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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

June 2015

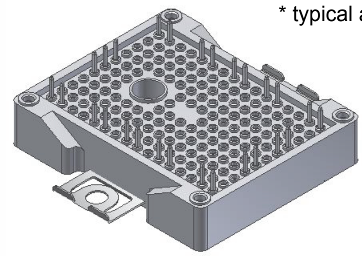
FPF2G120BF07ASP

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.

* typical appearance



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

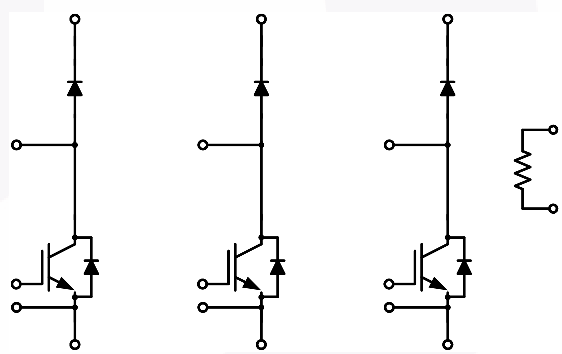
- Compact Size : F2 Package
- Soldering Pin
- Al_2O_3 Substrate with Low Thermal Resistance
- Pre-applied PCM (Phase Change Material)

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 $T_C = 25^oC$ 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 °C, T_{Jmax} = 175 °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	°C
Protection Diode				
V_{RRM}	Peak Repetitive Reverse Voltage		650	V
I_F	Continuous Forward Current	T_C = 80 °C, T_{Jmax} = 175 °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	°C
Boost Diode				
V_{RRM}	Peak Repetitive Reverse Voltage		650	V
I_F	Continuous Forward Current	T_C = 80 °C, T_{Jmax} = 175 °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	°C
Module				
T_{STG}	Storage Temperature		- 40 to + 125	°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°C unless otherwise noted.

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

Electrical Characteristics T_C = 25°C unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
NTC (Thermistor)						
R_{NTC}	Rated Resistance	T_C = 25 °C	-	10	-	kΩ
		T_C = 100 °C	-	936	-	Ω
	Tolerance	T_C = 25 °C	- 3	-	+ 3	%
P_D	Power Dissipation	T_C = 25 °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

