FAIRCHILD™

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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.

FAIRCHILD

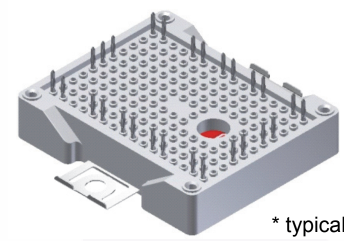
June 2015

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.



* typical appearance

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

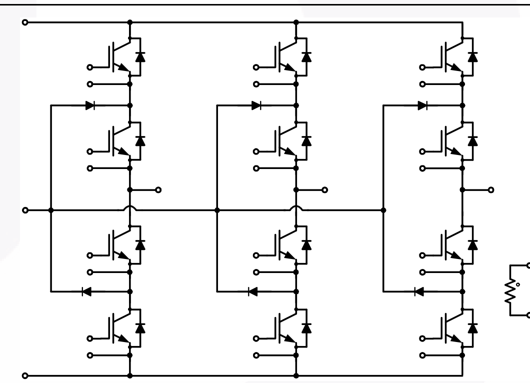
- Compact Size : F2 Package
- Press-fit Contact Technology
- Al_2O_3 Substrate with Low Thermal Resistance

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°C 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

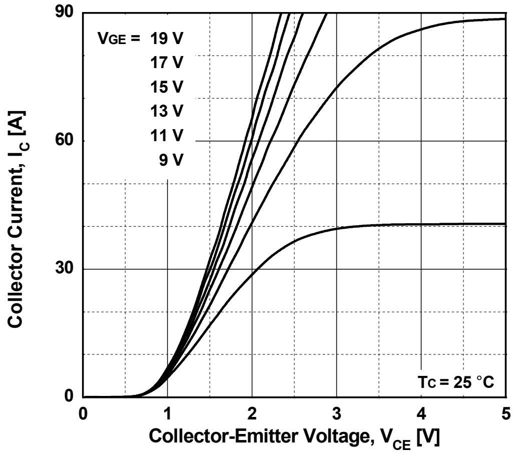


Fig 2. Typical Output Characteristics - Outer IGBT

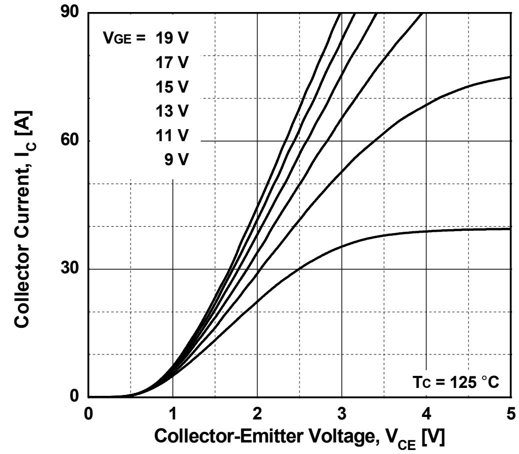


Fig 3. Typical Saturation Voltage Characteristics - Outer IGBT

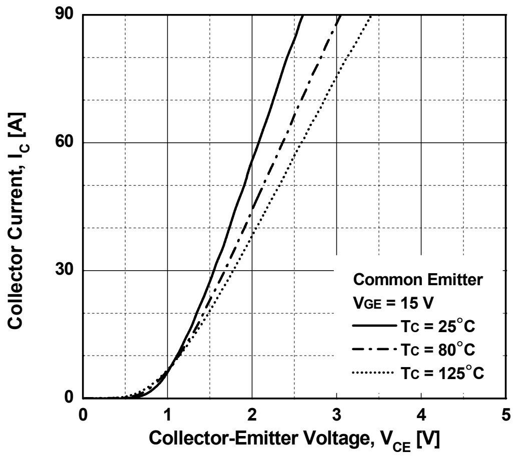


Fig 4. Switching Loss vs. Collector Current - Outer IGBT

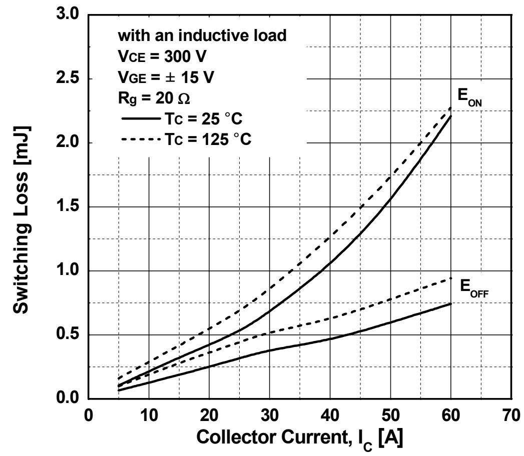


Fig 5. Switching Loss vs. Gate Resistance - Outer IGBT

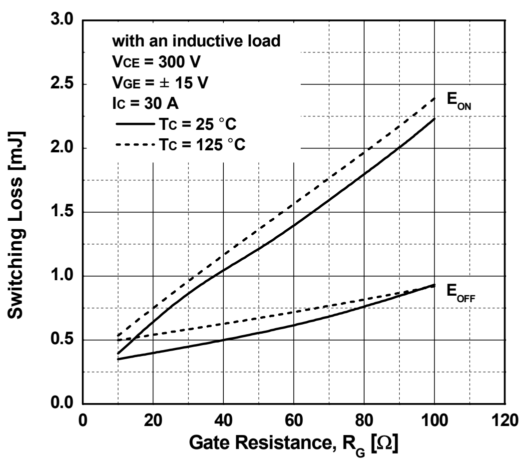
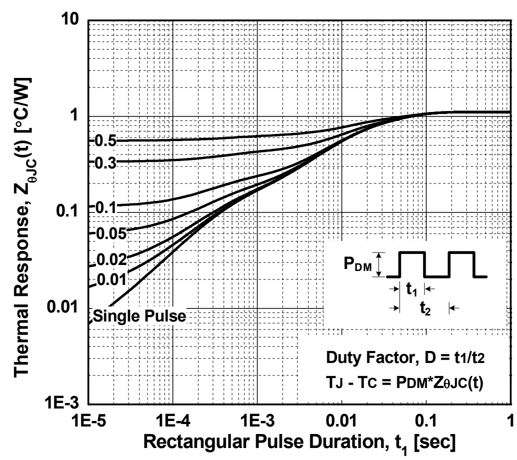


