



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.

Electrical Features

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

Mechanical Features

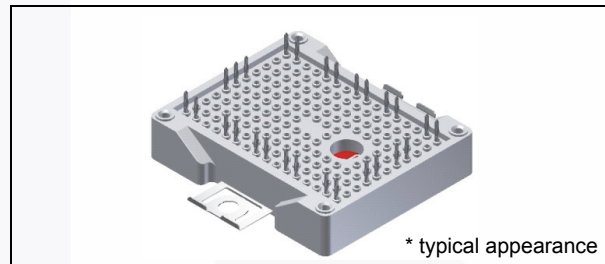
- Compact Size : F2 Package
- Press-fit Contact Technology
- Al₂O₃ Substrate with Low Thermal Resistance

Applications

- Solar Inverter
- UPS

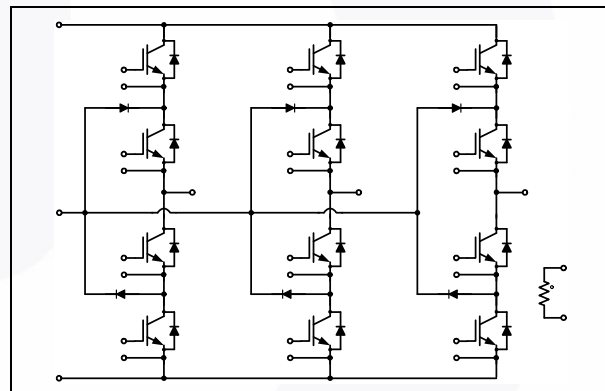
Related Materials

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



* typical appearance

Package Code: F2



Internal Circuit Diagram

Package Marking and Ordering Information

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

FPF2C8P2NL07A - F2, 3-phase, 3-level NPC module with Press-fit / NTC

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ 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 @ $T_C = 80^\circ\text{C}$, $T_{Jmax} = 175^\circ\text{C}$	30	A
I_{CM}	Pulsed Collector Current limited by T_{Jmax}	60	A
P_D	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	135	W
T_J	Operating Junction Temperature	- 40 to + 150	$^\circ\text{C}$
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 @ $T_C = 80^\circ\text{C}$, $T_{Jmax} = 175^\circ\text{C}$	50	A
I_{CM}	Pulsed Collector Current limited by T_{Jmax}	100	A
P_D	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	174	W
T_J	Operating Junction Temperature	- 40 to + 150	$^\circ\text{C}$
Outer - Inner IGBT Series Connection			
SCWT	Short Circuit Withstand Time	$V_{DC} = 300\text{ V}$, $V_{GE} = 15\text{ V}$ $T_C = 25^\circ\text{C}$	4 μS
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
P_D	Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$	100	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	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 $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units	
Outer 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	$V_{GE} = V_{CE}, I_C = 30\text{ mA}$	4.5	5.6	6.7	V	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 30\text{ A}, V_{GE} = 15\text{ V}$	-	1.55	2.2	V	
		$I_C = 30\text{ A}, V_{GE} = 15\text{ V} @ T_C = 125^\circ\text{C}$	-	1.75	-	V	
		$I_C = 60\text{ A}, V_{GE} = 15\text{ V}$	-	2.13	-	V	
Switching Characteristics							
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300\text{ V}$ $I_C = 30\text{ A}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 20\ \Omega$ Inductive Load $T_C = 25^\circ\text{C}$	-	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		$V_{CC} = 300\text{ V}$ $I_C = 30\text{ A}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 20\ \Omega$ Inductive Load $T_C = 125^\circ\text{C}$	-	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	$V_{CC} = 300\text{ V}, I_C = 30\text{ A}, V_{GE} = \pm 15\text{ V}$		-	0.26	-	μC
$R_{\theta JC}$	Thermal Resistance of Junction to Case	per Chip		-	-	1.11	$^\circ\text{C/W}$
Inner 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	$V_{GE} = V_{CE}, I_C = 50\text{ mA}$	4.5	5.6	6.7	V	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 50\text{ A}, V_{GE} = 15\text{ V}$	-	1.65	2.3	V	
		$I_C = 50\text{ A}, V_{GE} = 15\text{ V} @ T_C = 125^\circ\text{C}$	-	1.95	-	V	
		$I_C = 100\text{ A}, V_{GE} = 15\text{ V}$	-	2.49	-	V	
Switching Characteristics							
$t_{d(on)}$	Turn-On Delay Time	$V_{CC} = 300\text{ V}$ $I_C = 50\text{ A}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 15\ \Omega$ Inductive Load $T_C = 25^\circ\text{C}$	-	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		$V_{CC} = 300\text{ V}$ $I_C = 50\text{ A}$ $V_{GE} = \pm 15\text{ V}$ $R_G = 15\ \Omega$ Inductive Load $T_C = 125^\circ\text{C}$	-	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	$V_{CC} = 300\text{ V}, I_C = 50\text{ A}, V_{GE} = \pm 15\text{ V}$		-	0.39	-	nC
$R_{\theta JC}$	Thermal Resistance of Junction to Case	per Chip		-	-	0.86	$^\circ\text{C/W}$

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
Diode						
V_{FM}	Diode Forward Voltage	$I_F = 15\text{ A}$	-	2.75	3.4	V
		$I_F = 15\text{ A @ }T_C = 125^\circ\text{C}$	-	1.78	-	V
I_R	Reverse Leakage Current	$V_R = 650\text{ V}$	-	-	250	μA
t_{rr}	Reverse Recovery Time	$V_R = 300\text{ V}, I_F = 15\text{ A}$ $di_F / dt = 700\text{ A/us}$ $T_C = 25^\circ\text{C}$	-	23	-	ns
I_{rr}	Reverse Recovery Current		-	9.9	-	A
Q_{rr}	Reverse Recovery Charge		-	113	-	nC
t_{rr}	Reverse Recovery Time	$V_R = 300\text{ V}, I_F = 15\text{ A}$ $di_F / dt = 700\text{ A/us}$ $T_C = 125^\circ\text{C}$	-	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	$^\circ\text{C/W}$
NTC_ Thermistor						
R_{NTC}	Rated Resistance	$T_C = 25^\circ\text{C}$	-	5.0	-	k Ω
		$T_C = 100^\circ\text{C}$	-	493	-	Ω
	Tolerance	$T_C = 25^\circ\text{C}$	-5	-	+5	%
P_D	Power Dissipation	$T_C = 25^\circ\text{C}$	-	-	20	mW
B_{Value}	B-Constance	$B_{25/50}$	-	3375	-	K
		$B_{25/100}$	-	3436	-	K

Typical Performance Characteristic

Fig 1. Typical Output Characteristics
- Outer IGBT

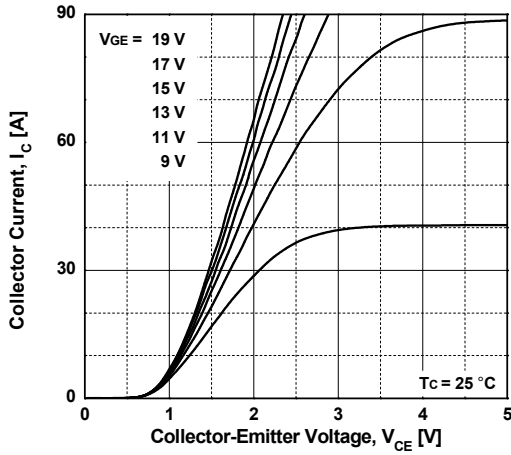


Fig 2. Typical Output Characteristics
- Outer IGBT

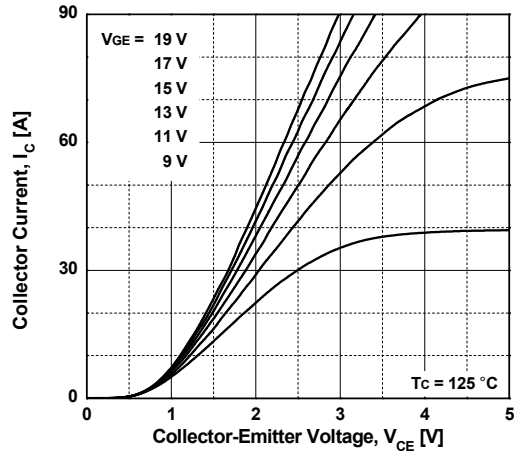


Fig 3. Typical Saturation Voltage Characteristics
- Outer IGBT

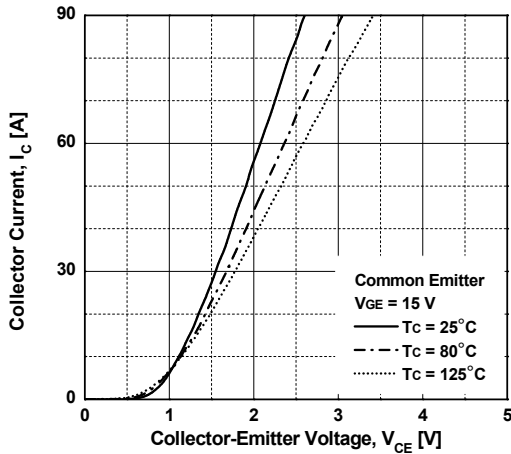


Fig 4. Switching Loss vs. Collector Current
- Outer IGBT

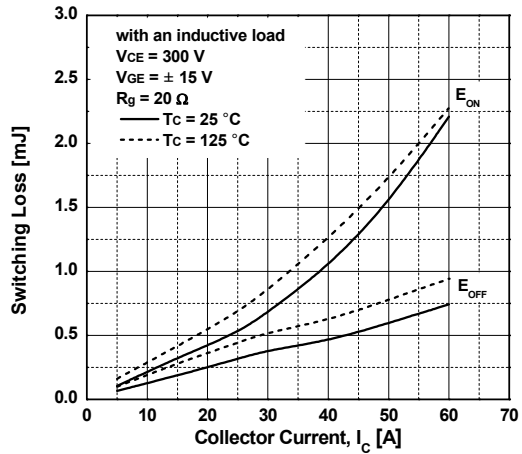


Fig 5. Switching Loss vs. Gate Resistance
- Outer IGBT

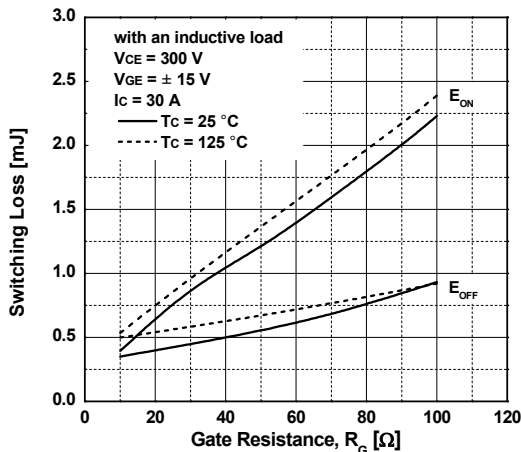
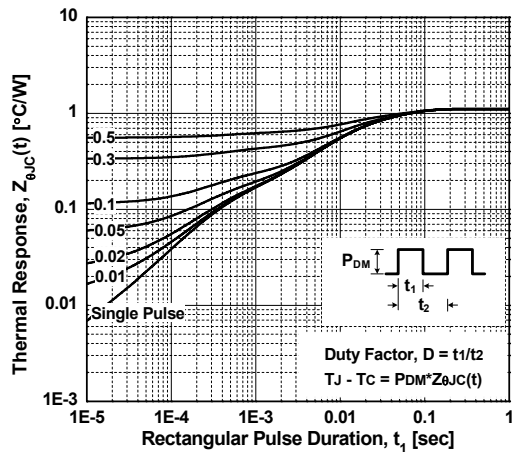


Fig 6. Transient Thermal Impedance
- Outer IGBT



Typical Performance Characteristic

Fig 7. Typical Output Characteristics - Inner IGBT

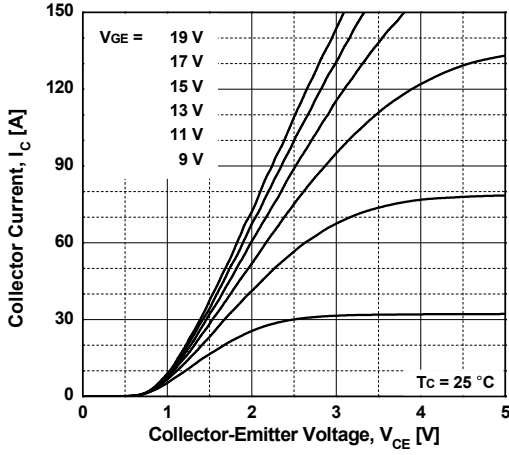


Fig 8. Typical Output Characteristics - Inner IGBT

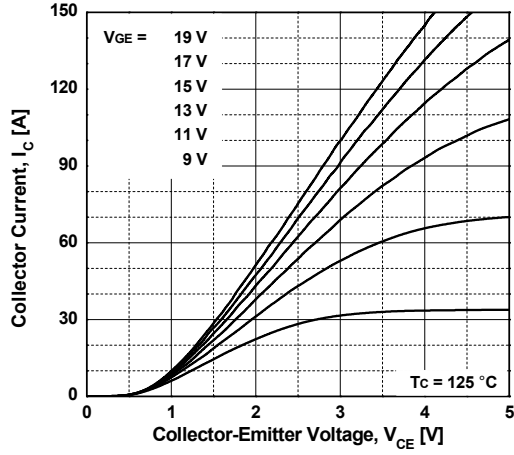


Fig 9. Typical Saturation Voltage Characteristics - Inner IGBT

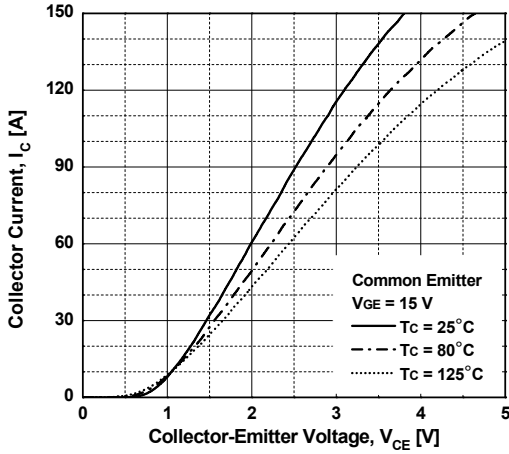


Fig 10. Switching Loss vs. Collector Current - Inner IGBT

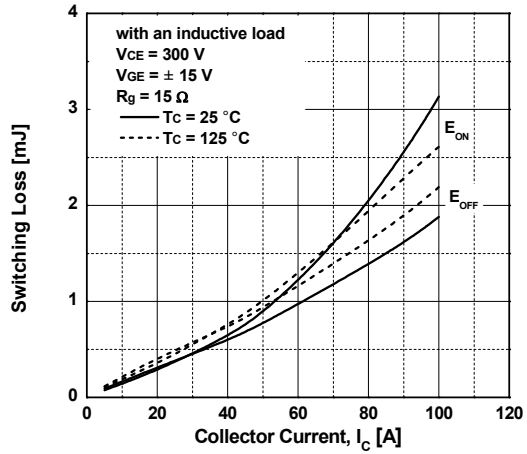


Fig 11. Switching Loss vs. Gate Resistance - Inner IGBT

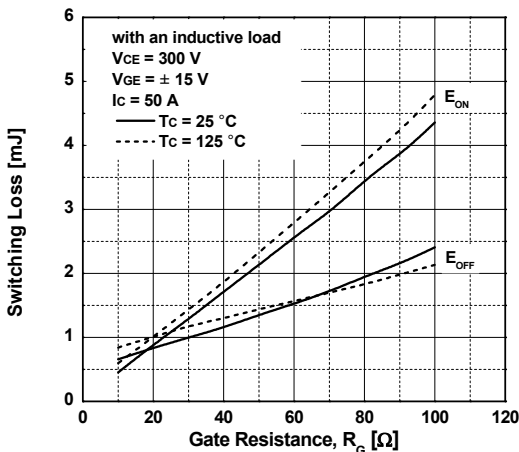
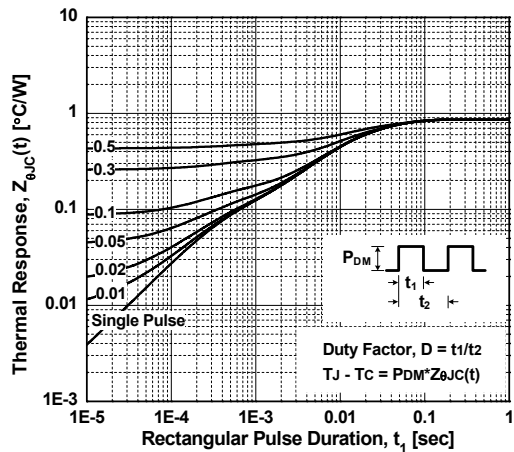


Fig 12. Transient Thermal Impedance - Inner IGBT



Typical Performance Characteristic

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

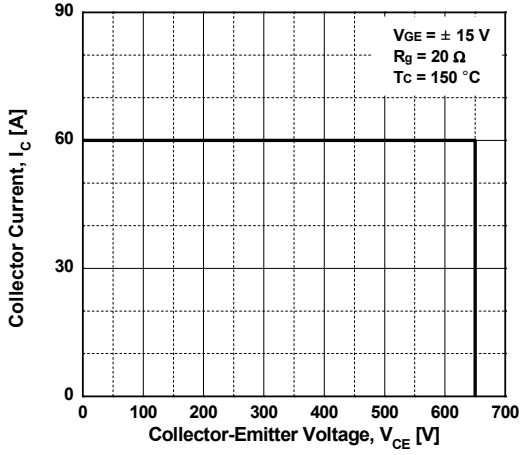


Fig 14. Reverse Bias Safe Operating Area (RBSOA) - Inner IGBT

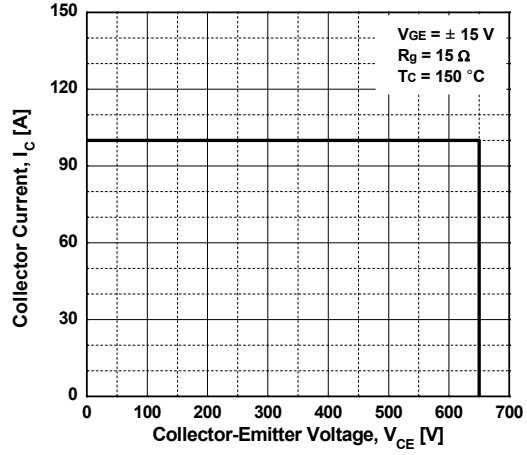


Fig 15. Typical Forward Voltage Drop - Diode

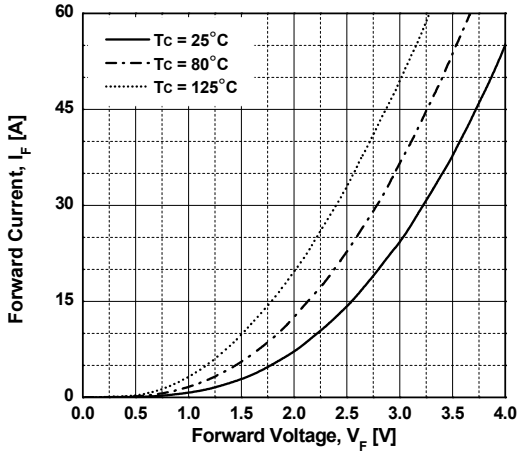


Fig 16. Reverse Recovery Energy vs. Forward Current - Diode

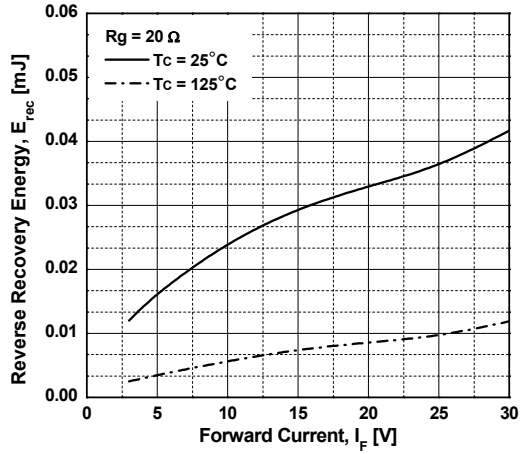
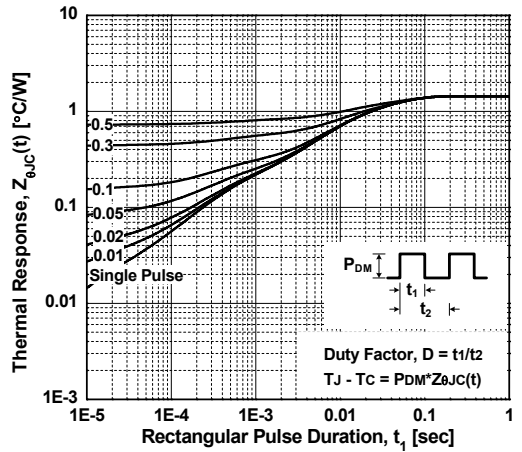
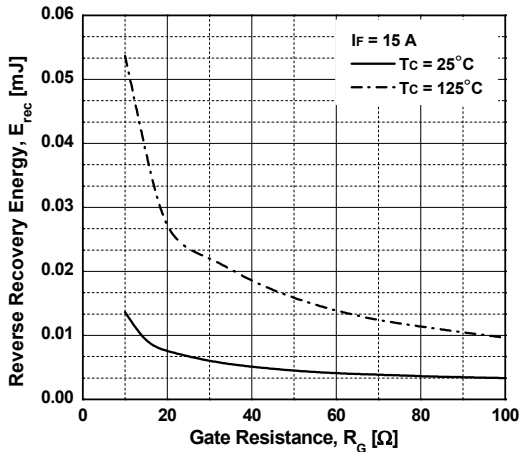
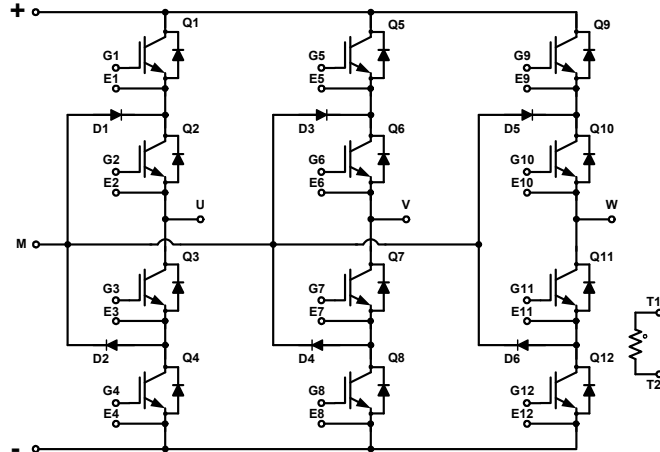


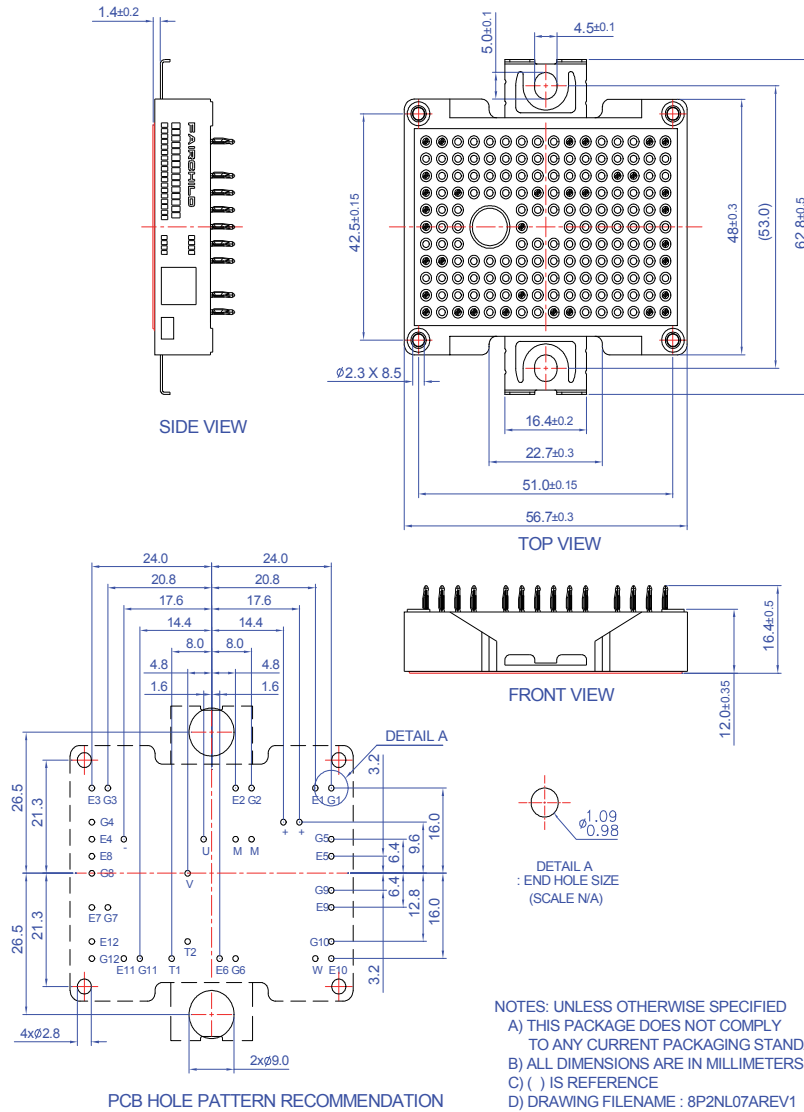
Fig 17. Reverse Recovery Energy vs. Gate Resistance - Diode **Fig 18. Transient Thermal Impedance - Diode**



Internal Circuit Diagram



Package Outlines [mm]



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





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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.
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