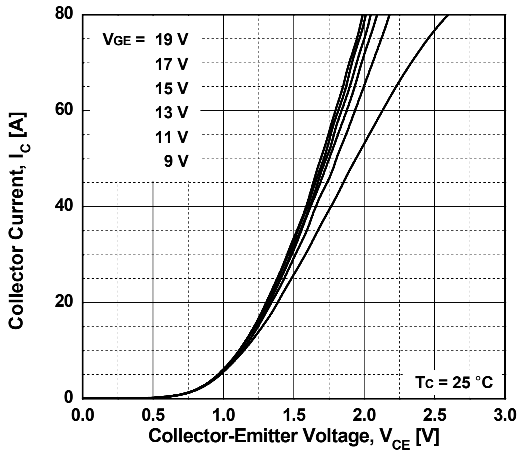


Fig 2. Typical Output Characteristics - IGBT

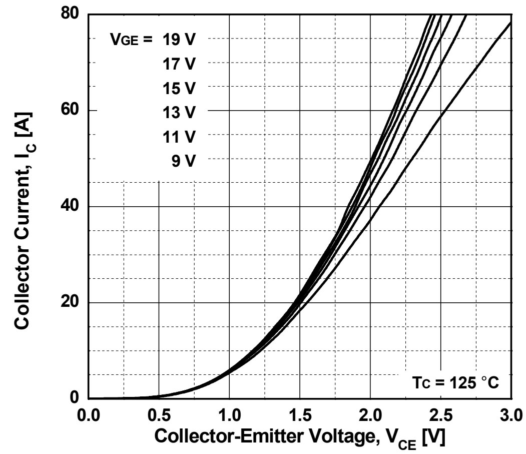


Fig 3. Typical Saturation Voltage Characteristics - IGBT

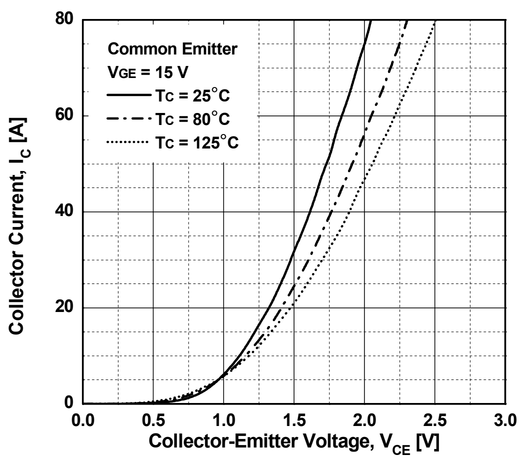


Fig 4. Switching Loss vs. Collector Current - IGBT

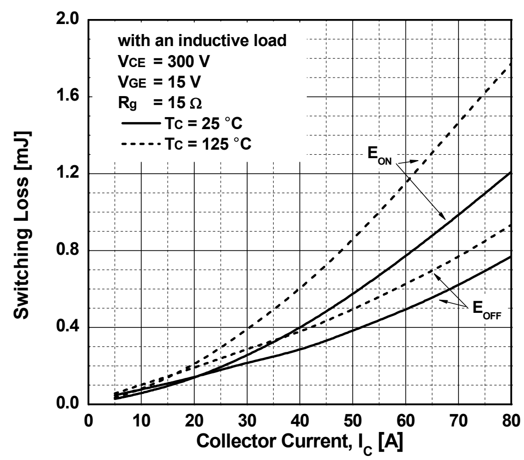


Fig 5. Switching Loss vs. Gate Resistance - IGBT

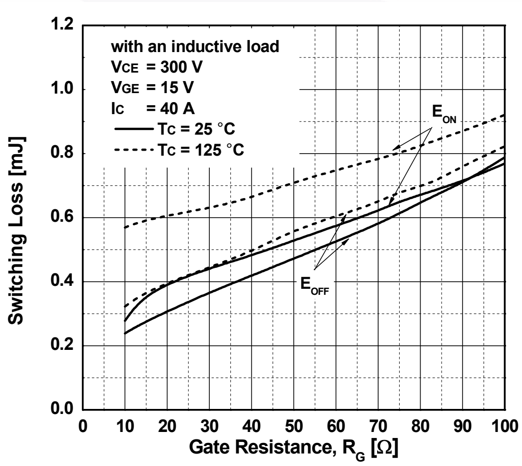
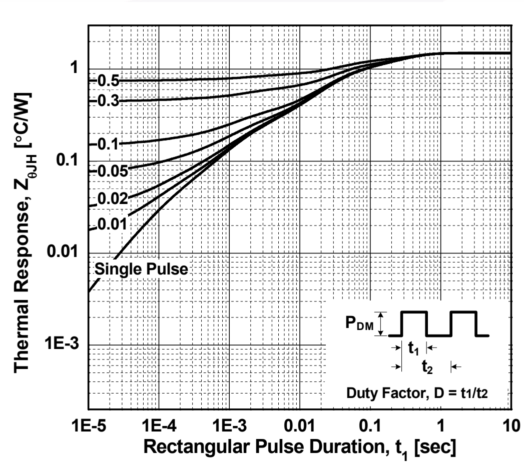


Fig 6. Transient Thermal Impedance - IGBT



Typical Performance Characteristic

Fig 7. Typical Forward Voltage Drop - Protection Diode

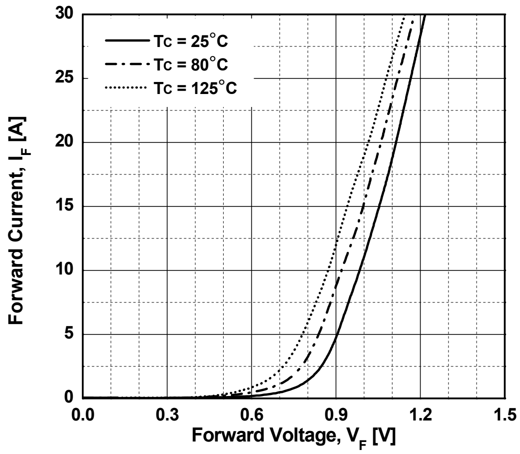


Fig 8. Transient Thermal Impedance - Protection Diode

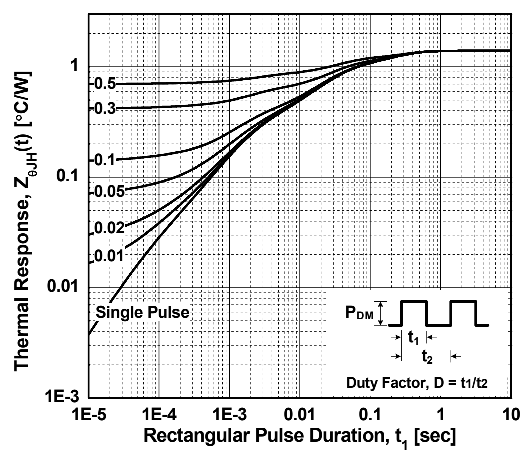


Fig 9. Typical Forward Voltage Drop - Boost Diode

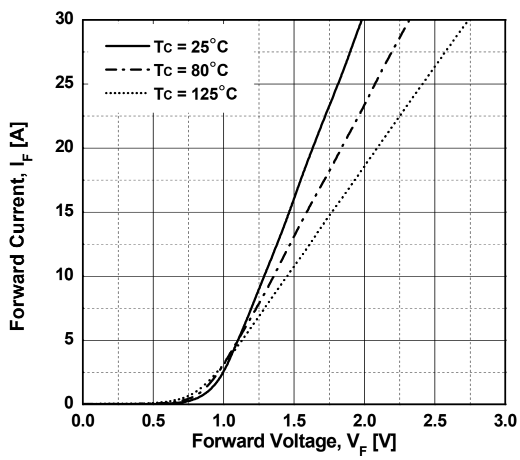


Fig 10. Reverse Recovery Energy vs. Forward Current - Boost Diode

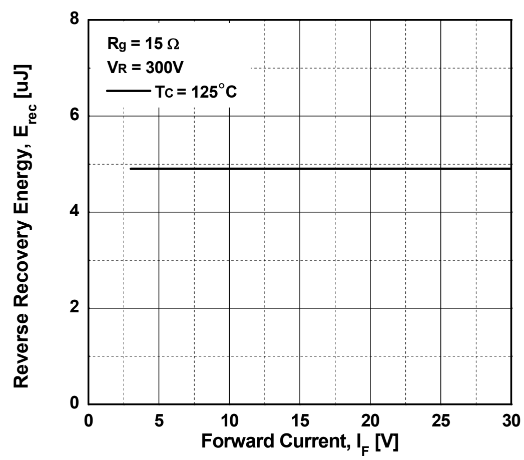


Fig 11. Reverse Recovery Energy vs. Gate Resistance - Boost Diode

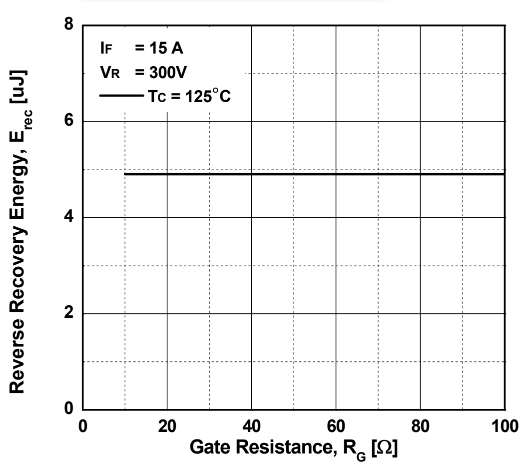
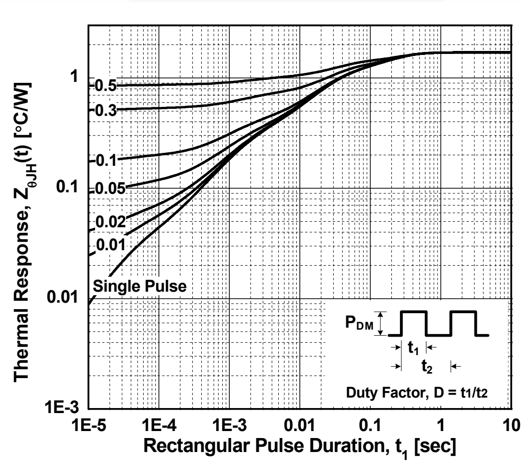
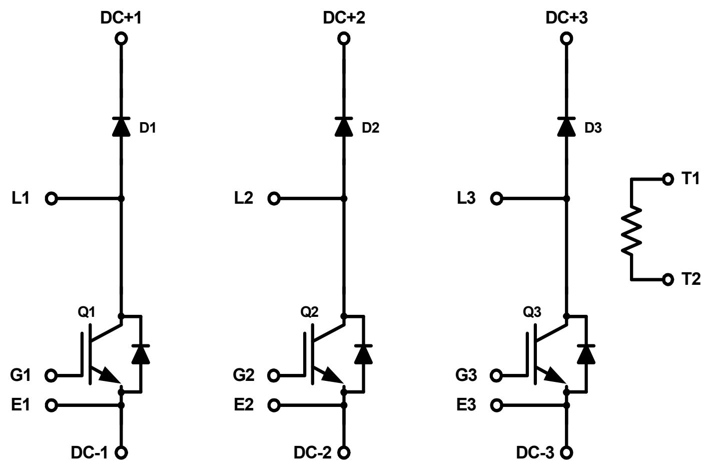


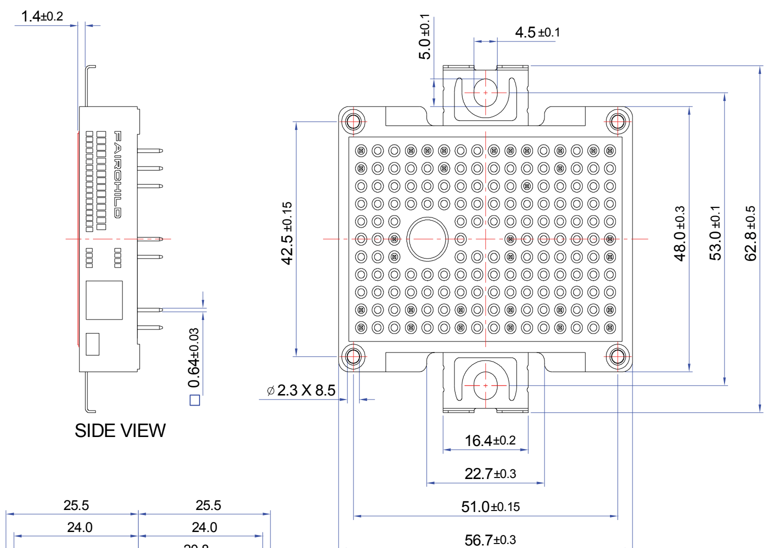
Fig 12. Transient Thermal Impedance - Boost Diode

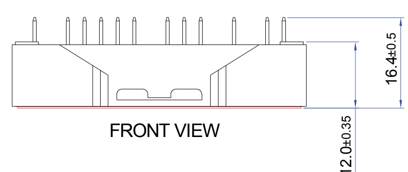


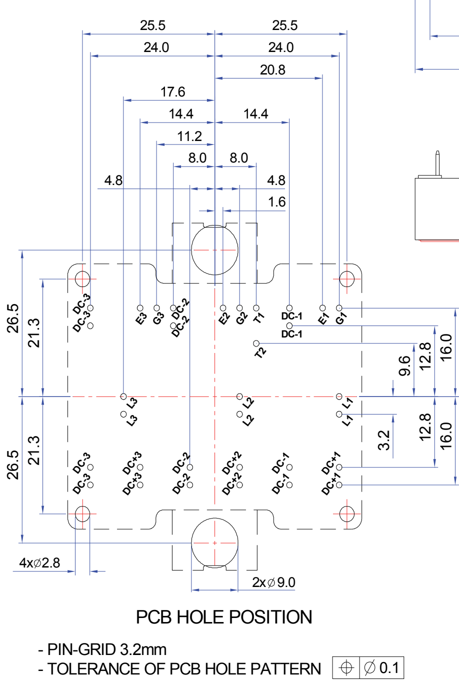
Internal Circuit Diagram



Package Outlines [mm]







PCB HOLE POSITION

- PIN-GRID 3.2mm
- TOLERANCE OF PCB HOLE PATTERN ⌖ ⌀ 0.1

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

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Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
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.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I74

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