Is Now Part of

ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.onsemi.com

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.

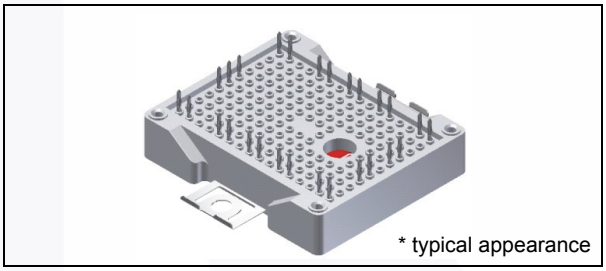
June 2015

FPF2C8P2NL07A

F2, 3-phase, 3-level NPC module with Press-fit / NTC

General Description

Fairchild's new inverter modules provide low conduction and switching loss as well. And Press-Fit technology provides simple and reliable mounting. These modules are optimized for the applications such as solar inverter and UPS where a high efficiency and robust design is needed.



Package Code: F2

Electrical Features

- High Efficiency
- Low Conduction and Switching Losses
- Field Stop IGBT for Inner and Outer Switch
- STEALTH^{TM} Diode for Path Diode
- Built-in NTC for Temperature Monitoring

Mechanical Features

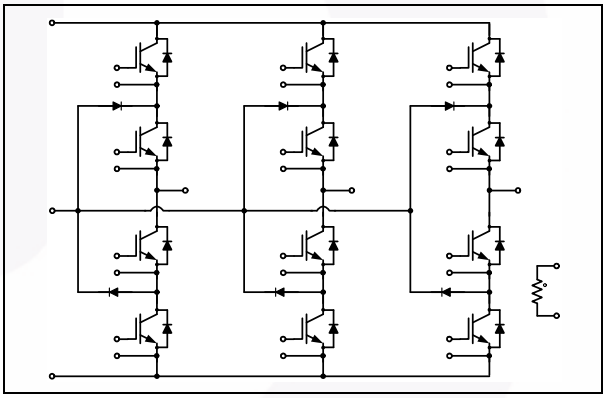
- Compact Size : F2 Package
- Press-fit Contact Technology
- Al_2O_3 Substrate with Low Thermal Resistance

Applications

- Solar Inverter
- UPS

Related Materials

- AN-4167: Mounting Guideline for F1 / F2 Modules with Press-Fit Pins



Internal Circuit Diagram

Package Marking and Ordering Information

Device	Device Marking	Package	Packing Type	Quantity / Tray
FPF2C8P2NL07A	FPF2C8P2NL07A	F2	Tray	14

Absolute Maximum Ratings $T_C = 25^oC$ unless otherwise noted.

Symbol	Description		Rating	Units
Outer IGBT(Q1, Q4, Q5, Q8, Q9, Q12)				
V_{CES}	Collector-Emitter Voltage		650	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current	@ T_C = 80 °C, T_{Jmax} = 175 °C	30	A
I_{CM}	Pulsed Collector Current	limited by T_{Jmax}	60	A
P_D	Maximum Power Dissipation	@ T_C = 25 °C	135	W
T_J	Operating Junction Temperature		- 40 to + 150	°C
Inner IGBT(Q2, Q3, Q6, Q7, Q10, Q11)				
V_{CES}	Collector-Emitter Voltage		650	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current	@ T_C = 80 °C, T_{Jmax} = 175 °C	50	A
I_{CM}	Pulsed Collector Current	limited by T_{Jmax}	100	A
P_D	Maximum Power Dissipation	@ T_C = 25 °C	174	W
T_J	Operating Junction Temperature		- 40 to + 150	°C
Outer - Inner IGBT Series Connection				
SCWT	Short Circuit Withstand Time	V_{DC} = 300 V, V_{GE} = 15 V T_C = 25 °C	4	μS
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
P_D	Maximum Power Dissipation	@ T_C = 25 °C	100	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	Nm
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
Outer 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 = 30 mA	4.5	5.6	6.7	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 30 A, V_{GE} = 15 V	-	1.55	2.2	V
		I_C = 30 A, V_{GE} = 15 V @T_C = 125 °C	-	1.75	-	V
		I_C = 60 A, V_{GE} = 15 V	-	2.13	-	V
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 30 A, V_{GE} = ± 15 V, R_G = 20 Ω, Inductive Load, T_C = 25 °C	-	33	-	ns
t_r	Rise Time		-	43	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	197	-	ns
t_f	Fall Time		-	17	-	ns
E_{ON}	Turn-On Switching Loss per Pulse		-	0.68	-	mJ
E_{OFF}	Turn-Off Switching Loss per Pulse		-	0.38	-	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 30 A, V_{GE} = ± 15 V, R_G = 20 Ω, Inductive Load, T_C = 125 °C	-	29	-	ns
t_r	Rise Time		-	50	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	205	-	ns
t_f	Fall Time		-	25	-	ns
E_{ON}	Turn-On Switching Loss per Pulse		-	0.86	-	mJ
E_{OFF}	Turn-Off Switching Loss per Pulse		-	0.52	-	mJ
Q_g	Total Gate Charge	V_{CC} = 300 V, I_C = 30 A, V_{GE} = ± 15 V	-	0.26	-	μC
$R_{\theta JC}$	Thermal Resistance of Junction to Case	per Chip	-	-	1.11	°C/W
Inner 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 = 50 mA	4.5	5.6	6.7	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 50 A, V_{GE} = 15 V	-	1.65	2.3	V
		I_C = 50 A, V_{GE} = 15 V @T_C = 125 °C	-	1.95	-	V
		I_C = 100 A, V_{GE} = 15 V	-	2.49	-	V
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 50 A, V_{GE} = ± 15 V, R_G = 15 Ω, Inductive Load, T_C = 25 °C	-	41	-	ns
t_r	Rise Time		-	65	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	233	-	ns
t_f	Fall Time		-	18	-	ns
E_{ON}	Turn-On Switching Loss per Pulse		-	0.87	-	mJ
E_{OFF}	Turn-Off Switching Loss per Pulse		-	0.77	-	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 50 A, V_{GE} = ± 15 V, R_G = 15 Ω, Inductive Load, T_C = 125 °C	-	39	-	ns
t_r	Rise Time		-	76	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	243	-	ns
t_f	Fall Time		-	20	-	ns
E_{ON}	Turn-On Switching Loss per Pulse		-	0.99	-	mJ
E_{OFF}	Turn-Off Switching Loss per Pulse		-	0.93	-	mJ
Q_g	Total Gate Charge	V_{CC} = 300 V, I_C = 50 A, V_{GE} = ± 15 V	-	0.39	-	nC
$R_{\theta JC}$	Thermal Resistance of Junction to Case	per Chip	-	-	0.86	°C/W

Electrical Characteristics T_C = 25°C unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
Diode						
V_{FM}	Diode Forward Voltage	I_F = 15 A	-	2.55	3.4	V
		I_F = 15 A @T_C = 125 °C	-	1.78	-	V
I_R	Reverse Leakage Current	V_R = 650 V	-	-	250	μA
t_{rr}	Reverse Recovery Time	V_R = 300 V, I_F = 15 A di_F / dt = 700 A/us T_C = 25 °C	-	23	-	ns
I_{rr}	Reverse Recovery Current		-	9.9	-	A
Q_{rr}	Reverse Recovery Charge		-	113	-	nC
t_{rr}	Reverse Recovery Time	V_R = 300 V, I_F = 15 A di_F / dt = 700 A/us T_C = 125 °C	-	49	-	ns
I_{rr}	Reverse Recovery Current		-	15.2	-	A
Q_{rr}	Reverse Recovery Charge		-	366	-	nC
$R_{\theta JC}$	Thermal Resistance of Junction to Case	per Chip	-	-	1.44	°C/W
NTC_ Thermistor						
R_{NTC}	Rated Resistance	T_C = 25 °C	-	5.0	-	kΩ
		T_C = 100 °C	-	493	-	Ω
	Tolerance	T_C = 25 °C	- 5	-	+ 5	%
P_D	Power Dissipation	T_C = 25 °C	-	-	20	mW
B_{Value}	B-Constant	$B_{25/50}$	-	3375	-	K
		$B_{25/100}$	-	3436	-	K

Typical Performance Characteristic

Fig 1. Typical Output Characteristics - Outer IGBT

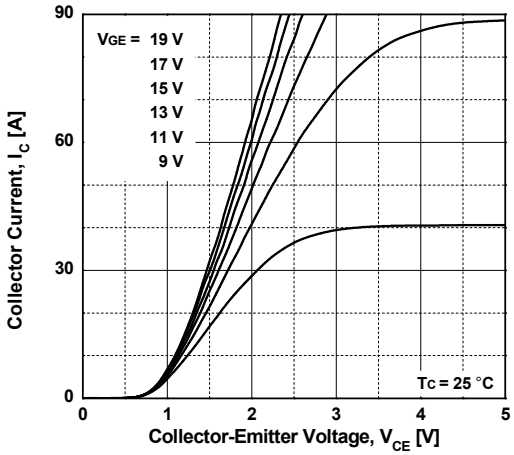


Fig 2. Typical Output Characteristics - Outer IGBT

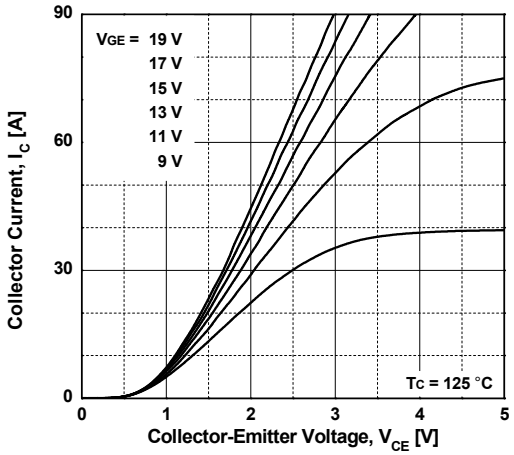


Fig 3. Typical Saturation Voltage Characteristics - Outer IGBT

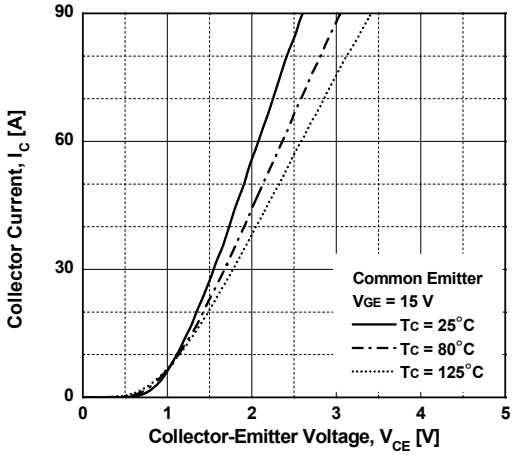


Fig 4. Switching Loss vs. Collector Current - Outer IGBT

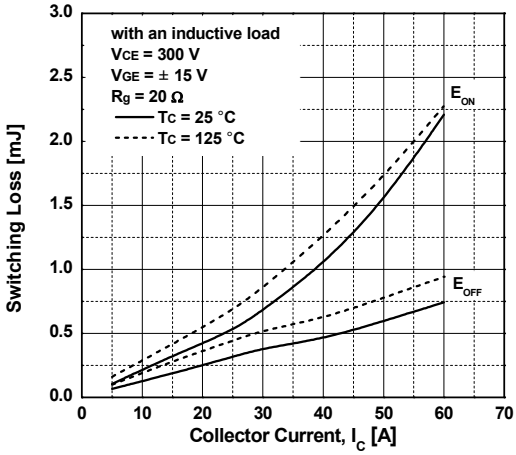


Fig 5. Switching Loss vs. Gate Resistance - Outer IGBT

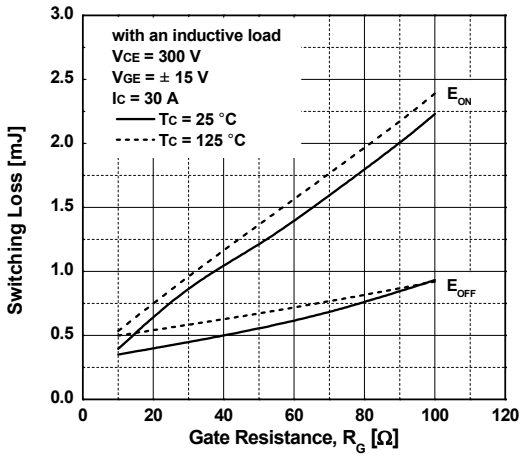
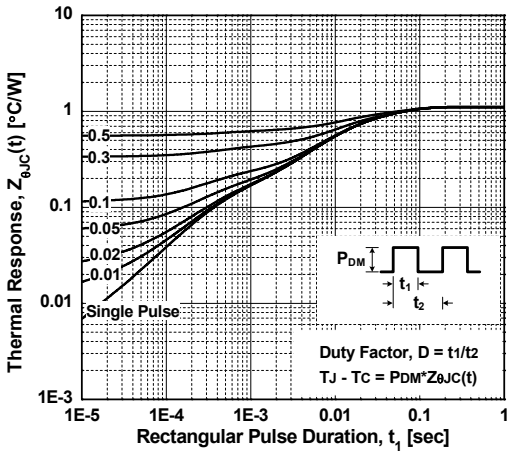


Fig 6. Transient Thermal Impedance - Outer IGBT



Typical Performance Characteristic

Fig 7. Typical Output Characteristics - Inner IGBT

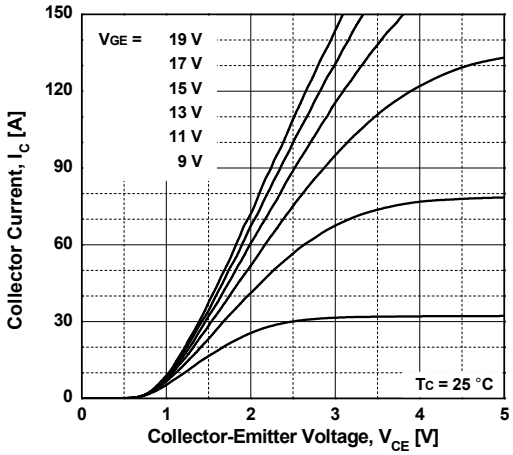


Fig 8. Typical Output Characteristics - Inner IGBT

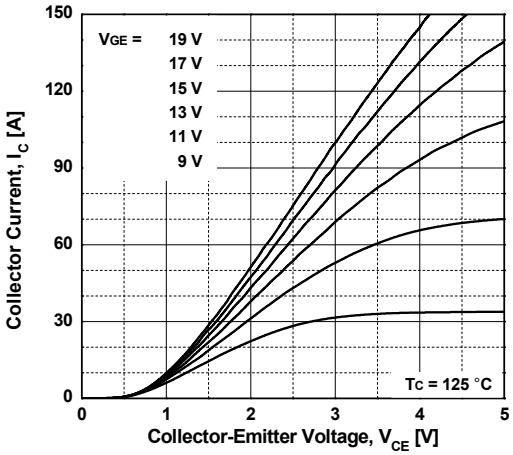


Fig 9. Typical Saturation Voltage Characteristics - Inner IGBT

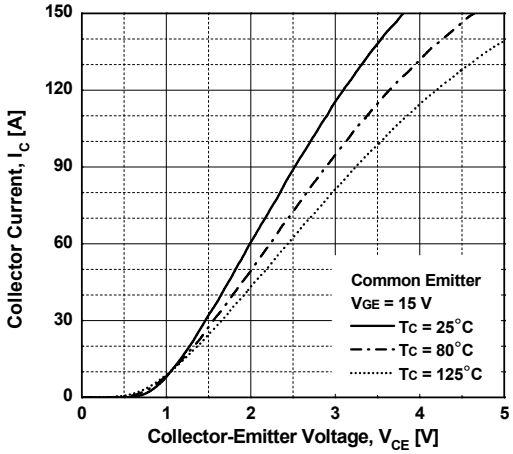


Fig 10. Switching Loss vs. Collector Current - Inner IGBT

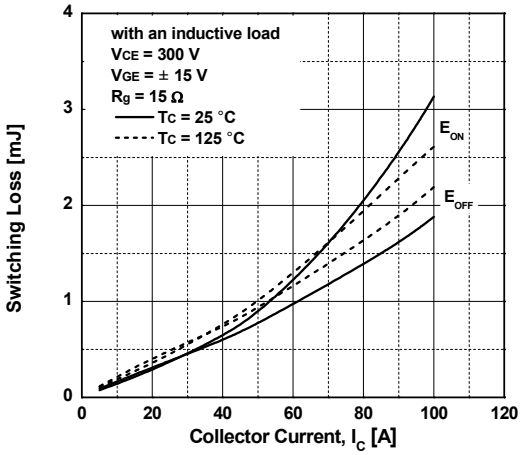


Fig 11. Switching Loss vs. Gate Resistance - Inner IGBT

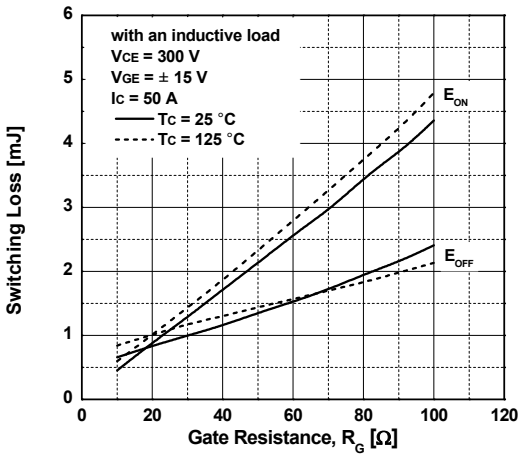
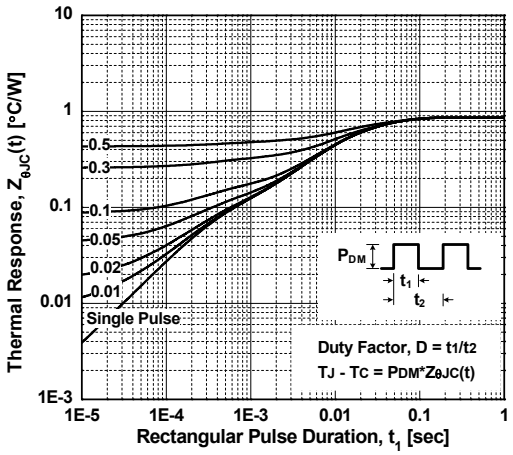


Fig 12. Transient Thermal Impedance - Inner IGBT



Typical Performance Characteristic

Fig 13. Reverse Bias Safe Operating Area (RBSOA) - Outer IGBT

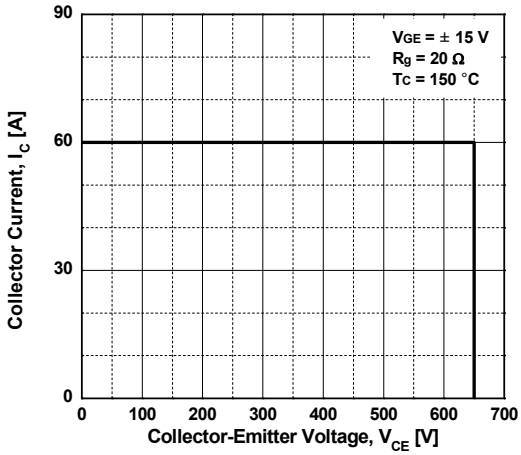


Fig 14. Reverse Bias Safe Operating Area (RBSOA) - Inner IGBT

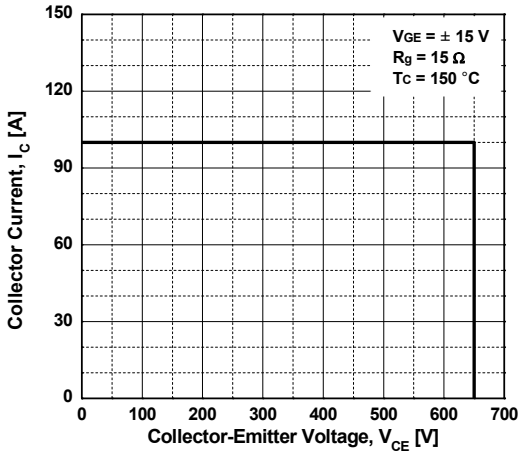


Fig 15. Typical Forward Voltage Drop - Diode

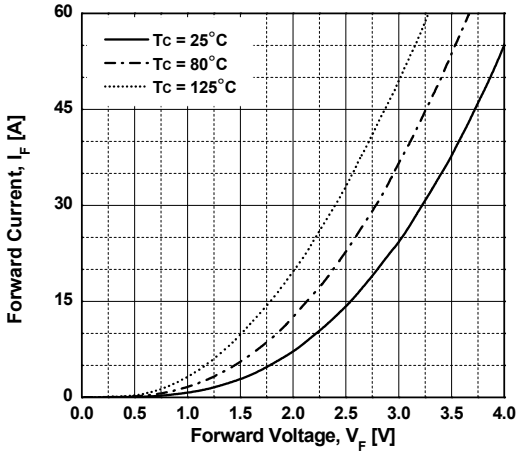


Fig 16. Reverse Recovery Energy vs. Forward Current - Diode

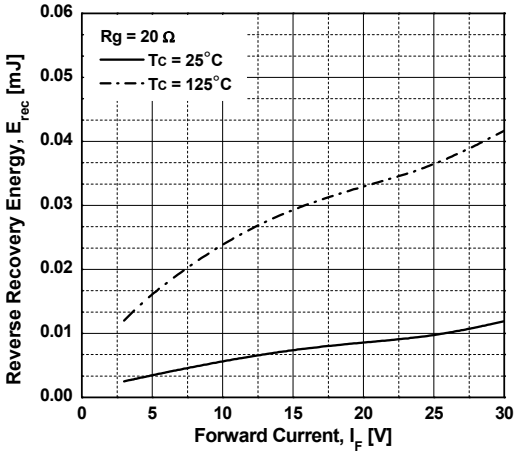


