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FGH40N120AN

1200V NPT IGBT

Features

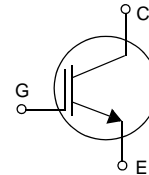
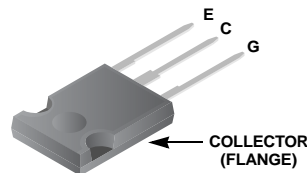
- High speed switching
- Low saturation voltage : $V_{CE(sat)} = 2.6\text{ V @ } I_C = 40\text{ A}$
- High input impedance
- RoHS compliant

Description

Employing NPT technology, Fairchild's AN series of IGBTs provides low conduction and switching losses. The AN series offers an solution for application such as induction heating (IH), motor control, general purpose inverters and uninterruptible power supplies (UPS).

Applications

Induction Heating, UPS, AC & DC motor controls and general purpose inverters.



Absolute Maximum Ratings

| Symbol | Parameter | FGH40N120AN | Units |
|-------------|--|-------------|-------|
| V_{CES} | Collector-Emitter Voltage | 1200 | V |
| V_{GES} | Gate-Emitter Voltage | ±25 | V |
| I_C | Collector Current @ $T_C = 25^\circ\text{C}$ | 64 | A |
| | Collector Current @ $T_C = 100^\circ\text{C}$ | 40 | A |
| $I_{CM(1)}$ | Pulsed Collector Current | 160 | A |
| P_D | Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$ | 417 | W |
| | Maximum Power Dissipation @ $T_C = 100^\circ\text{C}$ | 167 | W |
| SCWT | Short Circuit Withstand Time, $V_{CE} = 600\text{V}, V_{GE} = 15\text{V}, T_C = 125^\circ\text{C}$ | 10 | µs |
| T_J | Operating Junction Temperature | -55 to +150 | °C |
| T_{STG} | Storage Temperature Range | -55 to +150 | °C |
| T_L | Maximum Lead Temp. for Soldering Purposes, 1/8" from Case for 5 seconds | 300 | °C |

Notes:

(1) Pulse width limited by max. junction temperature

Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Units |
|-----------------------|---|------|------|-------|
| $R_{\theta JC}(IGBT)$ | Thermal Resistance, Junction-to-Case | -- | 0.3 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | -- | 40 | °C/W |

Package Marking and Ordering Information

| Device Marking | Device | Package | Reel Size | Tape Width | Quantity |
|----------------|-------------|---------|-----------|------------|----------|
| FGH40N120AN | FGH40N120AN | TO-247 | - | - | 30 |

Electrical Characteristics of the IGBT $T_C = 25^\circ\text{C}$ unless otherwise noted

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|----------------------------------|--|--|------|------|-----------|---------------------|
| Off Characteristics | | | | | | |
| BV_{CES} | Collector-Emitter Breakdown Voltage | $V_{GE} = 0V, I_C = 1mA$ | 1200 | -- | -- | V |
| $BV_{CES}/\Delta T_J$ | Temperature Coefficient of Breakdown Voltage | $V_{GE} = 0V, I_C = 1mA$ | -- | 0.6 | -- | V/ $^\circ\text{C}$ |
| I_{CES} | Collector Cut-Off Current | $V_{CE} = V_{CES}, V_{GE} = 0V$ | -- | -- | 1 | mA |
| I_{GES} | G-E Leakage Current | $V_{GE} = V_{GES}, V_{CE} = 0V$ | -- | -- | ± 250 | nA |
| On Characteristics | | | | | | |
| $V_{GE(th)}$ | G-E Threshold Voltage | $I_C = 250\mu A, V_{CE} = V_{GE}$ | 3.5 | 5.5 | 7.5 | V |
| $V_{CE(sat)}$ | Collector to Emitter Saturation Voltage | $I_C = 40A, V_{GE} = 15V$ | -- | 2.6 | 3.2 | V |
| | | $I_C = 40A, V_{GE} = 15V, T_C = 125^\circ\text{C}$ | -- | 2.9 | -- | V |
| | | $I_C = 64A, V_{GE} = 15V$ | -- | 3.15 | -- | V |
| Dynamic Characteristics | | | | | | |
| C_{ies} | Input Capacitance | $V_{CE} = 30V, V_{GE} = 0V$ $f = 1MHz$ | -- | 3200 | -- | pF |
| C_{oes} | Output Capacitance | | -- | 370 | -- | pF |
| C_{res} | Reverse Transfer Capacitance | | -- | 125 | -- | pF |
| Switching Characteristics | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CC} = 600V, I_C = 40A,$ $R_G = 5\Omega, V_{GE} = 15V,$ Inductive Load, $T_C = 25^\circ\text{C}$ | -- | 15 | -- | ns |
| t_r | Rise Time | | -- | 20 | -- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 110 | -- | ns |
| t_f | Fall Time | | -- | 40 | 80 | ns |
| E_{on} | Turn-On Switching Loss | | -- | 2.3 | 3.45 | mJ |
| E_{off} | Turn-Off Switching Loss | | -- | 1.1 | 1.65 | mJ |
| E_{ts} | Total Switching Loss | | -- | 3.4 | 5.1 | mJ |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CC} = 600V, I_C = 40A,$ $R_G = 5\Omega, V_{GE} = 15V,$ Inductive Load, $T_C = 125^\circ\text{C}$ | -- | 20 | -- | ns |
| t_r | Rise Time | | -- | 25 | -- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 120 | -- | ns |
| t_f | Fall Time | | -- | 45 | -- | ns |
| E_{on} | Turn-On Switching Loss | | -- | 2.5 | -- | mJ |
| E_{off} | Turn-Off Switching Loss | | -- | 1.8 | -- | mJ |
| E_{ts} | Total Switching Loss | | -- | 4.3 | -- | mJ |
| Q_g | Total Gate charge | $V_{CE} = 600V, I_C = 40A,$ $V_{GE} = 15V$ | -- | 220 | -- | nC |
| Q_{ge} | Gate-Emitter Charge | | -- | 25 | -- | nC |
| Q_{gc} | Gate-Collector Charge | | -- | 130 | -- | nC |

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

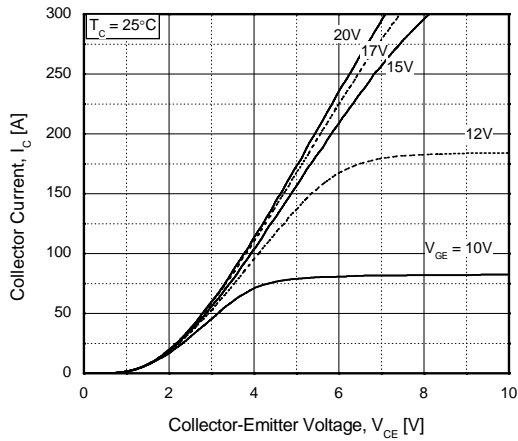


Figure 2. Typical Saturation Voltage Characteristics

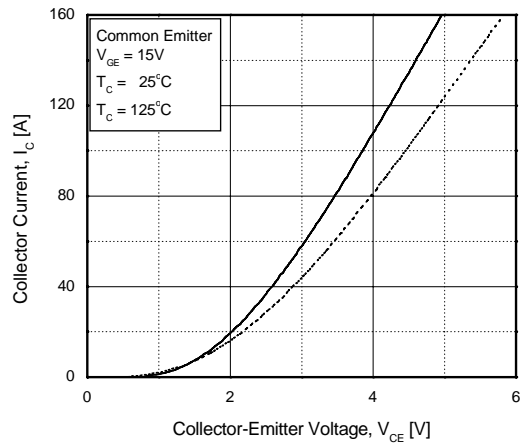


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

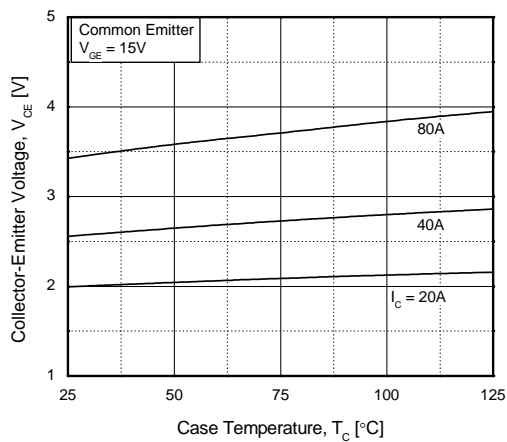


Figure 4. Load Current vs. Frequency

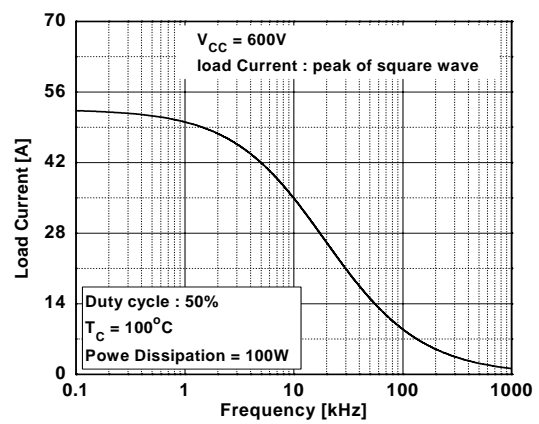


Figure 5. Saturation Voltage vs. V_GE

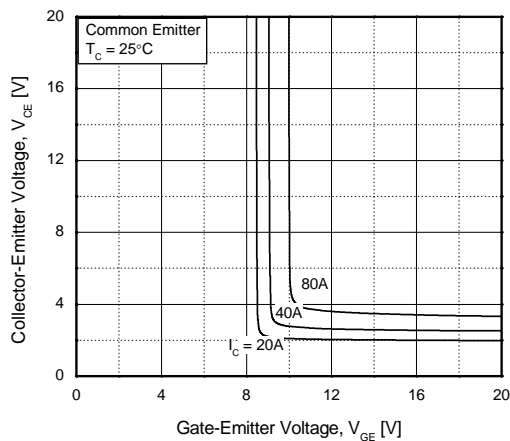
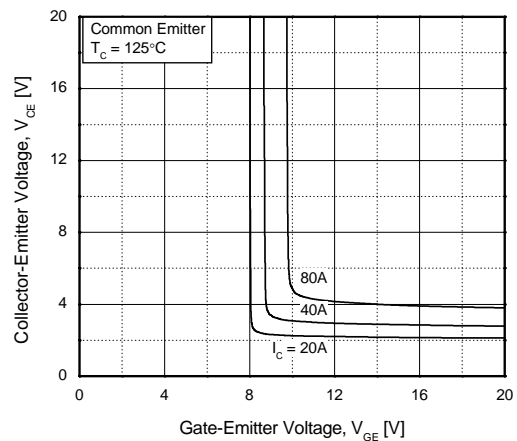


Figure 6. Saturation Voltage vs. V_GE



Typical Performance Characteristics (Continued)

