Q2BOOST Module

Advance Information

SNXH225B95H4Q2F2PG

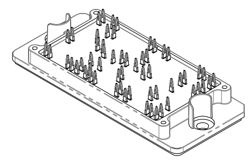
This high−density, integrated power module combines high−performance IGBTs with rugged anti−parallel diodes.

Features

- Extremely Efficient Trench with Field Stop Technology
- Low Switching Loss Reduces System Power Dissipation
- Module Design Offers High Power Density
- Low Inductive Layout
- Q2BOOST Package with Press−Fit Pins
- 1200 V SiC Diode

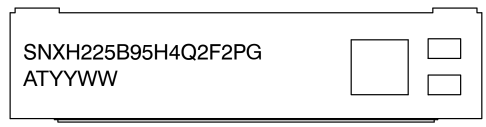
Typical Applications

- Solar Inverters
- UPS Systems

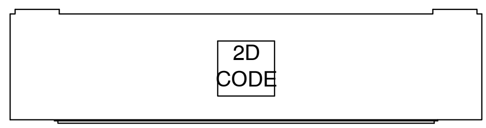


**Q2BOOST MODULE
CASE 180AV**

MARKING DIAGRAM



FRONTSIDE MARKING



BACKSIDE MARKING

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

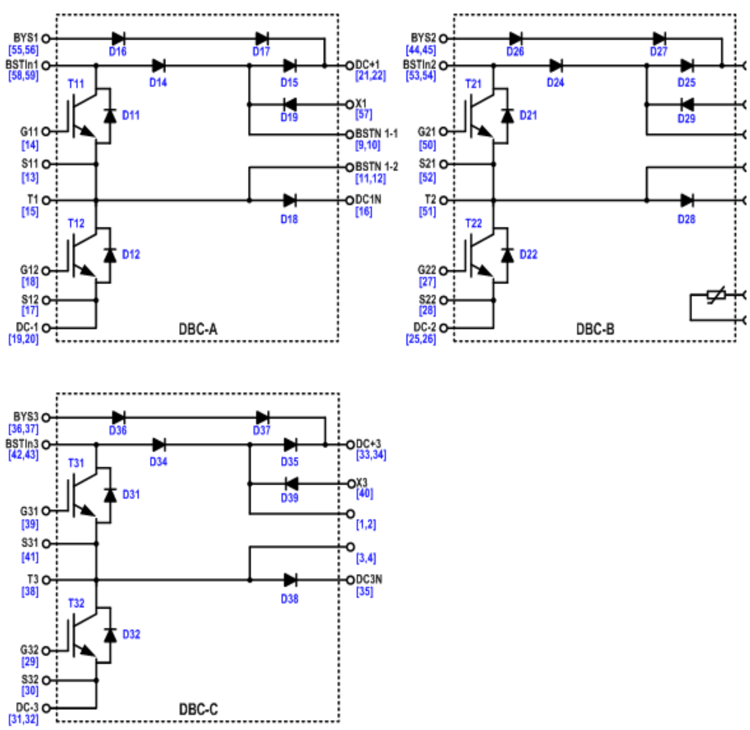
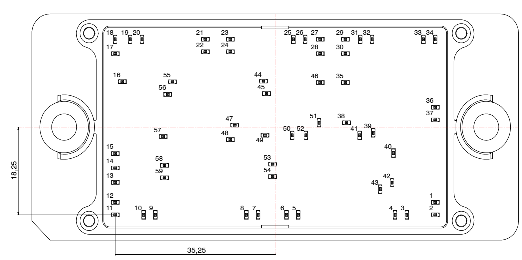


Figure 1. Schematic of Q2BOOST

PIN CONNECTIONS



ORDERING INFORMATION

Device	Package	Shipping†
SNXH225B95H4Q2F2PG	Q2BOOST (Pb−Free)	12 Units / Blister Tray

This document contains information on a new product. Specifications and information herein are subject to change without notice.

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
IGBT (T11, T21, T31, T12, T22, T32)			
Collector−emitter Voltage	V_{CES}	950	V
Collector Current @ T_h = 80°C	I_C	65	A
Pulsed Collector Current, T_{pulse} =1 ms	I_{CM}	195	A
Power Dissipation per IGBT T_J = T_{Jmax} T_h = 80°C	P_{tot}	136	W
Gate−emitter Voltage Positive transient gate−emitter voltage (Tpulse = 5 μs, D < 0.10)	V_{GE}	±20 30	V
Maximum Junction Temperature	T_J	150	°C
IGBT INVERSE DIODE (D11, D12, D21, D22, D31, D32)			
Peak Repetitive Reverse Voltage	V_{RRM}	1600	V
Forward Current, DC @ T_h = 80°C	I_F	53	A
Repetitive Peak Forward Current, Tpulse = 1 ms	I_{FSM}	450	A
Power Dissipation per Diode T_J = T_{Jmax}, T_h = 80°C	P_{tot}	67	W
Maximum Junction Temperature	T_J	150	°C
DIODE (D16 + D17, D26 + D27, D36 + D37)			
Peak Repetitive Reverse Voltage	V_{RRM}	2000	V
Forward Current, DC @ T_h = 80°C	I_F	49	A
Nonrepetitive Peak Surge Current, Tp = 8.3 ms, T_J = 25°C	I_{FSM}	480	A
Power Dissipation per Diode T_J = T_{Jmax}, T_h = 80°C	P_{tot}	134	W
Maximum Junction Temperature	T_J	150	°C
SILICON CARBIDE SCHOTTKY DIODE (D14, D15, D24, D25, D34, D45)			
Peak Repetitive Reverse Voltage	V_{RRM}	1200	V
Forward Current, DC @ T_h = 80°C	I_F	42	A
Repetitive Peak Forward Current, Tpulse = 1 ms	I_{FRM}	126	A
Power Dissipation per Diode T_J = T_{Jmax}, T_h = 80°C	P_{tot}	133.5	W
Maximum Junction Temperature	T_J	175	°C
DIODE (D18, D19, D28, D29, D38, D39)			
Peak Repetitive Reverse Voltage	V_{RRM}	1200	V
Forward Current, DC @ T_h = 80°C	I_F	21	A
Repetitive Peak Forward Current, Tpulse = 1 ms	I_{FRM}	63	A
Power Dissipation per Diode T_J = T_{Jmax}, T_h = 80°C	P_{tot}	52	W
Maximum Junction Temperature	T_J	150	°C

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.

THERMAL PROPERTIES

Parameter	Symbol	Value	Unit
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

Parameter	Symbol	Value	Unit
Isolation Test Voltage, t = 1 s, 50/60 Hz	V_{is}	3400	V_{RMS}
Creepage Distance		12.7	mm
Comparative tracking index	CTI	> 600	

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

Characteristic	Test Conditions	Symbol	Min	Typ	Max	Unit
IGBT (T11, T12, T21, T22, T31, T32)						
Collector−emitter Breakdown Voltage	V_{GE} = 0 V, I_C = 1 mA	$V_{(BR)CES}$	950	–	–	V
Collector−emitter Saturation Voltage	V_{GE} = 15 V, I_C = 75 A, T_J = 25°C V_{GE} = 15 V, I_C = 75A, T_J = 150°C	$V_{CE(sat)}$	– –	1.80 2.10	2.3 –	V
Gate−emitter Threshold Voltage	V_{GE} = V_{CE}, I_C = 75 mA	$V_{GE(TH)}$	4.1	4.65	5.7	V
Collector−emitter Cutoff Current	V_{GE} = 0 V, V_{CE} = 950 V	I_{CES}	–	–	300	μA
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} = 600 V, I_C = 35 A V_{GE} = +15 V, -8 V; R_G = 11 Ω	$t_{d(on)}$	–	60	–	ns
Rise Time		t_r	–	13.6	–	
Turn−off Delay Time		$t_{d(off)}$	–	208	–	
Fall Time		t_f	–	36	–	
Turn On Switching Loss		E_{on}	–	0.43	–	mJ
Turn Off Switching Loss		E_{off}	–	0.81	–	
Turn−on Delay Time	T_J = 125°C V_{CE} = 600 V, I_C = 35 A V_{GE} = +15 V, −8 V; R_G = 11 Ω	$t_{d(on)}$	–	56	–	ns
Rise Time		t_r	–	15.2	–	
Turn−off Delay Time		$t_{d(off)}$	–	252.8	–	
Fall Time		t_f	–	40.8	–	
Turn On Switching Loss		E_{on}	–	0.51	–	mJ
Turn Off Switching Loss		E_{off}	–	1.08	–	
Input Capacitance	V_{CE} = 20 V, V_{GE} = 0 V, f = 10 kHz	C_{ies}	–	4773	–	pF
Output Capacitance		C_{oes}	–	121	–	
Reverse Transfer Capacitance		C_{res}	–	27	–	
Gate Charge Total	V_{CE} = 600 V, I_C = 20 A, V_{GE} = 15 V	Q_g	–	143	–	nC
Thermal Resistance − Chip−to−Heatsink	Thermal grease, Thickness = 2.1 Mil ±2%, λ = 2.9 W/mK	R_{thJH}	–	0.706	Ω	°C/W
IGBT INVERSE DIODE (D11, D12, D21, D22, D31, D32)						
Forward Voltage	I_F = 30 A, T_J = 25°C I_F = 30 A, T_J = 150°C	V_F	– –	1.0 0.93	1.5 –	V
Thermal Resistance − Chip−to−Heatsink	Thermal grease, Thickness = 2.1 Mil ±2%, λ = 2.9 W/mK	R_{thJH}	Ω	1.038	Ω	°C/W
DIODE (D16+D17, D26+D27, D36+D37)						
Forward Voltage	I_F = 45 A, T_J = 25°C I_F = 45 A, T_J = 150°C	V_F	– –	2.27 2.17	2.75 –	V
Reverse Leakage Current	V_R = 2000 V	I_r	–	–	100	μA
Thermal Resistance − Chip−to−Heatsink	Thermal grease, Thickness = 2.1 Mil ±2%, λ = 2.9 Ω/μK	R_{thJH}	–	0.523	–	°C/W

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

Characteristic	Test Conditions	Symbol	Min	Typ	Max	Unit
SIC DIODE (D14, D15, D24, D25, D34, D35)						
Forward Voltage	I_F = 30 A, T_J = 25°C I_F = 30 A, T_J = 150°C	V_F	– –	1.52 2.10	1.70 –	V
Reverse Leakage Current	V_R = 1200 V	Ir	–	–	600	μA
Thermal Resistance – Chip–to–Heatsink	Thermal grease, Thickness = 2.1 Mil ±2%, λ = 2.9 W/mK	R_{thJH}	–	1.070	–	°C/W
DIODE (D18, D19, D28, D29, D38, D39)						
Forward Voltage	I_F = 30 A, T_J = 25°C I_F = 30 A, T_J = 150°C	V_F	– –	2.50 2.25	3.0 –	V
Reverse Leakage Current	V_R = 1200 V	I_r	–	–	600	μA
Thermal Resistance – Chip–to–Heatsink	Thermal grease, Thickness = 2.1 Mil ±2%, λ = 2.9 W/mK	R_{thJH}	–	1.347	–	°C/W
THERMISTOR CHARACTERISTICS						
Nominal Resistance	T = 25°C	R25	–	22	–	kΩ
Nominal Resistance	T = 100°C	R100	–	1468	–	Ω
Deviation of R100		DR/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
(T11/D11, T12/D12, T21/D21, T22/D22, T31/D31, T32/D32)

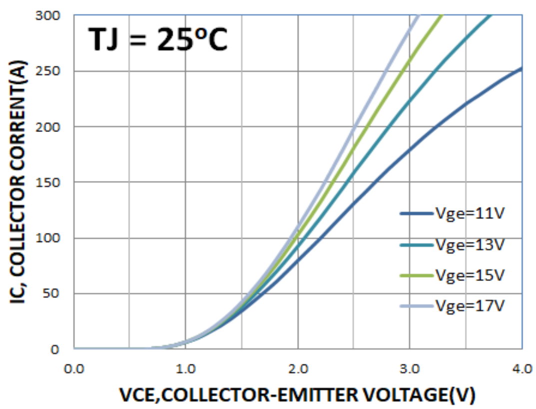


Figure 2. Typical Output Characteristics

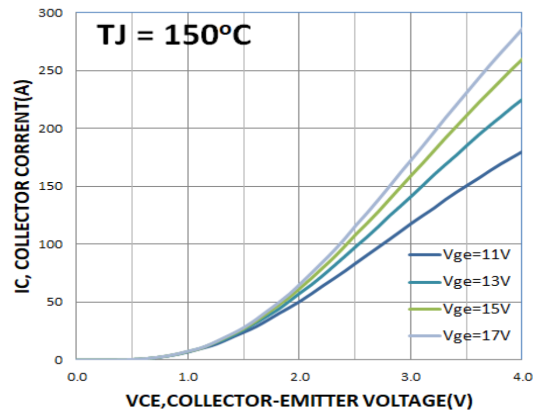


Figure 3. Typical Output Characteristics

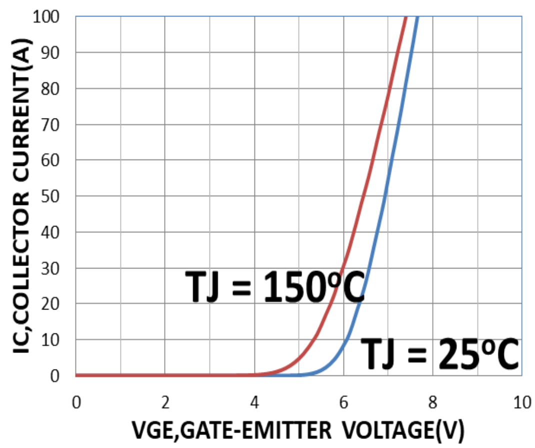


Figure 4. Typical Transfer Characteristics

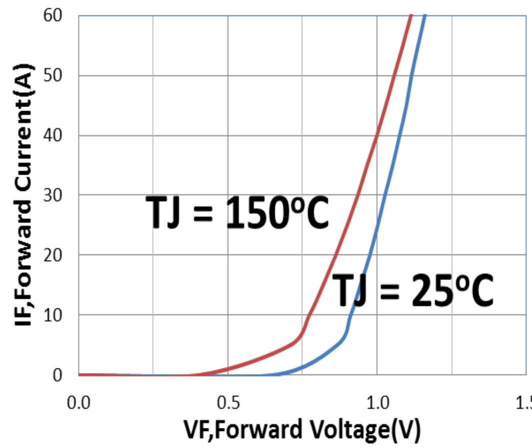


Figure 5. Diode Forward Characteristics

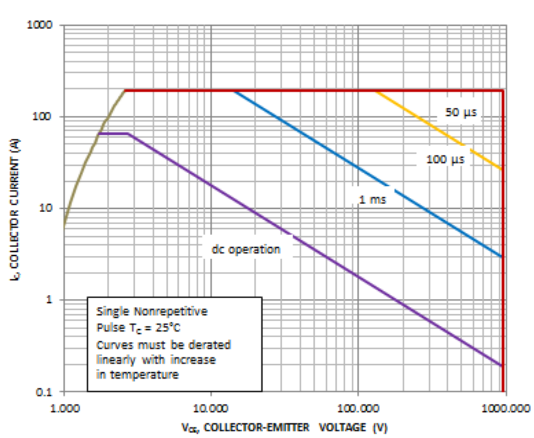


Figure 6. FBSOA

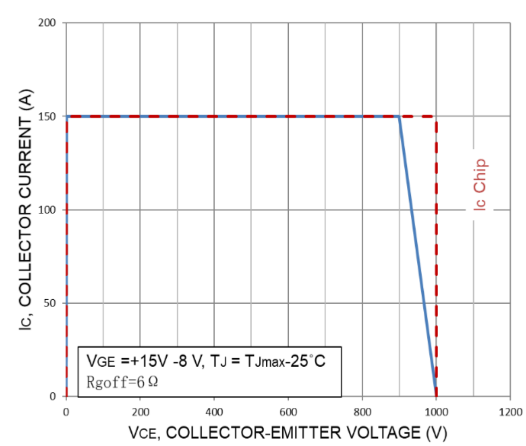


Figure 7. RBSOA

TYPICAL CHARACTERISTICS (CONTINUED)
(T11/D11, T12/D12, T21/D21, T22/D22, T31/D31, T32/D32)

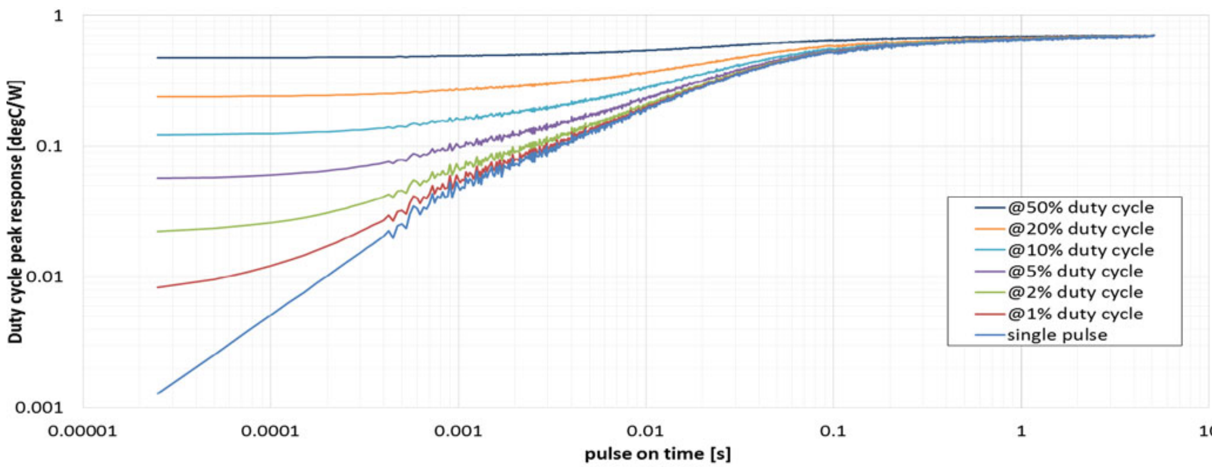


Figure 8. Transient Thermal Impedance (T11, T12, T21, T22, T31, T32)

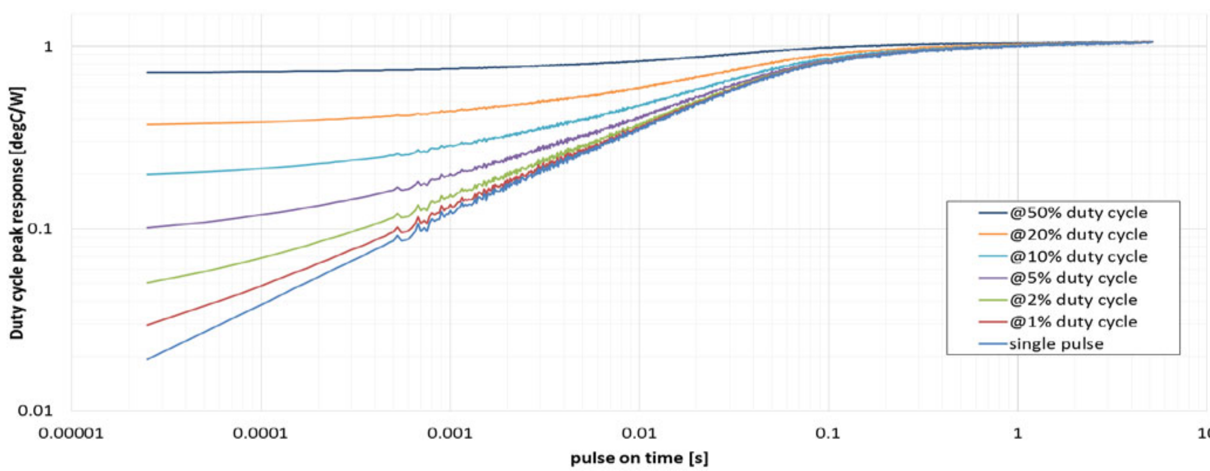


Figure 9. Transient Thermal Impedance (D11, D12, D21, D22, D31, D32)

TYPICAL CHARACTERISTICS
(D16 + D17, D26 + D27, D36 + D37)

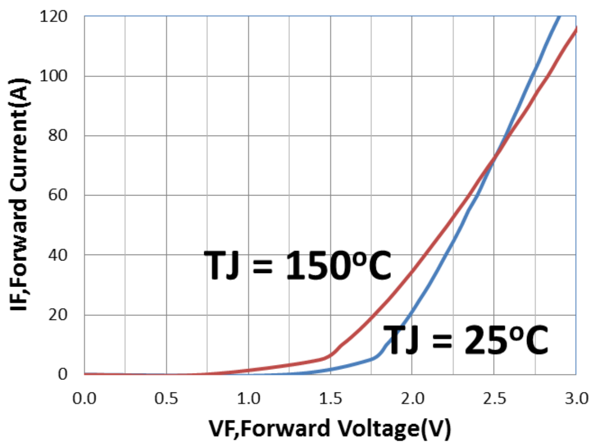


Figure 10. Diode Forward Characteristics

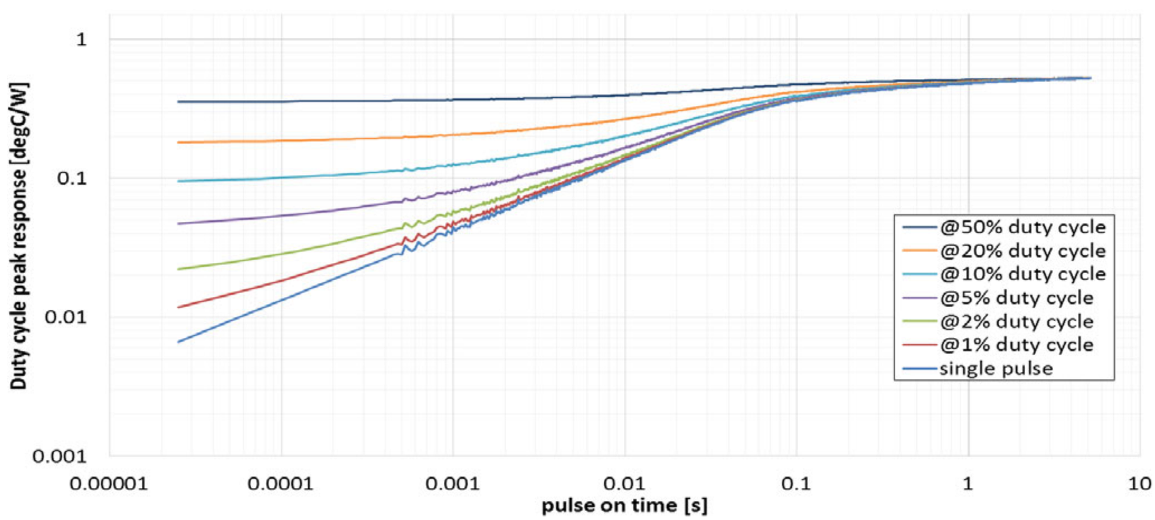


Figure 11. Transient Thermal Impedance

TYPICAL CHARACTERISTICS
(D18, D19, D28, D29, D38, D39)

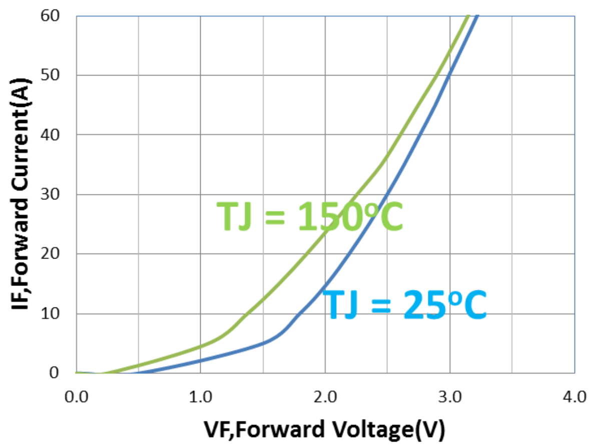


Figure 12. Diode Forward Characteristics

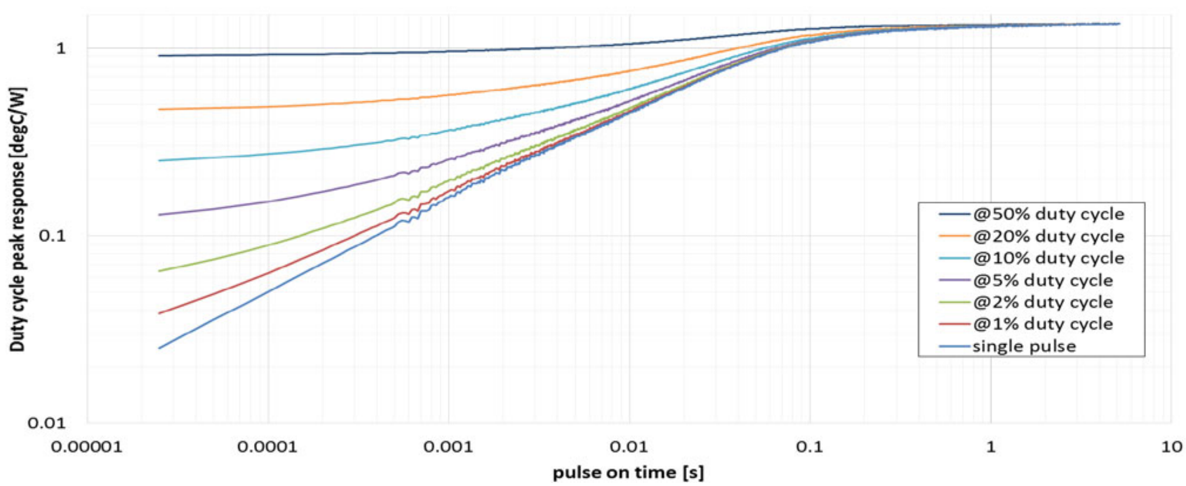


Figure 13. Transient Thermal Impedance

TYPICAL CHARACTERISTICS
(D14, D15, D24, D25, D34, D35)

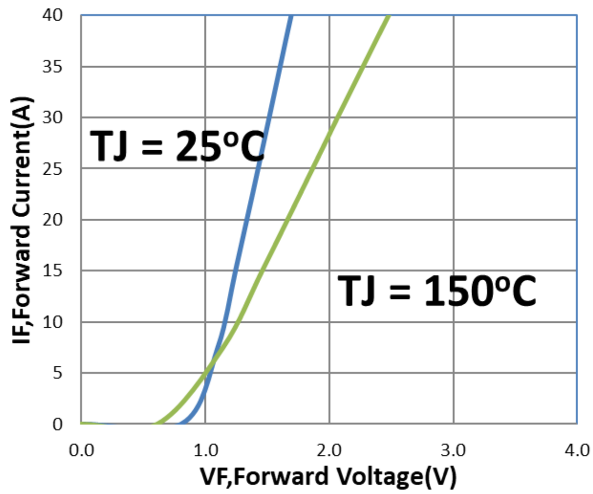


Figure 14. Diode Forward Characteristics

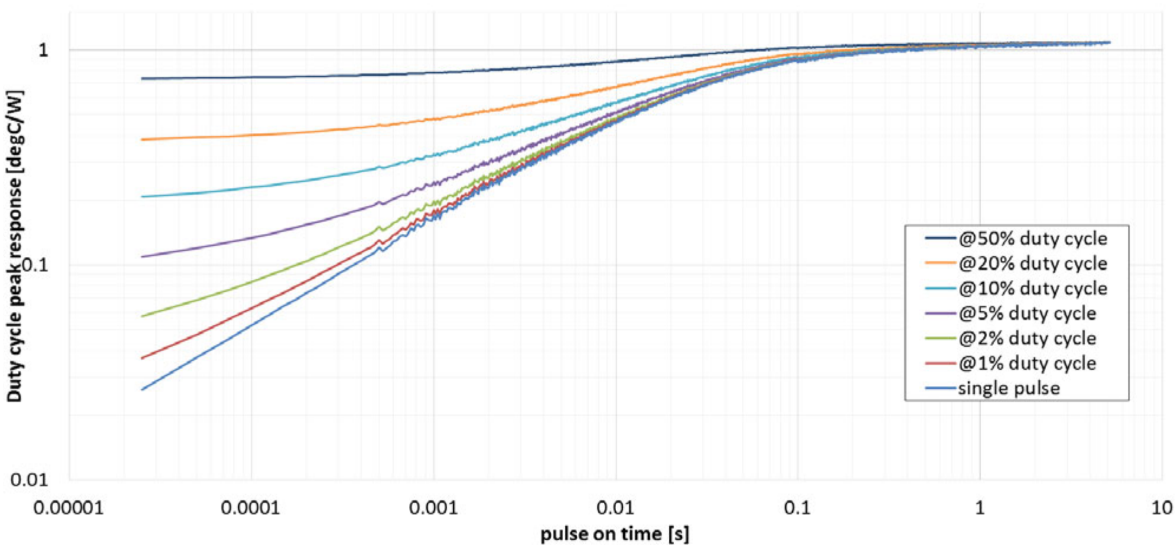


Figure 15. Transient Thermal Impedance

TYPICAL SWITCHING CHARACTERISTICS T11 & T12 IGBT COMUTATES D14 DIODE

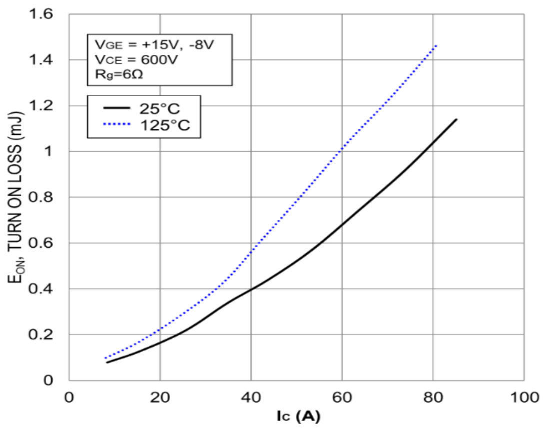


Figure 16. Typical Turn ON Loss vs. IC

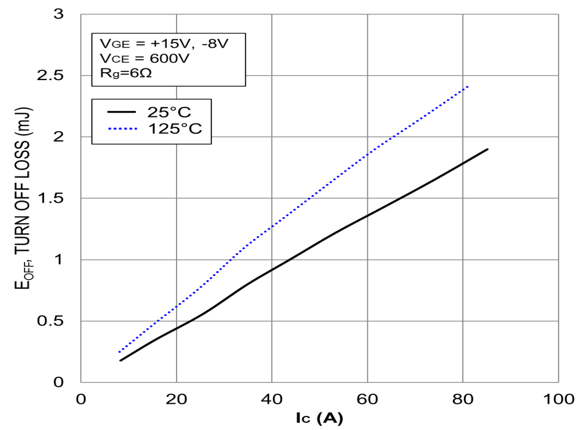


Figure 17. Typical Turn OFF Loss vs. IC

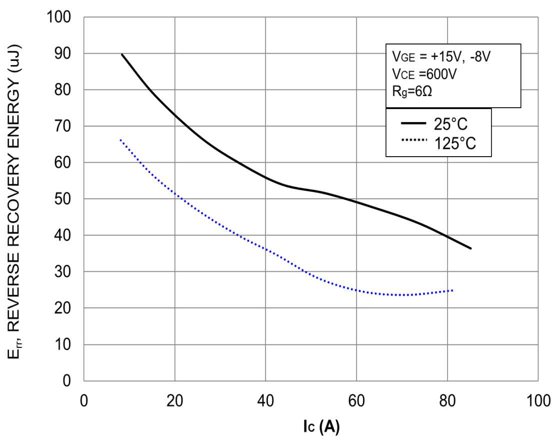


Figure 18. Typical Reverse Recovery Energy Loss vs. IC

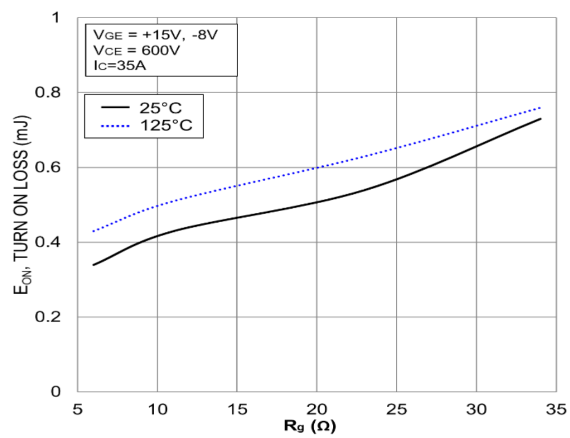


Figure 19. Typical Turn ON Loss vs. RG

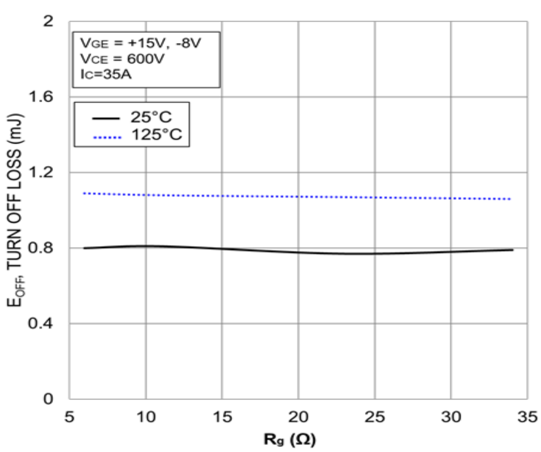


Figure 20. Typical Turn OFF Loss vs. RG

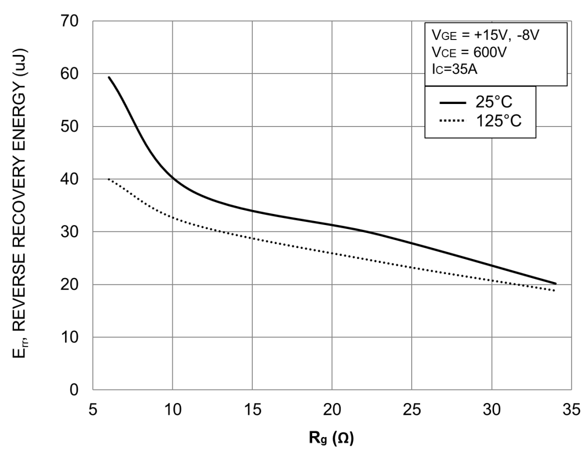


Figure 21. Typical Reverse Recovery Energy Loss vs. RG

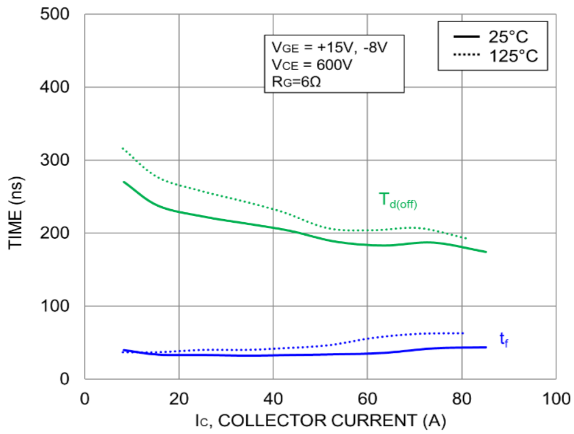


Figure 22. Typical Turn−Off Switching Time vs. IC

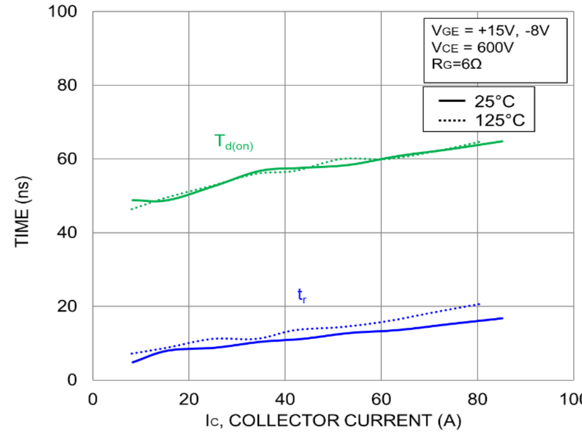


Figure 23. Typical Turn−On Switching Time vs. IC

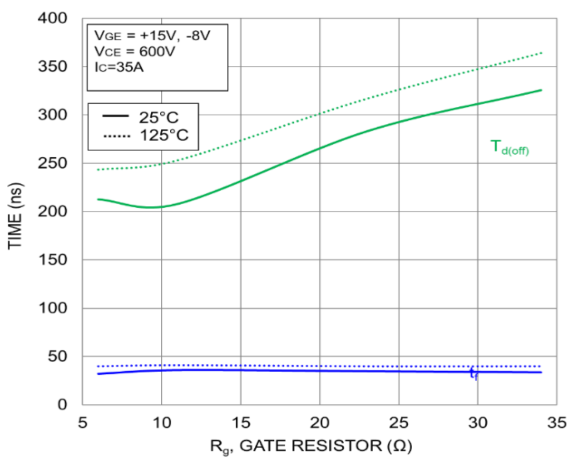


Figure 24. Typical Turn−Off Switching Time vs. RG

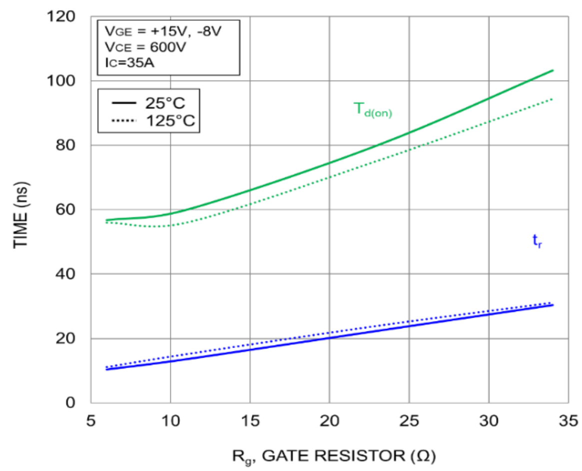


Figure 25. Typical Turn−On Switching Time vs. RG

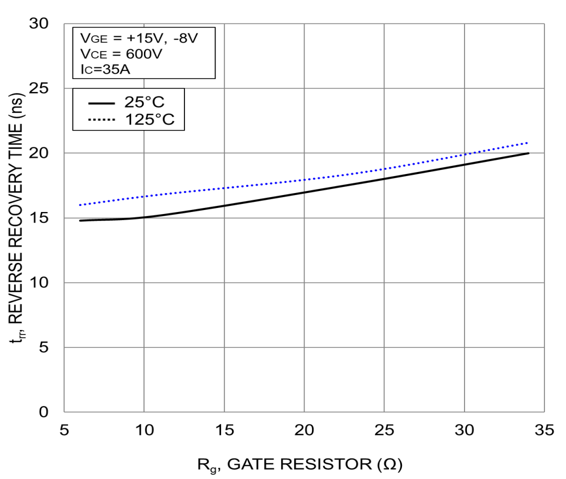


Figure 26. Typical Reverse Recovery Time vs. RG

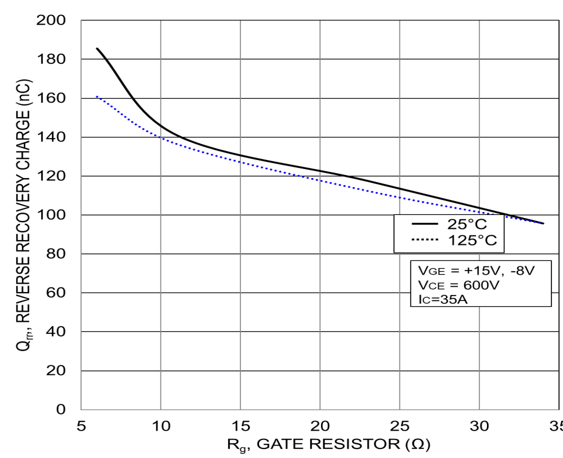


Figure 27. Typical Reverse Recovery Charge vs. RG

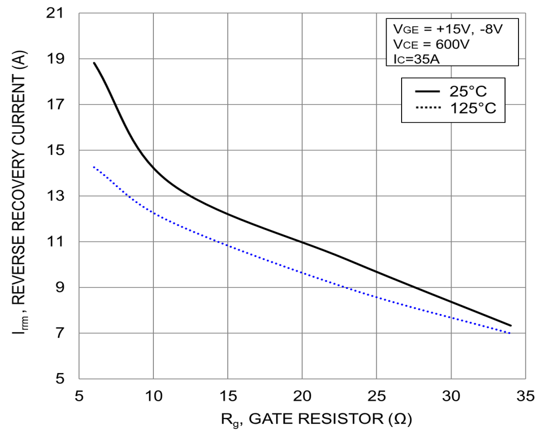


Figure 28. Typical Reverse Recovery Peak Current vs. RG

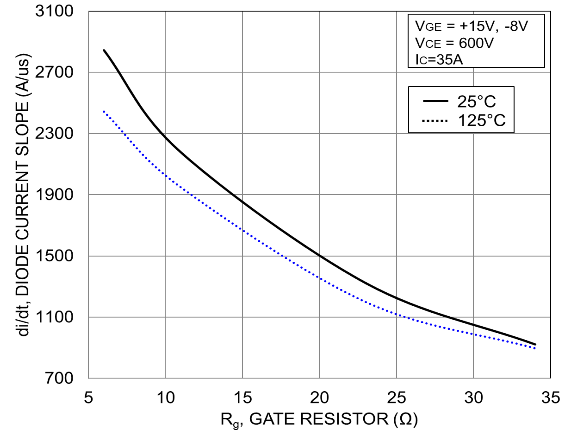


Figure 29. Typical di/dt vs. RG

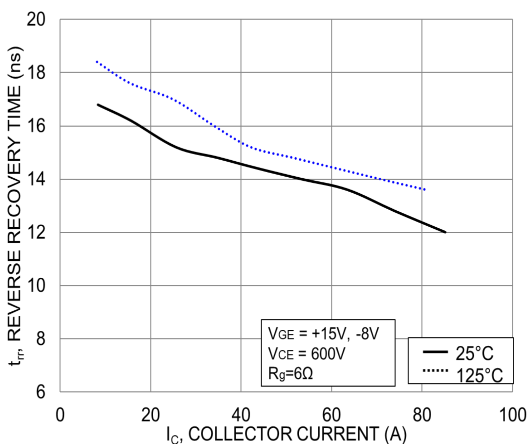


Figure 30. Typical Reverse Recovery Time vs. IC

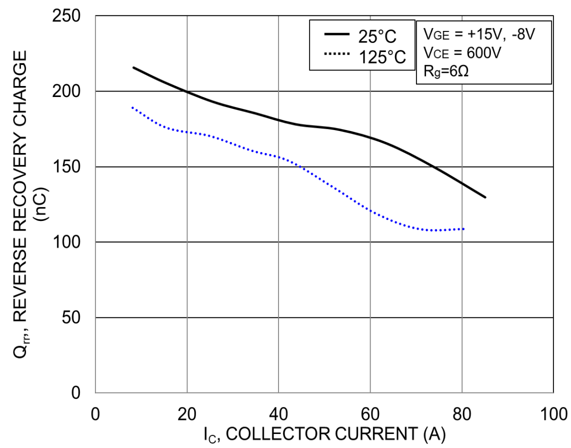


Figure 31. Typical Reverse Recovery Charge vs. IC

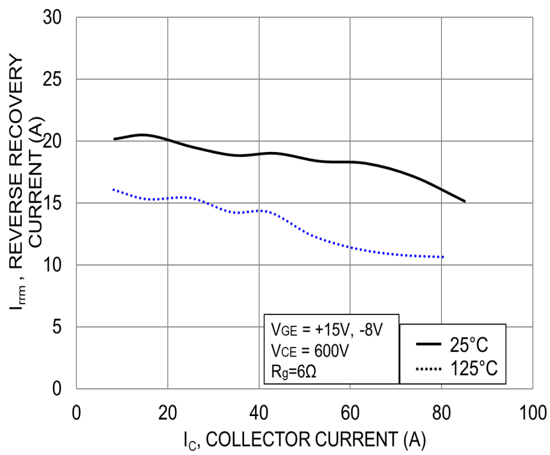


Figure 32. Typical Reverse Recovery Peak Current vs. IC

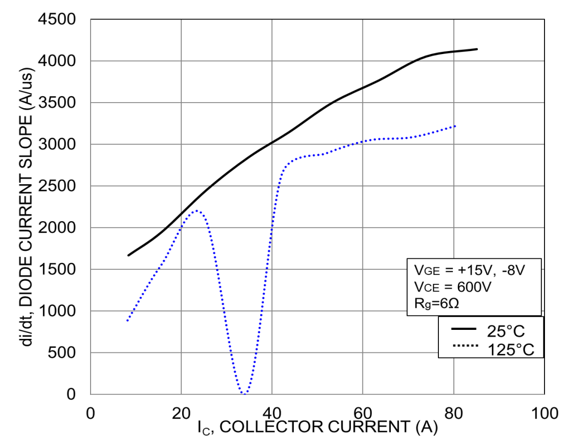
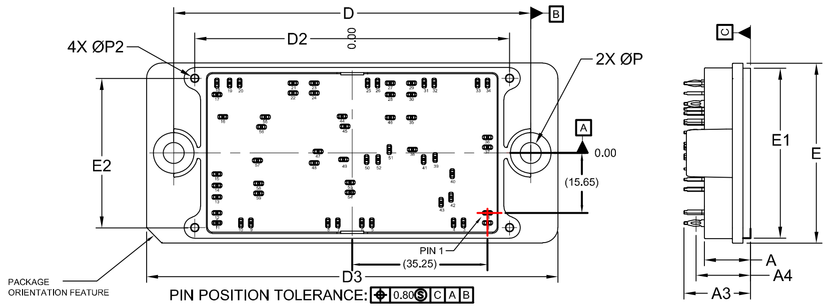


Figure 33. Typical di/dt Current Slope vs. IC

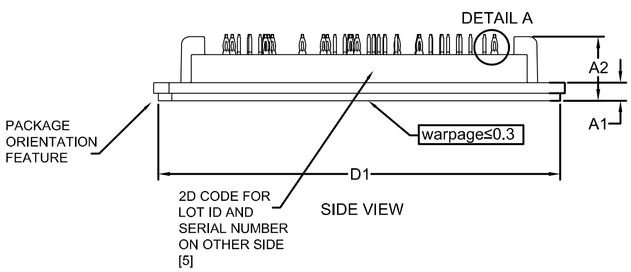
PACKAGE DIMENSIONS

PIM59 93.00x47.00x12.00
CASE 180AV
ISSUE D

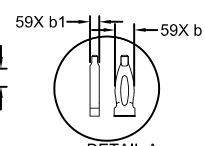


TOP VIEW

END VIEW



SIDE VIEW

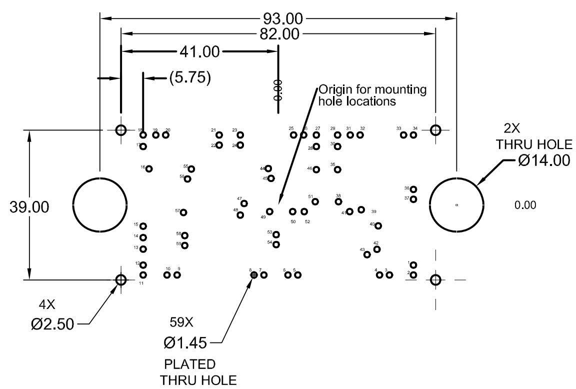


DETAIL A

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	11.70	12.00	12.30
A1	4.40	4.70	5.00
A2	16.40	16.70	17.00
A3	16.90	17.30	17.70
A4	13.97	14.18	14.39
A5	4.90	5.30	5.70
b	1.630	1.645	1.665
b1	0.75	0.80	0.85
D	92.90	93.00	93.10
D1	104.45	104.75	105.05
D2	81.80	82.00	82.20
D3	106.90	107.20	107.50
E	46.20	47.00	47.80
E1	44.10	44.40	44.70
E2	38.80	39.00	39.10
P	5.40	5.50	5.60
P1	5.05	5.35	5.65
P2	1.80	2.00	2.20

NOTE 4

MOUNTING HOLE POSITION					
PIN	X	Y	PIN	X	Y
1	35.25	−15.65	31	18.75	18.254
2	35.25	−18.25	32	21.35	18.25
3	29.0	−18.25	33	32.65	18.25
4	26.4	−18.25	34	35.25	18.25
5	5.10	−18.25	35	15.45	9.25
6	2.5	−18.25	36	35.25	4.10
7	−3.75	−18.25	37	35.25	1.50
8	−6.35	−18.25	38	15.70	0.90
9	−26.4	−18.25	39	21.60	−1.20
10	−29.0	−18.25	40	26.05	−5.40
11	−35.25	−18.25	41	18.60	−1.70
12	−35.25	−15.65	42	25.75	−11.55
13	−35.25	−11.50	43	23.15	−12.90
14	−35.25	−8.50	44	−2.60	9.55
15	−35.25	−5.50	45	−1.90	6.95
16	−33.70	9.45	46	9.90	9.25
17	−35.25	15.25	47	−8.90	0.40
18	−35.25	18.25	48	−9.90	−2.60
19	−31.95	18.25	49	−2.25	−1.70
20	−29.35	18.25	50	3.75	−1.70
21	−15.40	18.25	51	9.65	0.90
22	−15.40	15.65	52	6.75	−1.70
23	−9.90	18.25	53	−0.55	−7.70
24	−9.90	15.65	54	−0.55	−10.30
25	4.0	18.25	55	−22.65	9.40
26	6.60	18.25	56	−23.65	6.80
27	9.90	18.25	57	−24.70	−1.95
28	9.90	15.25	58	−24.40	−7.95
29	15.45	18.25	59	−24.40	−10.55
30	15.45	15.25			



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 A4.
4. POSITION OF THE CENTER OF THE TERMINALS IS DETERMINED FROM DATUM B THE CENTER OF DIMENSION D, X DIRECTION, AND FROM DATUM A, Y DIRECTION. POSITIONAL TOLERANCE, AS NOTED IN DRAWING, APPLIES TO EACH TERMINAL IN BOTH DIRECTIONS.
5. PACKAGE MARKING IS LOCATED AS SHOWN ON THE SIDE OPPOSITE THE PACKAGE ORIENTATION FEATURES.
6. PRESS FIT PIN

ADDITIONAL INFORMATION

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