

Data Sheet

Customer : _____

Product : Insulated Gate Bipolar Transistor (IGBT) _____

Type : H25G3U120SC _____

Issued Date: 05-Sep.-2023 _____

Edition : Ver. 1 _____

Record of change

| Date | Ver. | Description | Page |
|--------------|------|-------------|------|
| 05-Sep.-2023 | 1 | | |
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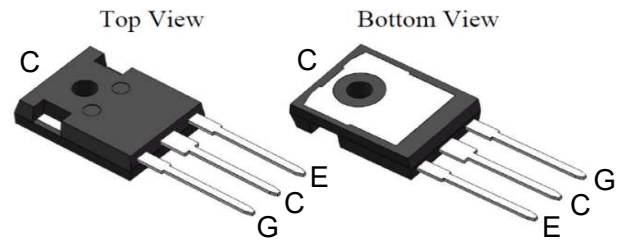
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FEATURES

- Low switching losses
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant



TO-247-3L

MECHANICAL DATA

Case:TO-247-3L molded plastic body
 Terminals : Leads solderable per MIL-STD-750,
 Method 2026
 Polarity: As marked
 Mounting Position: Any



MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

| Symbol | Parameter/Test Conditions | Values | Unit |
|-------------|--|---------------------------|------------------|
| V_{CES} | Collector Emitter Voltage | $T_J = 25^\circ\text{C}$ | V |
| V_{GES} | Gate Emitter Voltage | | |
| I_C | DC Collector Current | $T_C = 25^\circ\text{C}$ | A |
| | | $T_C = 100^\circ\text{C}$ | |
| I_{Cpuls} | Pulsed collector current, tp limited by T_{Jmax} | | |
| P_{tot} | Power Dissipation Per IGBT | $T_C = 25^\circ\text{C}$ | W |
| | | $T_C = 100^\circ\text{C}$ | |
| V_{RRM} | Repetitive Reverse Voltage | $T_J = 25^\circ\text{C}$ | V |
| I_F | Average Forward Current | $T_C = 25^\circ\text{C}$ | A |
| | | $T_C = 100^\circ\text{C}$ | |
| T_{Jmax} | Max. Junction Temperature | | $^\circ\text{C}$ |
| T_{Jop} | Operating Temperature | | $^\circ\text{C}$ |
| T_{stg} | Storage Temperature | | $^\circ\text{C}$ |

Thermal Resistance

| Parameter | Symbol | Conditions | Value | | | Unit |
|--|---------------|------------|-------|------|------|--------------------|
| | | | min. | typ. | max. | |
| R_{th} Characteristics | | | | | | |
| IGBT thermal resistance, junction - case(IGBT) | $R_{th(j-c)}$ | | - | - | 0.43 | $^\circ\text{C/W}$ |
| Diode thermal resistance, junction - case(per diode) | $R_{th(j-c)}$ | | - | - | 1.15 | $^\circ\text{C/W}$ |
| Thermal resistance junction - ambient | $R_{th(j-a)}$ | | - | - | 40 | $^\circ\text{C/W}$ |

IGBT

Electrical Characteristic (at TC = 25 °C, unless otherwise specified)

| Symbol | Parameter/Test Conditions | | Min. | Typ. | Max. | Unit | | |
|---------------|--------------------------------------|--|---------------------------------|------|------|------|--|----|
| $V_{GE(th)}$ | Gate Emitter Threshold Voltage | $V_{CE}=V_{GE}, I_C=250\mu A$ | 4.5 | 6.0 | 7.0 | V | | |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $I_C=25A, V_{GE}=15V, T_J=25^\circ C$ | | 1.78 | 2.40 | | | |
| | | $I_C=25A, V_{GE}=15V, T_J=150^\circ C$ | | 2.30 | | | | |
| I_{CES} | Collector Leakage Current | $V_{CE}=1200V, V_{GE}=0V, T_J=25^\circ C$ | | | 1.0 | mA | | |
| I_{GES} | Gate Leakage Current | $V_{CE}=0V, V_{GE}=\pm 20V, T_J=25^\circ C$ | -250 | | 250 | nA | | |
| Q_g | Total Gate Charge | $V_{CE}=600V, I_C=25A, V_{GE}=15V$ | | 154 | | nC | | |
| Q_{ge} | Gate emitter charge | | | 20 | | | | |
| Q_{gc} | Gate collector charge | | | 85 | | | | |
| $t_{d(on)}$ | Turn on Delay Time | $V_{CE}=600V, I_C=25A$ $R_G=10\Omega,$ $V_{GE}=15V,$ Inductive Load | $T_J=25^\circ C$ | | 50 | ns | | |
| | | | $T_J=150^\circ C$ | | 44 | | | |
| t_r | Rise Time | | $T_J=25^\circ C$ | | 25 | | | |
| | | | $T_J=150^\circ C$ | | 30 | | | |
| $t_{d(off)}$ | Turn off Delay Time | | $T_J=25^\circ C$ | | 323 | | | |
| | | | $T_J=150^\circ C$ | | 362 | | | |
| t_f | Fall Time | | $T_J=25^\circ C$ | | 67 | | | |
| | | | $T_J=150^\circ C$ | | 135 | | | |
| E_{on} | Turn on Energy | $V_{CE}=600V, I_C=25A$ $R_G=10\Omega,$ $V_{GE}=15V,$ Inductive Load | $T_J=25^\circ C$ | | 1.9 | mJ | | |
| | | | $T_J=150^\circ C$ | | 2.16 | | | |
| E_{off} | Turn off Energy | | $T_J=25^\circ C$ | | 1.18 | | | |
| | | | $T_J=150^\circ C$ | | 1.51 | | | |
| E_{ts} | Total Energy | | $T_J=25^\circ C$ | | 3.08 | | | |
| | | | $T_J=150^\circ C$ | | 3.67 | | | |
| C_{ies} | Input Capacitance | | $V_{CE}=30V, V_{GE}=0V, f=1MHz$ | | 2700 | | | nF |
| C_{oes} | output Capacitance | | | | 107 | | | |
| C_{res} | Reverse Transfer Capacitance | | | 63 | | | | |

Anti-Parallel Diode

Electrical Characteristic (at TC = 25 °C, unless otherwise specified)

| Symbol | Parameter/Test Conditions | | Min. | Typ. | Max. | Unit |
|-----------|-------------------------------|---------------------------------------|------|------|------|------|
| V_F | Forward Voltage | $I_F=25A, V_{GE}=0V, T_J=25^\circ C$ | | 2.0 | 3.2 | V |
| | | $I_F=25A, V_{GE}=0V, T_J=150^\circ C$ | | 1.7 | | |
| t_{rr} | Reverse Recovery Time | $I_F=25A$ | | 73 | | ns |
| I_{RRM} | Max. Reverse Recovery Current | $di_F/dt=100A/\mu s$ | | 3.63 | | A |
| Q_{RR} | Reverse Recovery Charge | $T_C=25^\circ C$ | | 132 | | nC |

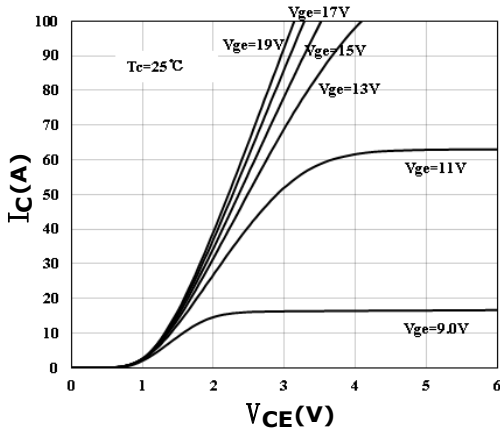


Figure 1. Output Characteristics

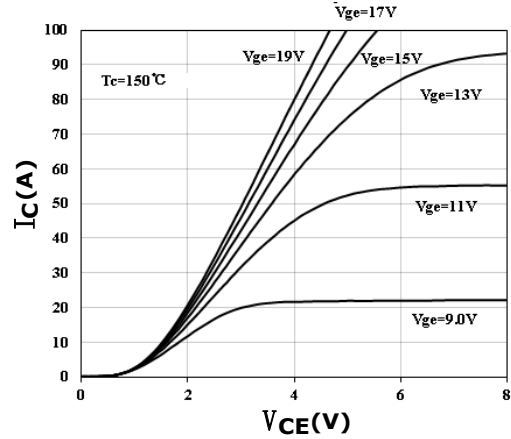


Figure 2. Output Characteristics

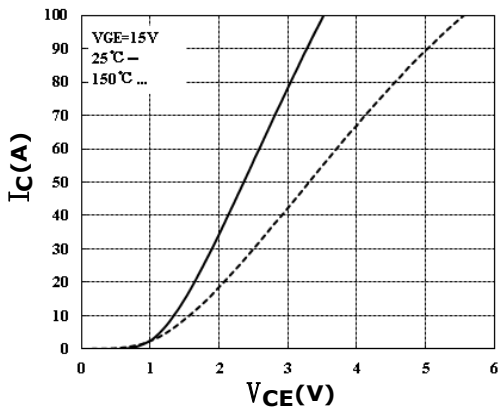


Figure 3. Saturation Voltage Characteristics

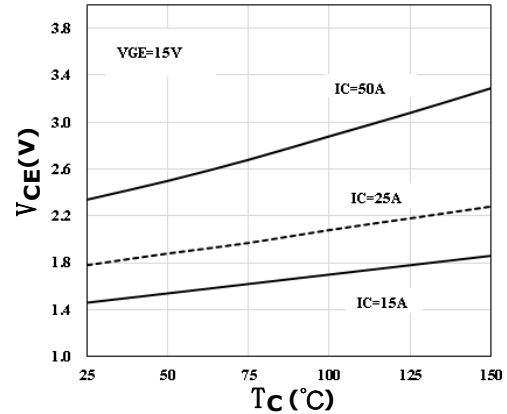


Figure 4. Saturation Voltage - TC Characteristics

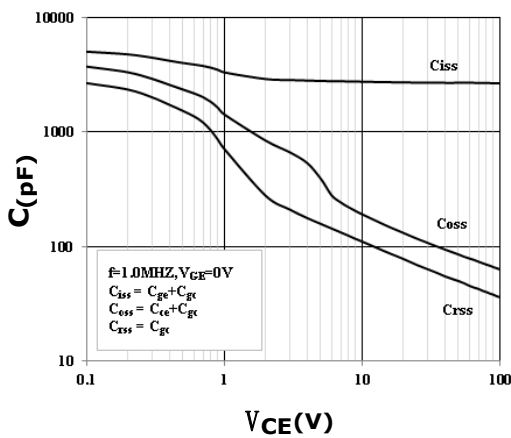


Figure 5. Capacitance Characteristics

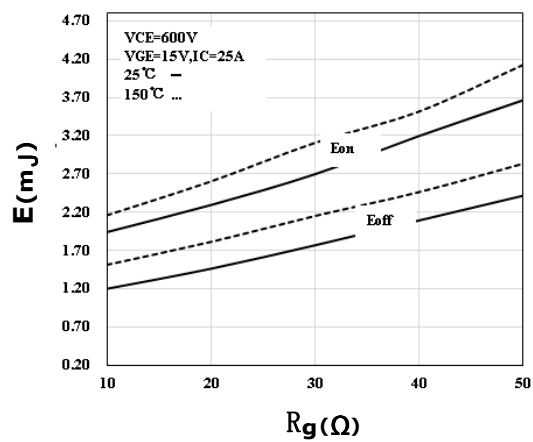


Figure 6. Switching Loss-RG Characteristics

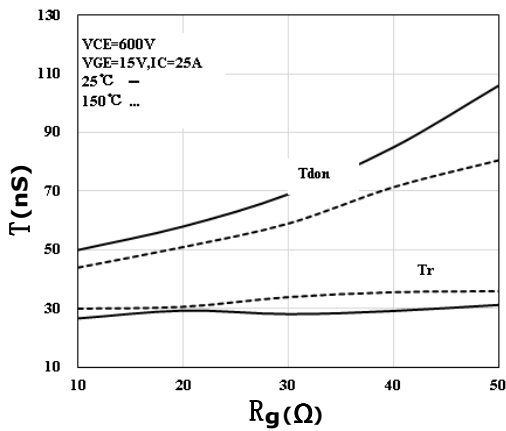


Figure 7. Opening Time-RG Characteristics

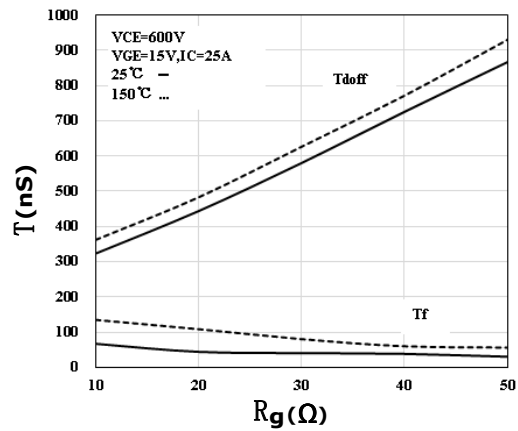


Figure 8. Closing Time-RG Characteristics

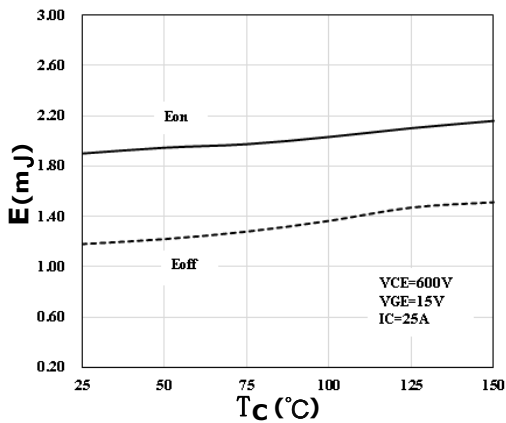


Figure 9. Switching loss-Tc Characteristics

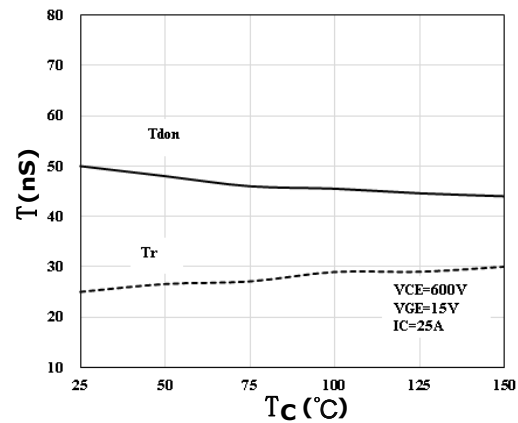


Figure 10. Opening Time-Tc Characteristics

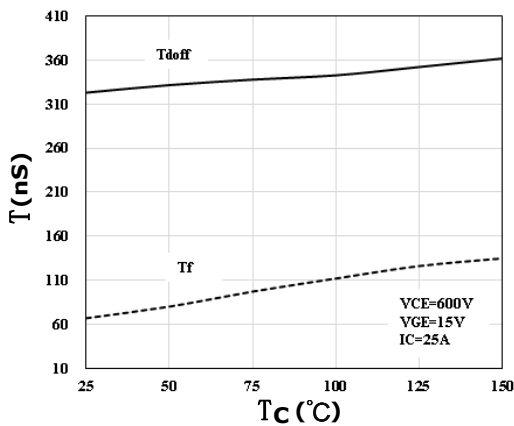


Figure 11. Closing Time-Tc Characteristics

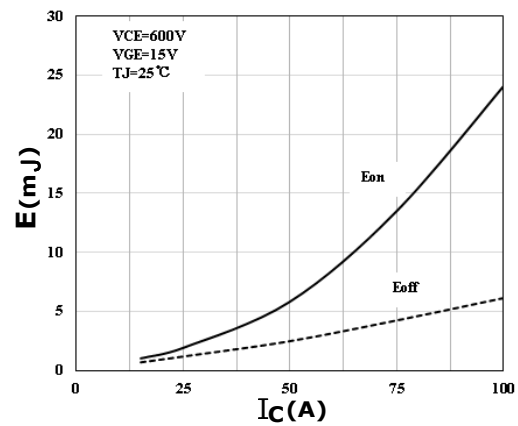


Figure 12. Switching Loss-IC Characteristics

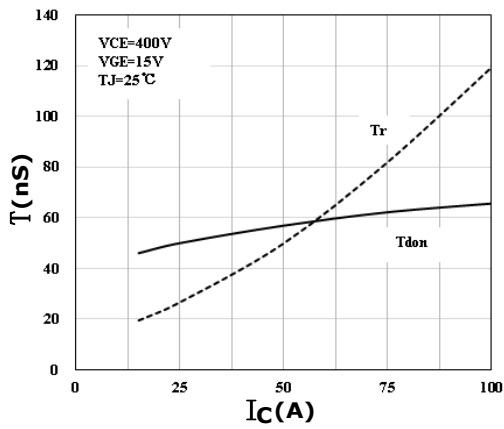


Figure 13. Opening Time-Ic Characteristics

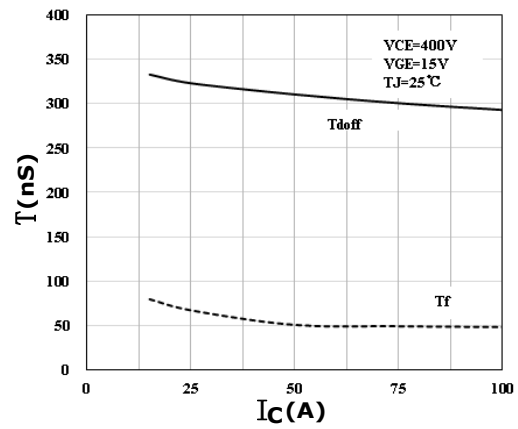


Figure 14. Closing Time-Ic Characteristics

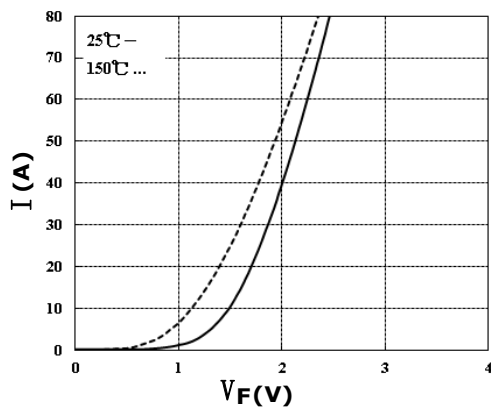


Figure 15. Diode Forward Characteristics

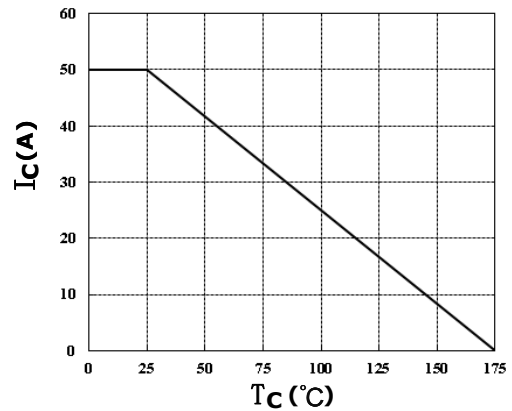


Figure 16. Collector Current-Tc Characteristics ($T_j \leq 175^\circ\text{C}$)

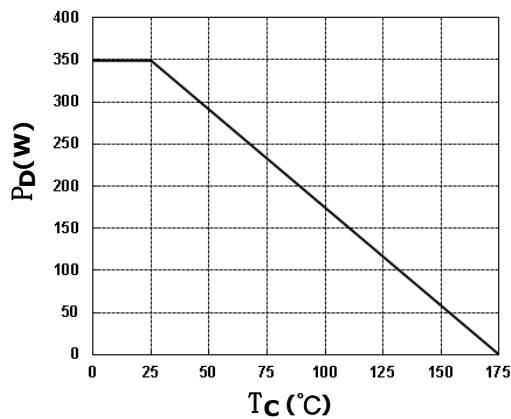


Figure 17. Power Dissipation-Tc Characteristics ($T_j \leq 175^\circ\text{C}$)

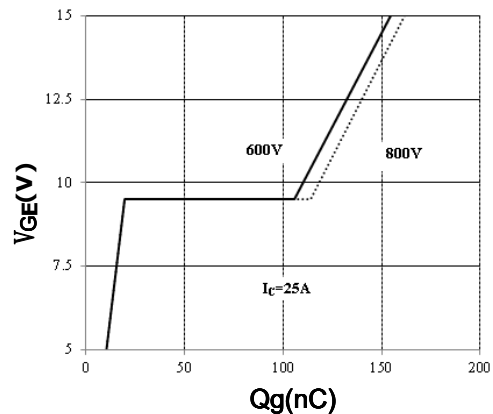


Figure 18. Gage Charge Characteristics

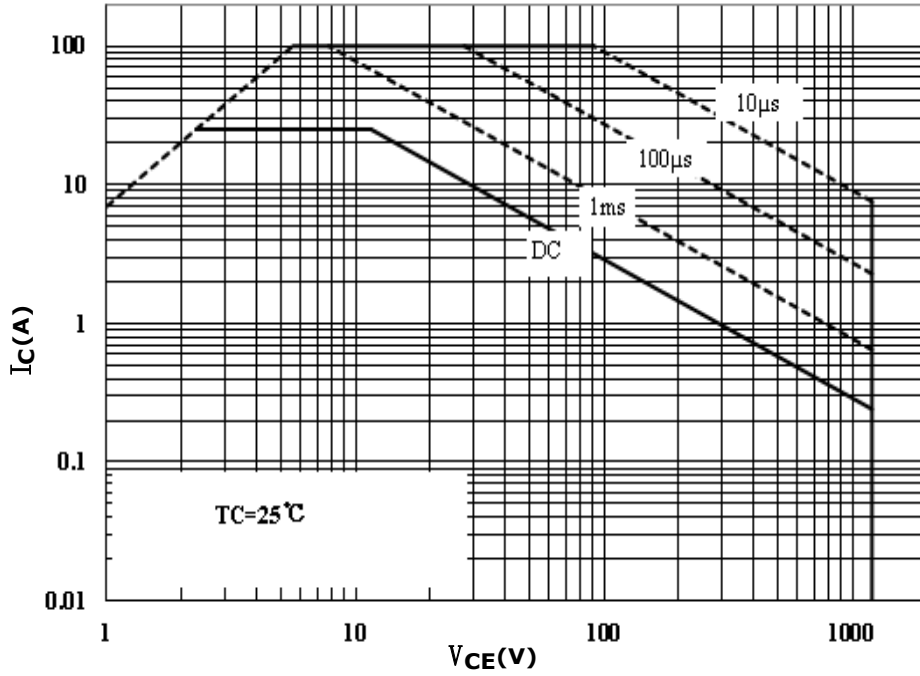


Figure 19. Forward Bias Safe Operating Area

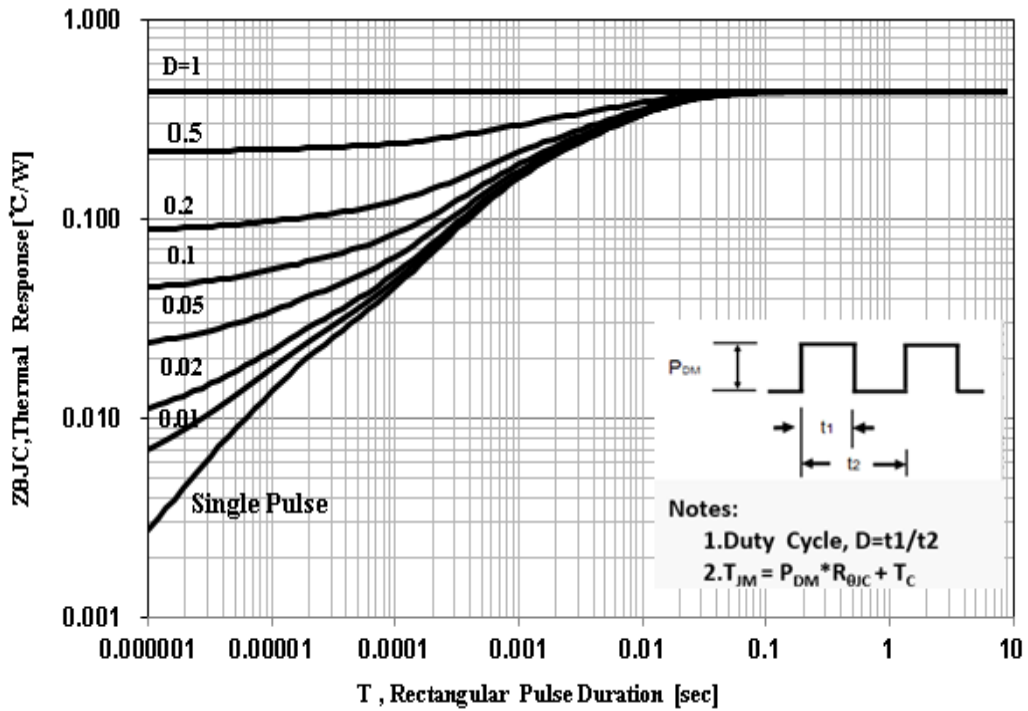
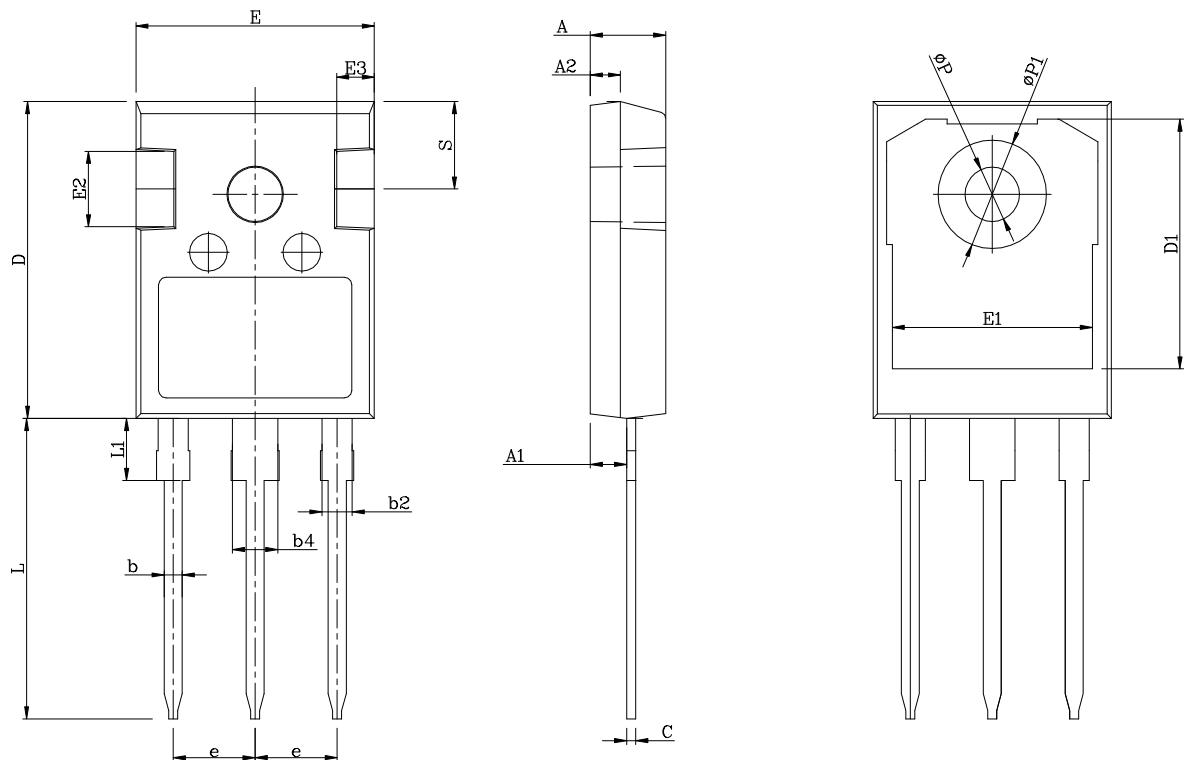


Figure 20. Transient Thermal Impedance

TO-247-3L



COMMON DIMENSIONS

| SYMBOL | mm | | | SYMBOL | mm | | |
|--------|-------|-------|-------|--------|---------|-------|-------|
| | Min | Nom | Max | | Min | Nom | Max |
| A | 4.80 | 5.00 | 5.20 | E1 | 13.00 | 13.26 | 13.56 |
| A1 | 2.23 | 2.41 | 2.59 | E2 | 4.80 | 5.00 | 5.20 |
| A2 | 1.85 | 2.00 | 2.15 | E3 | 2.30 | 2.50 | 2.70 |
| b | 1.11 | 1.21 | 1.36 | e | 5.44BSC | | |
| b2 | 1.91 | 2.01 | 2.21 | L | 19.82 | 19.92 | 20.22 |
| b4 | 2.91 | 3.01 | 3.21 | L1 | 3.94 | 4.12 | 4.30 |
| c | 0.51 | 0.61 | 0.75 | ØP | 3.40 | 3.60 | 3.80 |
| D | 20.80 | 21.00 | 21.30 | ØP1 | 7.08 | 7.19 | 7.30 |
| D1 | 16.25 | 16.55 | 16.85 | S | 6.15BSC | | |
| E | 15.50 | 15.80 | 16.10 | | | | |