Fig 17. Reverse Recovery Energy vs. Gate Resistance - Diode

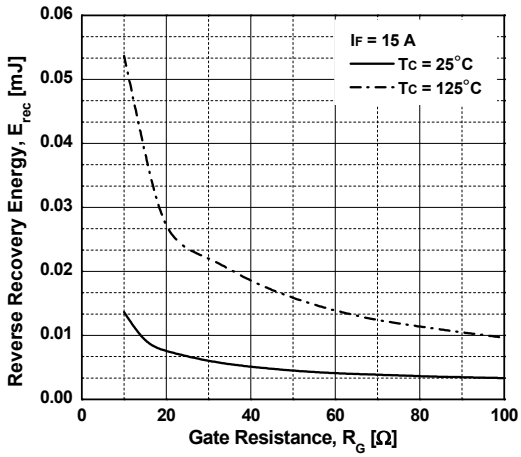
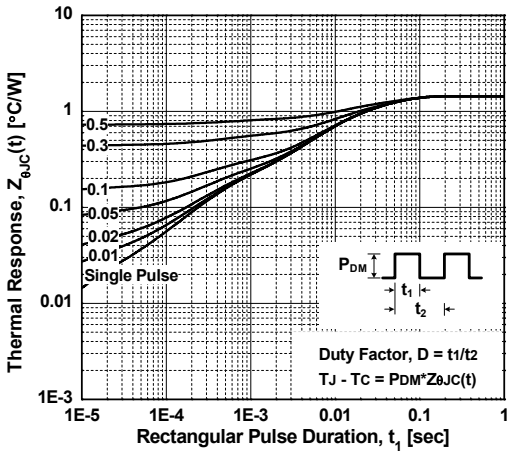
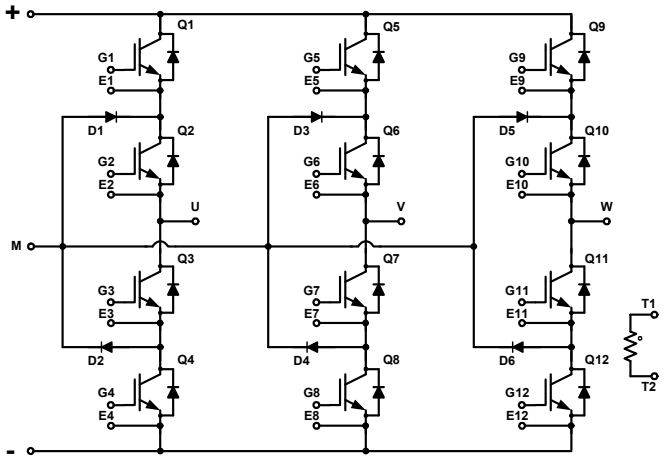


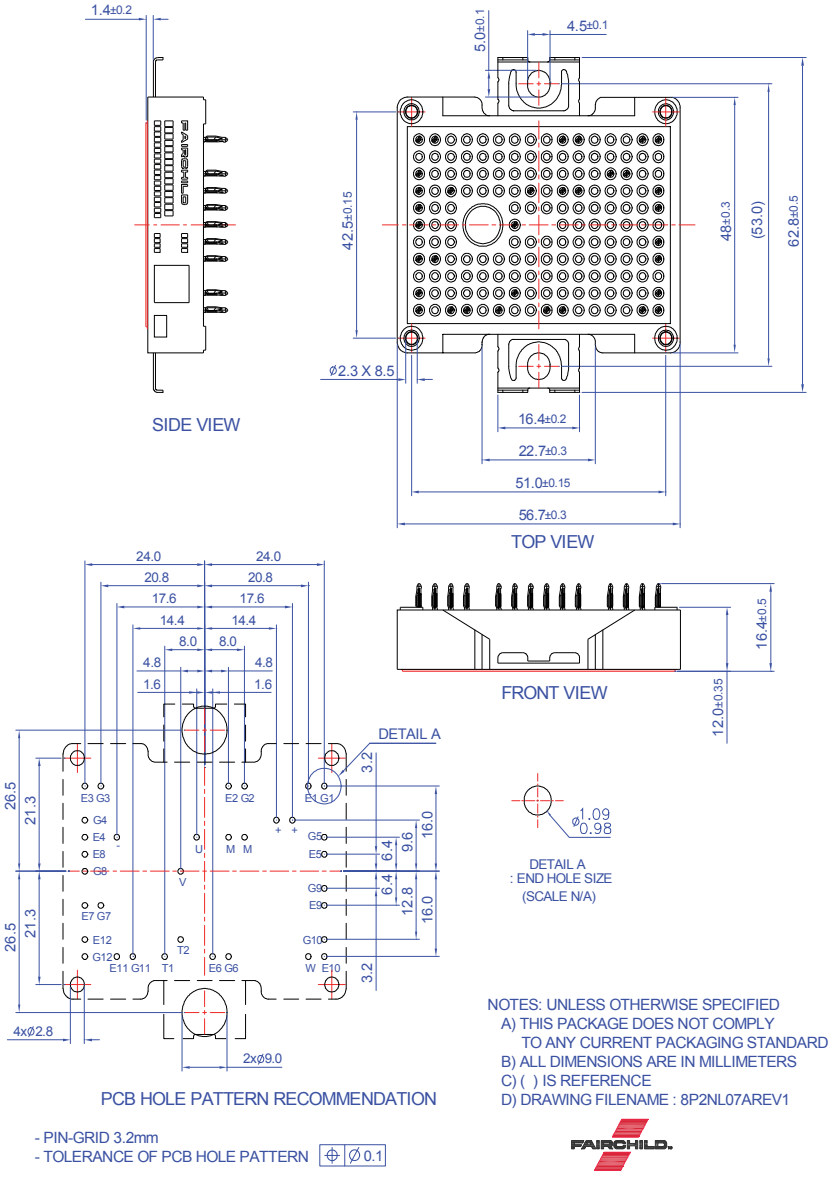
Fig 18. Transient Thermal Impedance - Diode



