Split T-Type NPC Power Module

NXH200T120H3Q2F2SG, NXH200T120H3Q2F2STG

The NXH200T120H3Q2F2SG is a power module containing a split T−type neutral point clamped three−level inverter. The integrated field stop trench IGBTs and SiC Diodes provide lower conduction losses and switching losses, enabling designers to achieve high efficiency and superior reliability. NXH200T120H3Q2F2STG is Pre−applied Thermal Interface Material (TIM) module.

Features

- Split T−type Neutral Point Clamped Three−level Inverter Module
- 1200 V Ultra Field Stop IGBTs & 650 V FS4 IGBTs
- 650 V SiC Diodes
- Low Inductive Layout
- Solderable Pins
- Thermistor
- Pre−applied Thermal Interface Material (TIM)

Typical Applications

- Solar Inverters
- Uninterruptible Power Supplies

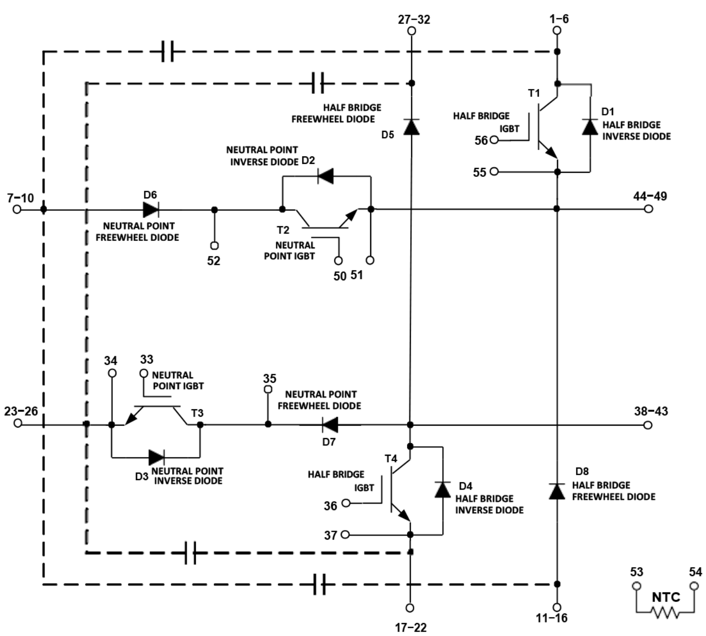

Figure 1. NXH200T120H3Q2F2SG Schematic Diagram

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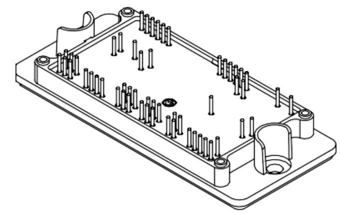
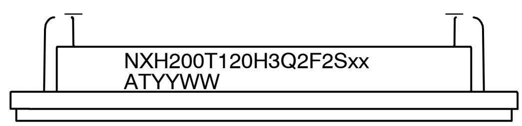


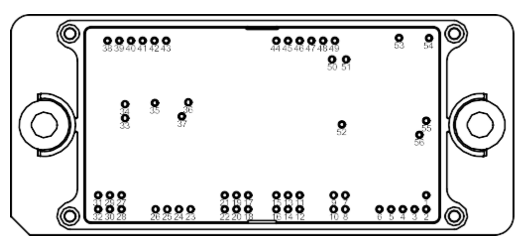
PIM56, 93x47 (SOLDER PIN)
CASE 180AK

MARKING DIAGRAM



NXH200T120H3Q2F2SG, NXH200T120H3Q2F2STG	= Device Code
YYWW	= Year and Work Week Code
A	= Assembly Site Code
T	= Test Side Code
G	= Pb−Free Package

PIN CONNECTIONS



ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

Table 1. ABSOLUTE MAXIMUM RATINGS (Note 1) T_J = 25°C unless otherwise noted

Rating	Symbol	Value	Unit
HALF BRIDGE IGBT			
Collector−Emitter Voltage	V_{CES}	1200	V
Gate−Emitter Voltage	V_{GE}	±20	V
Continuous Collector Current @ T_C = 25°C	I_C	330	A
Continuous Collector Current @ T_C = 80°C (T_J = 175°C)		256	
Pulsed Collector Current (T_J = 175°C)	I_{Cpulse}	768	A
Maximum Power Dissipation @ T_C = 80°C (T_J = 175°C)	P_{tot}	679	W
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	175	°C
NEUTRAL POINT IGBT			
Collector−Emitter Voltage	V_{CES}	650	V
Gate−Emitter Voltage	V_{GE}	±20	V
Continuous Collector Current @ T_C = 80°C (T_J = 175°C)	I_C	128	A
Pulsed Collector Current (T_J = 175°C)	I_{Cpulse}	384	A
Maximum Power Dissipation @ T_C = 80°C (T_J = 175°C)	P_{tot}	264	W
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	175	°C
HALF BRIDGE FREEWHEEL DIODE			
Peak Repetitive Reverse Voltage	V_{RRM}	1200	V
Continuous Forward Current @ T_C = 80°C (T_J = 175°C)	I_F	94	A
Repetitive Peak Forward Current (T_J = 175°C, t_p limited by T_{Jmax})	I_{FRM}	282	A
Maximum Power Dissipation @ T_C = 80°C (T_J = 175°C)	P_{tot}	232	W
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	175	°C
HALF BRIDGE INVERSE DIODE			
Peak Repetitive Reverse Voltage	V_{RRM}	1200	V
Continuous Forward Current @ T_C = 80°C (T_J = 175°C)	I_F	18	A
Repetitive Peak Forward Current (T_J = 175°C, t_p limited by T_{Jmax})	I_{FRM}	54	A
Maximum Power Dissipation @ T_C = 80°C (T_J = 175°C)	P_{tot}	62	W
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	175	°C
NEUTRAL POINT FREEWHEEL DIODE			
Peak Repetitive Reverse Voltage	V_{RRM}	650	V
Continuous Forward Current @ T_C = 80°C (T_J = 175°C)	I_F	75	A
Repetitive Peak Forward Current (T_J = 175°C, t_p limited by T_{Jmax})	I_{FRM}	225	A
Maximum Power Dissipation @ T_C = 80°C (T_J = 175°C)	P_{tot}	216	W
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	175	°C

Table 1. ABSOLUTE MAXIMUM RATINGS (Note 1) T_J = 25°C unless otherwise noted

Rating	Symbol	Value	Unit
NEUTRAL POINT INVERSE DIODE			
Peak Repetitive Reverse Voltage	V_{RRM}	650	V
Continuous Forward Current @ T_C = 80°C (T_J = 175°C)	I_F	36	A
Repetitive Peak Forward Current (T_J = 175°C, t_p limited by T_{Jmax})	I_{FRM}	108	A
Maximum Power Dissipation @ T_c = 80°C (T_J = 175°C)	P_{tot}	90	W
Minimum Operating Junction Temperature	T_{JMIN}	−40	°C
Maximum Operating Junction Temperature	T_{JMAX}	175	°C
THERMAL PROPERTIES			
Storage Temperature range	T_{stg}	−40 to 125	°C
INSULATION PROPERTIES			
Isolation test voltage, t = 2 sec, 50 Hz	V_{is}	4000	V_{RMS}
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.

1. Refer to ELECTRICAL CHARACTERISTICS, RECOMMENDED OPERATING RANGES and/or APPLICATION INFORMATION for Safe Operating parameters.

Table 2. RECOMMENDED OPERATING RANGES

Rating	Symbol	Min	Max	Unit
Module Operating Junction Temperature	T_J	−40	(T_{Jmax} −25)	°C

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

Table 3. ELECTRICAL CHARACTERISTICS T_J = 25°C unless otherwise noted

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
HALF BRIDGE IGBT CHARACTERISTICS						
Collector−Emitter Cutoff Current	V_{GE} = 0 V, V_{CE} = 1200 V	I_{CES}	–	–	500	μA
Collector−Emitter Saturation Voltage	V_{GE} = 15 V, I_C = 200 A, T_J = 25°C	$V_{CE(sat)}$	1.40	1.86	2.30	V
	V_{GE} = 15 V, I_C = 200 A, T_J = 175°C		–	2.00	–	
Gate−Emitter Threshold Voltage	V_{GE} = V_{CE}, I_C = 6 mA	$V_{GE(TH)}$	4.80	5.52	6.50	V
Gate Leakage Current	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	500	nA
Breakdown Voltage	V_{GE} = 0 V, I_C = 1 mA	B_{VCES}	1200	1400	1450	V
Turn−on Delay Time	T_J = 25°C V_{CE} = 350 V, I_C = 170 A V_{GE} = −5/+15 V, R_G = 10 Ω	$t_{d(on)}$	–	302	–	ns
Rise Time		t_r	–	102	–	
Turn−off Delay Time		$t_{d(off)}$	–	923	–	
Fall Time		t_f	–	59	–	
Turn−on Switching Loss per Pulse		E_{on}	–	5.1	–	mJ
Turn−off Switching Loss per Pulse		E_{off}	–	5.4	–	

Table 3. ELECTRICAL CHARACTERISTICS T_J = 25°C unless otherwise noted

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
HALF BRIDGE IGBT CHARACTERISTICS						
Turn−on Delay Time	T_J = 125°C V_{CE} = 350 V, I_C = 170 A V_{GE} = −5/+15 V, R_G = 10 Ω	$t_{d(on)}$	–	276	–	ns
Rise Time		t_r	–	97	–	
Turn−off Delay Time		$t_{d(off)}$	–	997	–	
Fall Time		t_f	–	99	–	
Turn−on Switching Loss per Pulse		E_{on}	–	5.4	–	mJ
Turn−off Switching Loss per Pulse		E_{off}	–	7.9	–	
Input Capacitance	V_{CE} = 25 V. V_{GE} = 0 V f = 100 kHz	C_{ies}	–	35615	–	pF
Output Capacitance		C_{oes}	–	700	–	
Reverse Transfer Capacitance		C_{res}	–	530	–	
Total Gate Charge	V_{CE} = 600 V, I_C = 200 A, V_{GE} = 15 V	Q_g	–	1706.4	–	nC
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness < 100 μm, λ = 2.87 W/mK	R_{thJH}	–	0.24	–	°C/W
Thermal Resistance − chip−to−case		R_{thJC}	–	0.13	–	°C/W
NEUTRAL POINT FREEWHEEL DIODE CHARACTERISTICS						
Diode Reverse Leakage Current	V_R = 650 V	I_R	–	–	100	μA
Diode Forward Voltage	I_F = 100 A, T_J = 25°C	V_F	1.2	1.48	2.7	V
	I_F = 100 A, T_J = 175°C		–	1.90	–	
Reverse Recovery Time	T_J = 25°C V_{CE} = 350 V, I_C = 170 A V_{GE} = −5/+15 V, R_G = 10 Ω	t_{rr}	–	26.6	–	ns
Reverse Recovery Charge		Q_{rr}	–	308	–	nC
Peak Reverse Recovery Current		I_{RRM}	–	16.8	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	1659	–	A/μs
Reverse Recovery Energy		E_{rr}	–	34.5	–	μJ
Reverse Recovery Time	T_J = 125°C V_{CE} = 350 V, I_C = 170 A V_{GE} = −5/+15V, R_G = 10 Ω	t_{rr}	–	25.8	–	ns
Reverse Recovery Charge		Q_{rr}	–	294	–	nC
Peak Reverse Recovery Current		I_{RRM}	–	18.0	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	1672	–	A/μs
Reverse Recovery Energy		E_{rr}	–	35.2	–	μJ
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness < 100 μm, λ = 2.87 W/mK	R_{thJH}	–	0.54	–	°C/W
Thermal Resistance − chip−to−case		R_{thJC}	–	0.43	–	°C/W
NEUTRAL POINT IGBT CHARACTERISTICS						
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 = 150 A, T_J = 25°C	$V_{CE(sat)}$	0.8	1.36	2.05	V
	V_{GE} = 15 V, I_C = 150 A, T_J = 175°C		–	1.50	–	
Gate−Emitter Threshold Voltage	V_{GE} = V_{CE}, I_C = 1.2 mA	$V_{GE(TH)}$	3.5	4.03	6.4	V
Gate Leakage Current	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	300	nA
Breakdown Voltage	V_{GE} = 0 V, I_C = 1 mA	B_{VCES}	650	–	–	V

Table 3. ELECTRICAL CHARACTERISTICS T_J = 25°C unless otherwise noted

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
NEUTRAL POINT IGBT CHARACTERISTICS						
Turn−on Delay Time	T_J = 25°C V_{CE} = 350 V, I_C = 170 A V_{GE} = −5/+15 V, R_G = 10 Ω	$t_{d(on)}$	–	94	–	ns
Rise Time		t_r	–	45	–	
Turn−off Delay Time		$t_{d(off)}$	–	224	–	
Fall Time		t_f	–	22	–	
Turn−on Switching Loss per Pulse		E_{on}	–	3.1	–	mJ
Turn off Switching Loss per Pulse		E_{off}	–	2.4	–	
Turn−on Delay Time	T_J = 125°C V_{CE} = 350 V, I_C = 170 A V_{GE} = −5/+15 V, R_G = 10 Ω	$t_{d(on)}$	–	92	–	ns
Rise Time		t_r	–	51	–	
Turn−off Delay Time		$t_{d(off)}$	–	244	–	
Fall Time		t_f	–	19	–	
Turn−on Switching Loss per Pulse		E_{on}	–	4.7	–	mJ
Turn off Switching Loss per Pulse		E_{off}	–	3.0	–	
Input Capacitance	V_{CE} = 25 V, V_{GE} = 0 V, f = 100 kHz	C_{ies}	–	9316	–	pF
Output Capacitance		C_{oes}	–	249	–	
Reverse Transfer Capacitance		C_{res}	–	34	–	
Total Gate Charge	V_{CE} = 480 V, I_C = 80 A, V_{GE} = 15 V	Q_g	–	300.9	–	nC
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness < 100 μm, λ = 2.87 W/mK	R_{thJH}	–	0.50	–	°C/W
Thermal Resistance − chip−to−case		R_{thJC}	–	0.36	–	°C/W
HALF BRIDGE FREEWHEEL DIODE CHARACTERISTICS						
Diode Reverse Leakage Current	V_R = 1200 V	I_R	–	–	100	μA
Diode Forward Voltage	I_F =150 A, T_J = 25°C	V_F	1.6	2.71	3.6	V
	I_F = 150 A, T_J = 175°C		–	2.00	–	
Reverse Recovery Time	T_J = 25°C V_{CE} = 350 V, I_C = 170 A V_{GE} = −5/+15 V, R_G = 10 Ω	t_{rr}	–	62	–	ns
Reverse Recovery Charge		Q_{rr}	–	4700	–	nC
Peak Reverse Recovery Current		I_{RRM}	–	144	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	4017	–	A/μs
Reverse Recovery Energy		E_{rr}	–	849	–	μJ
Reverse Recovery Time	T_J = 125°C V_{CE} = 350 V, I_C = 170 A V_{GE} = −5/+15 V, R_G = 10 Ω	t_{rr}	–	107	–	ns
Reverse Recovery Charge		Q_{rr}	–	12510	–	nC
Peak Reverse Recovery Current		I_{RRM}	–	216	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	3815	–	A/μs
Reverse Recovery Energy		E_{rr}	–	2647	–	μJ
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness < 100 μm, λ = 2.87 W/mK	R_{thJH}	–	0.54	–	°C/W
Thermal Resistance − chip−to−case		R_{thJC}	–	0.40	–	°C/W

Table 3. ELECTRICAL CHARACTERISTICS T_J = 25°C unless otherwise noted

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
HALF BRIDGE INVERSE DIODE CHARACTERISTICS						
Diode Forward Voltage	I_F = 7 A, T_J = 25°C	V_F	1.05	1.93	2.80	V
	I_F = 7 A, T_J = 175°C		–	1.29	–	
Thermal Resistance – chip–to–heatsink	Thermal grease, Thickness < 100 μm, λ = 2.87 W/mK	R_{thJH}	–	1.71	–	°C/W
Thermal Resistance – chip–to–case		R_{thJC}	–	1.52	–	°C/W
NEUTRAL POINT INVERSE DIODE CHARACTERISTICS						
Diode Forward Voltage	I_F = 30 A, T_J = 25°C	V_F	1.3	2.35	3.2	V
	I_F = 30 A, T_J = 175°C		–	1.50	–	
Thermal Resistance – chip–to–heatsink	Thermal grease, Thickness 100 μm, λ = 2.87 W/mK	R_{thJH}	–	1.21	–	°C/W
Thermal Resistance – chip–to–case		R_{thJC}	–	1.02	–	°C/W
THERMISTOR CHARACTERISTICS						
Nominal resistance		R_{25}	–	22	–	kQ
Nominal resistance	T = 100°C	R_{100}	–	1486	–	Q
Deviation of R25		R/R	–5	–	5	%
Power dissipation		P_D	–	200	–	mW
Power dissipation constant			–	2	–	mW/K
B–value	B(25/50), tolerance ±3%		–	3950	–	K
B–value	B(25/100), tolerance ±3%		–	3998	–	K

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.

ORDERING INFORMATION

Device	Marking	Package	Shipping
NXH200T120H3Q2F2SG	NXH200T120H3Q2F2SG	Q2PACK – Case 180AK (Pb–Free and Halide–Free)	12 Units / Blister Tray
NXH200T120H3Q2F2STG	NXH200T120H3Q2F2STG	Q2PACK – Case 180AK (Pb–Free and Halide–Free)	12 Units / Blister Tray

TYPICAL CHARACTERISTICS – HALF BRIDGE IGBT AND NEUTRAL POINT DIODE

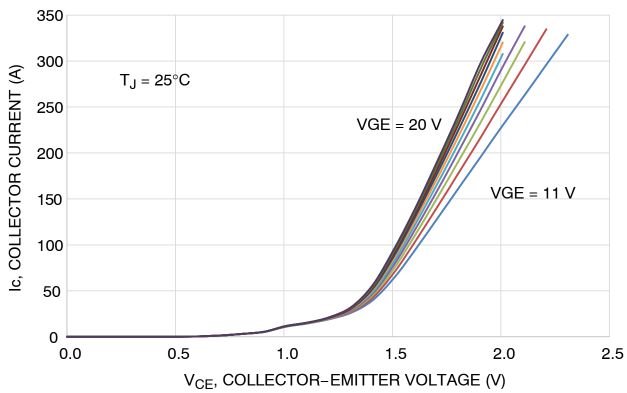


Figure 2. Typical Output Characteristics

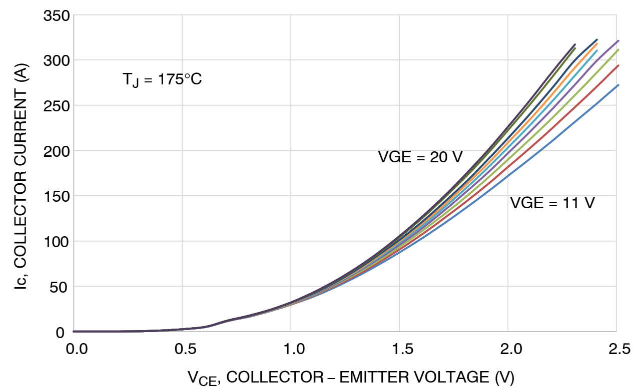


Figure 3. Typical Output Characteristics

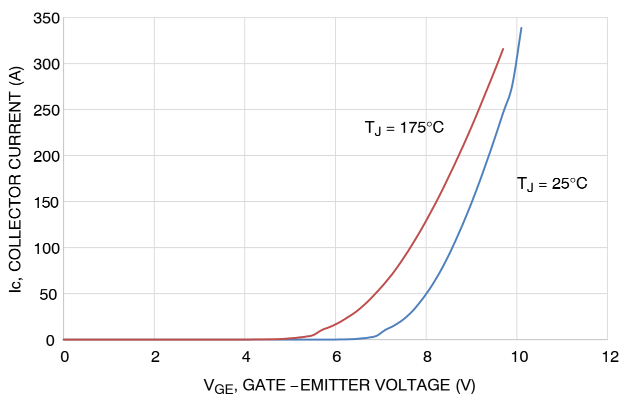


Figure 4. Typical Transfer Characteristics

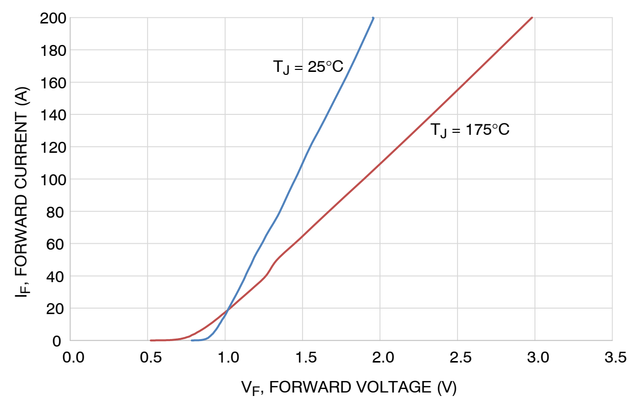


Figure 5. Typical Diode Forward Characteristics

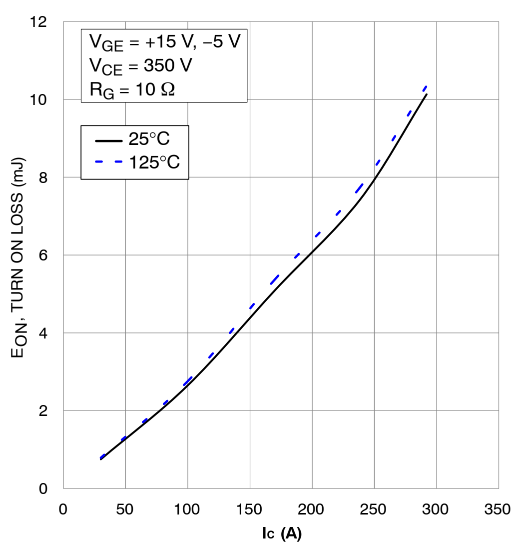


Figure 6. Typical Turn ON Loss vs. I_C

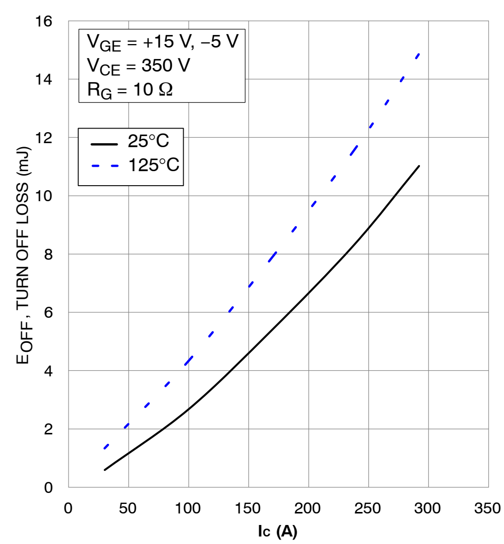


Figure 7. Typical Turn OFF Loss vs. I_C

TYPICAL CHARACTERISTICS – HALF BRIDGE IGBT AND NEUTRAL POINT DIODE

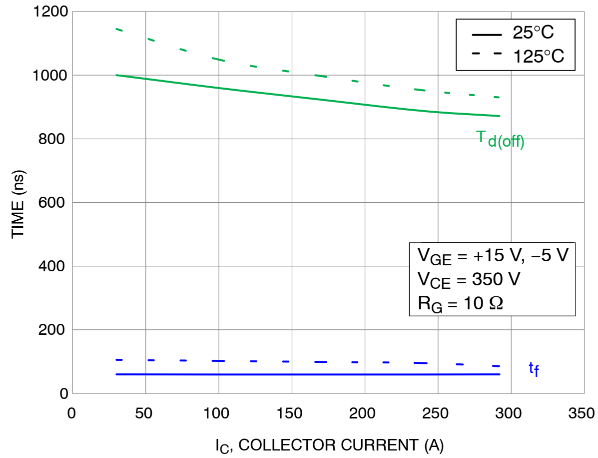


Figure 8. Typical Turn−Off SwitchingTime vs. I_C

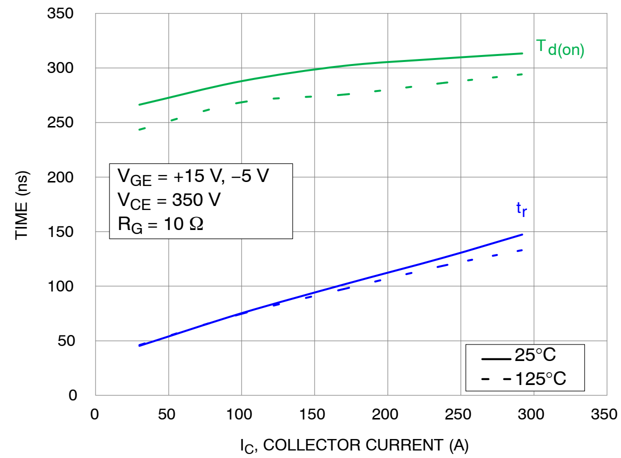


Figure 9. Typical Turn−On Switching Time vs. I_C

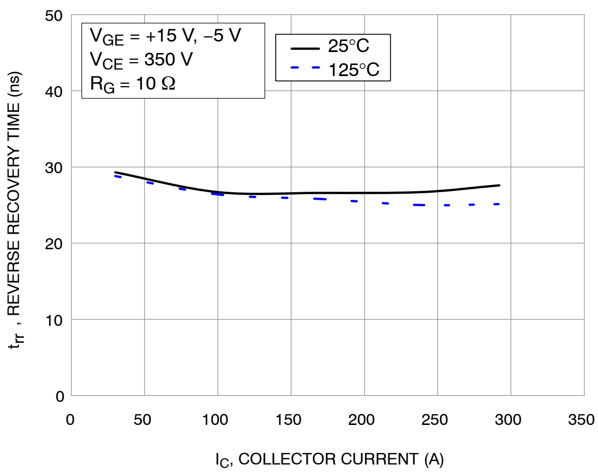


Figure 10. Typical Reverse Recovery Time vs. I_C

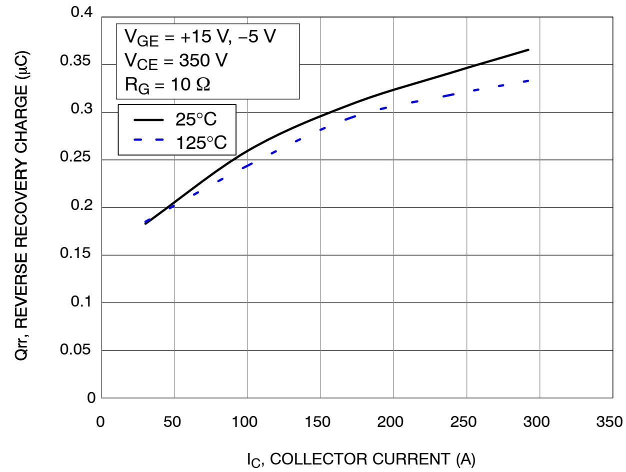


Figure 11. Typical Reverse Recovery Charge vs. I_C

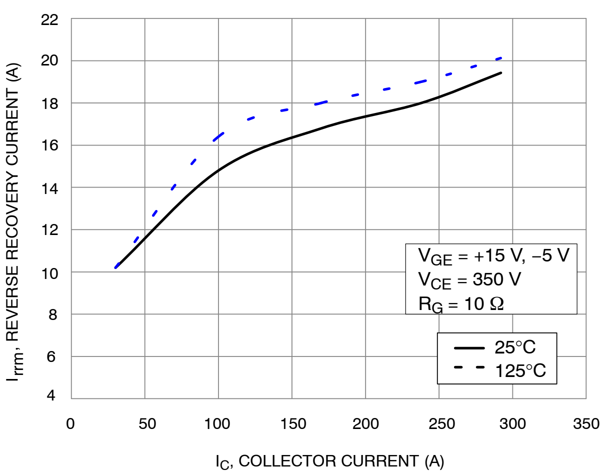


Figure 12. Typical Reverse Recovery Peak Current vs. I_C

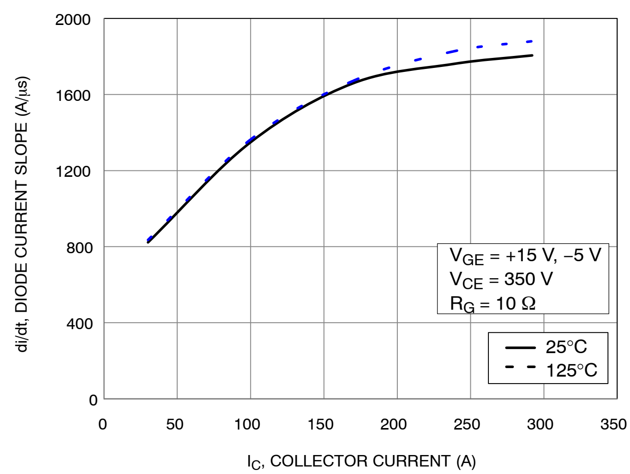


Figure 13. Typical Diode Current Slope vs. I_C

TYPICAL CHARACTERISTICS – HALF BRIDGE IGBT AND NEUTRAL POINT DIODE

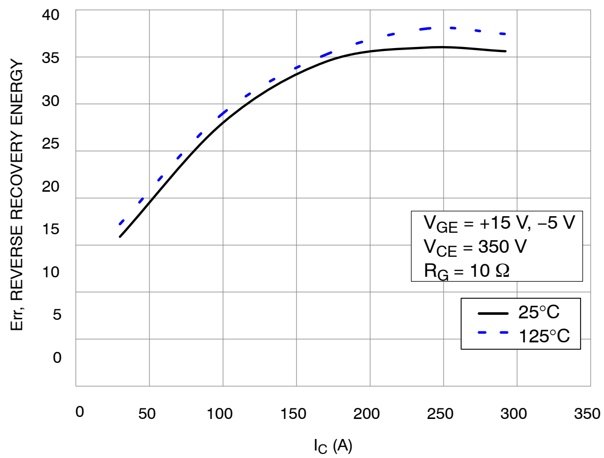


Figure 14. Typical Reverse Recovery Energy vs. I_C

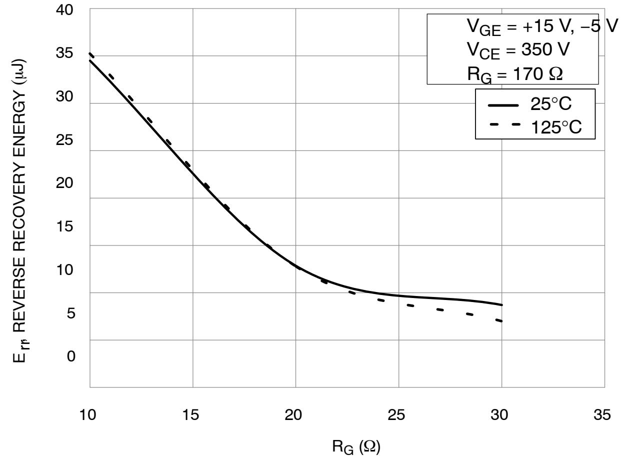


Figure 15. Typical Reverse Recovery Energy Loss vs. R_G

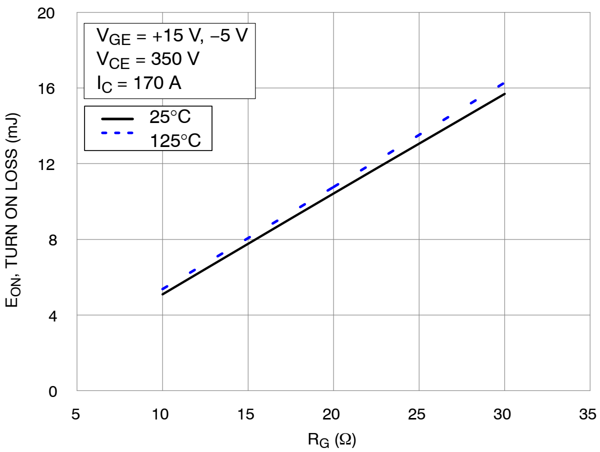


Figure 16. Typical Turn ON Loss vs. R_G

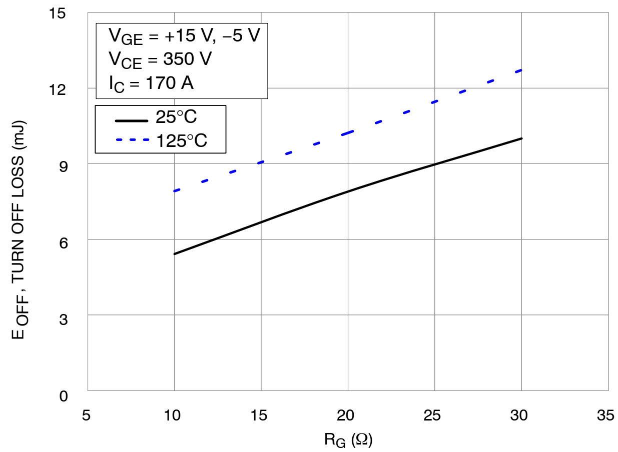


Figure 17. Typical Turn OFF vs. R_G

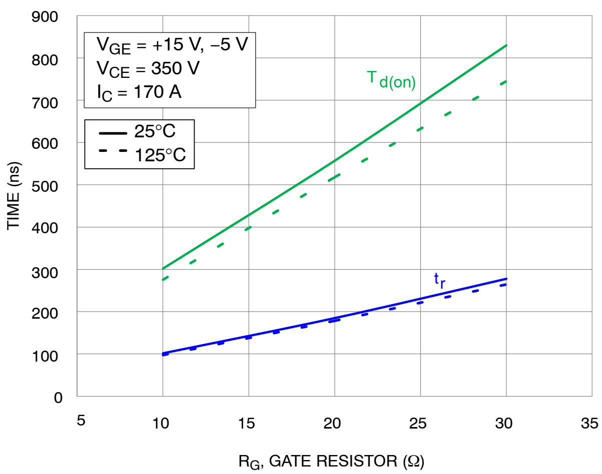


Figure 18. Typical Turn ON Switching Time vs. R_G

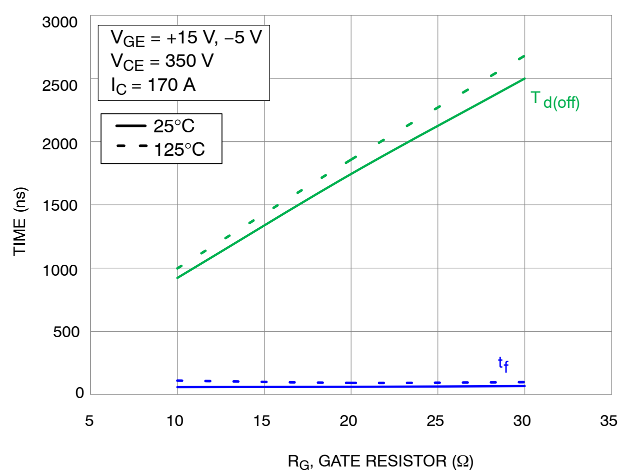


Figure 19. Typical Turn OFF Switching Time vs. R_G

TYPICAL CHARACTERISTICS – HALF BRIDGE IGBT AND NEUTRAL POINT DIODE

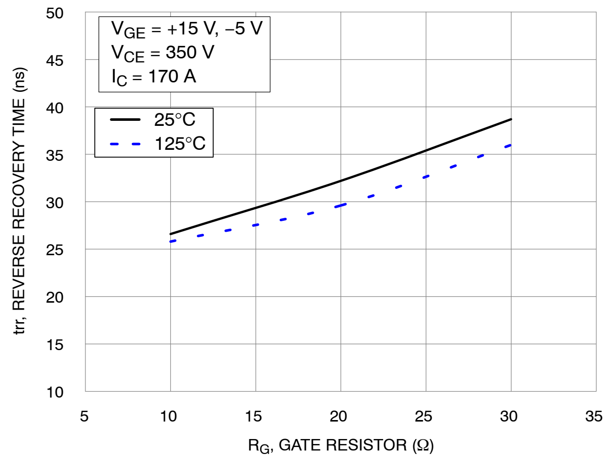


Figure 20. Typical Reverse Recovery Energy vs. I_C

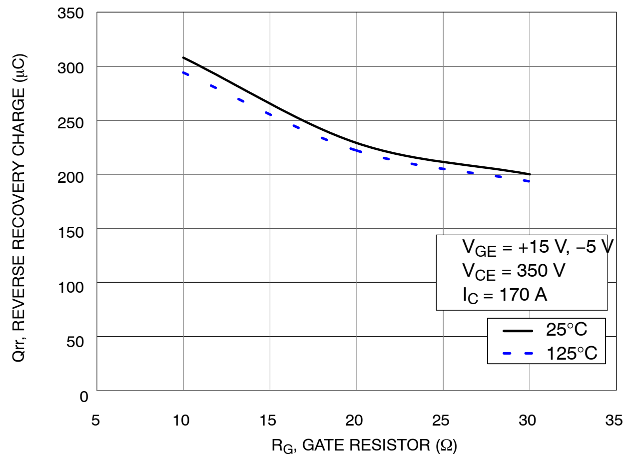


Figure 21. Typical Reverse Recovery Energy Loss vs. R_G

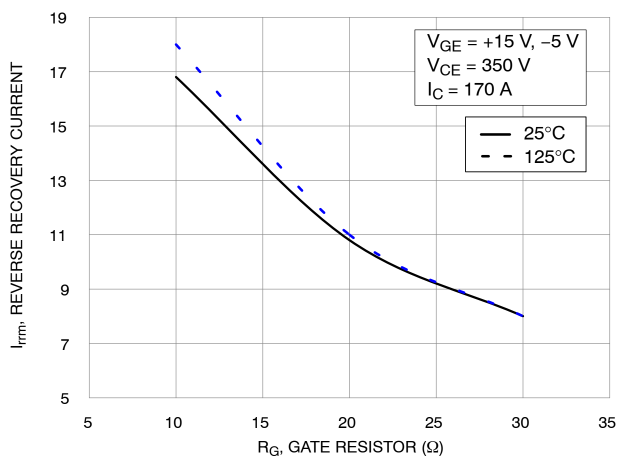


Figure 22. Typical Turn ON Loss vs. R_G

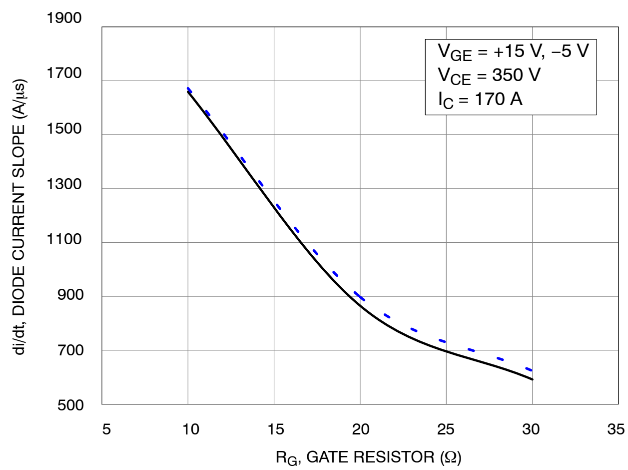


Figure 23. Typical Turn OFF vs. R_G

Figure 24. Gate Voltage vs. Gate Charge

TYPICAL CHARACTERISTICS – HALF BRIDGE IGBT AND NEUTRAL POINT DIODE

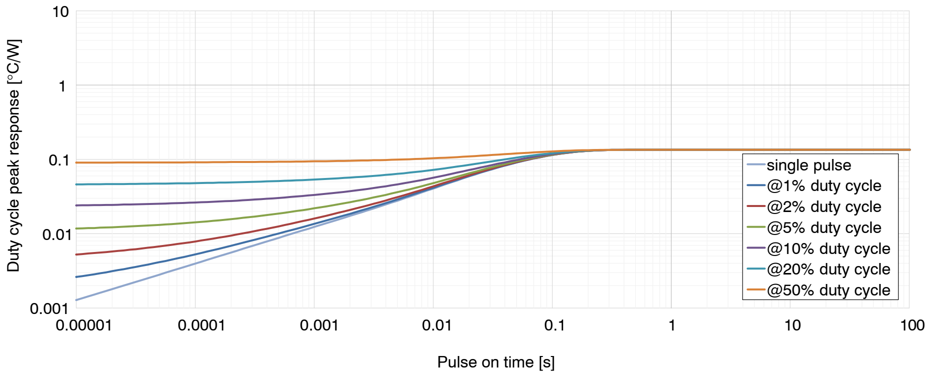


Figure 25. IGBT Transient Thermal Impedance

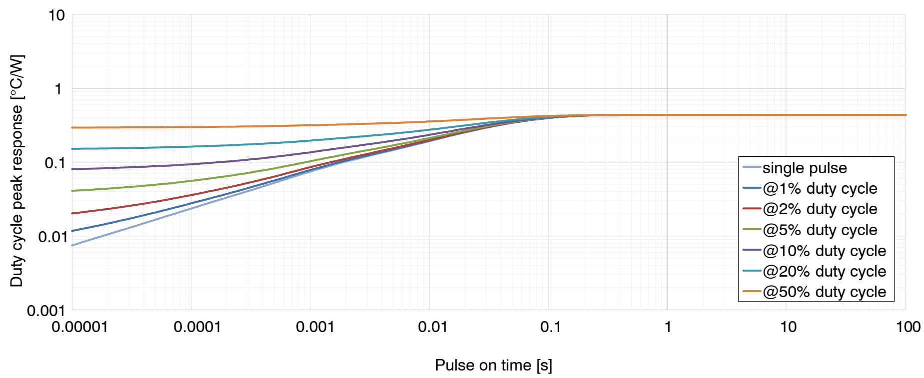


Figure 26. Diode Transient Thermal Impedance

TYPICAL CHARACTERISTICS – HALF BRIDGE IGBT AND NEUTRAL POINT DIODE

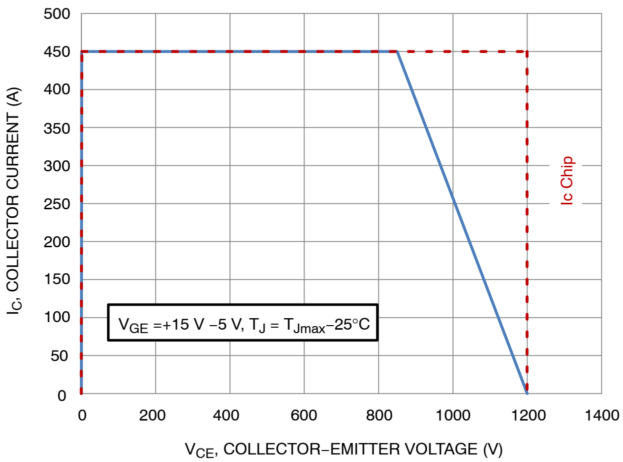


Figure 27. HB IGBT RBSOA

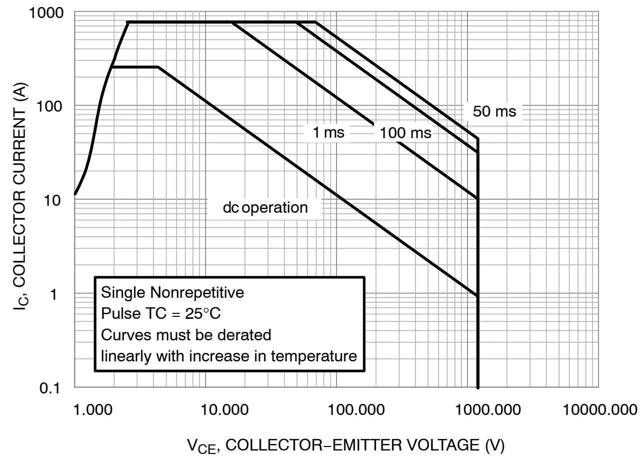