Figure 7. Capacitance Characteristics

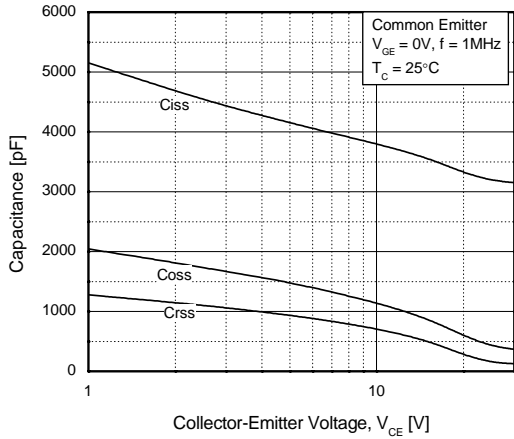


Figure 8. Turn-On Characteristics vs. Gate Resistance

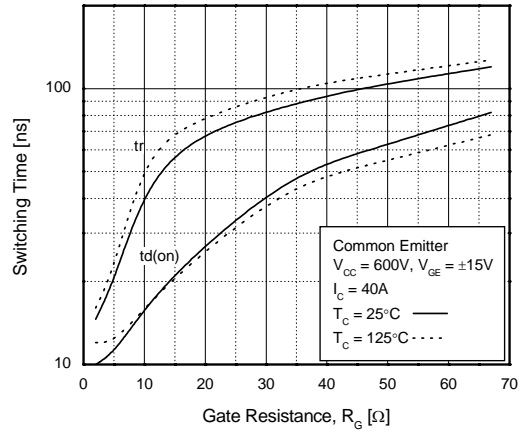


Figure 9. Turn-Off Characteristics vs. Gate Resistance

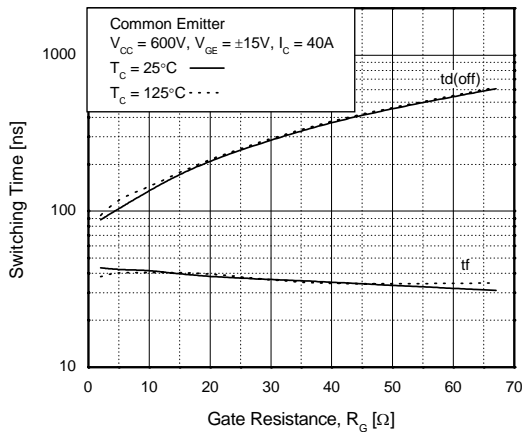


Figure 10. Switching Loss vs. Gate Resistance

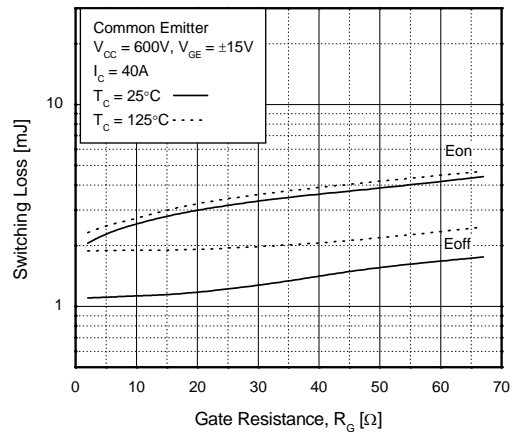


Figure 11. Turn-On Characteristics vs. Collector Current

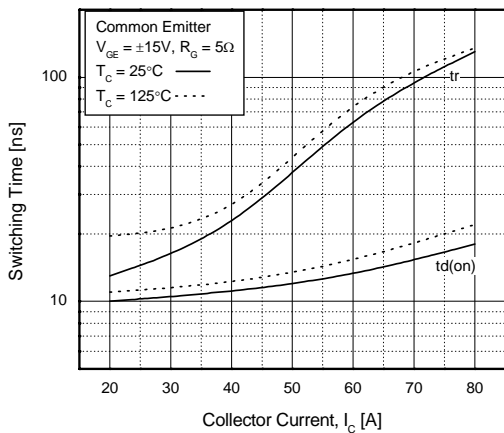
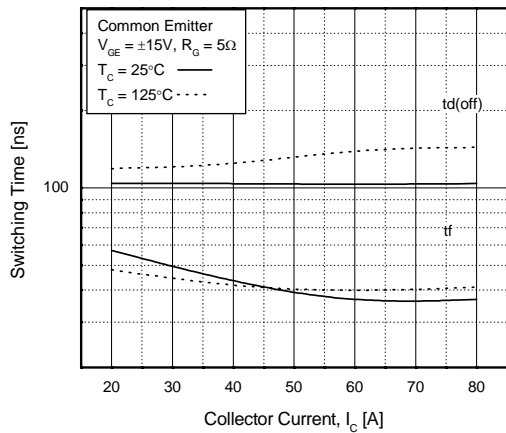


Figure 12. Turn-Off Characteristics vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Switching Loss vs. Collector Current

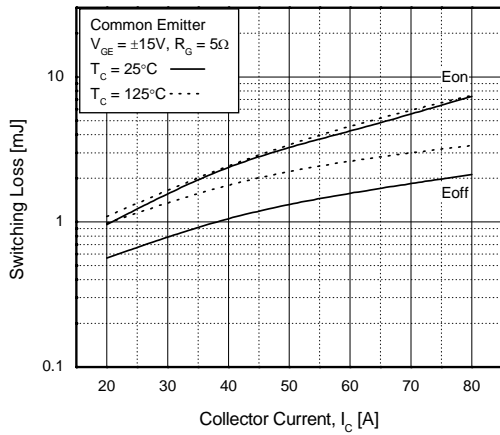


Figure 14. Gate Charge Characteristics

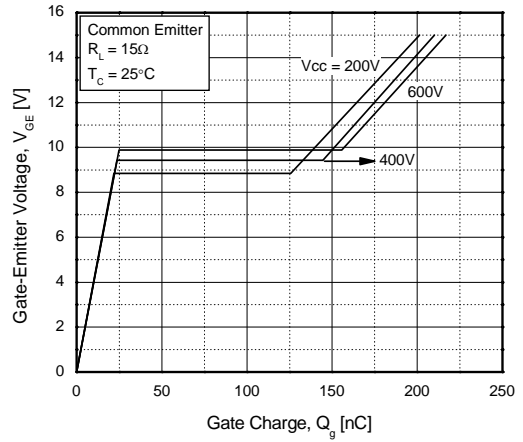


Figure 15. SOA Characteristics

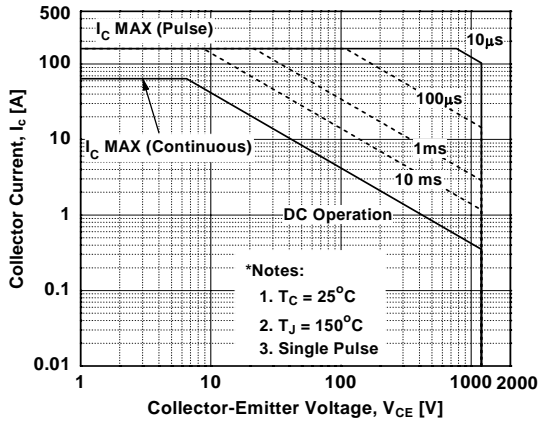


Figure 16. Turn-Off SOA

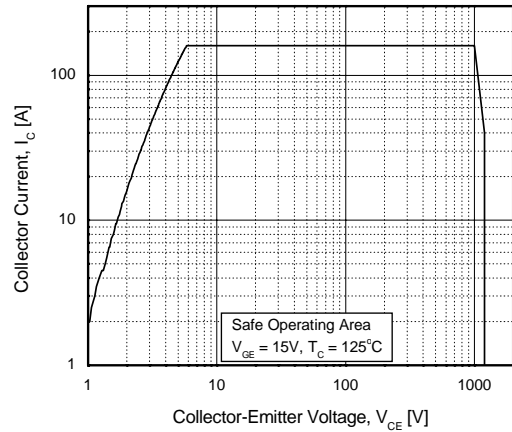
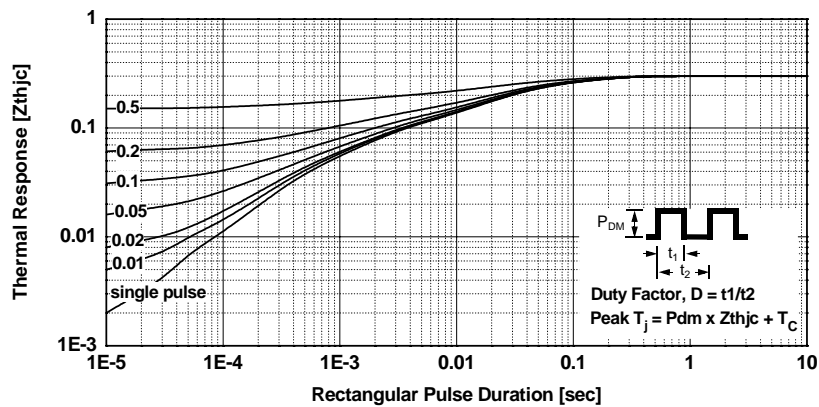
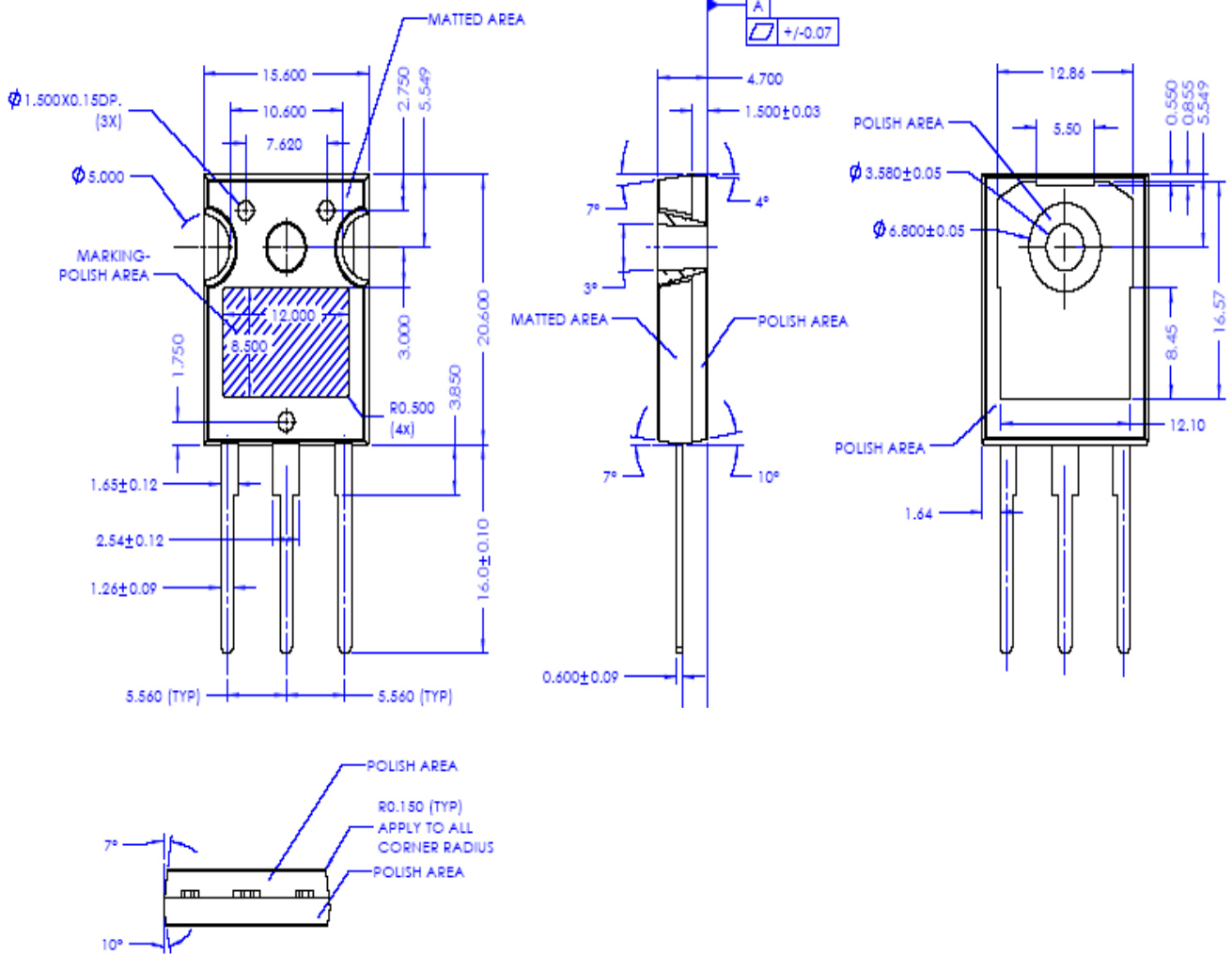


Figure 17. Transient Thermal Impedance of IGBT



Mechanical Dimensions

TO-247AB (FKS PKG CODE 001)




Dimensions in Millimeters



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