Internal Circuit Diagram



Package Outlines [mm]



TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™
AttitudeEngine™
Awinda®
AX-CAP®*
BitSiC™
Build it Now™
CorePLUS™
CorePOWER™
CROSSVOLT™
CTL™
Current Transfer Logic™
DEUXPEED®
Dual Cool™
EcoSPARK®
EfficientMax™
ESBC™
Fairchild®
Fairchild Semiconductor®
FACT Quiet Series™
FACT®
FAST®
FastvCore™
FETBench™
FPS™
F-PFS™
FRFET®
Global Power Resource℠
GreenBridge™
Green FPS™
Green FPS™ e-Series™
Gmax™
GTO™
IntelliMAX™
ISOPLANAR™
Making Small Speakers Sound Louder and Better™
MegaBuck™
MICROCOUPLER™
MicroFET™
MicroPak™
MicroPak2™
MillerDrive™
MotionMax™
MotionGrid®
MTi®
MTx®
MVN®
mWSaver®
OptoHiT™
OPTOLOGIC®
OPTOPLANAR®
Power Supply WebDesigner™
PowerTrench®
PowerXS™
Programmable Active Droop™
QFET®
QS™
Quiet Series™
RapidConfigure™
Saving our world, 1mW/W/kW at a time™
SignalWise™
SmartMax™
SMART START™
Solutions for Your Success™
SPM®
STEALTH™
SuperFET®
SuperSOT™-3
SuperSOT™-6
SuperSOT™-8
SupreMOS®
SyncFET™
Sync-Lock™
SYSTEM GENERAL®*
TinyBoost®
TinyBuck®
TinyCalc™
TinyLogic®
TINYOPTO™
TinyPower™
TinyPWM™
TinyWire™
TranSiC™
TriFault Detect™
TRUECURRENT®*
μSerDes™
UHC®
Ultra FRFET™
UniFET™
VCX™
VisualMax™
VoltagePlus™
XS™
Xsens™
仙童™

* Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. TO OBTAIN THE LATEST, MOST UP-TO-DATE DATASHEET AND PRODUCT INFORMATION, VISIT OUR WEBSITE AT HTTP://WWW.FAIRCHILDSEMI.COM. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed applications, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address any warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative