

PTDC1565HY

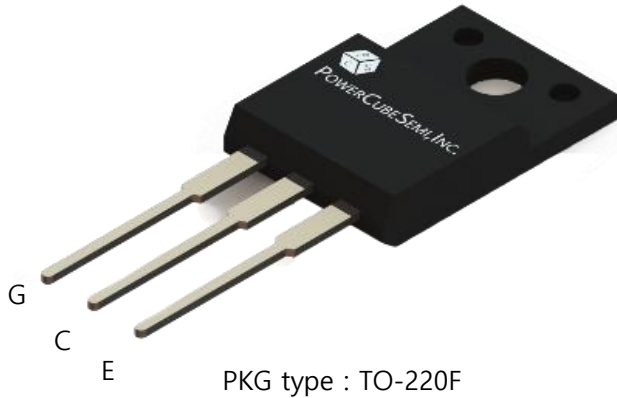
Features

IGBT Discrete

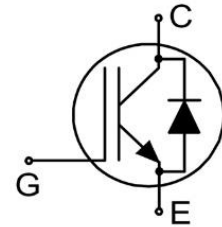
- Rated to 650V at 15Amps @ $T_j = 25^{\circ}\text{C}$
- $V_{CE(sat)} = 1.60\text{V}$ @ $I_C = 15\text{A}$
- Positive Temperature Coefficient
- High Speed Smooth Switching device for hard& Soft Switching
- High Ruggedness, Temperature Stable
- Maximum Junction Temperature 175°C

Application

- Soft switching applications
- Air Conditioning
- Motor Drive Inverter



PKG type : TO-220F



Absolute Maximum Ratings

| Symbol | Parameter | Value | Unit | |
|----------------|--------------------------------------|-----------------------------|--------------------|---|
| BV_{CES} | Collector-Emitter Breakdown Voltage | 650 | V | |
| I_C | DC Collector Current | $T_C = 25^{\circ}\text{C}$ | 30 | A |
| | | $T_C = 100^{\circ}\text{C}$ | 15 | |
| I_{CM} | Pulsed Collector Current | 45 | A | |
| I_F | Diode Forward Current | $T_C = 25^{\circ}\text{C}$ | 30 | A |
| | | $T_C = 100^{\circ}\text{C}$ | 15 | |
| $I_{F, Pulse}$ | Diode Pulsed Current | 45 | A | |
| V_{GE} | Continuous Gate-Emitter Voltage | ± 20 | V | |
| V_{GE} | Transient Gate-Emitter Voltage | ± 30 | | |
| P_D | Power Dissipation | $T_C = 25^{\circ}\text{C}$ | 110 | W |
| t_{SC} | Short circuit withstand time | 5 | 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 |
|----------------|----------|---------|----------------|------------|----------|
| PTDC1565HY | PTDC1565 | TO-220F | TUBE | - | 50 |

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 | $I_C=250\mu\text{A}$, $V_{GE}=0\text{V}$ | 650 | - | - | V | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C=15\text{A}$, $V_{GE}=15\text{V}$ | $T_J=25^{\circ}\text{C}$ | - | 1.40 | 1.70 | V |
| | | | $T_J=125^{\circ}\text{C}$ | - | 1.55 | - | |
| | | | $T_J=150^{\circ}\text{C}$ | - | 1.60 | - | |
| $V_{GE(TH)}$ | Gate-Emitter Threshold Voltage | $V_{CE}=V_{GE}$, $I_C=1\text{mA}$ | 5.0 | 5.8 | 6.5 | V | |
| I_{CES} | Zero Gate Voltage Collector Current | $V_{CE}=650\text{V}$, $V_{GE}=0\text{V}$ | $T_J=25^{\circ}\text{C}$ | - | - | 0.25 | mA |
| | | | $T_J=150^{\circ}\text{C}$ | - | - | 1.00 | |
| I_{GES} | Gate-Emitter Leakage Current | $V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$ | - | - | ± 200 | nA | |

Dynamic Characteristics

| Symbol | Parameter | Test Condition | Numerical | | | Unit | |
|-------------|---------------------------------|--|---------------------------|-------|------|---------------|---|
| | | | Min | Typ | Max | | |
| Q_G | Total Gate Charge | $V_{CC}=300\text{V}$, $I_C=15\text{A}$, $V_{GE}=15\text{V}$ | - | 0.069 | - | μC | |
| V_F | Diode Forward Voltage | $I_F=15\text{A}$ | $T_J=25^{\circ}\text{C}$ | - | 1.90 | 2.40 | V |
| | | | $T_J=125^{\circ}\text{C}$ | - | 1.70 | - | |
| | | | $T_J=150^{\circ}\text{C}$ | - | 1.60 | - | |
| C_{IES} | Input Capacitance | $V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=1\text{MHz}$ | - | 0.88 | - | nF | |
| C_{OES} | Output Capacitance | | - | 0.04 | - | | |
| C_{RES} | Reverse Transfer Capacitance | | - | 0.01 | - | | |
| $I_{C(SC)}$ | Short circuit collector current | $V_{GE}=15\text{V}$, $t_{SC}\leq 5\mu\text{s}$, $V_{CC}=400\text{V}$, $T_{J,start}=25^{\circ}\text{C}$ | - | 110 | - | A | |

Electrical Characteristics

Switching Characteristics

| Symbol | Parameter | Test Condition | | Numerical | | | Unit | | |
|--------------|---------------------------|---|--|-----------|------|-----|------|----|---|
| | | | | Min | Typ | Max | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{GE} = -5 \sim 15V$, $V_{CC} = 300V$, $I_C = 15A$, $R_G = 51\Omega$ | $T_J = 25^\circ C$ $T_J = 125^\circ C$ $T_J = 150^\circ C$ | - | 10 | - | ns | | |
| | | | | - | 14 | - | | | |
| | | | | - | 16 | - | | | |
| t_r | Turn-On Rise Time | | | - | 28 | - | | | |
| | | | | - | 36 | - | | | |
| | | | | - | 43 | - | | | |
| $t_{d(off)}$ | Turn-Off Delay Time | | | | | - | 68 | - | |
| | | | | - | 69 | - | | | |
| | | | | - | 69 | - | | | |
| t_f | Turn-Off Fall Time | | | - | 138 | - | | | |
| | | | | - | 161 | - | | | |
| | | | | - | 182 | - | | | |
| E_{on} | Turn-On Switching Energy | | | - | 0.33 | - | mJ | | |
| | | | | - | 0.38 | - | | | |
| | | | | - | 0.43 | - | | | |
| E_{off} | Turn-Off Switching Energy | | | - | 0.16 | - | mJ | | |
| | | | | - | 0.27 | - | | | |
| | | | | - | 0.32 | - | | | |
| E_{rec} | Reverse Recovery Energy | | | - | 0.05 | - | mJ | | |
| | | | | - | 0.22 | - | | | |
| | | | | - | 0.25 | - | | | |
| I_{rr} | Reverse Recovery Current | $I_F = 15A$, $V_R = 300V$, $-di/dt = 460A/\mu s$ | $T_J = 25^\circ C$ $T_J = 125^\circ C$ $T_J = 150^\circ C$ | - | 9 | - | A | | |
| | | | | | | - | | 12 | - |
| | | | | | | - | | 14 | - |
| Q_{rr} | Reverse Recovery Charge | | | - | 0.17 | - | uC | | |
| | | | | - | 0.65 | - | | | |
| | | | | - | 0.82 | - | | | |

Thermal Characteristics

| Symbol | Parameter | Numerical | Unit |
|-------------------|---|-----------|------|
| $R_{\theta(J-A)}$ | Thermal Resistance Junction-to-Ambient | 60 | K/W |
| $R_{\theta(J-C)}$ | Thermal Resistance Junction-to-Case for IGBT | 4.4 | |
| $R_{\theta(J-C)}$ | Thermal Resistance Junction-to-Case for Diode | 4.8 | |

Typical Characteristics

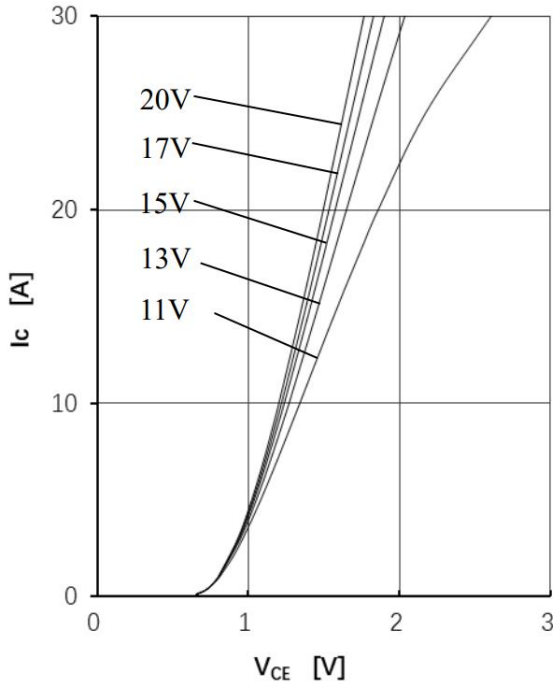


Figure 1. Output Characteristics ($T_J=25^\circ\text{C}$)

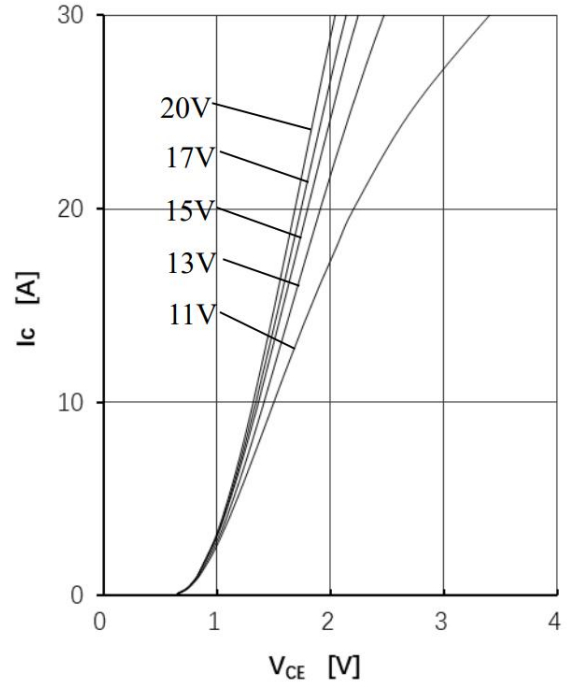


Figure 2. Output Characteristics ($T_J=150^\circ\text{C}$)

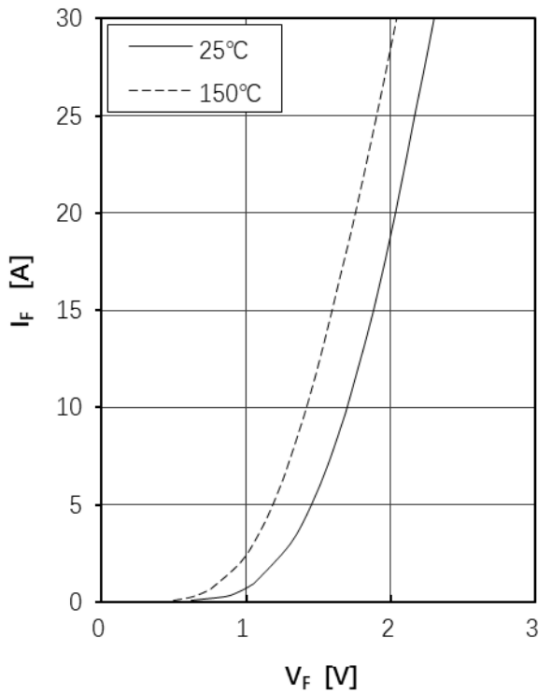


Figure 3. Diode Forward Characteristics

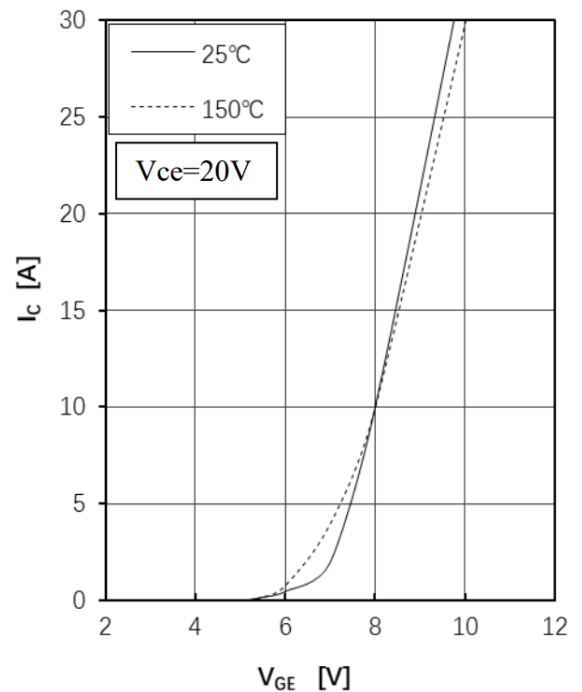


Figure 4. IGBT Transfer Characteristics

Typical Characteristics

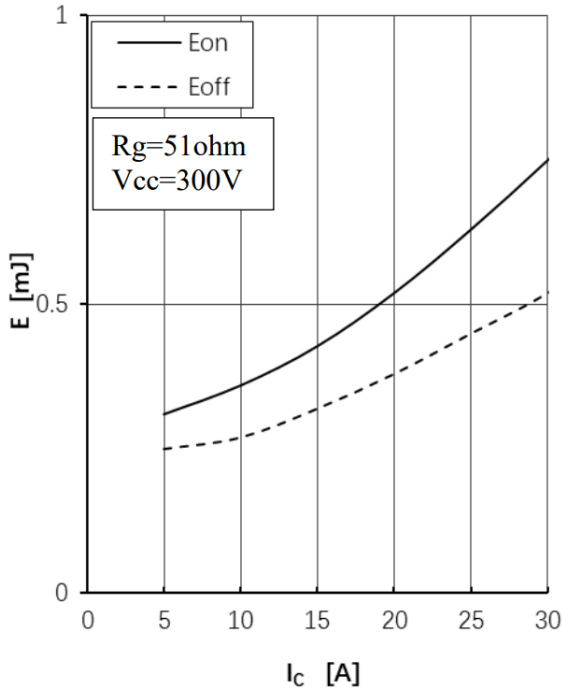


Figure 5. IGBT Switching Loss vs. I_c (150°C)

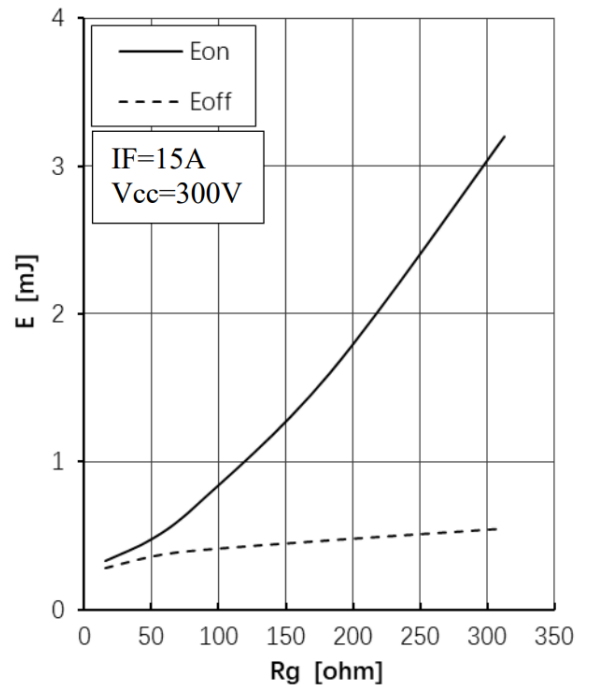


Figure 6. IGBT Switching Loss vs. R_g (150°C)

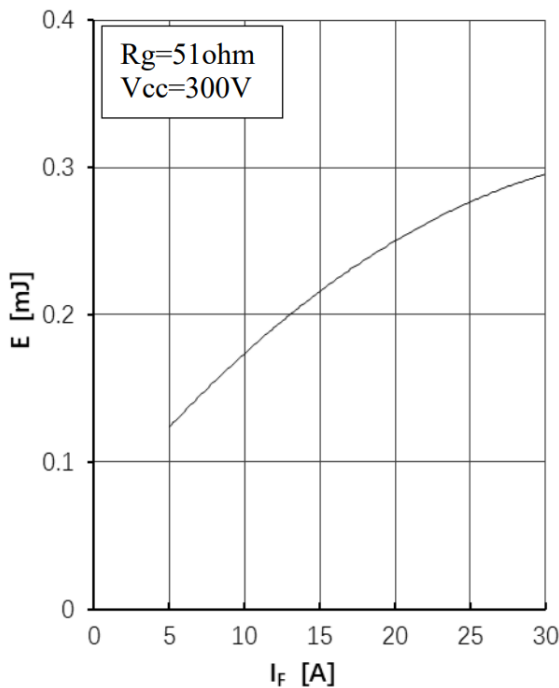


Figure 7. Diode Switching Loss (E_{rec}) vs. I_F (150°C)

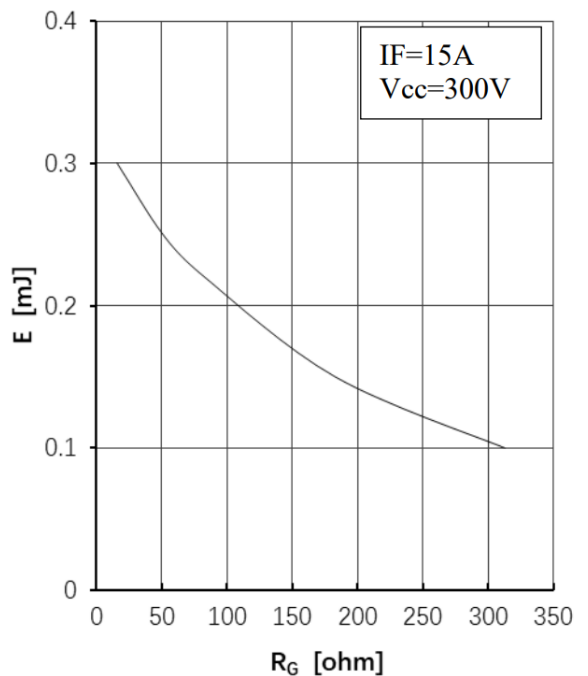


Figure 8. Diode Switching Loss (E_{rec}) vs. R_g (150°C)

Typical Characteristics

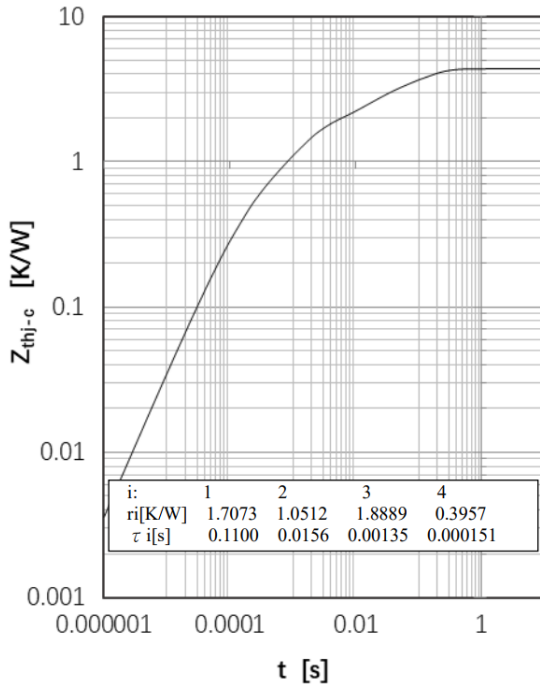


Figure 9. IGBT Transient Thermal Impedance

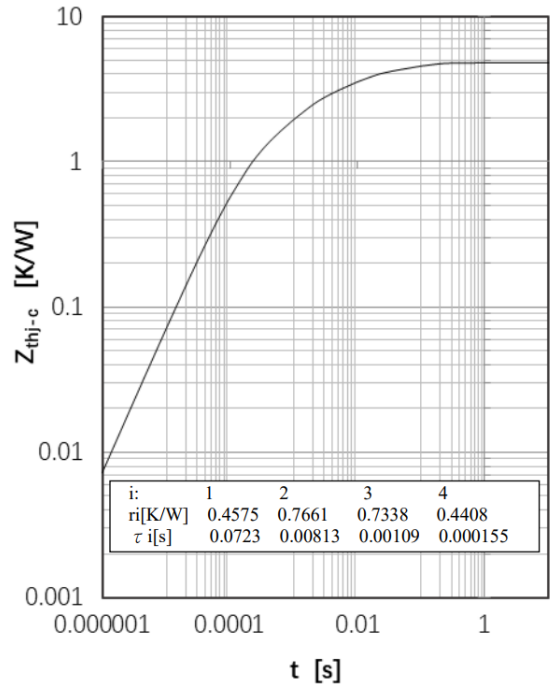
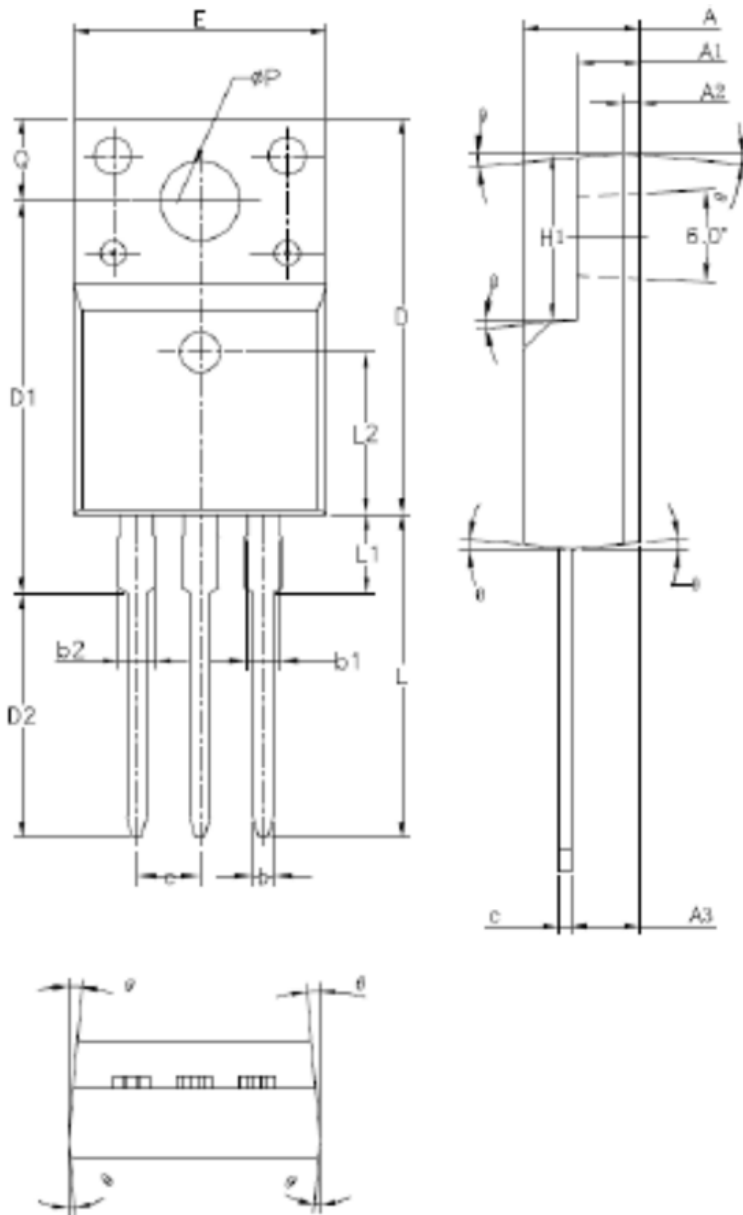


Figure 10. Diode Transient Thermal Impedance

Package Outline

Unit : mm



| SYMBOL | DIMENSIONS | | |
|------------------------------|------------|-------|-------|
| | MIN | NOM | MAX |
| A | 4.50 | 4.70 | 4.83 |
| A1 | 2.34 | 2.54 | 2.74 |
| A2 | 0.70 REF | | |
| A3 | 2.56 | 2.76 | 2.93 |
| b | 0.70 | - | 0.90 |
| b1 | 1.18 | - | 1.38 |
| b2 | - | - | 1.47 |
| c | 0.45 | 0.50 | 0.60 |
| D | 15.67 | 15.87 | 16.07 |
| D1 | 15.55 | 15.75 | 15.95 |
| D2 | 9.60 | 9.80 | 10.0 |
| E | 9.96 | 10.16 | 10.36 |
| e | 2.54 BSC | | |
| H1 | 6.48 | 6.68 | 6.88 |
| L | 12.68 | 12.98 | 13.28 |
| L1 | - | - | 3.50 |
| L2 | 6.50 REF | | |
| ΦP | 3.08 | 3.18 | 3.28 |
| Q | 3.20 | - | 3.40 |
| $\theta 1$ | 1° | 3° | 5° |