Fig 6. Transient Thermal Impedance - Outer IGBT



Typical Performance Characteristic

Fig 7. Typical Output Characteristics - Inner IGBT

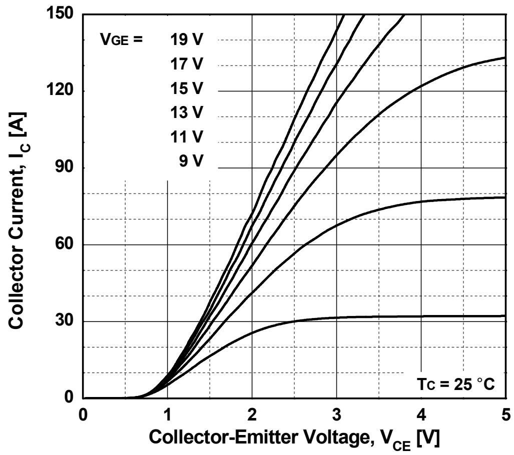


Fig 8. Typical Output Characteristics - Inner IGBT

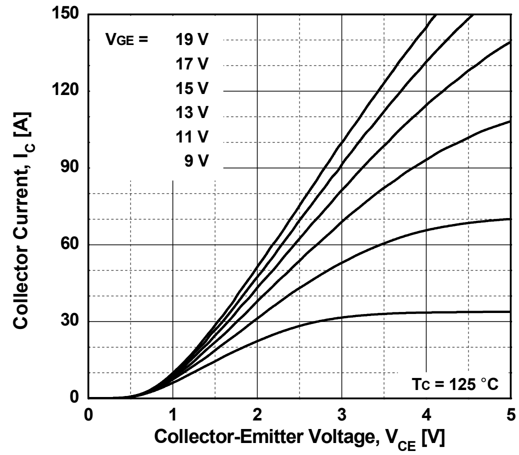


Fig 9. Typical Saturation Voltage Characteristics - Inner IGBT

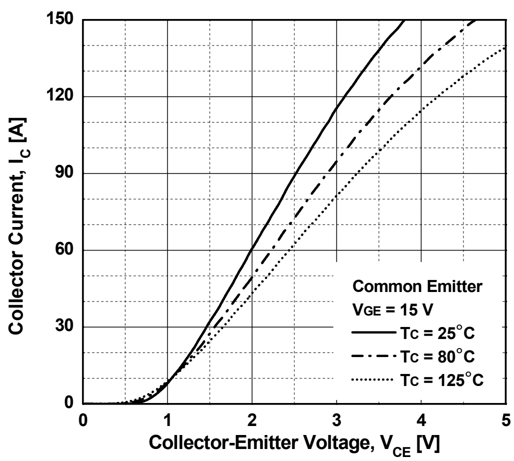


Fig 10. Switching Loss vs. Collector Current - Inner IGBT

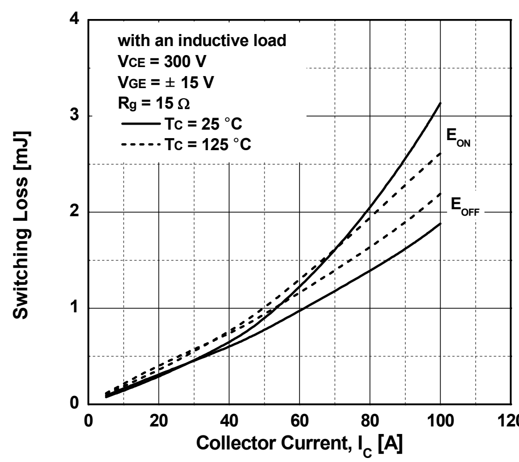


Fig 11. Switching Loss vs. Gate Resistance - Inner IGBT

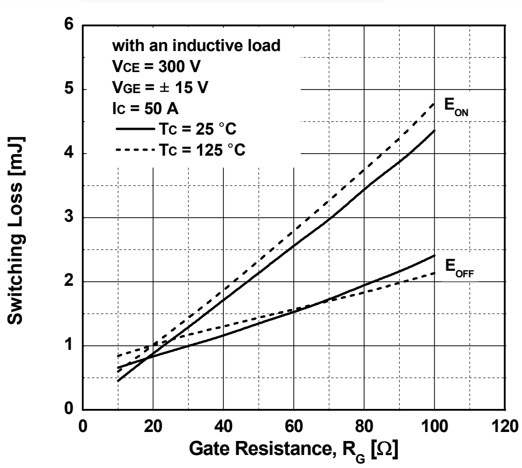
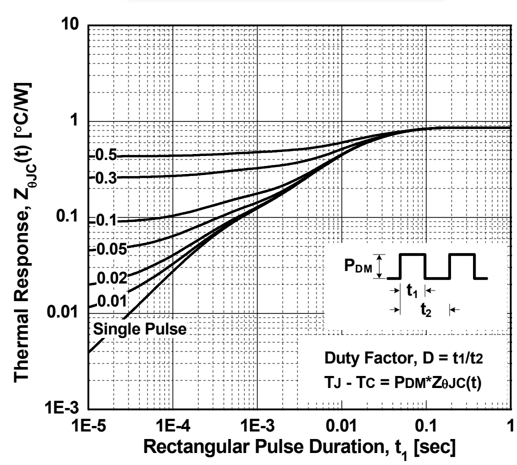


Fig 12. Transient Thermal Impedance - Inner IGBT



Typical Performance Characteristic

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

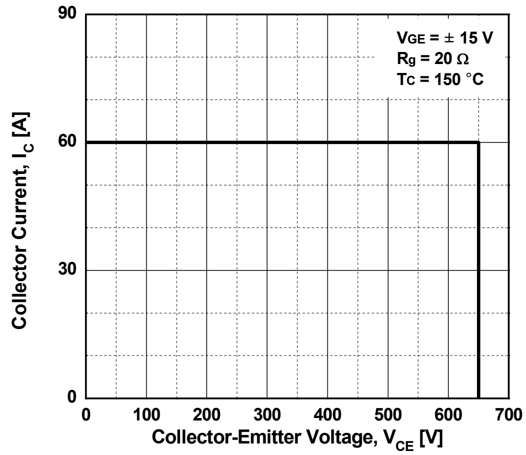


Fig 14. Reverse Bias Safe Operating Area (RBSOA) - Inner IGBT

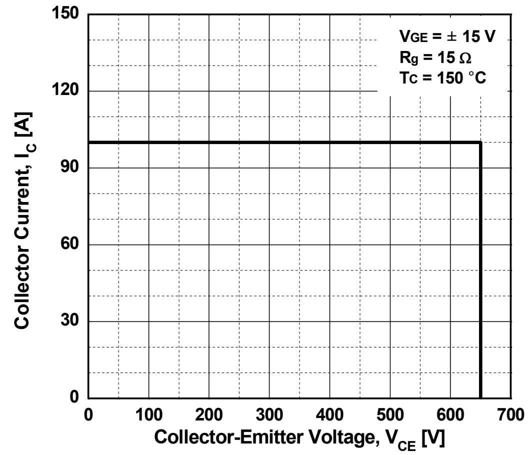


Fig 15. Typical Forward Voltage Drop - Diode

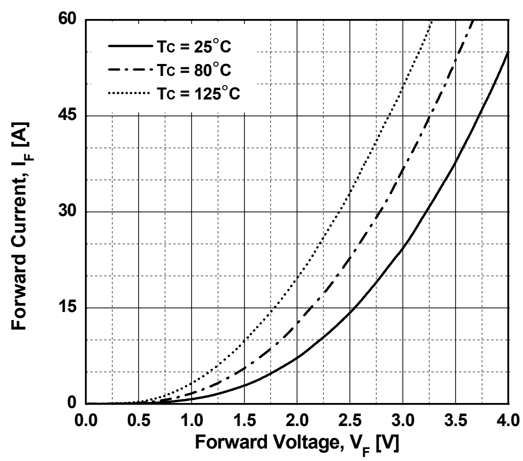


Fig 16. Reverse Recovery Energy vs. Forward Current - Diode

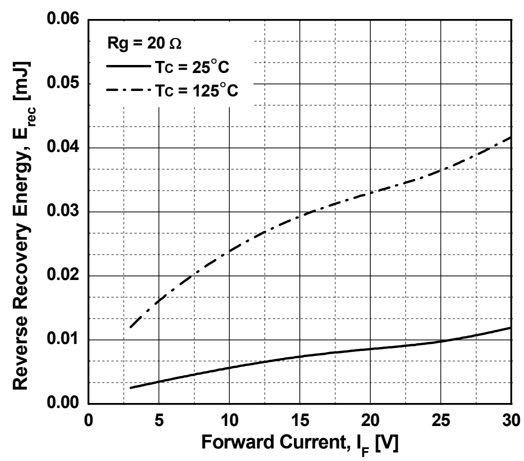


Fig 17. Reverse Recovery Energy vs. Gate Resistance - Diode

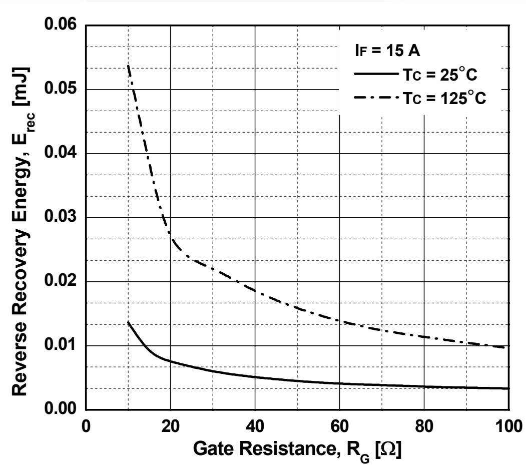
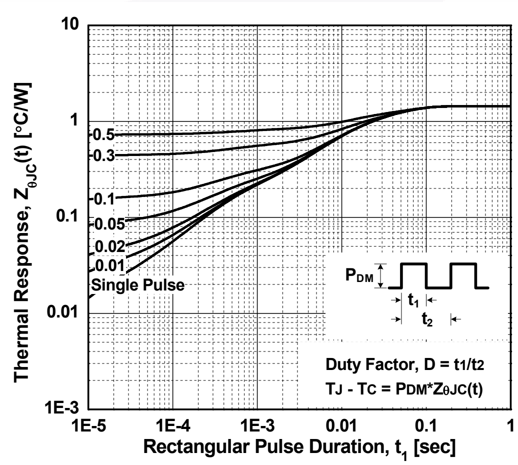
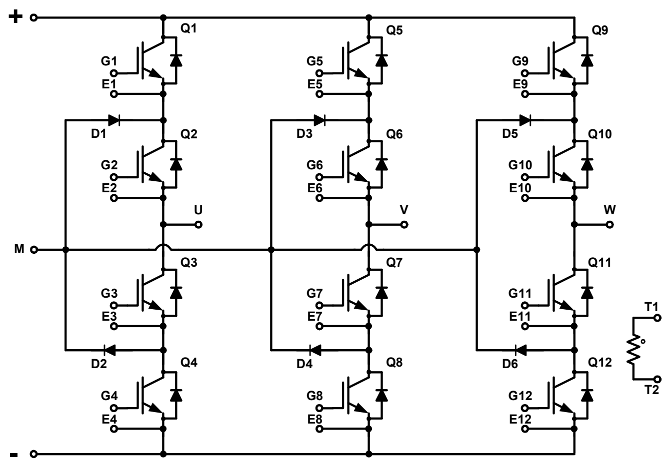


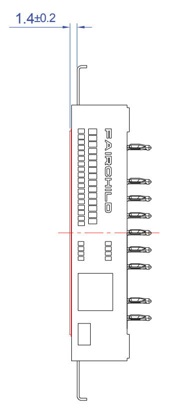
Fig 18. Transient Thermal Impedance - Diode



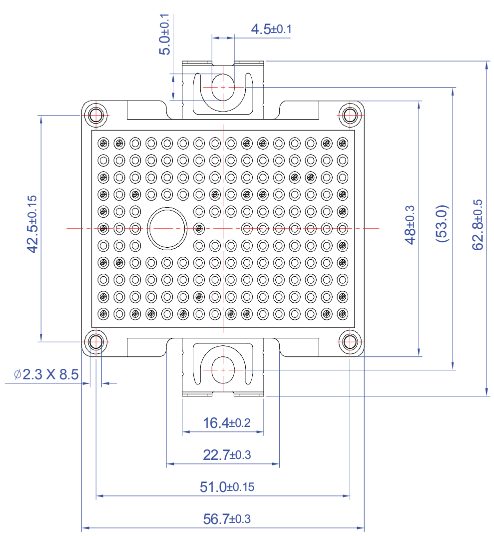
Internal Circuit Diagram



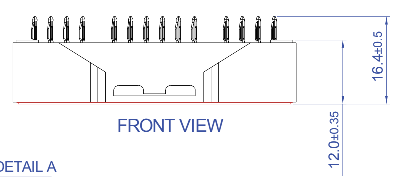
Package Outlines [mm]



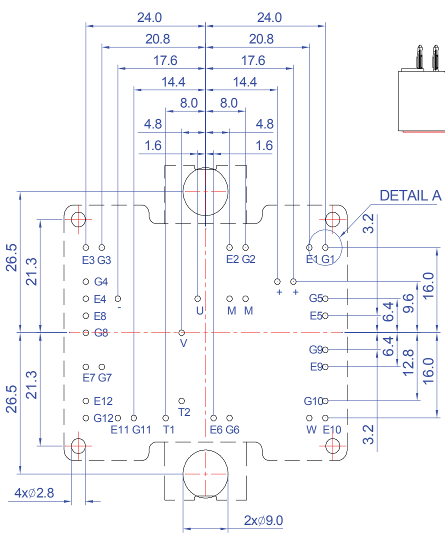
SIDE VIEW

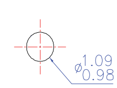


TOP VIEW



FRONT VIEW





DETAIL A
: END HOLE SIZE
(SCALE N/A)

NOTES: UNLESS OTHERWISE SPECIFIED
A) THIS PACKAGE DOES NOT COMPLY
TO ANY CURRENT PACKAGING STANDARD
B) ALL DIMENSIONS ARE IN MILLIMETERS
C) ( ) IS REFERENCE
D) DRAWING FILENAME : 8P2NL07AREV1

PCB HOLE PATTERN RECOMMENDATION

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

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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.

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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

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Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
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