

# 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

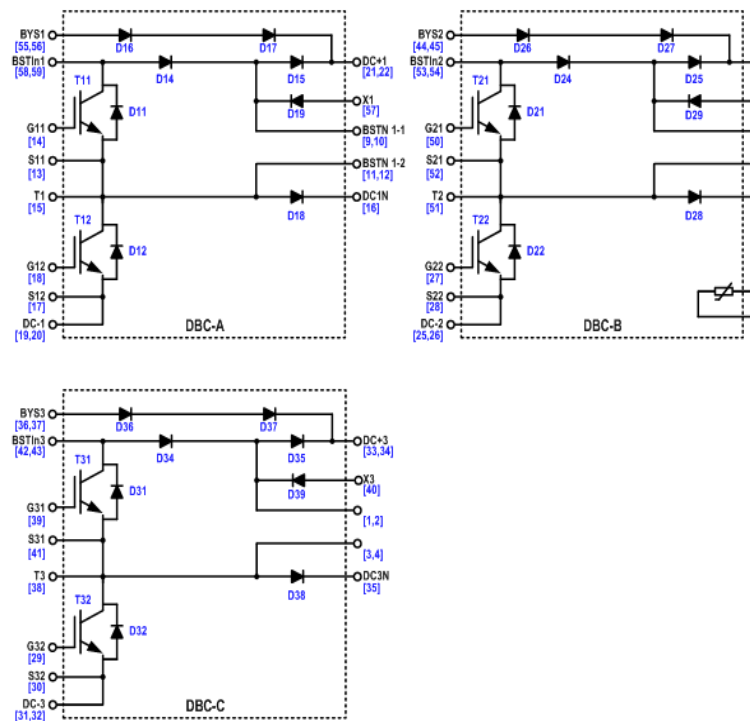
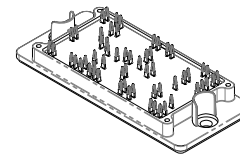


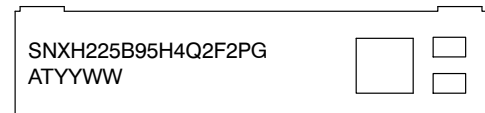
Figure 1. Schematic of Q2BOOST

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

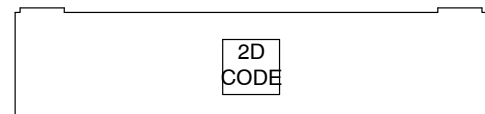


Q2BOOST MODULE  
CASE 180AV

### MARKING DIAGRAM



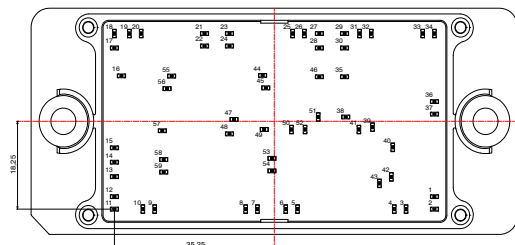
FRONTSIDE MARKING



BACKSIDE MARKING

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

### PIN CONNECTIONS



### ORDERING INFORMATION

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

# SNXH225B95H4Q2F2PG

## ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
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### IGBT (T11, T21, T31, T12, T22, T32)

Collector-emitter Voltage	$V_{CES}$	950	V
Collector Current @ $T_h = 80^\circ\text{C}$	$I_C$	65	A
Pulsed Collector Current, $T_{\text{pulse}} = 1 \text{ ms}$	$I_{CM}$	195	A
Power Dissipation per IGBT $T_J = T_{J\text{max}}$ , $T_h = 80^\circ\text{C}$	$P_{\text{tot}}$	136	W
Gate-emitter Voltage Positive transient gate-emitter voltage ( $T_{\text{pulse}} = 5 \mu\text{s}$ , $D < 0.10$ )	$V_{GE}$	$\pm 20$ 30	V
Maximum Junction Temperature	$T_J$	150	$^\circ\text{C}$

### IGBT INVERSE DIODE (D11, D12, D21, D22, D31, D32)

Peak Repetitive Reverse Voltage	$V_{RRM}$	1600	V
Forward Current, DC @ $T_h = 80^\circ\text{C}$	$I_F$	53	A
Repetitive Peak Forward Current, $T_{\text{pulse}} = 1 \text{ ms}$	$I_{FSM}$	450	A
Power Dissipation per Diode $T_J = T_{J\text{max}}$ , $T_h = 80^\circ\text{C}$	$P_{\text{tot}}$	67	W
Maximum Junction Temperature	$T_J$	150	$^\circ\text{C}$

### DIODE (D16 + D17, D26 + D27, D36 + D37)

Peak Repetitive Reverse Voltage	$V_{RRM}$	2000	V
Forward Current, DC @ $T_h = 80^\circ\text{C}$	$I_F$	49	A
Nonrepetitive Peak Surge Current, $T_p = 8.3 \text{ ms}$ , $T_J = 25^\circ\text{C}$	$I_{FSM}$	480	A
Power Dissipation per Diode $T_J = T_{J\text{max}}$ , $T_h = 80^\circ\text{C}$	$P_{\text{tot}}$	134	W
Maximum Junction Temperature	$T_J$	150	$^\circ\text{C}$

### SILICON CARBIDE SCHOTTKY DIODE (D14, D15, D24, D25, D34, D45)

Peak Repetitive Reverse Voltage	$V_{RRM}$	1200	V
Forward Current, DC @ $T_h = 80^\circ\text{C}$	$I_F$	42	A
Repetitive Peak Forward Current, $T_{\text{pulse}} = 1 \text{ ms}$	$I_{FRM}$	126	A
Power Dissipation per Diode $T_J = T_{J\text{max}}$ , $T_h = 80^\circ\text{C}$	$P_{\text{tot}}$	133.5	W
Maximum Junction Temperature	$T_J$	175	$^\circ\text{C}$

### DIODE (D18, D19, D28, D29, D38, D39)

Peak Repetitive Reverse Voltage	$V_{RRM}$	1200	V
Forward Current, DC @ $T_h = 80^\circ\text{C}$	$I_F$	21	A
Repetitive Peak Forward Current, $T_{\text{pulse}} = 1 \text{ ms}$	$I_{FRM}$	63	A
Power Dissipation per Diode $T_J = T_{J\text{max}}$ , $T_h = 80^\circ\text{C}$	$P_{\text{tot}}$	52	W
Maximum Junction Temperature	$T_J$	150	$^\circ\text{C}$

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	$T_{VJ \text{ OP}}$	-40 to $(T_{J\text{max}} - 25)$	$^\circ\text{C}$
Storage Temperature Range	$T_{\text{stg}}$	-40 to +125	$^\circ\text{C}$

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## 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 ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Test Conditions	Symbol	Min	Typ	Max	Unit
<b>IGBT (T11, T12, T21, T22, T31, T32)</b>						
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, $T_J = 25^\circ\text{C}$ $V_{GE} = 15$ V, $I_C = 75$ A, $T_J = 150^\circ\text{C}$	$V_{CE(sat)}$	— —	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	$\mu\text{A}$
Gate Leakage Current	$V_{GE} = 20$ V, $V_{CE} = 0$ V	$I_{GES}$	—	—	400	nA
Turn-on Delay Time	$T_J = 25^\circ\text{C}$ $V_{CE} = 600$ V, $I_C = 35$ A $V_{GE} = +15$ V, $-8$ V; $R_G = 11$ $\Omega$	$t_{d(on)}$	—	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	$T_J = 125^\circ\text{C}$ $V_{CE} = 600$ V, $I_C = 35$ A $V_{GE} = +15$ V, $-8$ V; $R_G = 11$ $\Omega$	$t_{d(on)}$	—	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 $\pm 2\%$ , $\lambda = 2.9$ W/mK	$R_{thJH}$	—	0.706	$\Omega$	$^\circ\text{C/W}$

## IGBT INVERSE DIODE (D11, D12, D21, D22, D31, D32)

Forward Voltage	$I_F = 30$ A, $T_J = 25^\circ\text{C}$ $I_F = 30$ A, $T_J = 150^\circ\text{C}$	$V_F$	— —	1.0 0.93	1.5 —	V
Thermal Resistance – Chip-to-Heatsink	Thermal grease, Thickness = 2.1 Mil $\pm 2\%$ , $\lambda = 2.9$ W/mK	$R_{thJH}$	$\Omega$	1.038	$\Omega$	$^\circ\text{C/W}$

## DIODE (D16+D17, D26+D27, D36+D37)

Forward Voltage	$I_F = 45$ A, $T_J = 25^\circ\text{C}$ $I_F = 45$ A, $T_J = 150^\circ\text{C}$	$V_F$	— —	2.27 2.17	2.75 —	V
Reverse Leakage Current	$V_R = 2000$ V	$I_r$	—	—	100	$\mu\text{A}$
Thermal Resistance – Chip-to-Heatsink	Thermal grease, Thickness = 2.1 Mil $\pm 2\%$ , $\lambda = 2.9$ $\Omega/\mu\text{K}$	$R_{thJH}$	—	0.523	—	$^\circ\text{C/W}$

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## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted) (continued)

Characteristic	Test Conditions	Symbol	Min	Typ	Max	Unit
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### SIC DIODE (D14, D15, D24, D25, D34, D35)

Forward Voltage	I <sub>F</sub> = 30 A, T <sub>J</sub> = 25°C I <sub>F</sub> = 30 A, T <sub>J</sub> = 150°C	V <sub>F</sub>	– –	1.52 2.10	1.70 –	V
Reverse Leakage Current	V <sub>R</sub> = 1200 V	I <sub>r</sub>	–	–	600	μA
Thermal Resistance – Chip-to-Heatsink	Thermal grease, Thickness = 2.1 Mil ±2%, λ = 2.9 W/mK	R <sub>thJH</sub>	–	1.070	–	°C/W

### DIODE (D18, D19, D28, D29, D38, D39)

Forward Voltage	I <sub>F</sub> = 30 A, T <sub>J</sub> = 25°C I <sub>F</sub> = 30 A, T <sub>J</sub> = 150°C	V <sub>F</sub>	– –	2.50 2.25	3.0 –	V
Reverse Leakage Current	V <sub>R</sub> = 1200 V	I <sub>r</sub>	–	–	600	μA
Thermal Resistance – Chip-to-Heatsink	Thermal grease, Thickness = 2.1 Mil ±2%, λ = 2.9 W/mK	R <sub>thJH</sub>	–	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 <sub>D</sub>	–	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.

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

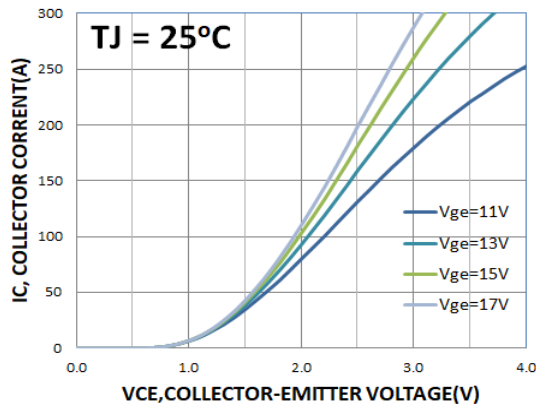


Figure 2. Typical Output Characteristics

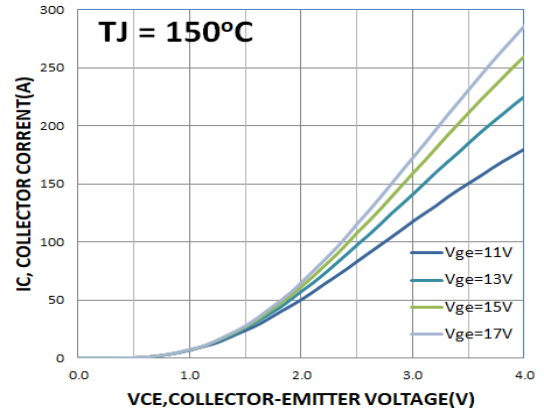


Figure 3. Typical Output Characteristics

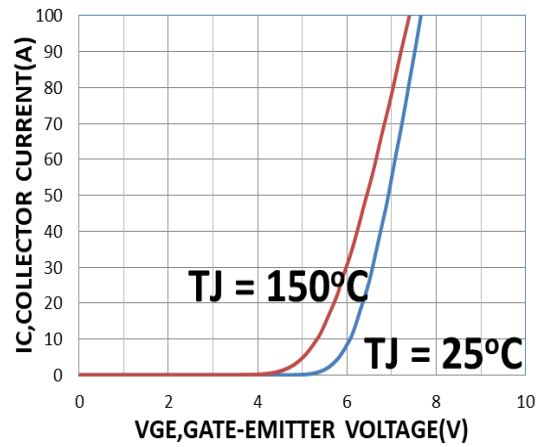


Figure 4. Typical Transfer Characteristics

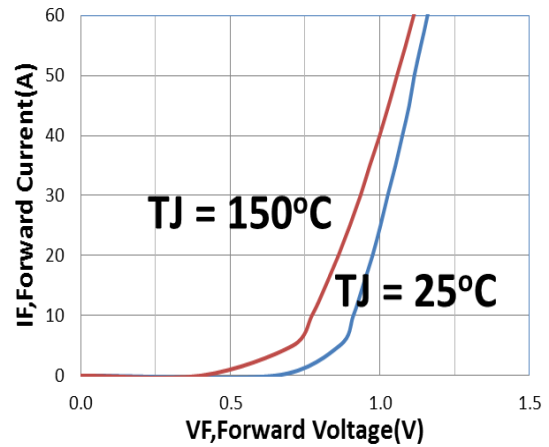


Figure 5. Diode Forward Characteristics

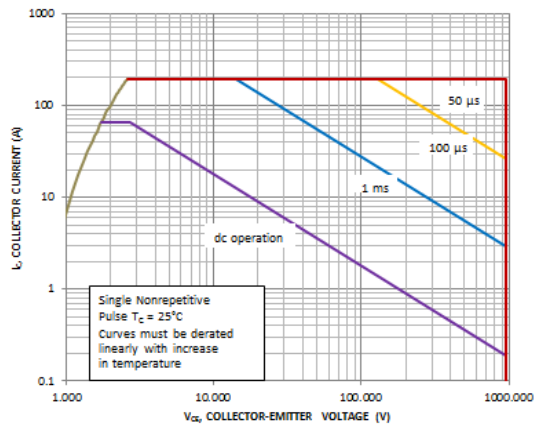


Figure 6. FBSOA

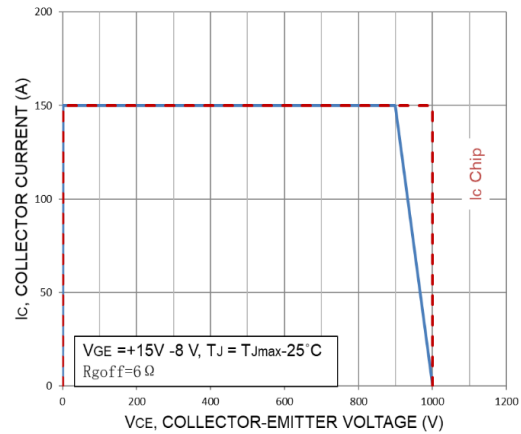


Figure 7. RBSOA

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

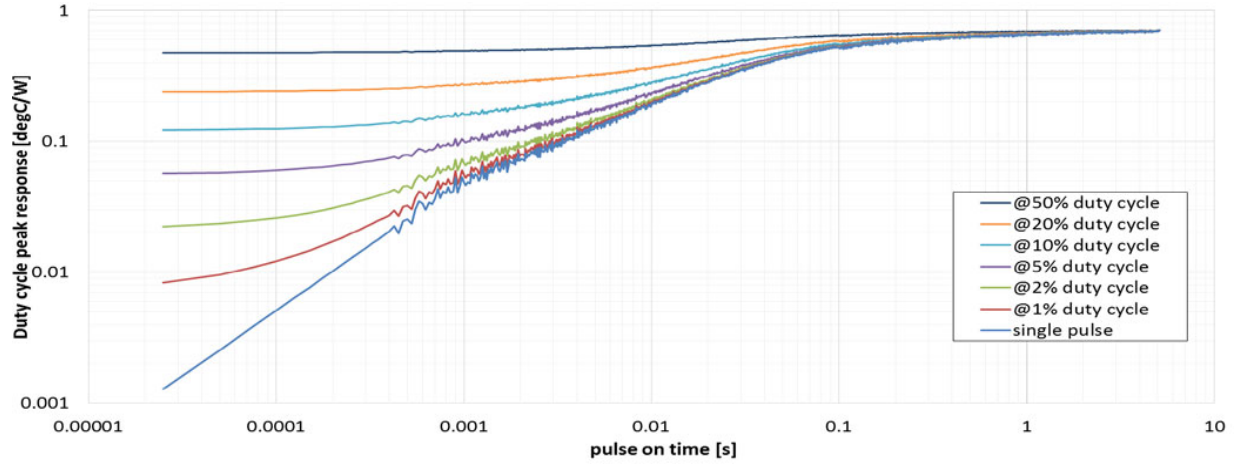


Figure 8. Transient Thermal Impedance (T11, T12, T21, T22, T31, T32)

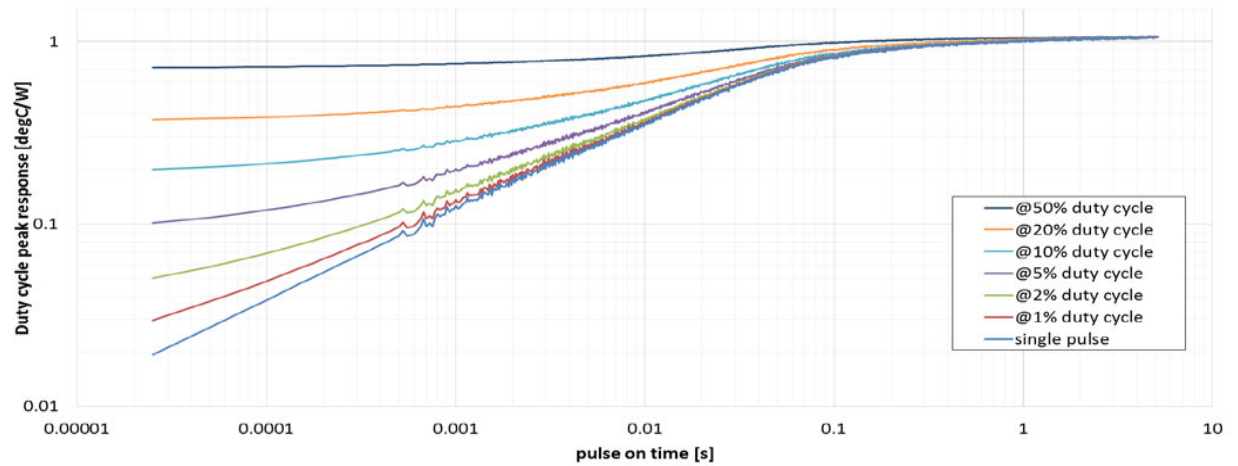


Figure 9. Transient Thermal Impedance (D11, D12, D21, D22, D31, D32)

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

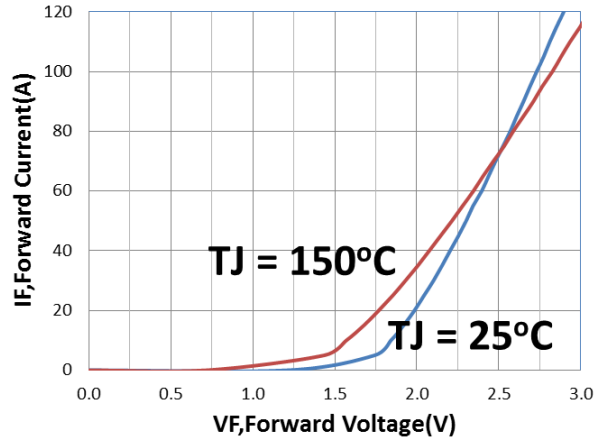


Figure 10. Diode Forward Characteristics

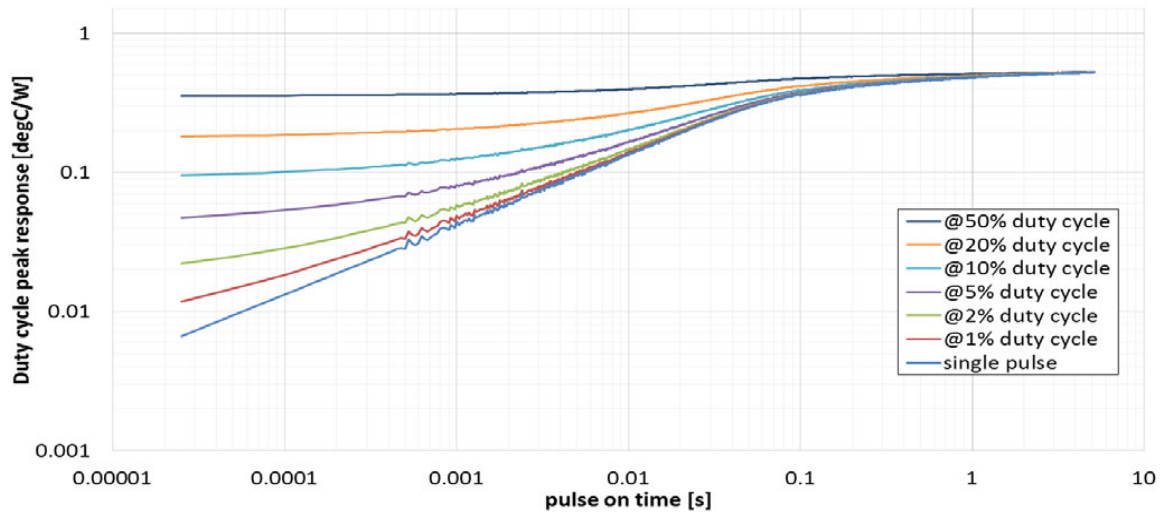


Figure 11. Transient Thermal Impedance

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

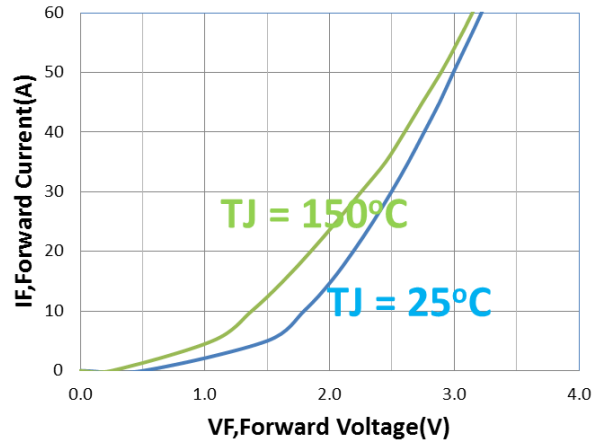


Figure 12. Diode Forward Characteristics

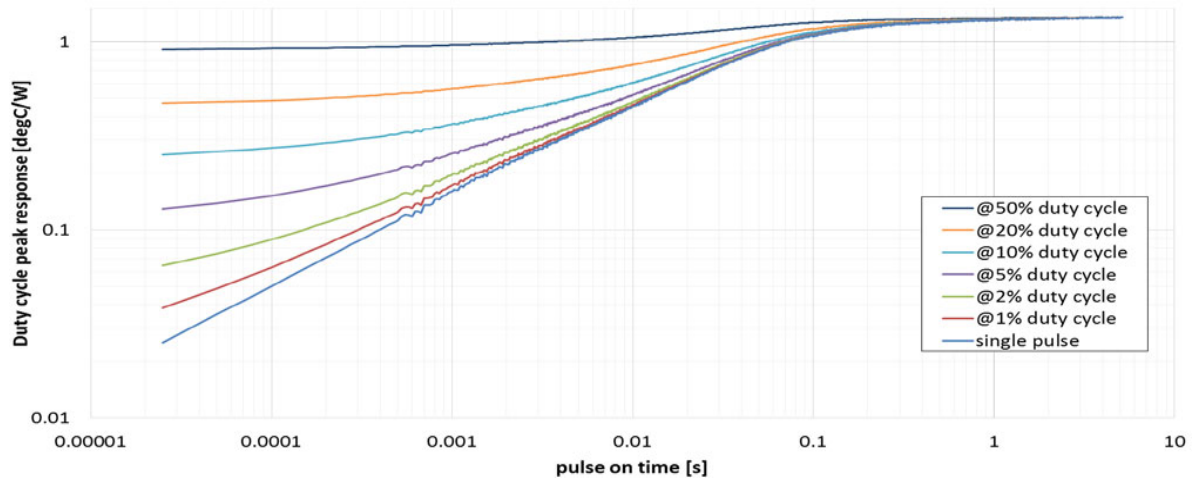


Figure 13. Transient Thermal Impedance



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

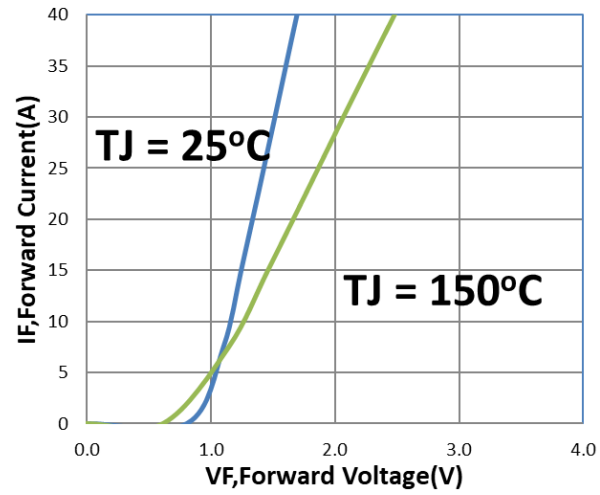


Figure 14. Diode Forward Characteristics

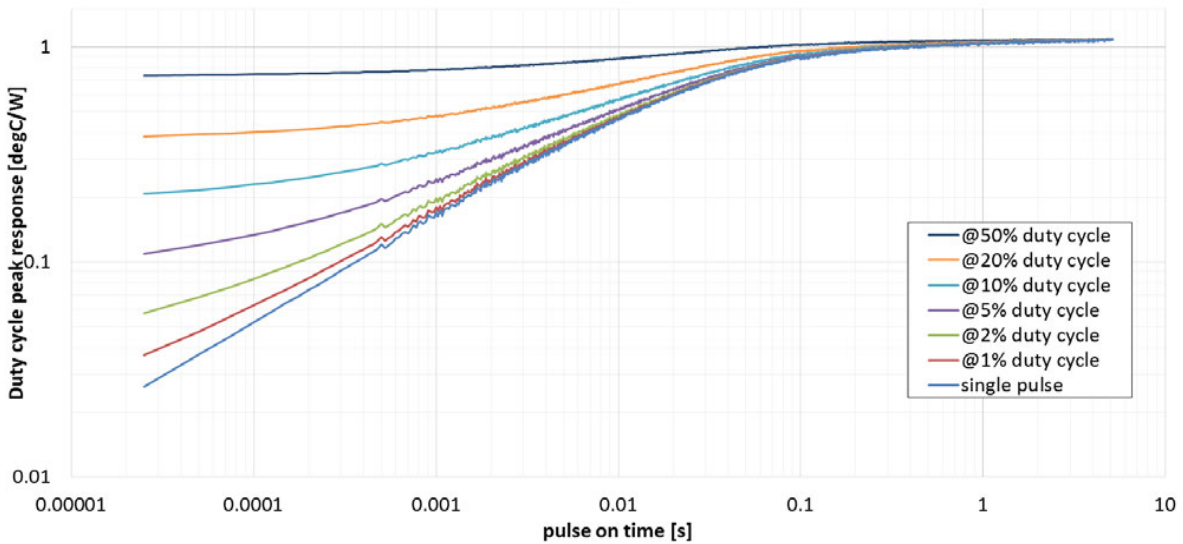


Figure 15. Transient Thermal Impedance

TYPICAL SWITCHING CHARACTERISTICS T11 & T12 IGBT COMUTATES D14 DIODE

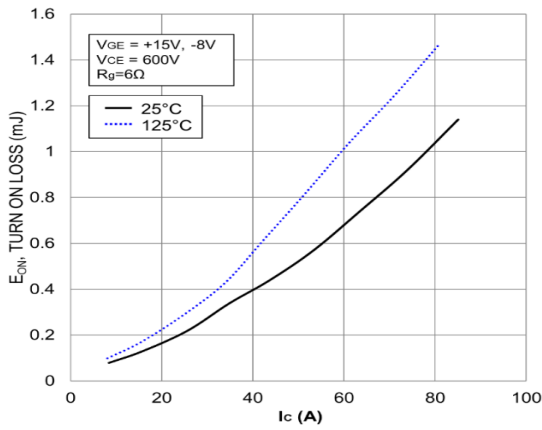


Figure 16. Typical Turn ON Loss vs. IC

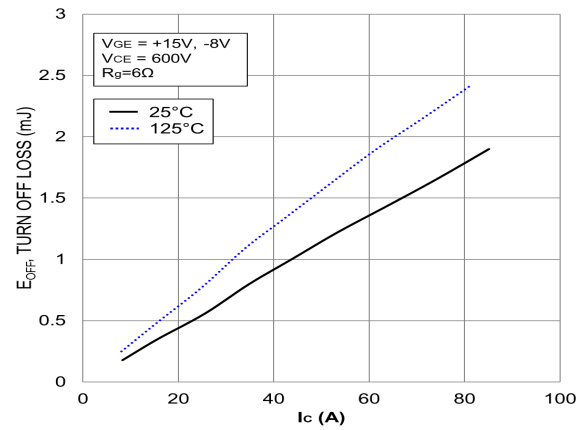


Figure 17. Typical Turn OFF Loss vs. IC

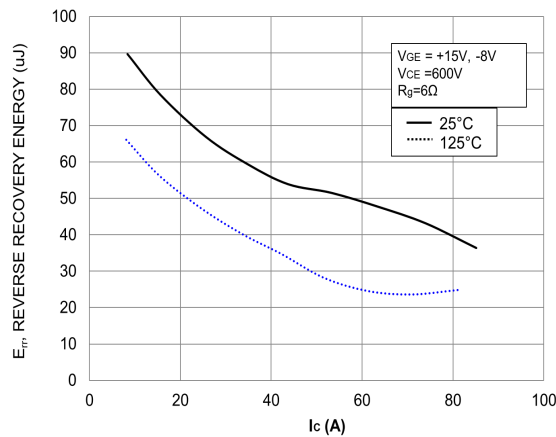


Figure 18. Typical Reverse Recovery Energy Loss vs. IC

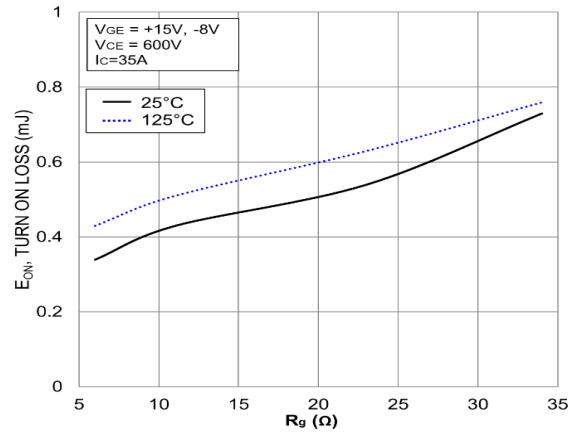


Figure 19. Typical Turn ON Loss vs. R<sub>g</sub>

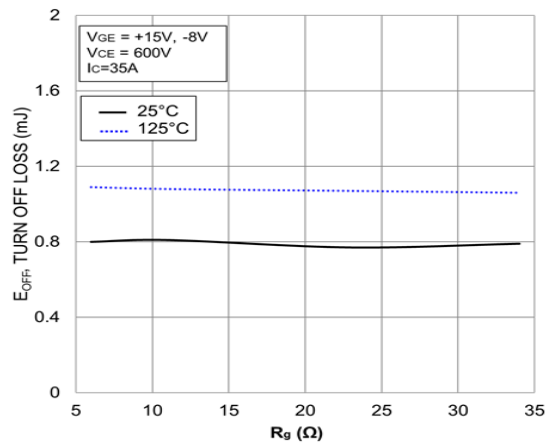


Figure 20. Typical Turn OFF Loss vs. R<sub>g</sub>

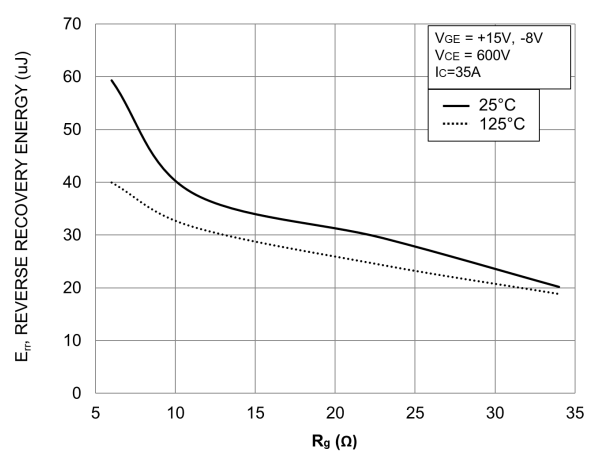


Figure 21. Typical Reverse Recovery Energy Loss vs. R<sub>g</sub>

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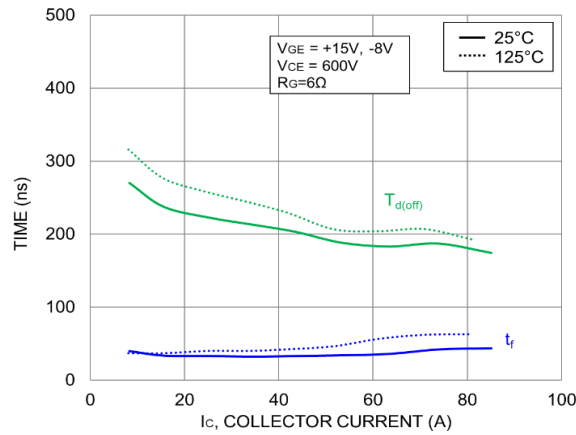


Figure 22. Typical Turn-Off Switching Time vs. IC

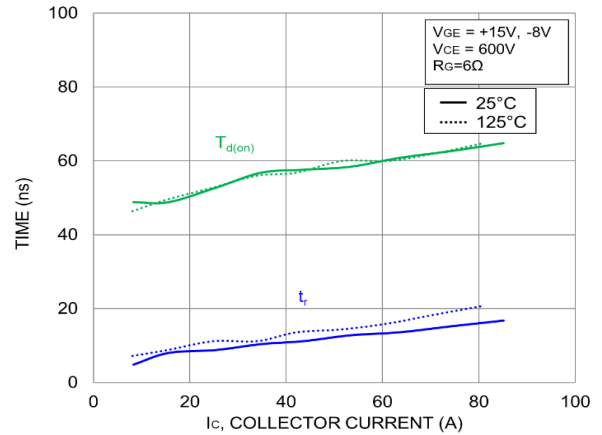


Figure 23. Typical Turn-On Switching Time vs. IC

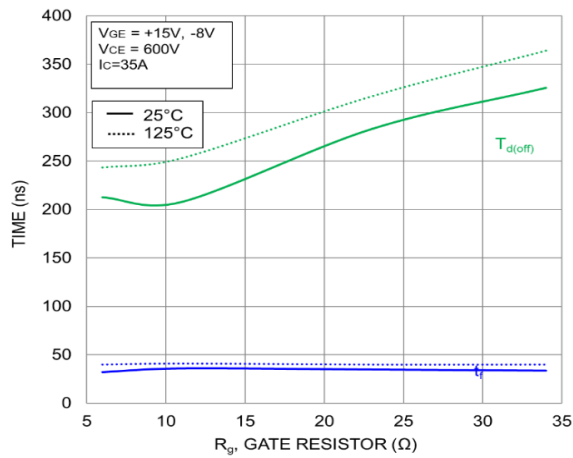


Figure 24. Typical Turn-Off Switching Time vs. RG

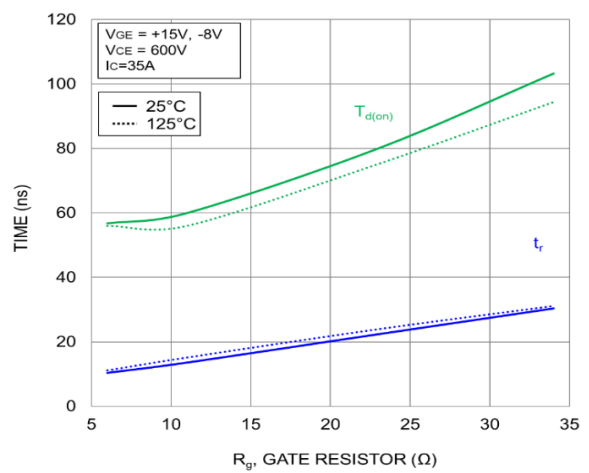


Figure 25. Typical Turn-On Switching Time vs. RG

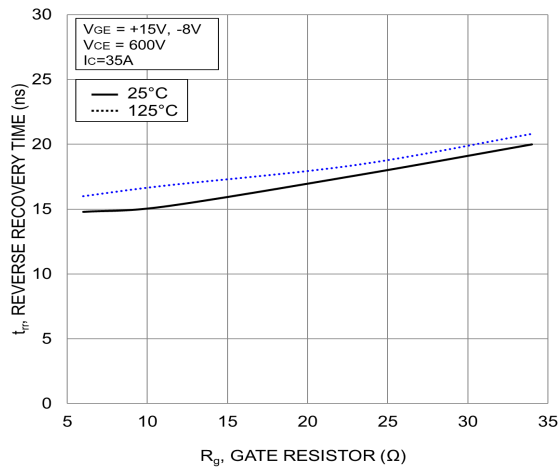


Figure 26. Typical Reverse Recovery Time vs. RG

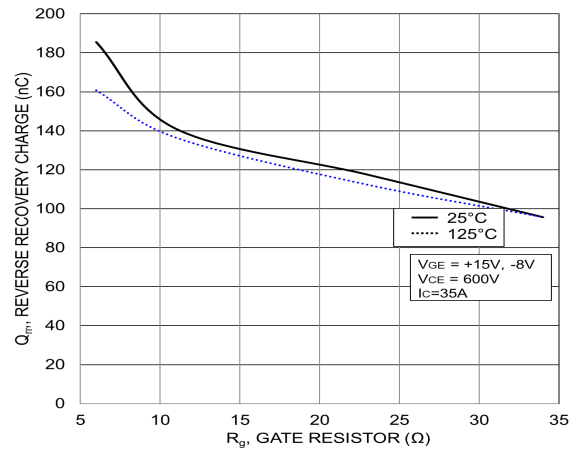


Figure 27. Typical Reverse Recovery Charge vs. RG

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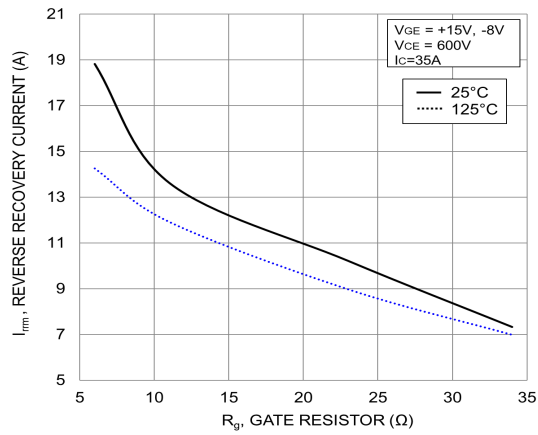


Figure 28. Typical Reverse Recovery Peak Current vs.  $R_g$

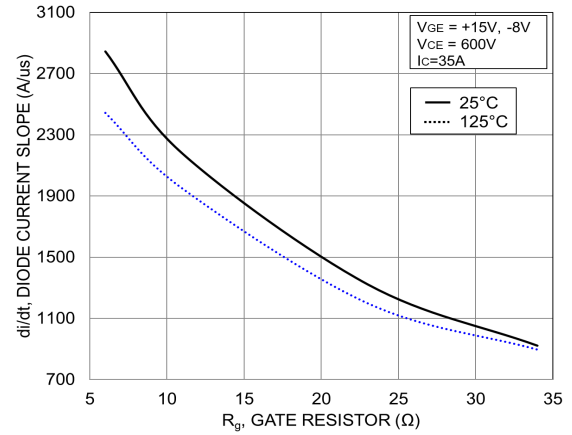


Figure 29. Typical  $di/dt$  vs.  $R_g$

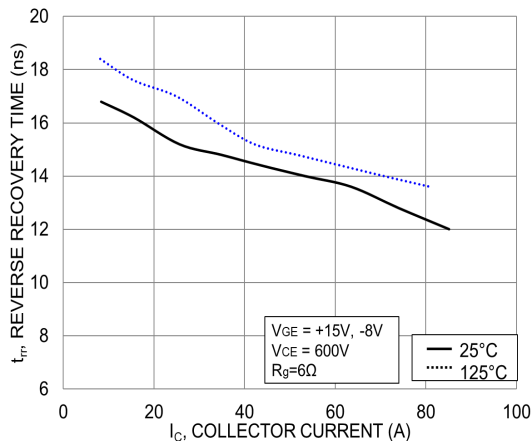


Figure 30. Typical Reverse Recovery Time vs.  $I_C$

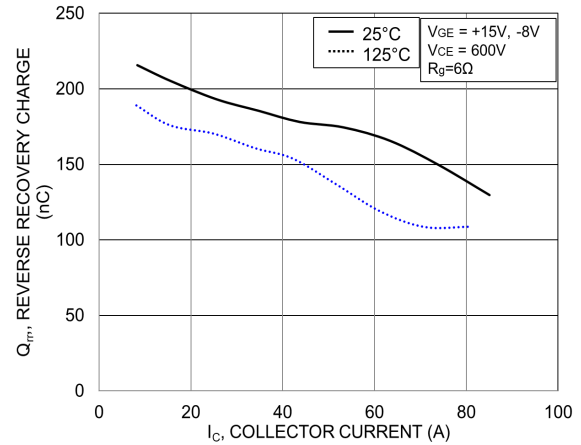


Figure 31. Typical Reverse Recovery Charge vs.  $I_C$

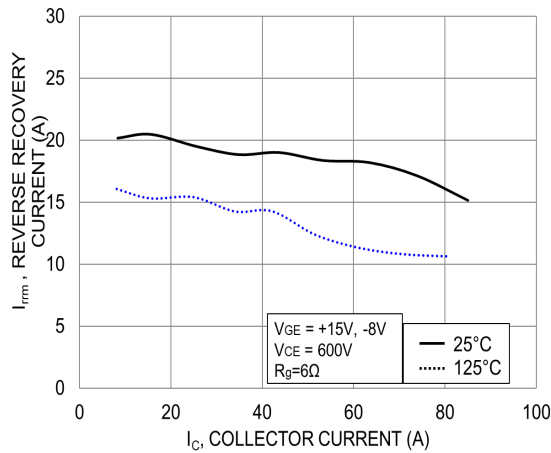


Figure 32. Typical Reverse Recovery Peak Current vs.  $I_C$

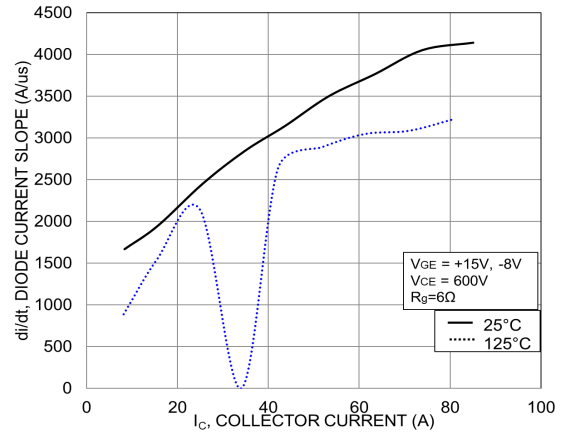
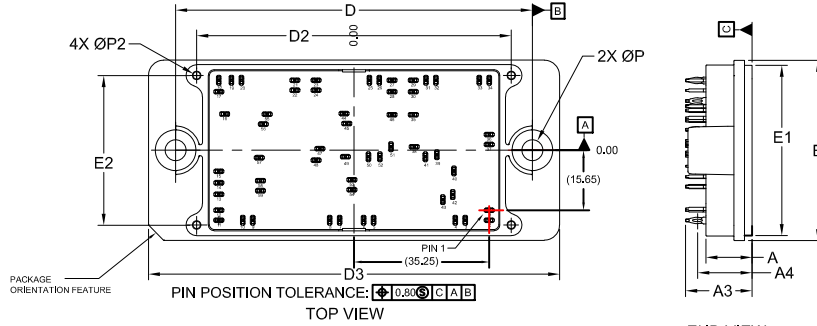


Figure 33. Typical  $di/dt$  Current Slope vs.  $I_C$

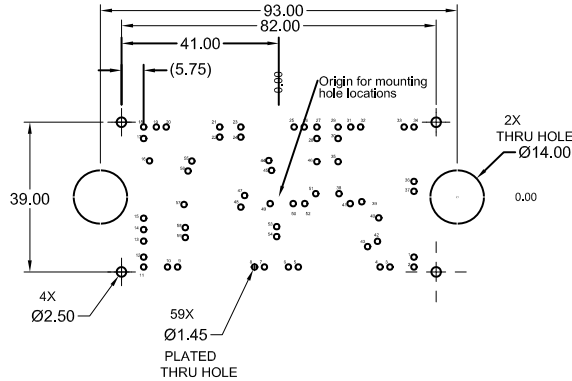
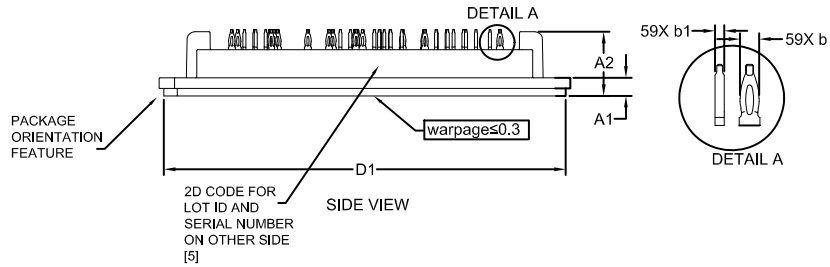
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## PACKAGE DIMENSIONS

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



END VIEW



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

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			

### 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

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