Q1PACK Module

NXH75M65L4Q1SG, NXH75M65L4Q1PTG

This high−density, integrated power module combines high−performance IGBTs with rugged anti−parallel diodes.

Features

- Extremely Efficient Trench with Fieldstop Technology
- Low Switching Loss Reduces System Power Dissipation
- Module Design Offers High Power Density
- Low Inductive Layout
- Q1PACK Packages with Solder and Pressfit Pins

Typical Applications

- Solar Inverters
- Uninterruptable Power Supplies

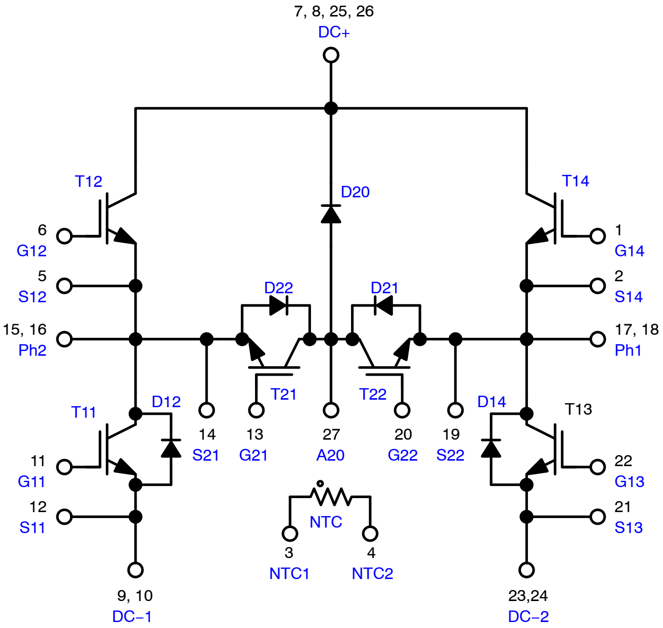


Figure 1. Schematic

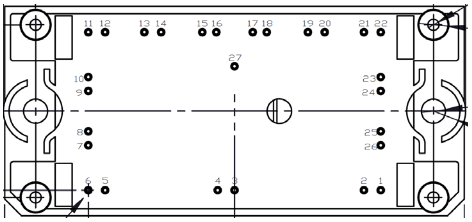
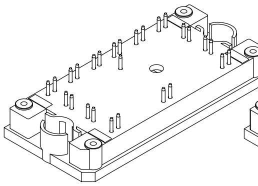
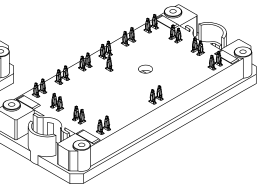


Figure 2. Pin Assignments

75 A, 650 V Module

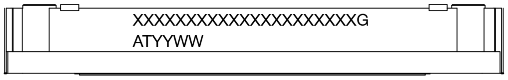


PIM27, 71x37.4
(SOLDER PIN)
CASE 180CA



PIM27, 71x37.4
(PRESSFIT PIN)
CASE 180CP

MARKING DIAGRAM



XXXXX	= Specific Device Code
G	= Pb−Free Package
AT	= Assembly & Test Site Code
YYWW	= Year and Work Week Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 9 of this data sheet.

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
IGBT (T11, T12, T13, T14, T21, T22)			
Collector−emitter voltage	V_{CES}	650	V
Collector current @ T_h = 80°C (per IGBT)	I_C	59	A
Pulsed collector current, T_{pulse} limited by T_{jmax}	I_{CM}	176	A
Power Dissipation Per IGBT $T_j = T_{jmax}$, T_h = 80°C	P_{tot}	83	W
Gate−emitter voltage	V_{GE}	±20	V
Maximum Junction Temperature	T_J	175	°C
DIODE (D12, D14, D20, D21, D22)			
Peak Repetitive Reverse Voltage	V_{RRM}	650	V
Forward Current, DC @ T_h = 80°C (per Diode)	I_F	50	A
Nonrepetitive Peak Surge Current (Surge applied at rated load conditions halfwave, single phase, 60 Hz)	I_{FSM}	225	A
Power Dissipation Per Diode $T_j = T_{jmax}$, T_h = 80°C	P_{tot}	86	W
Maximum Junction Temperature	T_J	175	°C
THERMAL PROPERTIES			
Operating Temperature under switching condition	$T_{VJ\ OP}$	−40 to (T_{jmax} − 25)	°C
Storage Temperature range	T_{stg}	−40 to 125	°C
INSULATION PROPERTIES			
Isolation test voltage, t = 2 min, 60 Hz	V_{is}	4000	Vac
Creepage distance		12.7	mm

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Test Condition	Symbol	Min	Typ	Max	Unit
IGBT (T11, T12, T13, T14, T21, T22)						
Collector−emitter cutoff current	V_{GE} = 0 V, V_{CE} = 650 V	I_{CES}	–	–	300	μA
Collector−emitter saturation voltage	V_{GE} = 15 V, I_C = 75 A, T_j = 25°C V_{GE} = 15 V, I_C = 75 A, T_j = 150°C	$V_{CE(sat)}$	– –	1.56 1.76	2.22 –	V
Gate−emitter threshold voltage	$V_{GE} = V_{CE}$, I_C = 75mA	$V_{GE(TH)}$	3.1	4.45	5.2	V
Gate leakage current	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	400	nA
Turn−on delay time	T_j = 25°C V_{CE} =350 V, I_C = 80 A V_{GE} = 15 V, −9 V, R_G = 10 Ω	$t_{d(on)}$	–	38	–	ns
Rise time		t_r	–	34	–	
Turn−off delay time		$t_{d(off)}$	–	129	–	
Fall time		t_f	–	17	–	
Turn on switching loss		E_{on}	–	0.606	–	mJ
Turn off switching loss		E_{off}	–	0.903	–	
Turn−on delay time	T_j = 125°C V_{CE} = 350 V, I_C = 80 A V_{GE} = 15 V, −9 V, R_G = 10 Ω	$t_{d(on)}$	–	37	–	ns
Rise time		t_r	–	34	–	
Turn−off delay time		$t_{d(off)}$	–	139	–	
Fall time		t_f	–	23	–	
Turn on switching loss		E_{on}	–	1.024	–	mJ
Turn off switching loss		E_{off}	–	1.141	–	

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified) (continued)

Parameter	Test Condition	Symbol	Min	Typ	Max	Unit
IGBT (T11, T12, T13, T14, T21, T22)						
Input capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1 MHz	C_{ies}	–	5665	–	pF
Output capacitance		C_{oes}	–	205	–	
Reverse transfer capacitance		C_{res}	–	100	–	
Gate charge total	V_{CE} = 480 V, I_C = 50 A, V_{GE} = ±15 V	Q_g	–	550	–	nC
Thermal Resistance – chip–to–heatsink	Thermal grease, Thickness = 2.1 Mil ±2% λ = 2.9 W/mK	R_{thJH}	–	1.15	–	°C/W
Thermal Resistance – chip–to–case		R_{thJC}	–	0.75	–	°C/W
IGBT INVERSE DIODE (D12, D14, D21, D22)						
Forward voltage	I_F = 50 A, T_j = 25°C I_F = 50 A, T_j = 175°C	V_F	– –	2.25 1.7	2.7 –	V
Reverse Recovery Time	T_j = 25°C V_{CE} = 350 V, I_C = 80 A V_{GE} = 15 V, −9 V, R_G = 10 Ω	t_{rr}	–	63	–	ns
Reverse Recovery Current		Q_{rr}	–	552	–	nc
Peak Reverse Recovery Current		I_{rrm}	–	25	–	A
Peak Rate of Fall of Recovery Current		Di/dt_{max}	–	1.80	–	A/μs
Reverse Recovery Energy		E_{rr}	–	136	–	μJ
Reverse Recovery Time	T_j = 125°C V_{CE} = 350 V, I_C = 50 A V_{GE} = 15 V, −9 V, R_G = 10 Ω	t_{rr}	–	135	–	ns
Reverse Recovery Current		Q_{rr}	–	1538	–	nc
Peak Reverse Recovery Current		I_{rrm}	–	43	–	A
Peak Rate of Fall of Recovery Current		Di/dt_{max}	–	1.60	–	A/μs
Reverse Recovery Energy		E_{rr}	–	346	–	μJ
Thermal Resistance – chip–to–heatsink	Thermal grease, Thickness = 2.1 Mil ±2% λ = 2.9 W/mK	R_{thJH}	–	1.10	–	°C/W
Thermal Resistance – chip–to–case		R_{thJC}	–	0.79	–	°C/W
DIODE (D20)						
Forward voltage	I_F = 50 A, T_j = 25°C I_F = 50 A, T_j = 175°C	V_F	– –	2.25 1.7	2.7 –	V
Reverse leakage current	V_{CE} = 650 V, V_{GE} = 0 V	I_r	–	–	300	μA
Thermal Resistance – chip–to–heatsink	Thermal grease, Thickness = 2.1 Mil ±2% λ = 2.9 W/mK	R_{thJH}	–	1.10	–	°C/W
Thermal Resistance – chip–to–case		R_{thJC}	–	0.79	–	°C/W
THERMISTOR CHARACTERISTICS						
Nominal resistance	T = 25°C	R_{25}	–	22	–	kΩ
Nominal resistance	T = 100°C	R_{100}	–	1486	–	Ω
Deviation of R25		R/R	−5	–	5	%
Power dissipation		P_D	–	200	–	mW
Power dissipation constant			–	2	–	mW/°C
B−value	B (25/50), tol ±3%		–	–	3950	°C
B−value	B (25/100), tol ±3%		–	–	3998	°C
NTC reference			–	–	B	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL CHARACTERISTICS – IGBT (T11, T12, T13, T14, T21, T22)

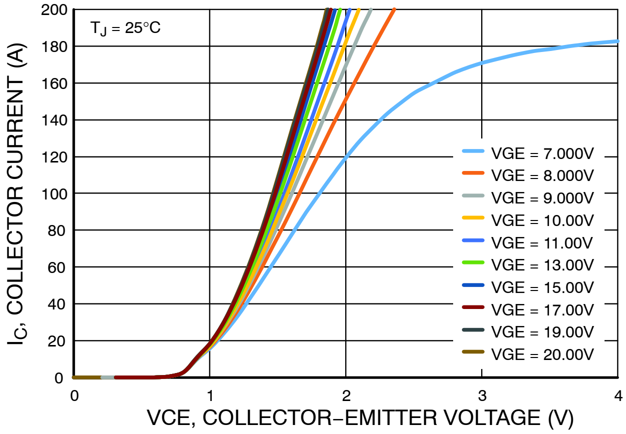


Figure 3. Typical Output Characteristics

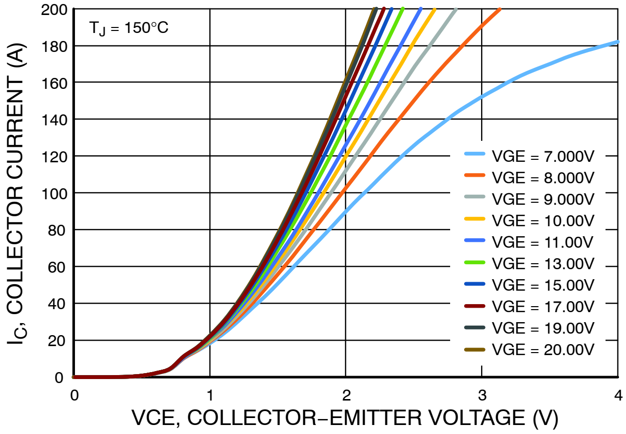


Figure 4. Typical Output Characteristics

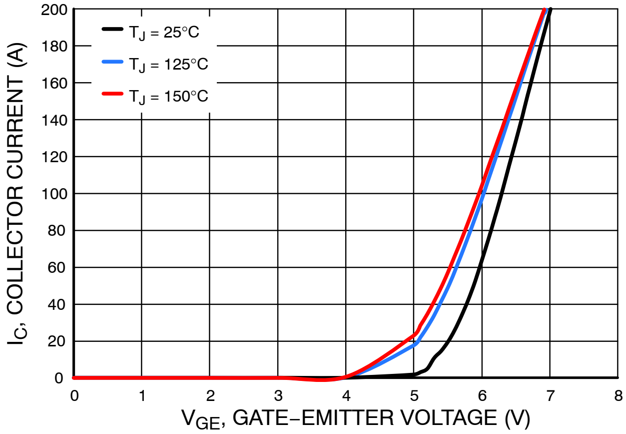


Figure 5. Typical Transfer Characteristics

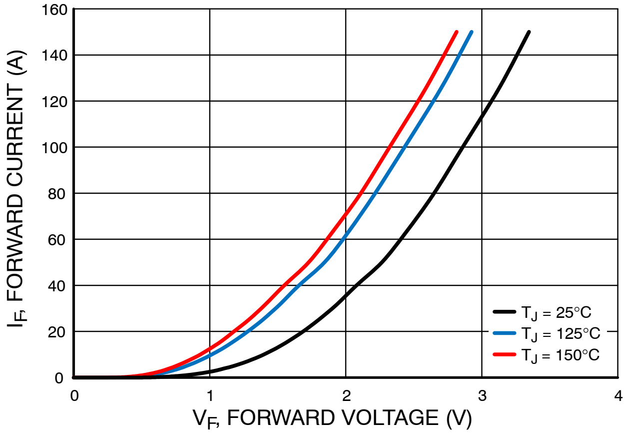


Figure 6. Diode Forward Characteristics

TYPICAL CHARACTERISTICS – (T11, T12, T13, T14) IGBT COMMUTATES D21, D22 DIODE

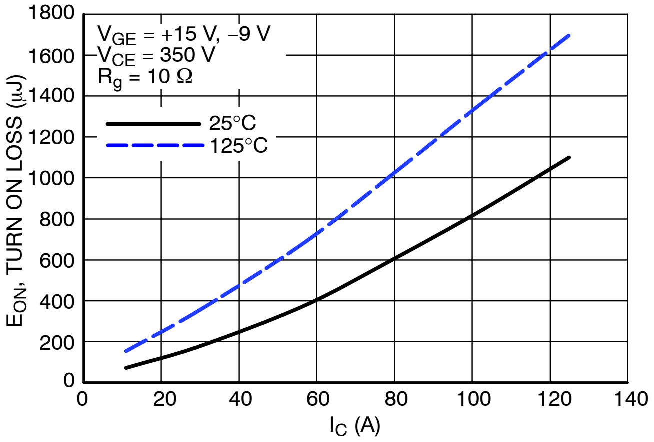


Figure 7. Typical Turn ON Loss vs. IC

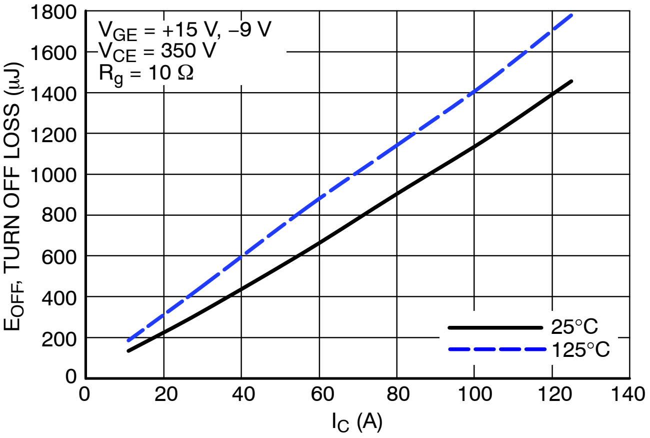


Figure 8. Typical Turn OFF Loss vs. IC

TYPICAL CHARACTERISTICS – (T11, T12, T13, T14) IGBT COMMUTATES D21, D22 DIODE (CONTINUED)

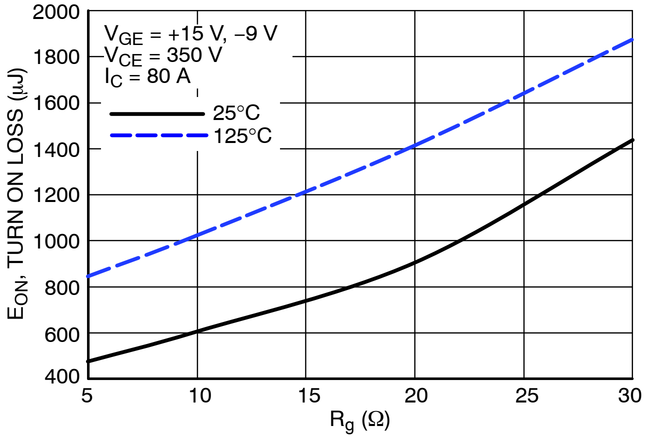


Figure 9. Typical Turn ON Loss vs. RG

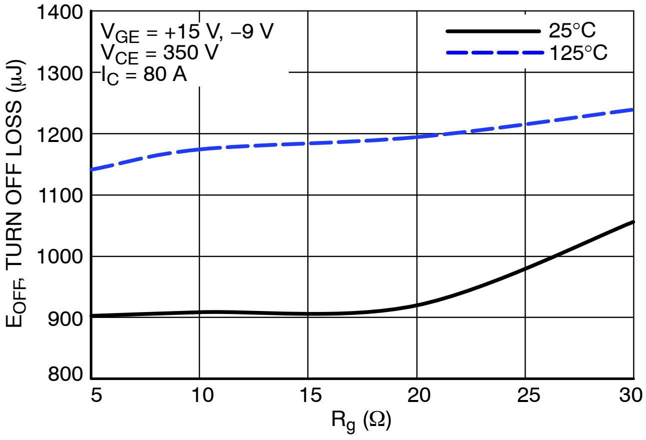


Figure 10. Typical Turn OFF Loss vs. RG

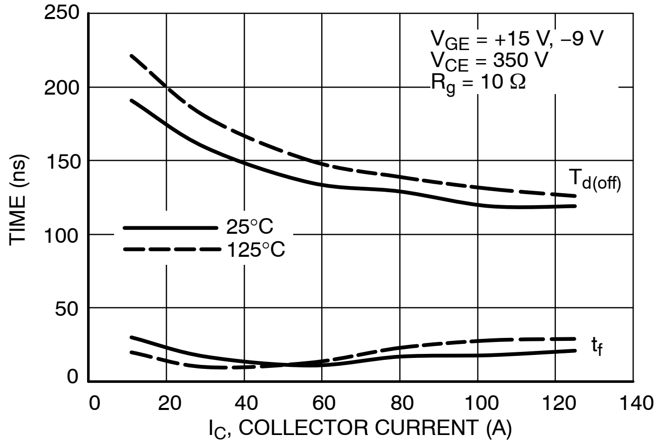


Figure 11. Typical Turn−Off Switching Time vs. IC

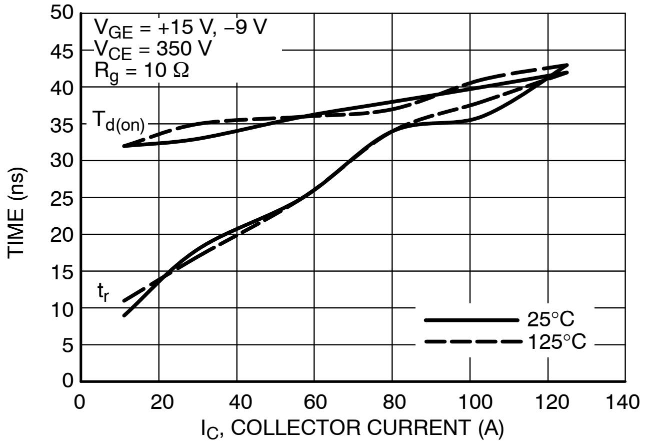


Figure 12. Typical Turn−On Switching Time vs. IC

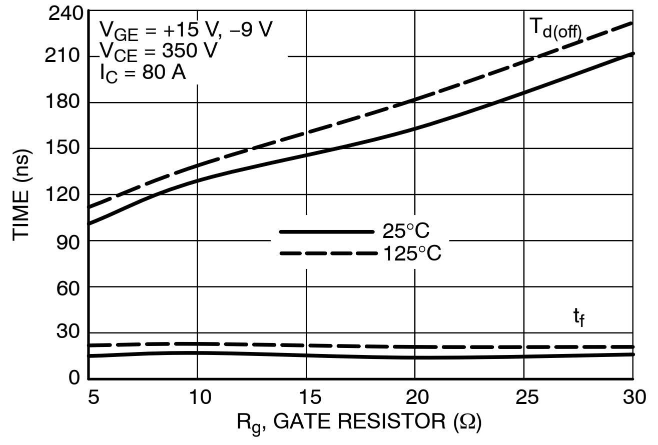


Figure 13. Typical Turn−Off Switching Time vs. Rg

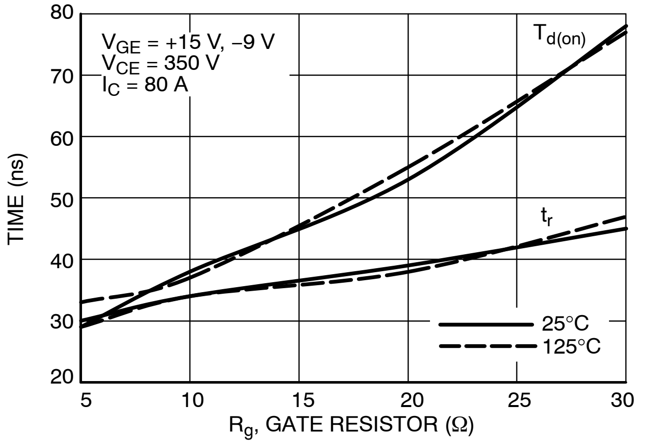


Figure 14. Typical Turn−On Switching Time vs. Rg

TYPICAL CHARACTERISTICS – (T21, T22) IGBT COMMUTATES D20 DIODE

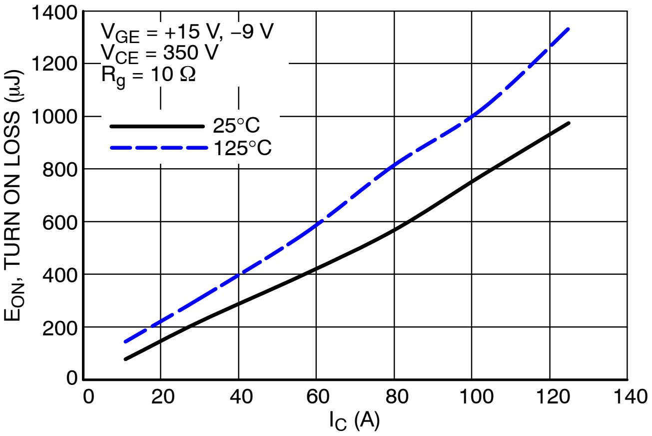


Figure 15. Typical Turn ON Loss vs. IC

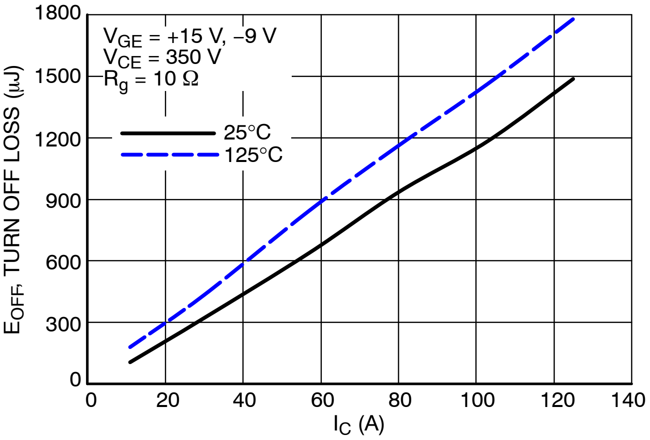


Figure 16. Typical Turn OFF Loss vs. IC

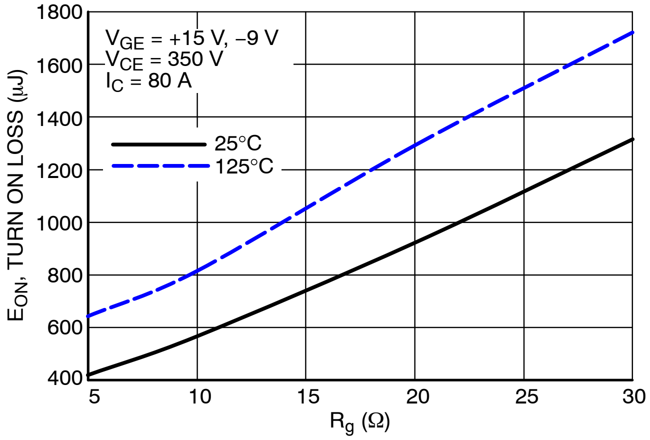


Figure 17. Typical Turn ON Loss vs. RG

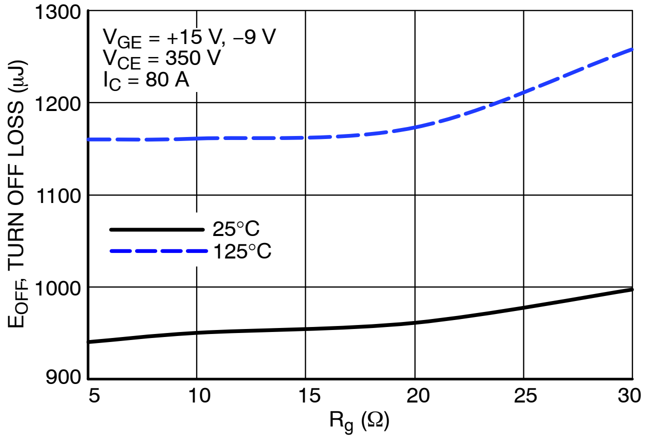


Figure 18. Typical Turn OFF Loss vs. RG

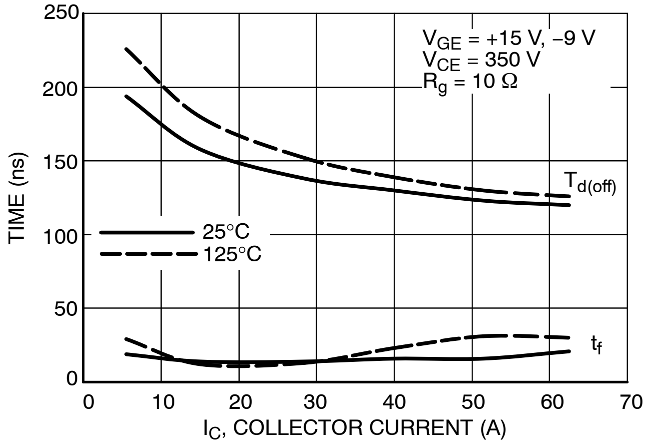


Figure 19. Typical Turn−Off Switching Time vs. IC

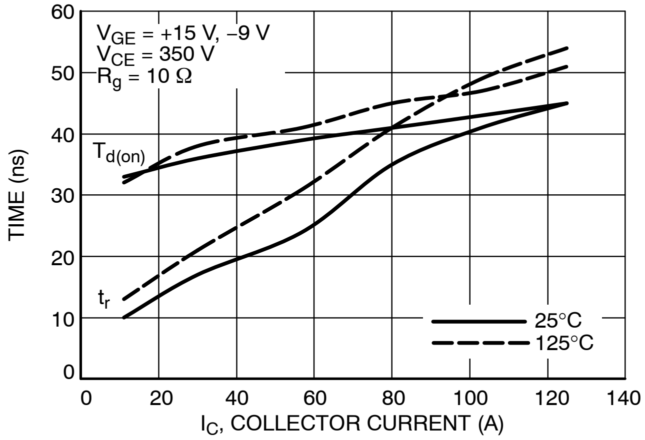


Figure 20. Typical Turn−On Switching Time vs. IC

TYPICAL CHARACTERISTICS – (T21, T22) IGBT COMMUTATES D20 DIODE (CONTINUED)

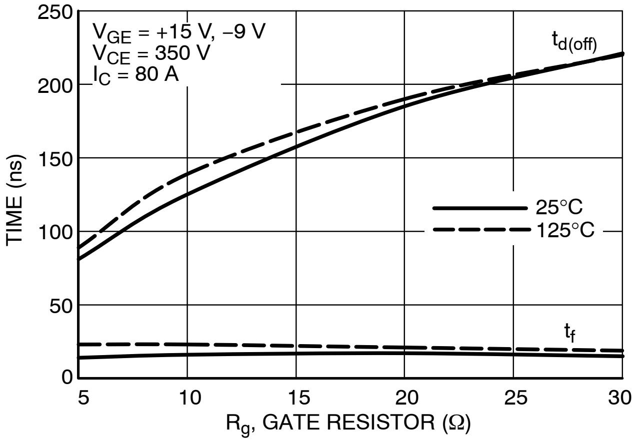


Figure 21. Typical Turn−Off Switching Time vs. Rg

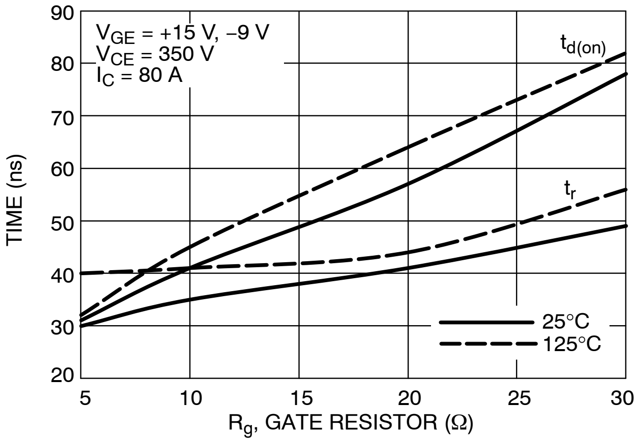


Figure 22. Typical Turn−On Switching Time vs. Rg

TYPICAL CHARACTERISTICS – DIODE

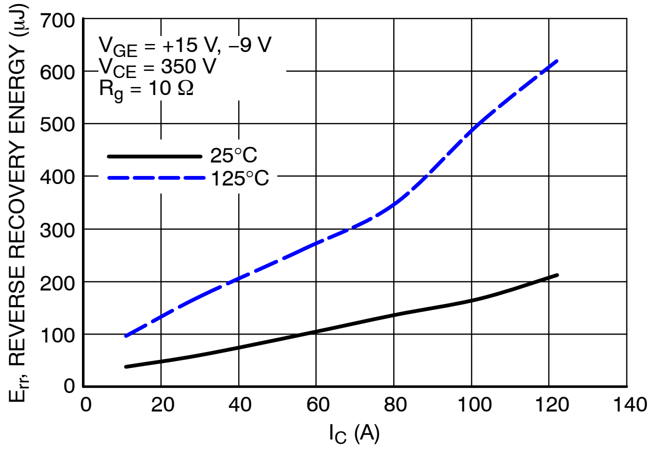


Figure 23. Typical Reverse Recovery Energy Loss vs. IC

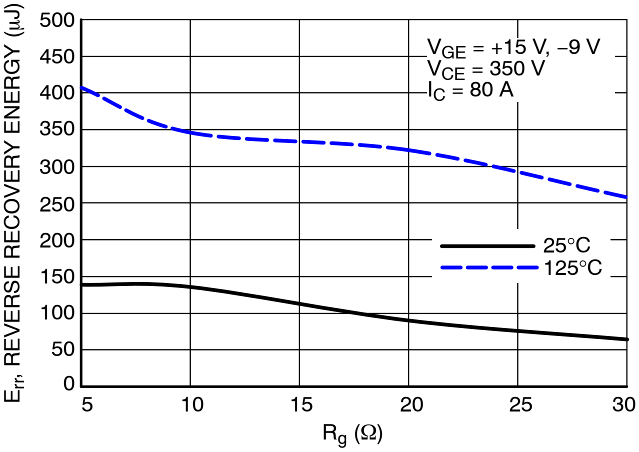


Figure 24. Typical Reverse Recovery Energy Loss vs. RG

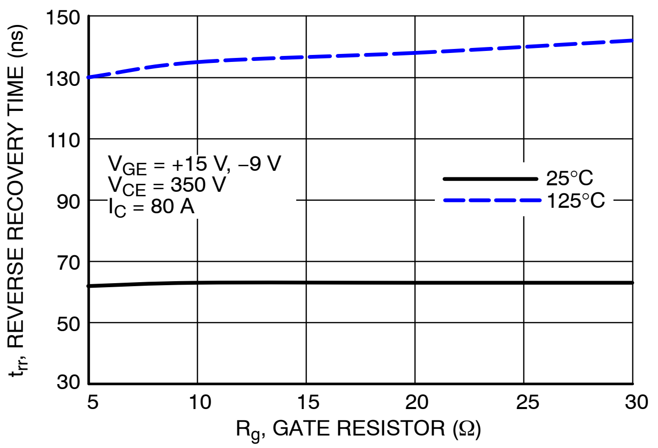


Figure 25. Typical Reverse Recovery Time vs. Rg

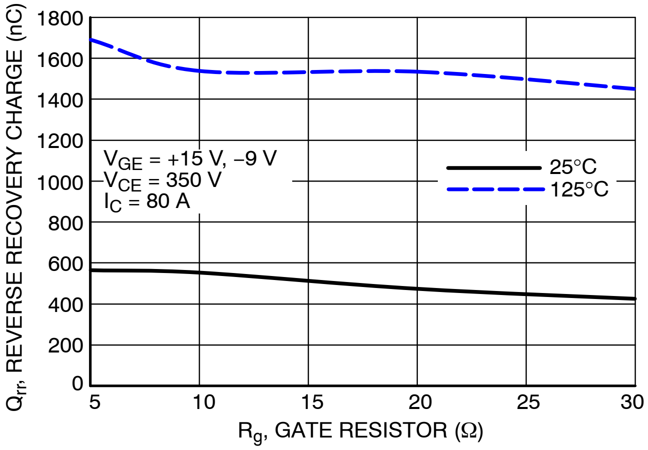


Figure 26. Typical Reverse Recovery Charge vs. Rg

TYPICAL CHARACTERISTICS – DIODE (CONTINUED)

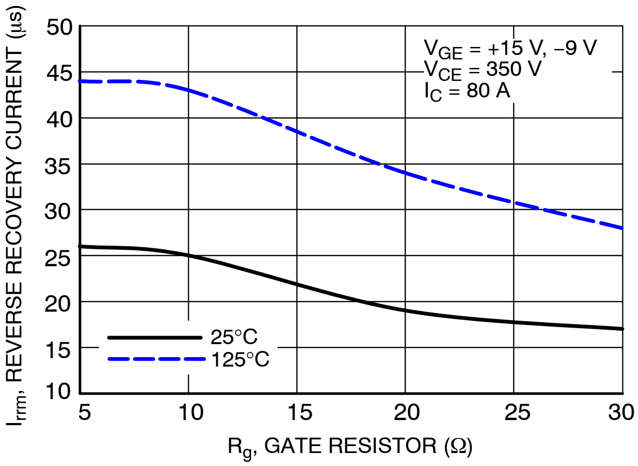


Figure 27. Typical Reverse Recovery Peak Current vs. Rg

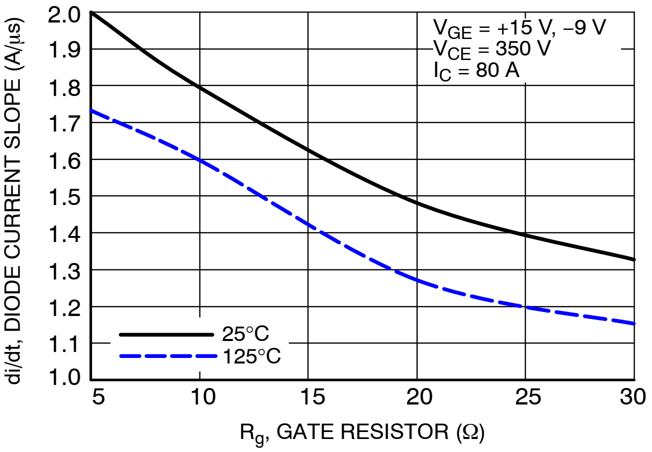


Figure 28. Typical di/dt vs. Rg

TYPICAL CHARACTERISTICS

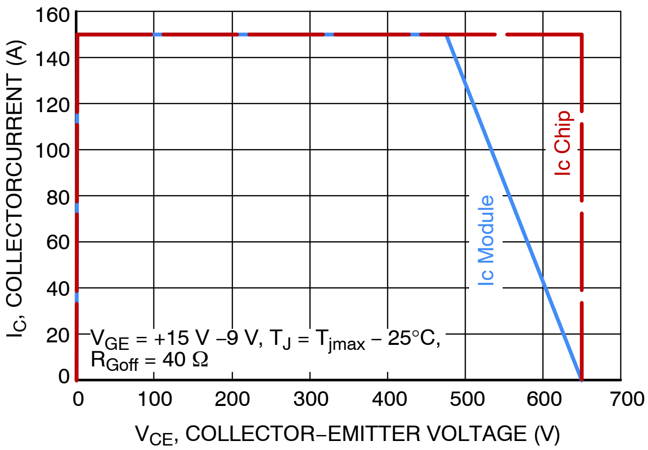


Figure 29. RBSOA Reverse Safe Operating Area

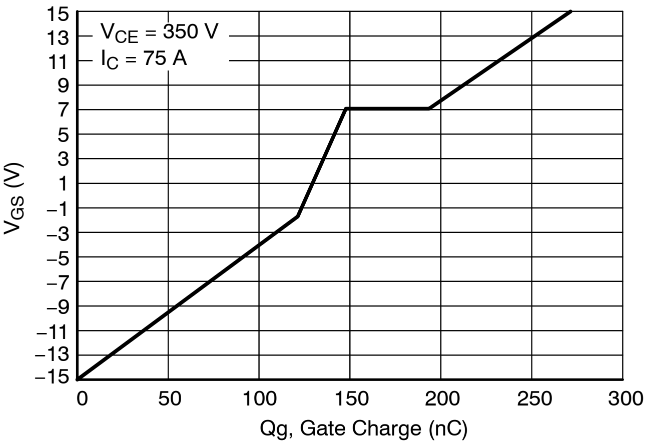


Figure 30. IGBT Gate Charge

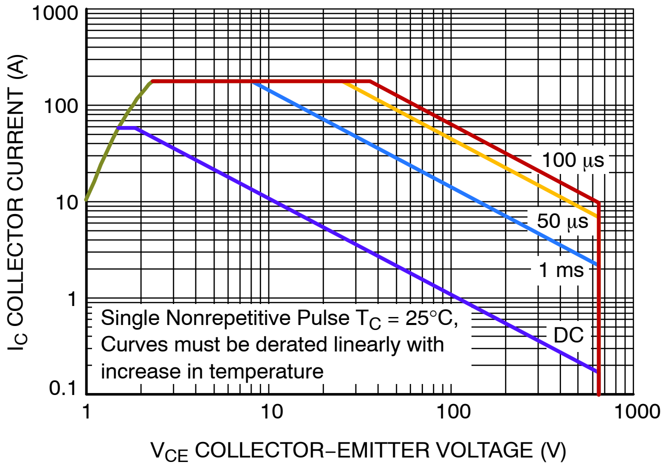


Figure 31. IGBT Safe Operating Area

TYPICAL THERMAL CHARACTERISTICS

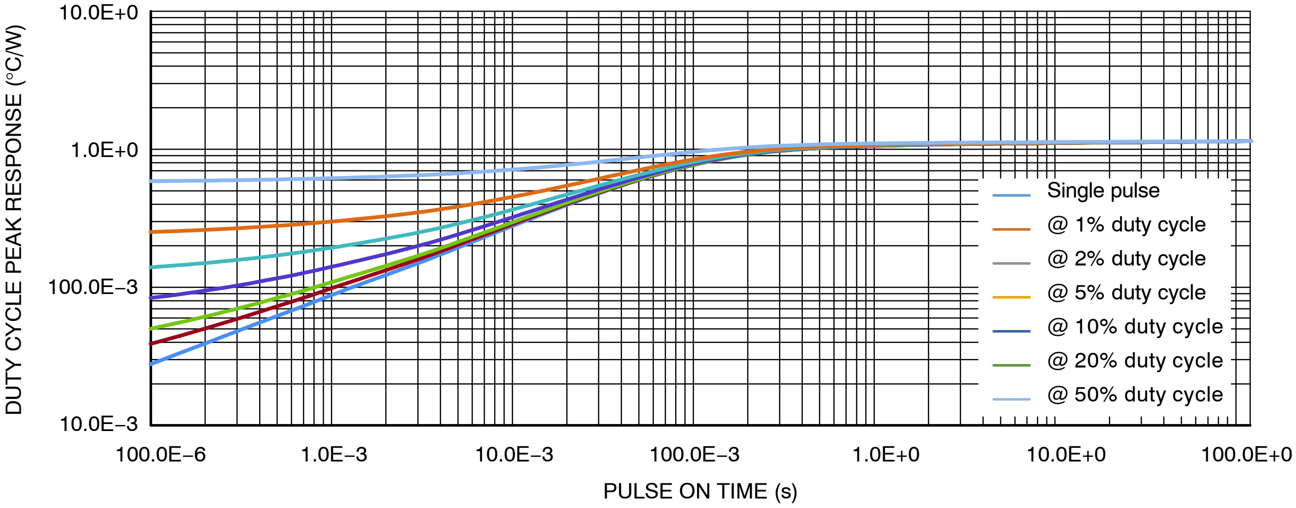


Figure 32. Transient Thermal Impedance – IGBT

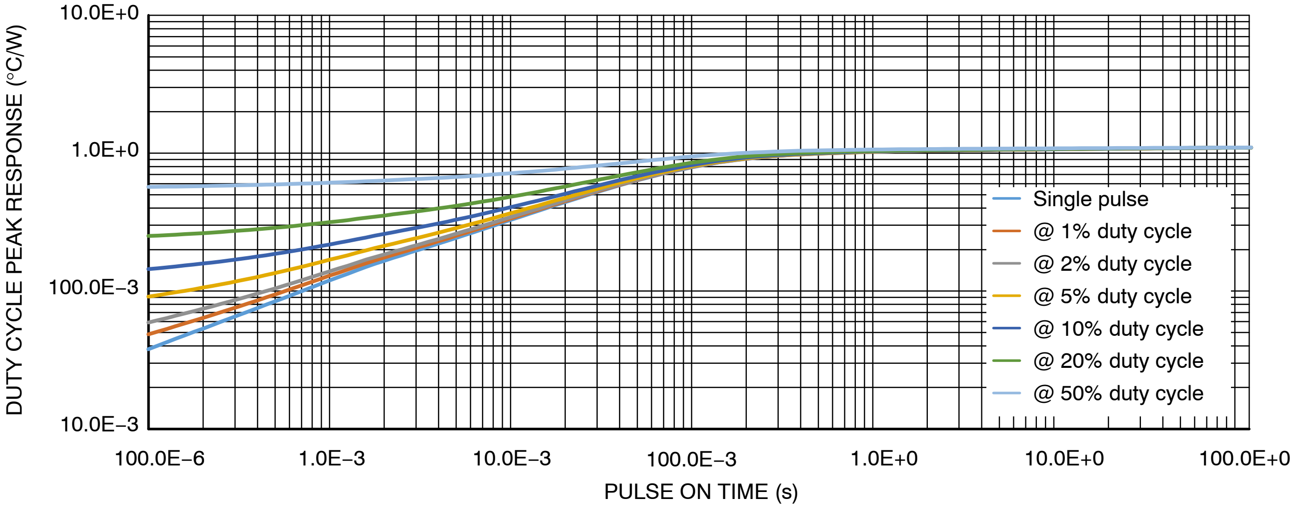
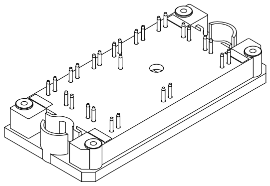


Figure 33. Transient Thermal Impedance – Diode

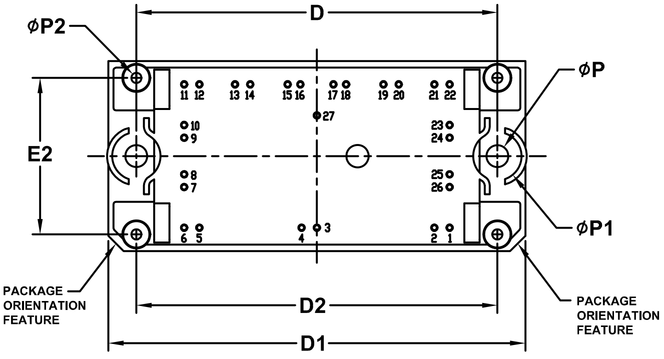
ORDERING INFORMATION

Device	Package Type	Shipping
NXH75M65L4Q1SG (Solder Pin)	PIM27, 71x37.4 Q1PACK	21 Units / BTRAY
NXH75M65L4Q1PTG (Pressfit Pin)	PIM27, 71x37.4 Q1PACK	21 Units / BTRAY

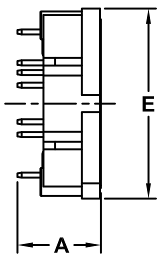


PIM27, 71x37.4 (SOLDER PIN)
CASE 180CA
ISSUE B

DATE 14 DEC 2022

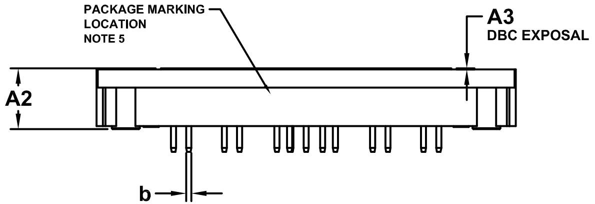


TOP VIEW



END VIEW

DIM	MILLIMETERS MIN.	NOM.	MAX.
A	15.90	16.40	16.90
A2	11.70	11.90	12.10
A3	0.00	0.20	0.60
b	0.95	1.00	1.05
b1	0.75	0.80	0.85
D	70.80	71.00	71.20
D1	81.70	82.00	82.30
D2	70.80	71.00	71.20
E	37.10	37.40	37.70
E2	30.60	30.80	31.00
P	4.10	4.30	4.50
P1	9.30	9.50	9.70
P2	1.80	2.00	2.20



SIDE VIEW

NOTES:

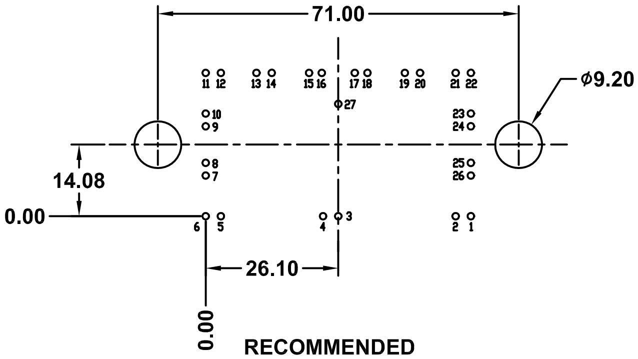
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009
2. CONTROLLING DIMENSION : MILLIMETERS
3. DIMENSIONS b AND b1 APPLY TO THE PLATED TERMINALS AND ARE MEASURED AT DIMENSION A1
4. PIN POSITION TOLERANCE IS ± 0.4mm
5. PACKAGE MARKING IS LOCATED AS SHOWN ON THE SIDE OPPOSITE THE PACKAGE ORIENTATION FEATURES

NOTE 4

PIN	PIN POSITION X	Y
1	52.20	0.00
2	49.20	0.00
3	26.10	0.00
4	23.10	0.00
5	3.00	0.00
6	0.00	0.00
7	0.00	8.00
8	0.00	10.50
9	0.00	17.70
10	0.00	20.20
11	0.00	28.20
12	3.00	28.20
13	10.00	28.20
14	13.00	28.20
15	20.35	28.20
16	22.85	28.20
17	29.35	28.20
18	31.85	28.20
19	39.20	28.20
20	42.20	28.20
21	49.20	28.20
22	52.20	28.20
23	52.20	20.20
24	52.20	17.70
25	52.20	10.50
26	52.20	8.00
27	26.10	22.10

PIM27, 71x37.4 (SOLDER PIN)
CASE 180CA
ISSUE B

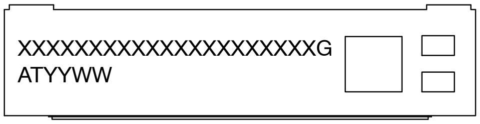
DATE 14 DEC 2022



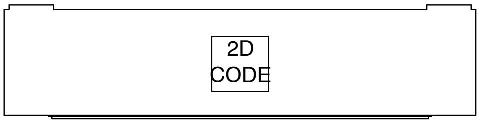
RECOMMENDED MOUNTING PATTERN

* For additional Information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



FRONTSIDE MARKING



BACKSIDE MARKING

XXXXX = Specific Device Code
G = Pb−Free Device
AT = Assembly & Test Site Code
YYWW = Year and Work Week Code

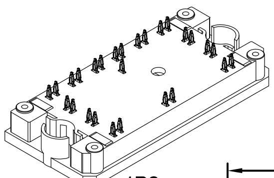
*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “ ▪”, may or may not be present. Some products may not follow the Generic Marking.

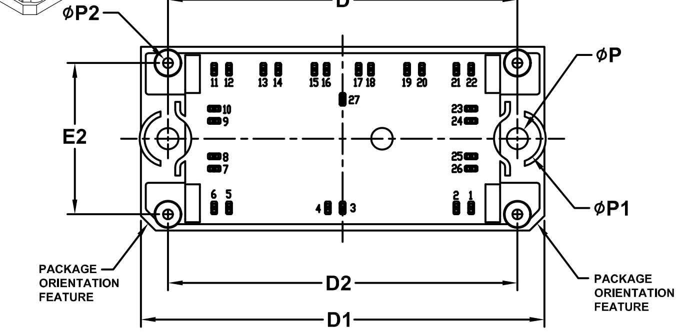
DOCUMENT NUMBER:	**98AON20006H**	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	**PIM27, 71x37.4 (SOLDER PIN)**	**PAGE 2 OF 2**

PIM27, 71x37.4 (PRESSFIT PIN)

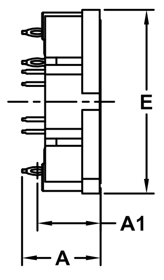
CASE 180CP
ISSUE A

DATE 20 DEC 2022



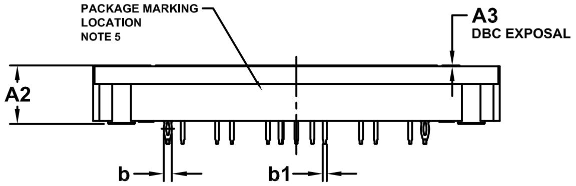


TOP VIEW



END VIEW

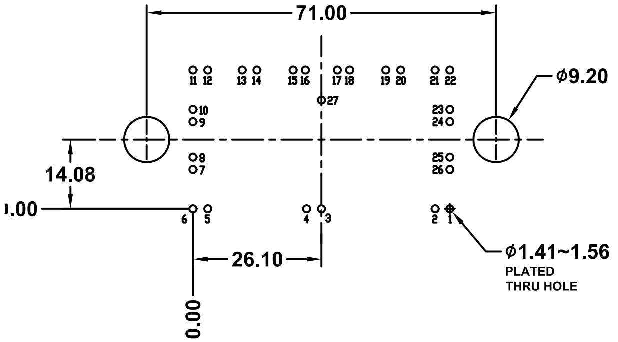
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	15.50	16.00	16.50
A1	12.38	12.88	13.38
A2	11.70	11.90	12.10
A3	0.00	0.20	0.60
b	1.61	1.66	1.71
b1	0.75	0.80	0.85
D	70.80	71.00	71.20
D1	81.70	82.00	82.30
D2	70.80	71.00	71.20
E	37.10	37.40	37.70
E2	30.60	30.80	31.00
P	4.10	4.30	4.50
P1	9.30	9.50	9.70
P2	1.80	2.00	2.20



SIDE VIEW

NOTE 4

PIN	PIN POSITION		PIN	PIN POSITION	
	X	Y		X	Y
1	52.20	0.00	15	20.35	28.20
2	49.20	0.00	16	22.85	28.20
3	26.10	0.00	17	29.35	28.20
4	23.10	0.00	18	31.85	28.20
5	3.00	0.00	19	39.20	28.20
6	0.00	0.00	20	42.20	28.20
7	0.00	8.00	21	49.20	28.20
8	0.00	10.50	22	52.20	28.20
9	0.00	17.70	23	52.20	20.20
10	0.00	20.20	24	52.20	17.70
11	0.00	28.20	25	52.20	10.50
12	3.00	28.20	26	52.20	8.00
13	10.00	28.20	27	26.10	22.10
14	13.00	28.20			



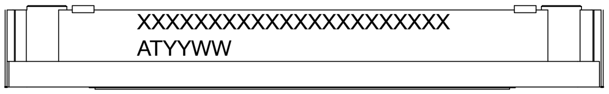
RECOMMENDED MOUNTING PATTERN

* For additional Information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009
2. CONTROLLING DIMENSION : MILLIMETERS
3. DIMENSIONS b AND b1 APPLY TO THE PLATED TERMINALS AND ARE MEASURED AT DIMENSION A1
4. PIN POSITION TOLERANCE IS ± 0.4mm
5. PACKAGE MARKING IS LOCATED AS SHOWN ON THE SIDE OPPOSITE THE PACKAGE ORIENTATION FEATURES

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code
AT = Assembly & Test Site Code
YYWW = Year and Work Week Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “ ▪ ”, may or may not be present. Some products may not follow the Generic Marking.

onsemi, onsemi, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba “**onsemi**” or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**’s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent−Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided “as−is” and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. “Typical” parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including “Typicals” must be validated for each customer application by customer’s technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales