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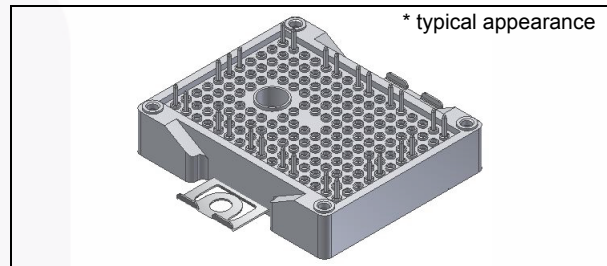


FPF2G120BF07ASP

F2, 3ch Boost module PCM and NTC

General Description

The FPF2G120BF07ASP is the 3ch boost topology which is providing an optimized solution for the multi-string solar application. And the integrated high speed field stop IGBTs and SiC diodes are providing lower conduction and switching losses. And the pre-applied PCM requires no additional process of the thermal interface material printing. Furthermore, the screw clamp provides a fast and reliable mounting method.



Package Code: F2

Electrical Features

- High Efficiency
- Low Conduction and Switching Losses
- High Speed Field Stop IGBT
- SiC SBD for Boost Diode
- Built-in NTC for Temperature Monitoring

Mechanical Features

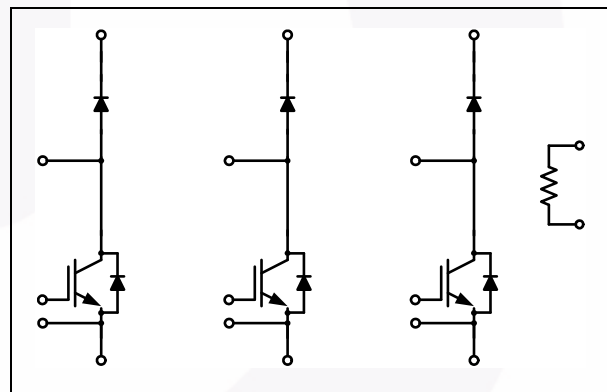
- Compact Size : F2 Package
- Soldering Pin
- Al₂O₃ Substrate with Low Thermal Resistance
- Pre-applied PCM (Phase Change Material)

Applications

- Solar Inverter

Related Materials

- AN-5077: Design Considerations for High Power Module (HPM)
- AN-4186: F1 and F2 Modules with Pre-applied Phase Change Material (PCM)



Internal Circuit Diagram

Package Marking and Ordering Information

| Device | Device Marking | Package | PCM | Packing Type | Quantity / Tray |
|-----------------|-----------------|---------|-----|--------------|-----------------|
| FPF2G120BF07AS | FPF2G120BF07AS | F2 | X | Tray | 14 |
| FPF2G120BF07ASP | FPF2G120BF07ASP | F2 | O | Tray | 14 |

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

| Symbol | Description | Condition | Rating | Units |
|-------------------------|-----------------------------------|--|-------------------------|----------------------|
| Boost IGBT | | | | |
| V_{CES} | Collector-Emitter Voltage | | 650 | V |
| V_{GES} | Gate-Emitter Voltage | | ± 20 | V |
| | Transient Gate-Emitter Voltage | | ± 25 | V |
| I_C | Continuous Collector Current | $T_C = 80^\circ\text{C}, T_{Jmax} = 175^\circ\text{C}$ | 40 | A |
| I_{CM} | Pulsed Collector Current | limited by T_{Jmax} | 80 | A |
| P_D | Maximum Power Dissipation | | 156 | W |
| T_J | Operating Junction Temperature | | - 40 to + 150 | $^\circ\text{C}$ |
| Protection Diode | | | | |
| V_{RRM} | Peak Repetitive Reverse Voltage | | 650 | V |
| I_F | Continuous Forward Current | $T_C = 80^\circ\text{C}, T_{Jmax} = 175^\circ\text{C}$ | 15 | A |
| I_{FM} | Maximum Forward Current | | 30 | A |
| I_{FSM} | Non-repetitive Peak Surge Current | 60Hz Single Half-Sine Wave | 150 | A |
| I^2t - value | Surge Current Integral Value | | 93 | A^2s |
| P_D | Maximum Power Dissipation | | 140 | W |
| T_J | Operating Junction Temperature | | - 40 to + 150 | $^\circ\text{C}$ |
| Boost Diode | | | | |
| V_{RRM} | Peak Repetitive Reverse Voltage | | 650 | V |
| I_F | Continuous Forward Current | $T_C = 80^\circ\text{C}, T_{Jmax} = 175^\circ\text{C}$ | 15 | A |
| I_{FM} | Maximum Forward Current | | 30 | A |
| I_{FSM} | Non-repetitive Peak Surge Current | 60Hz Single Half-Sine Wave | 120 | A |
| I^2t - value | Surge Current Integral Value | | 60 | A^2s |
| P_D | Maximum Power Dissipation | | 98 | W |
| T_J | Operating Junction Temperature | | - 40 to + 150 | $^\circ\text{C}$ |
| Module | | | | |
| T_{STG} | Storage Temperature | | - 40 to + 125 | $^\circ\text{C}$ |
| V_{ISO} | Isolation Voltage | AC 1 min. | 2500 | V |
| Iso_Material | Internal Isolation Material | | Al_2O_3 | - |
| T_{MOUNT} | Mounting Torque | | 2.0 to 5.0 | N•m |
| Creepage | Terminal to Heat Sink | | 11.5 | mm |
| | Terminal to Terminal | | 6.3 | mm |
| Clearance | Terminal to Heat Sink | | 10.0 | mm |
| | Terminal to Terminal | | 5.0 | mm |

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

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units | |
|----------------------------------|---|--|---|------|---------|---------------------------|---------------------------|
| Boost IGBT | | | | | | | |
| Off Characteristics | | | | | | | |
| BV_{CES} | Collector-Emitter Breakdown Voltage | $V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$ | 650 | - | - | V | |
| I_{CES} | Collector Cut-off Current | $V_{CE} = V_{CES}, V_{GE} = 0\text{ V}$ | - | - | 250 | μA | |
| I_{GES} | Gate-Emitter Leakage Current | $V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$ | - | - | ± 2 | μA | |
| On Characteristics | | | | | | | |
| $V_{GE(th)}$ | Gate-Emitter Threshold Voltage | $V_{GE} = V_{CE}, I_C = 40\text{ mA}$ | 3.9 | 5.1 | 6.8 | V | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C = 40\text{ A}, V_{GE} = 15\text{ V}$ | - | 1.55 | 2.2 | V | |
| | | $I_C = 40\text{ A}, V_{GE} = 15\text{ V}, T_C = 125^\circ\text{C}$ | - | 1.85 | - | V | |
| R_{LEAD} | Lead Resistance of Pin to Chip | per Chip | - | 3.3 | - | $\text{m}\Omega$ | |
| Switching Characteristics | | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{CC} = 300\text{ V}$ $I_C = 40\text{ A}$ $V_{GE} = 15\text{ V}$ $R_G = 15\ \Omega$ Inductive Load $T_C = 25^\circ\text{C}$ | - | 24 | - | ns | |
| t_r | Rise Time | | - | 24 | - | ns | |
| $t_{d(off)}$ | Turn-Off Delay Time | | - | 132 | - | ns | |
| t_f | Fall Time | | - | 17 | - | ns | |
| E_{ON} | Turn-On Switching Loss per Pulse | | - | 0.40 | - | mJ | |
| E_{OFF} | Turn-Off Switching Loss per Pulse | | - | 0.28 | - | mJ | |
| $t_{d(on)}$ | Turn-On Delay Time | | $V_{CC} = 300\text{ V}$ $I_C = 40\text{ A}$ $V_{GE} = 15\text{ V}$ $R_G = 15\ \Omega$ Inductive Load $T_C = 125^\circ\text{C}$ | - | 22 | - | ns |
| t_r | Rise Time | | | - | 27 | - | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | | - | 148 | - | ns |
| t_f | Fall Time | | | - | 17 | - | ns |
| E_{ON} | Turn-On Switching Loss per Pulse | - | | 0.59 | - | mJ | |
| E_{OFF} | Turn-Off Switching Loss per Pulse | - | | 0.37 | - | mJ | |
| Q_g | Total Gate Charge | $V_{CC} = 300\text{ V}, I_C = 40\text{ A}, V_{GE} = 15\text{ V}$ | | - | 65 | - | nC |
| $R_{\theta JC}$ | Thermal Resistance of Junction to Case | per Chip | | - | - | 0.96 | $^\circ\text{C}/\text{W}$ |
| $R_{\theta CH}$ | Thermal Resistance of Case to Heat sink | per Chip, $\lambda_{PCM} = 3.4\text{ W/mK}$ | | - | 0.54 | - | $^\circ\text{C}/\text{W}$ |
| Protection Diode | | | | | | | |
| V_F | Diode Forward Voltage | $I_F = 15\text{ A}$ | - | 1.05 | 1.4 | V | |
| | | $I_F = 15\text{ A}, T_C = 125^\circ\text{C}$ | - | 0.95 | - | V | |
| R_{LEAD} | Lead Resistance of Pin to Chip | per Chip | - | 2.4 | - | $\text{m}\Omega$ | |
| I_R | Reverse Leakage Current | $V_R = 650\text{ V}$ | - | - | 250 | μA | |
| $R_{\theta JC}$ | Thermal Resistance of Junction to Case | per Chip | - | - | 1.07 | $^\circ\text{C}/\text{W}$ | |
| $R_{\theta CH}$ | Thermal Resistance of Case to Heat sink | per Chip, $\lambda_{PCM} = 3.4\text{ W/mK}$ | - | 0.33 | - | $^\circ\text{C}/\text{W}$ | |
| Boost Diode | | | | | | | |
| V_F | Diode Forward Voltage | $I_F = 15\text{ A}$ | - | 1.45 | 1.9 | V | |
| | | $I_F = 15\text{ A}, T_C = 125^\circ\text{C}$ | - | 1.75 | - | V | |
| R_{LEAD} | Lead Resistance of Pin to Chip | per Chip | - | 2.8 | - | $\text{m}\Omega$ | |
| I_R | Reverse Leakage Current | $V_R = 650\text{ V}$ | - | - | 60 | μA | |
| I_{rr} | Reverse Recovery Current | $V_R = 300\text{ V}, I_F = 15\text{ A},$ $di/dt = 1390\text{ A}/\mu\text{s},$ $T_C = 25^\circ\text{C}$ | - | 9.2 | - | A | |
| Q_C | Total Capacitive Charge | $V_R = 300\text{ V}, I_F = 15\text{ A},$ $di/dt = 1390\text{ A}/\mu\text{s},$ $T_C = 125^\circ\text{C}$ | - | 60 | - | nC | |
| E_{rec} | Reverse Recovery Energy | | - | 4.9 | - | μJ | |
| I_{rr} | Reverse Recovery Current | | - | 9.2 | - | A | |
| Q_C | Total Capacitive Charge | $V_R = 300\text{ V}, I_F = 15\text{ A},$ $di/dt = 1390\text{ A}/\mu\text{s},$ $T_C = 125^\circ\text{C}$ | - | 65 | - | nC | |
| E_{rec} | Reverse Recovery Energy | | - | 4.9 | - | μJ | |
| $R_{\theta JC}$ | Thermal Resistance of Junction to Case | per Chip | - | - | 1.52 | $^\circ\text{C}/\text{W}$ | |
| $R_{\theta CH}$ | Thermal Resistance of Case to Heat sink | per Chip, $\lambda_{PCM} = 3.4\text{ W/mK}$ | - | 0.18 | - | $^\circ\text{C}/\text{W}$ | |

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

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|-------------------------|-------------------|---------------------------|------|------|------|------------------|
| NTC (Thermistor) | | | | | | |
| R_{NTC} | Rated Resistance | $T_C = 25^\circ\text{C}$ | - | 10 | - | $\text{k}\Omega$ |
| | | $T_C = 100^\circ\text{C}$ | - | 936 | - | Ω |
| | Tolerance | $T_C = 25^\circ\text{C}$ | -3 | - | +3 | % |
| P_D | Power Dissipation | $T_C = 25^\circ\text{C}$ | - | - | 20 | mW |
| B_{Value} | B-Constant | $B_{25/50}$ | - | 3450 | - | K |
| | | $B_{25/100}$ | - | 3513 | - | K |

Typical Performance Characteristics

Fig 1. Typical Output Characteristics - IGBT

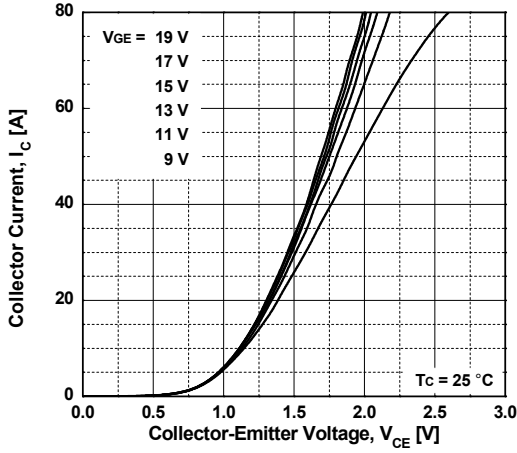


Fig 2. Typical Output Characteristics - IGBT

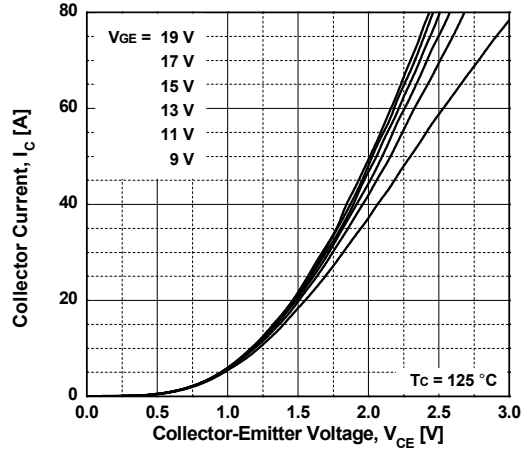


Fig 3. Typical Saturation Voltage Characteristics - IGBT

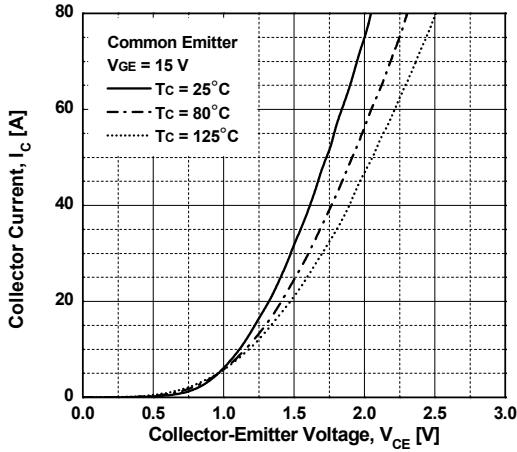


Fig 4. Switching Loss vs. Collector Current - IGBT

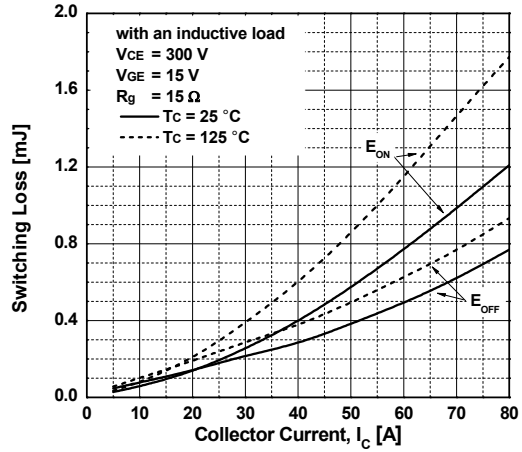


Fig 5. Switching Loss vs. Gate Resistance - IGBT

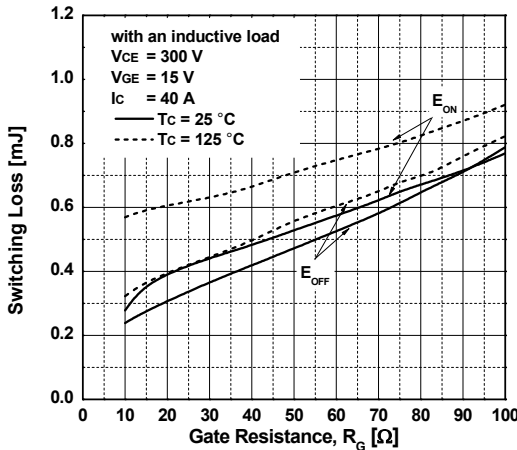
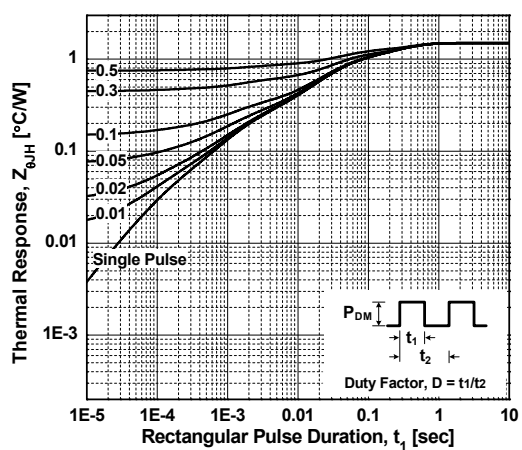


Fig 6. Transient Thermal Impedance - IGBT



Typical Performance Characteristic

Fig 7. Typical Forward Voltage Drop - Protection Diode

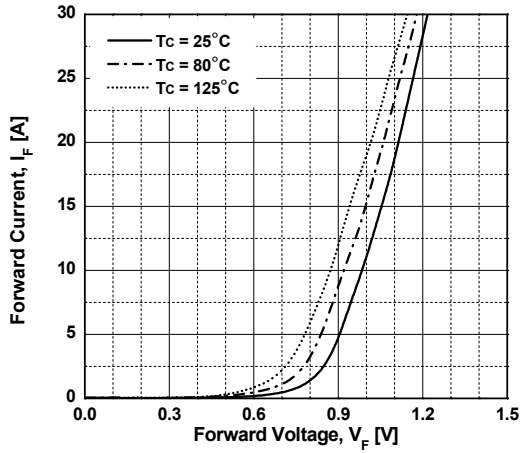


Fig 8. Transient Thermal Impedance - Protection Diode

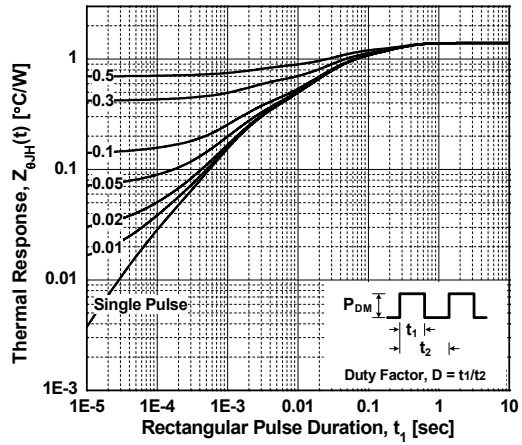


Fig 9. Typical Forward Voltage Drop - Boost Diode

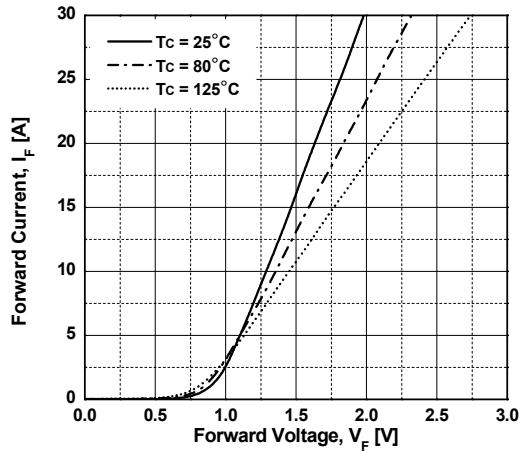


Fig 10. Reverse Recovery Energy vs. Forward Current - Boost Diode

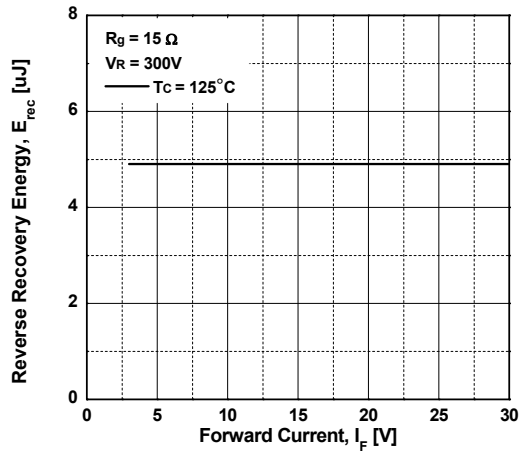
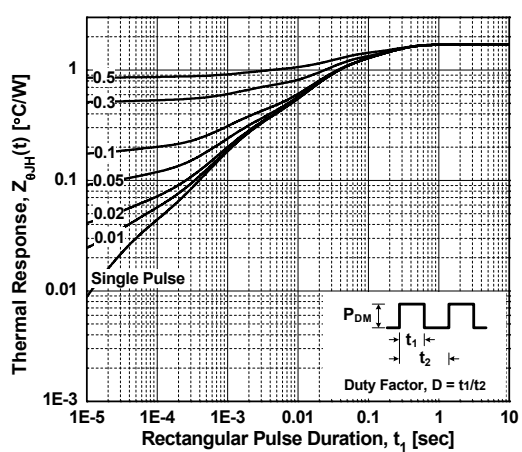
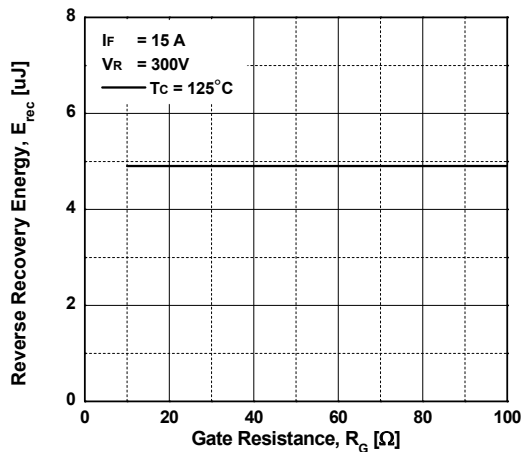
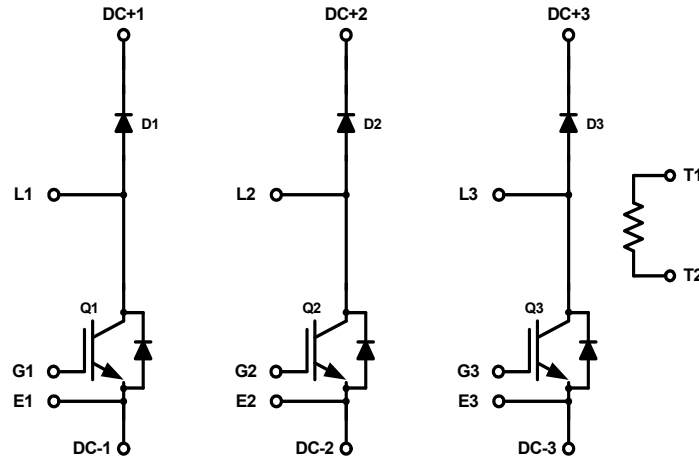


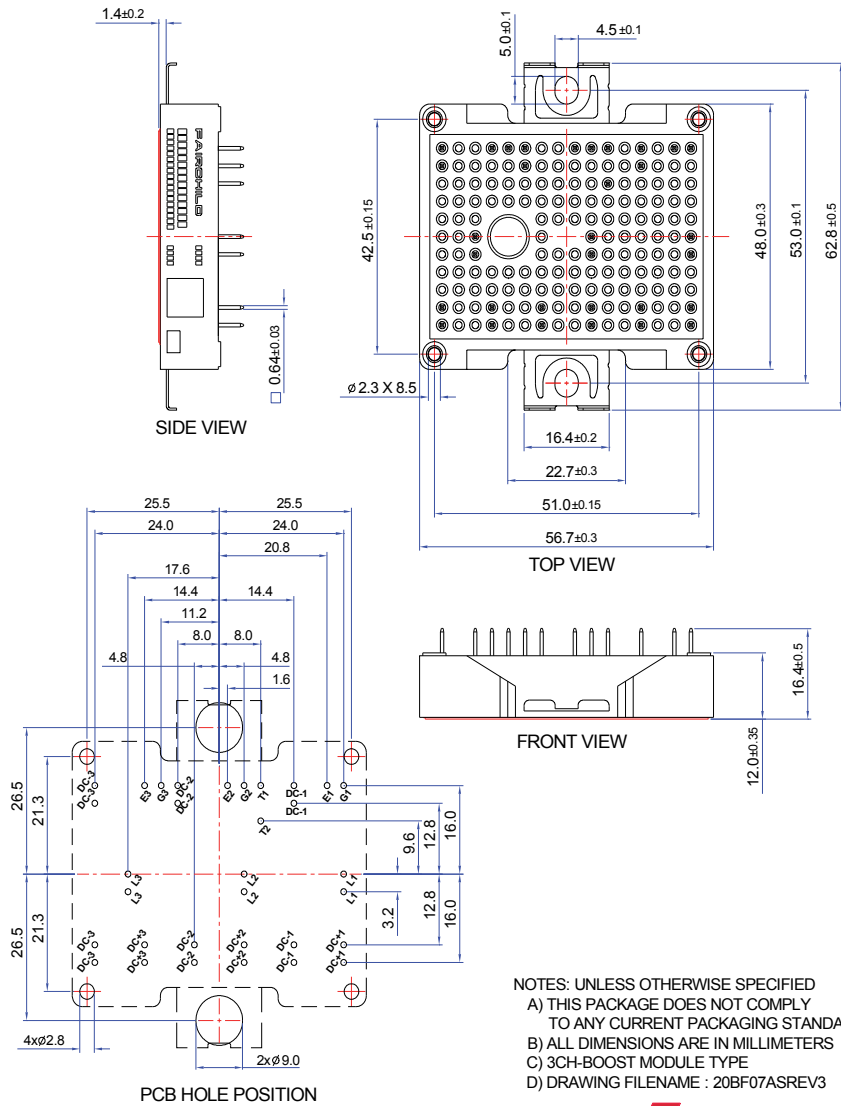
Fig 11. Reverse Recovery Energy vs. Gate Resistance - Boost Diode **Fig 12. Transient Thermal Impedance - Boost Diode**



Internal Circuit Diagram



Package Outlines [mm]



NOTES: UNLESS OTHERWISE SPECIFIED
 A) THIS PACKAGE DOES NOT COMPLY TO ANY CURRENT PACKAGING STANDARD
 B) ALL DIMENSIONS ARE IN MILLIMETERS
 C) 3CH-BOOST MODULE TYPE
 D) DRAWING FILENAME : 20BF07ASREV3




- PIN-GRID 3.2mm
 - TOLERANCE OF PCB HOLE PATTERN $\pm \varnothing 0.1$





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