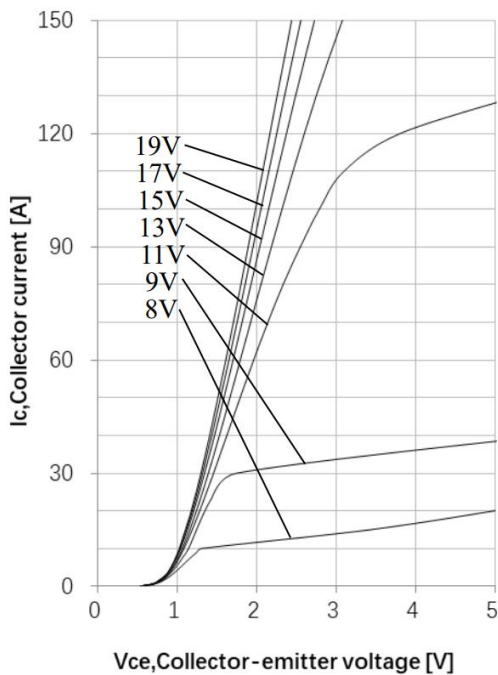


Figure 3. Output Characteristics ($T_J = 25^\circ\text{C}$)

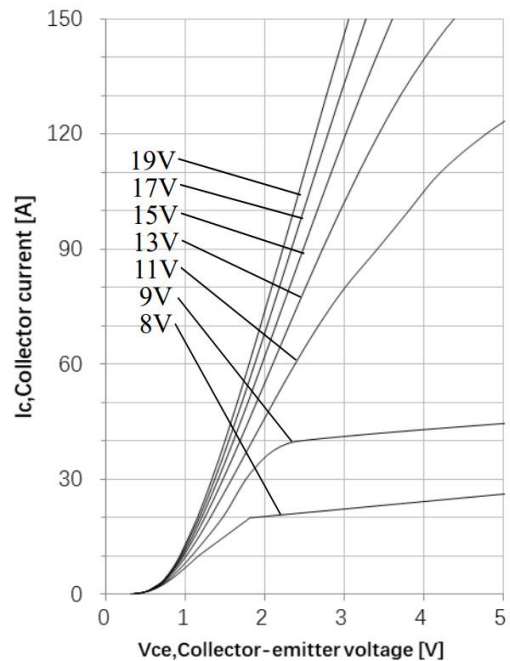


Figure 4. Output Characteristics ($T_J = 150^\circ\text{C}$)

Typical Characteristics

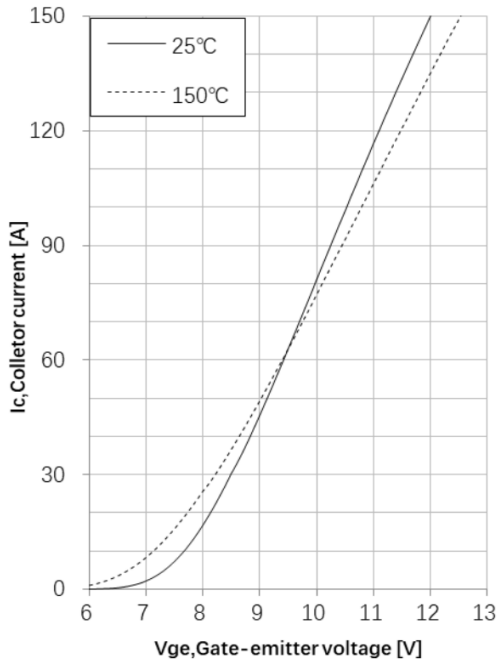


Figure 5. Typical transfer characteristic ($V_{CE}=20V$)

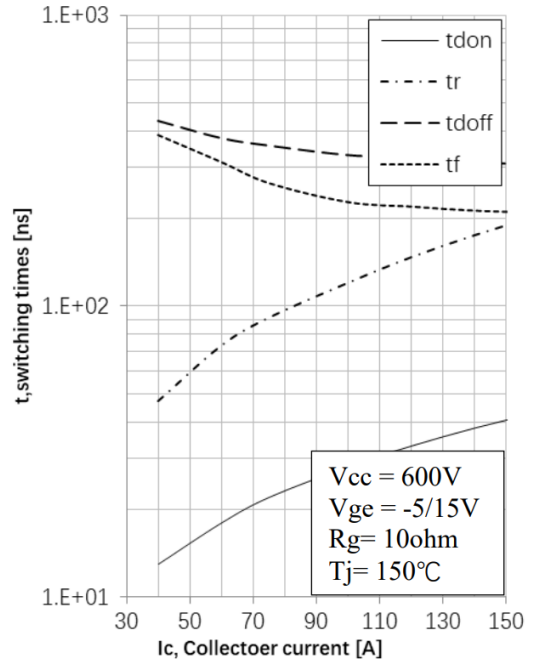


Figure 6. Typical Switching time as a function of collector current

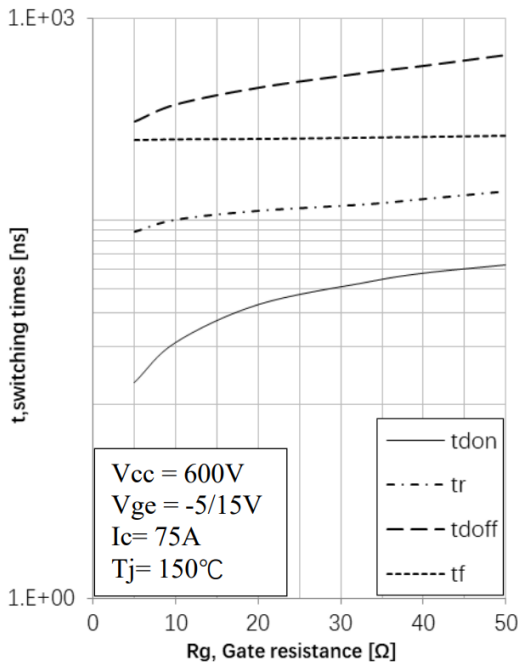


Figure 7. Typical Switching times as a function of gate resistance

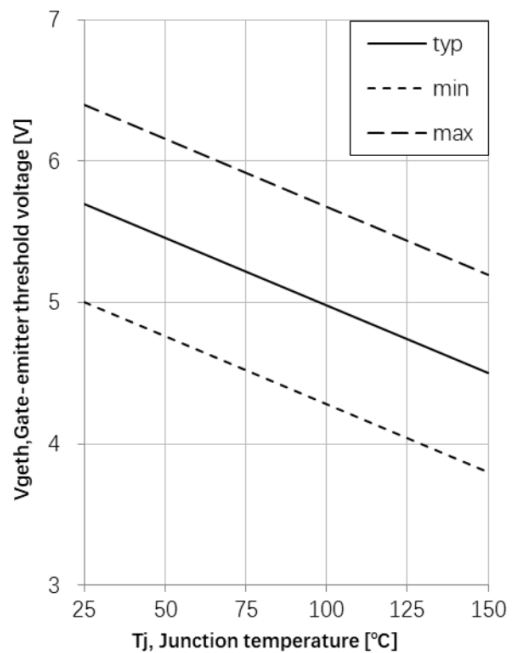


Figure 8. Typical Switching energy losses as a function of collector current

Typical Characteristics

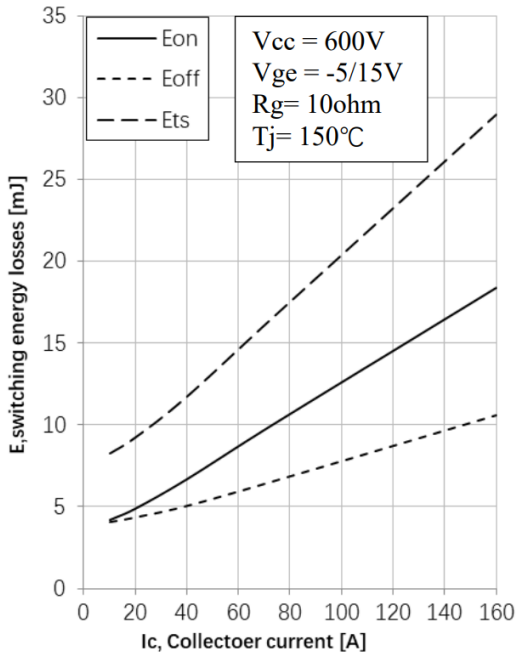


Figure 9. Typical Switching energy losses as a function of collector current

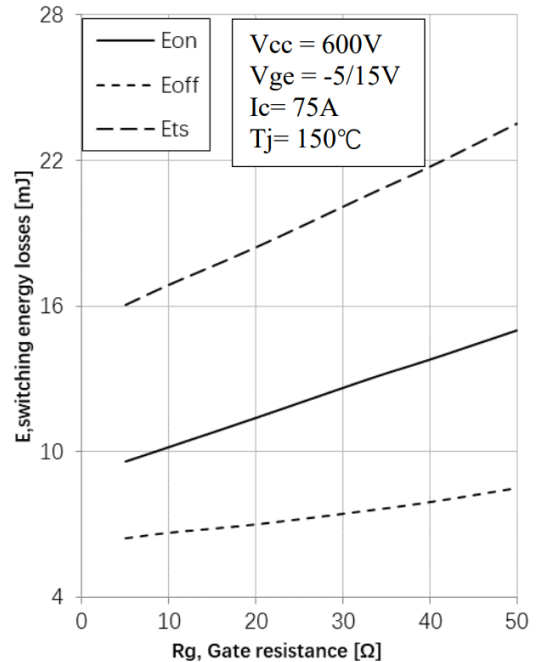


Figure 10. Typical Switching energy losses as a function of gate resistance

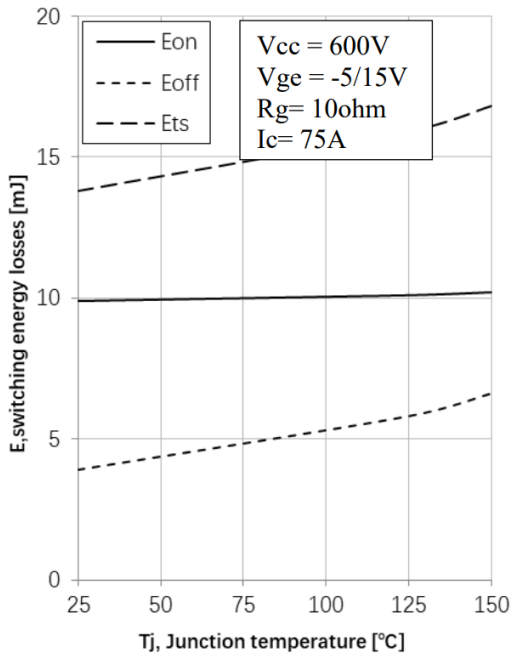


Figure 11. Typical Switching Energy losses as a function of junction temperature

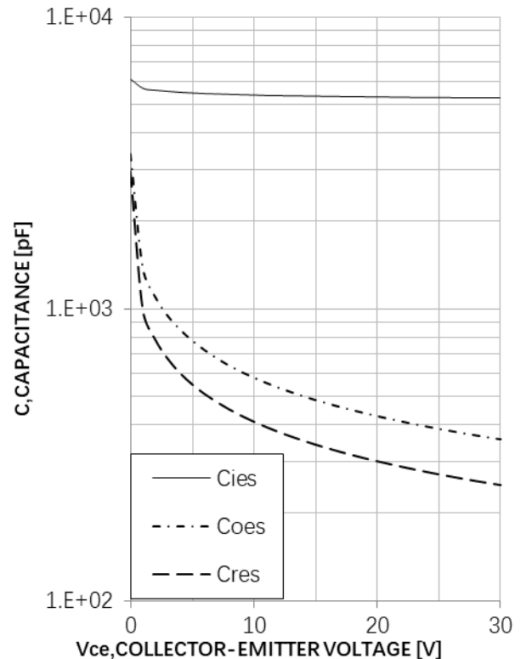


Figure 12. Typical capacitance as a function of collector-emitter voltage

Typical Characteristics

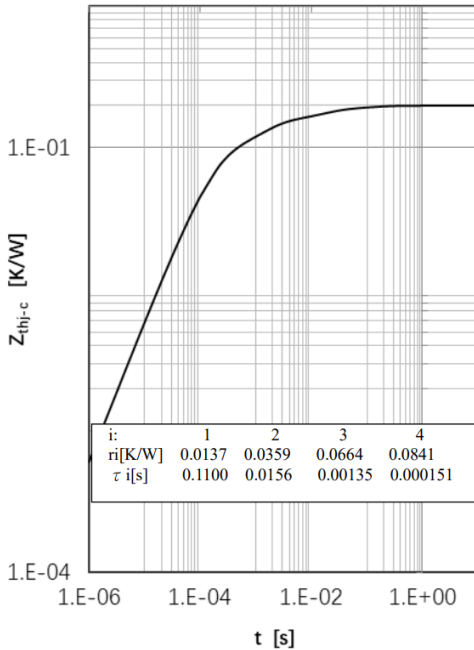


Figure 13. IGBT Transient Thermal Impedance

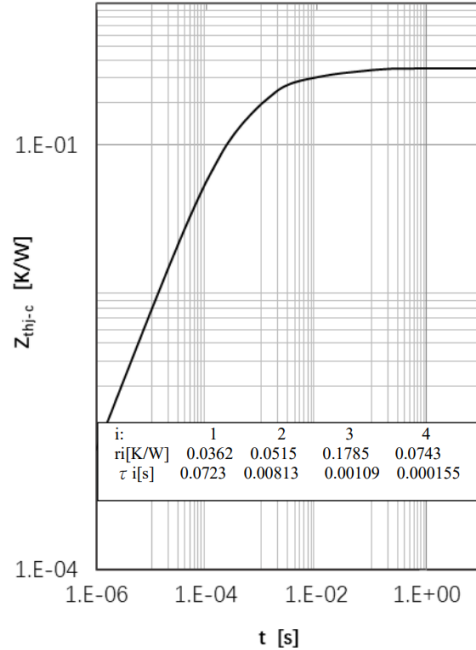


Figure 14. Diode Transient Thermal Impedance

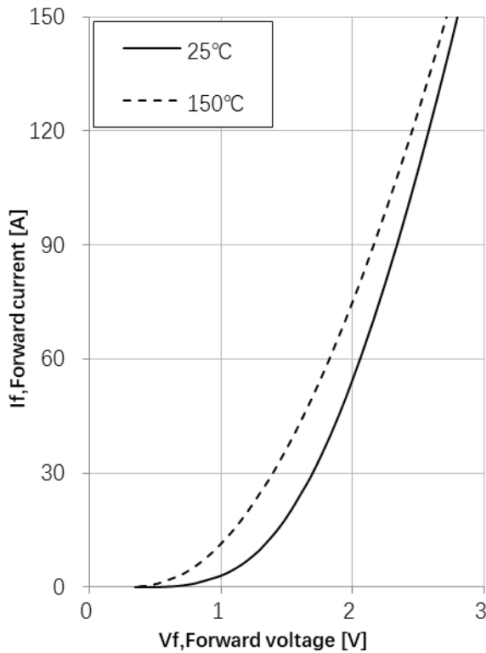


Figure 15. Diode forward current as a function of forward voltage

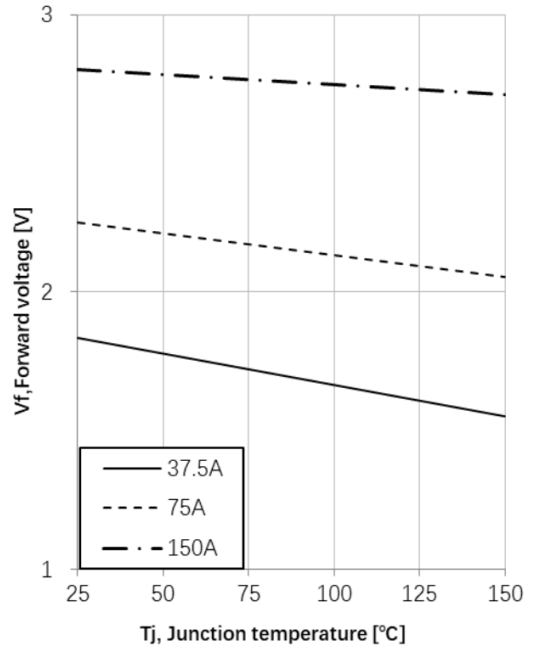
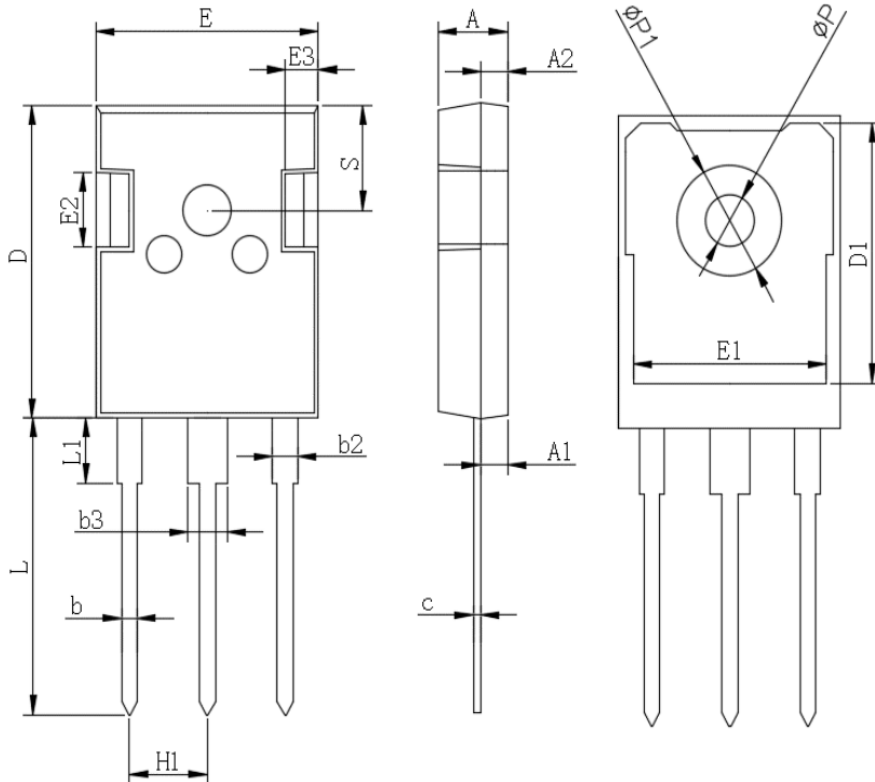


Figure 16. Typical diode forward voltage as a function of junction temperature

Package Outline

Unit : mm



| SYMBOL | DIMENSIONS | |
|-----------------------------|------------|-------|
| | MIN | MAX |
| A | 4.80 | 5.20 |
| A1 | 2.21 | 2.61 |
| A2 | 1.85 | 2.15 |
| b | 1.0 | 1.4 |
| b2 | 1.91 | 2.21 |
| C | 0.5 | 0.7 |
| D | 20.70 | 21.30 |
| D1 | 16.25 | 16.85 |
| E | 15.50 | 16.10 |
| E1 | 13.0 | 13.6 |
| E2 | 4.80 | 5.20 |
| E3 | 2.30 | 2.70 |
| L | 19.62 | 20.22 |
| L1 | - | 4.30 |
| ΦP | 3.40 | 3.80 |
| $\Phi P1$ | - | 7.30 |
| S | 6.15 Typ | |
| H1 | 5.44 Typ | |
| b3 | 2.80 | 3.20 |