

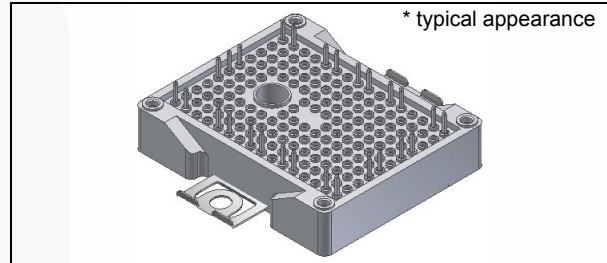


# FPF2G120BF07ASP

## 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

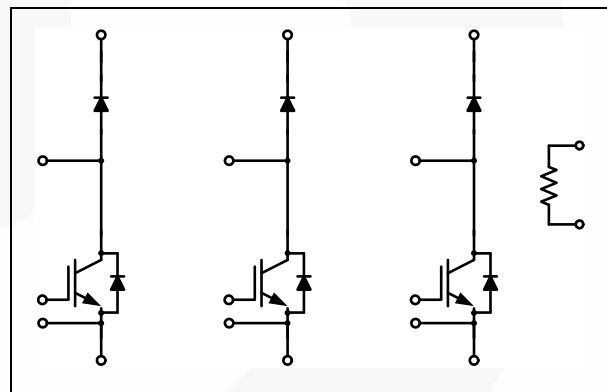
- Compact Size : F2 Package
- Soldering Pin
- Al<sub>2</sub>O<sub>3</sub> Substrate with Low Thermal Resistance
- Pre-applied PCM (Phase Change Material)

### 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
<b>Boost IGBT</b>				
$V_{CES}$	Collector-Emitter Voltage		650	V
$V_{GES}$	Gate-Emitter Voltage		$\pm 20$	V
	Transient Gate-Emitter Voltage		$\pm 25$	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	$^\circ\text{C}$
<b>Protection Diode</b>				
$V_{RRM}$	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	$\text{A}^2\text{s}$
$P_D$	Maximum Power Dissipation		140	W
$T_J$	Operating Junction Temperature		- 40 to + 150	$^\circ\text{C}$
<b>Boost Diode</b>				
$V_{RRM}$	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	$\text{A}^2\text{s}$
$P_D$	Maximum Power Dissipation		98	W
$T_J$	Operating Junction Temperature		- 40 to + 150	$^\circ\text{C}$
<b>Module</b>				
$T_{STG}$	Storage Temperature		- 40 to + 125	$^\circ\text{C}$
$V_{ISO}$	Isolation Voltage	AC 1 min.	2500	V
Iso_Material	Internal Isolation Material		$\text{Al}_2\text{O}_3$	-
$T_{MOUNT}$	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.

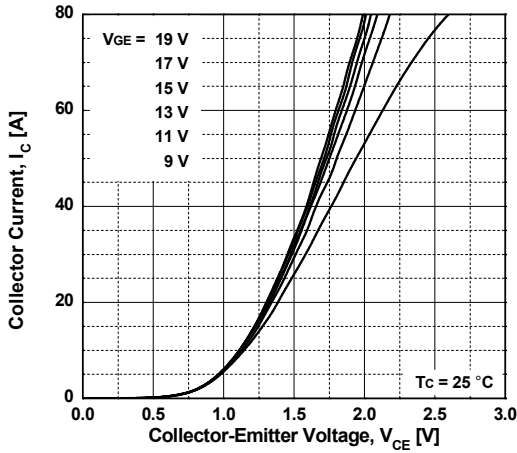
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
<b>Boost IGBT</b>						
<b>Off Characteristics</b>						
$BV_{CES}$	Collector-Emitter Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	650	-	-	V
$I_{CES}$	Collector Cut-off Current	$V_{CE} = V_{CES}, V_{GE} = 0\text{ V}$	-	-	250	$\mu\text{A}$
$I_{GES}$	Gate-Emitter Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$	-	-	$\pm 2$	$\mu\text{A}$
<b>On Characteristics</b>						
$V_{GE(th)}$	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	-	$\text{m}\Omega$
<b>Switching Characteristics</b>						
$t_{d(on)}$	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	-	$^\circ\text{C}/\text{W}$
<b>Protection Diode</b>						
$V_F$	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	$\mu\text{A}$
$R_{\theta JC}$	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	-	$^\circ\text{C}/\text{W}$
<b>Boost Diode</b>						
$V_F$	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	$\mu\text{A}$
$I_{rr}$	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	-	$\mu\text{J}$
$I_{rr}$	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	-	$\mu\text{J}$
$R_{\theta JC}$	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.

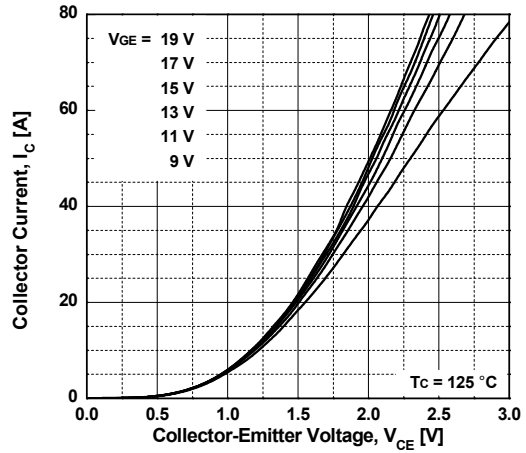
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
<b>NTC (Thermistor)</b>						
$R_{\text{NTC}}$	Rated Resistance	$T_C = 25^\circ\text{C}$	-	10	-	$\text{k}\Omega$
		$T_C = 100^\circ\text{C}$	-	936	-	$\Omega$
	Tolerance	$T_C = 25^\circ\text{C}$	- 3	-	+ 3	%
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$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

## Typical Performance Characteristics

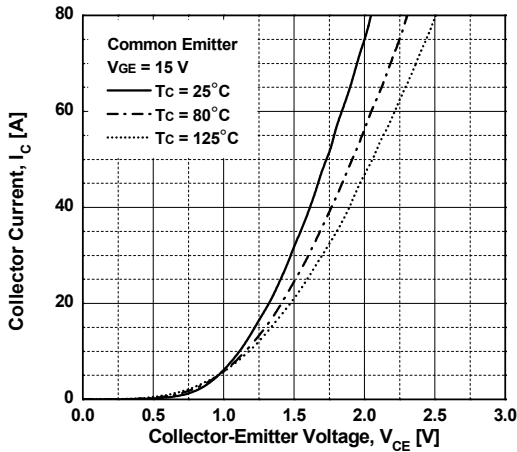
**Fig 1. Typical Output Characteristics - IGBT**



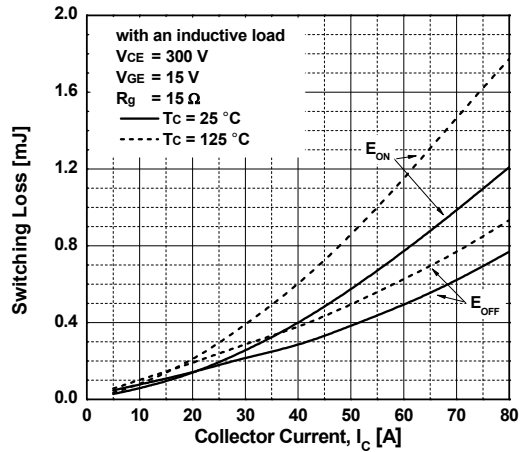
**Fig 2. Typical Output Characteristics - IGBT**



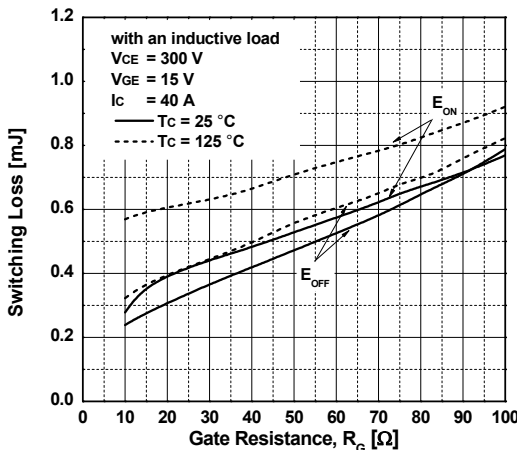
**Fig 3. Typical Saturation Voltage Characteristics - IGBT**



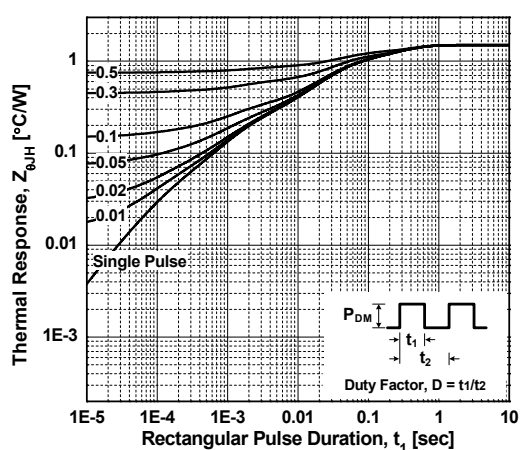
**Fig 4. Switching Loss vs. Collector Current - IGBT**



**Fig 5. Switching Loss vs. Gate Resistance - IGBT**

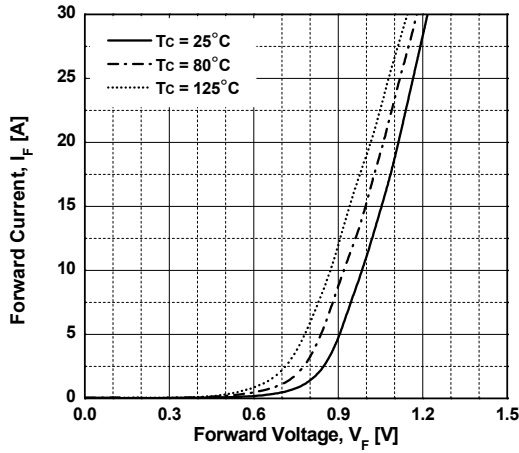


**Fig 6. Transient Thermal Impedance - IGBT**

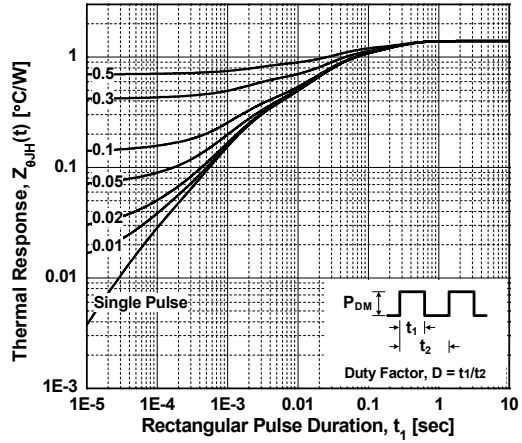


## Typical Performance Characteristic

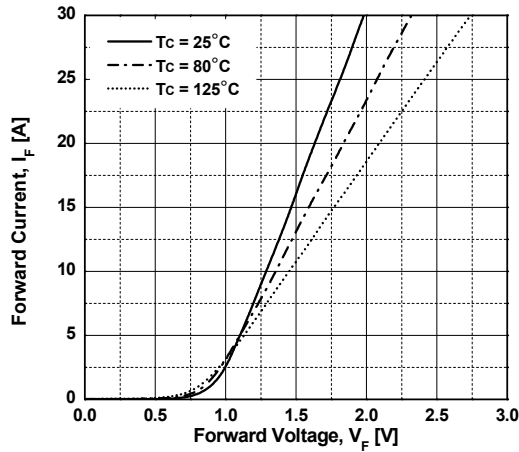
**Fig 7. Typical Forward Voltage Drop - Protection Diode**



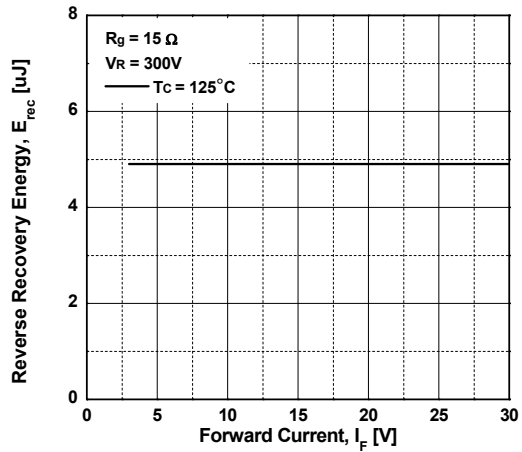
**Fig 8. Transient Thermal Impedance - Protection Diode**



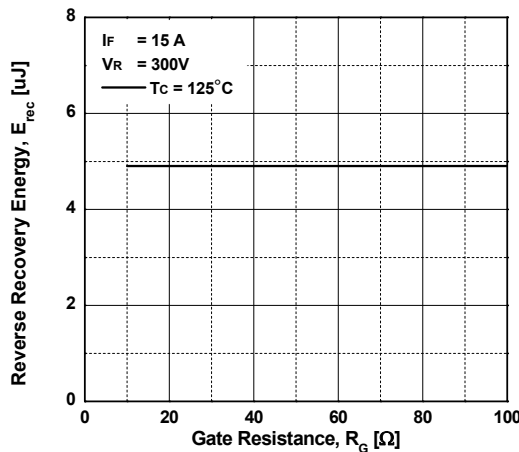
**Fig 9. Typical Forward Voltage Drop - Boost Diode**



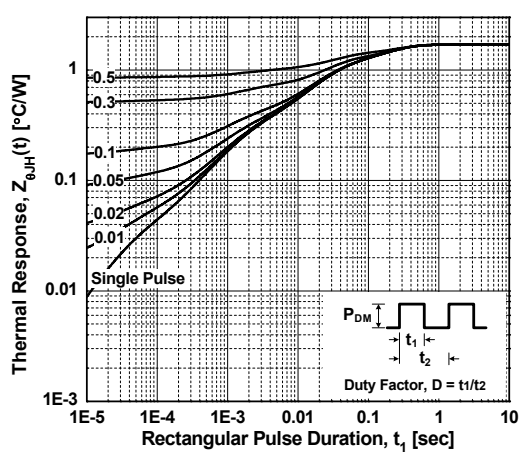
**Fig 10. Reverse Recovery Energy vs. Forward Current - Boost Diode**



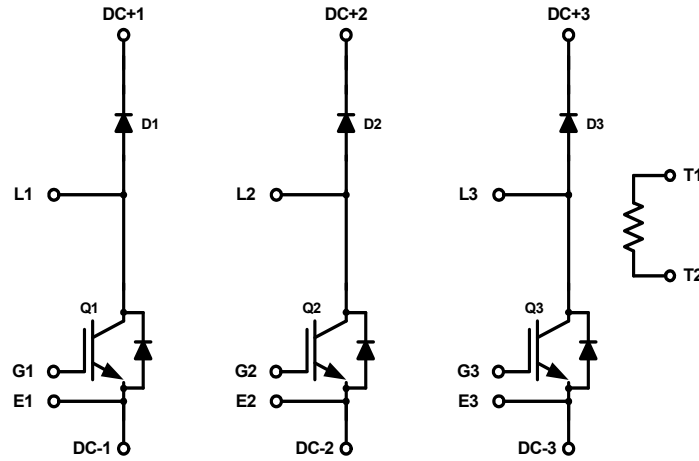
**Fig 11. Reverse Recovery Energy vs. Gate Resistance - Boost Diode**



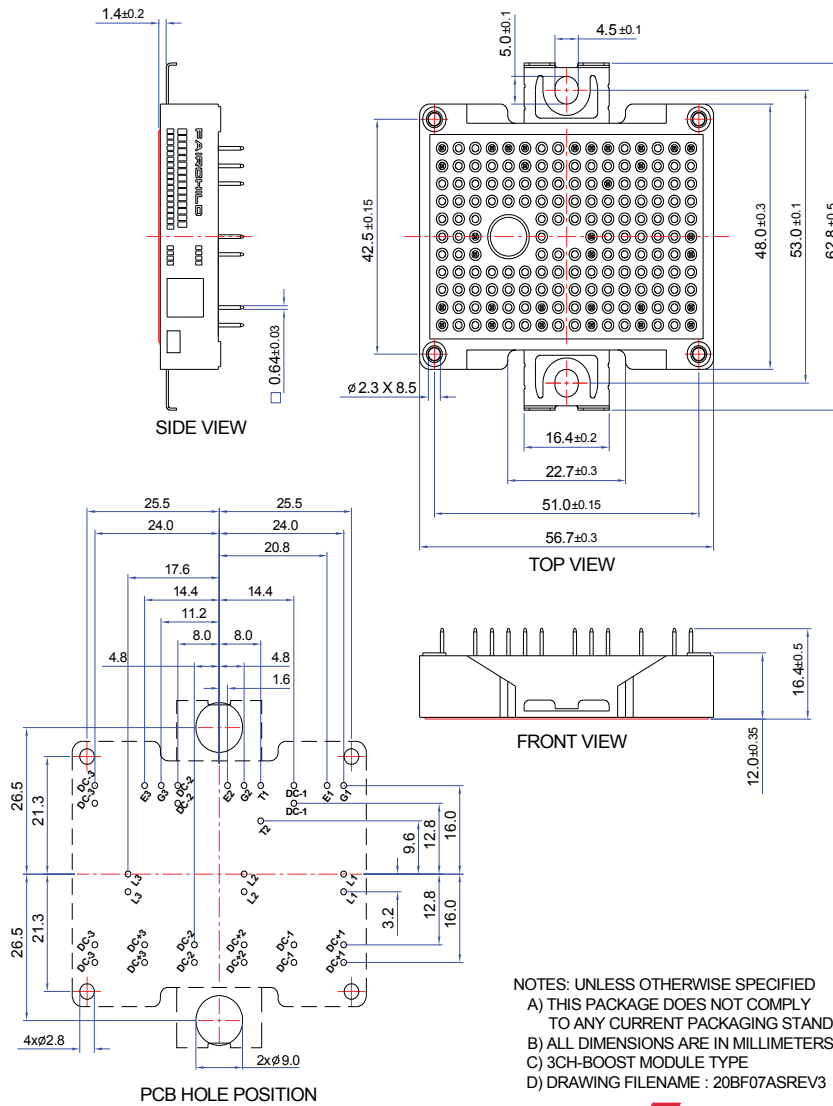
**Fig 12. Transient Thermal Impedance - Boost Diode**



### 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

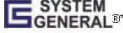




- PIN-GRID 3.2mm  
 - TOLERANCE OF PCB HOLE PATTERN  $\pm \varnothing 0.1$





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| Dual Cool™  | MICROCOUPLER™                                  | SignalWise™   | μSerDes™  |
| EcoSPARK®   | MicroFET™                                      | SmartMax™   |  |
| EfficientMax™   | MicroPak™                                      | SMART START™  | UHC®  |
| ESBC™   | MicroPak2™                                     | Solutions for Your Success™   | Ultra FRFET™  |
|  | MillerDrive™                                   | SPM®  | UniFET™   |
| Fairchild®  | MotionMax™                                     | STEALTH™  | VCX™  |
| Fairchild Semiconductor®  | MotionGrid®                                    | SuperFET®   | VisualMax™  |
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| FACT®   | MTX®   | SuperSOT™-6   | XS™   |
| FAST®   | MVN®   | SuperSOT™-8   | Xsens™  |
| FastvCore™  | mWSaver®                                       | SupreMOS®   | 仙童™   |
| FETBench™   | OptoHi™  | SyncFET™  |   |
| FPS™  | OPTOLOGIC®                                     | Sync-Lock™  |   |

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Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
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