Figure 28. HB IGBT FBSOA

TYPICAL CHARACTERISTICS – NEUTRAL POINT IGBT AND HALF BRIDGE DIODE

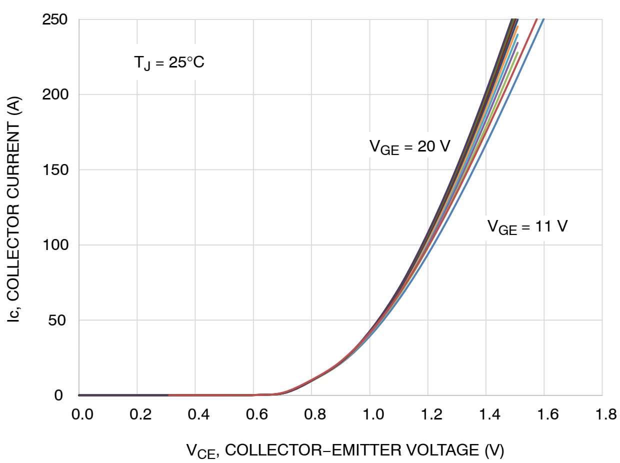


Figure 29. Typical Output Characteristics

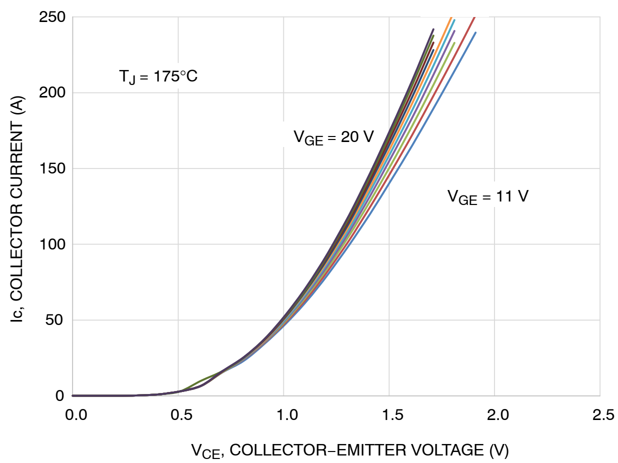


Figure 30. Typical Output Characteristics

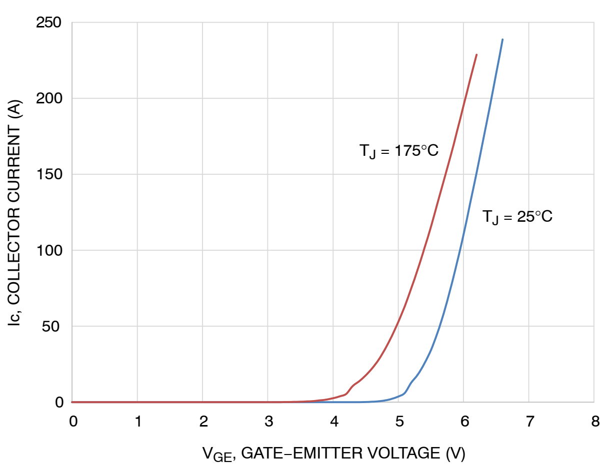


Figure 31. Typical Transfer Characteristics

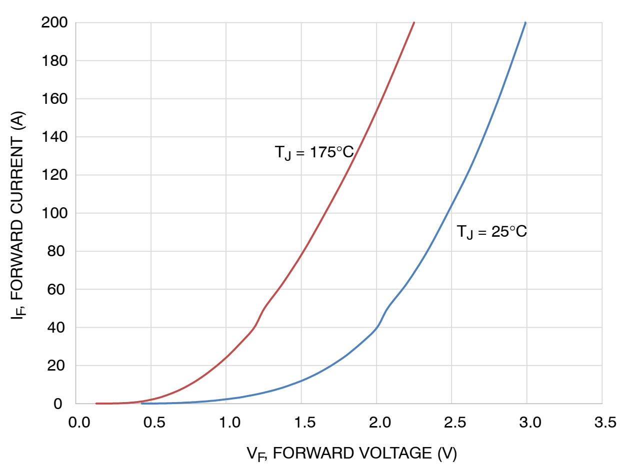


Figure 32. Typical Diode Forward Characteristics

TYPICAL CHARACTERISTICS – NEUTRAL POINT IGBT AND HALF BRIDGE DIODE

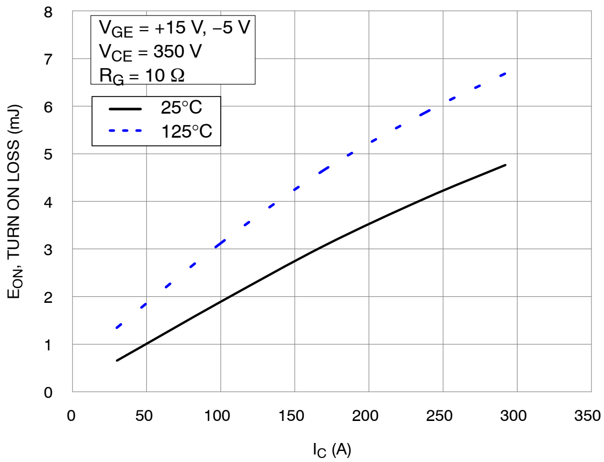


Figure 33. Typical Turn ON Loss vs. I_C

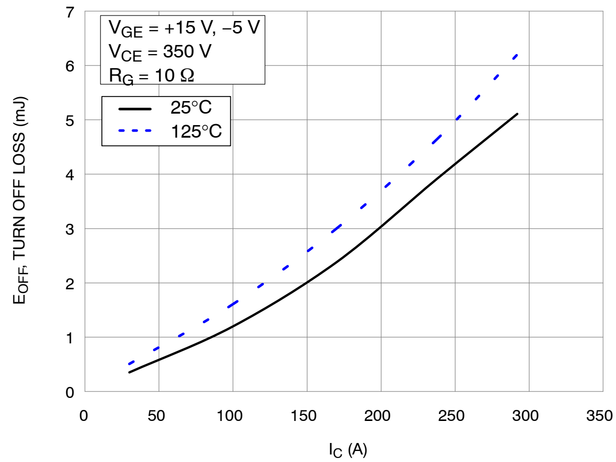


Figure 34. Typical Turn OFF Loss vs. I_C

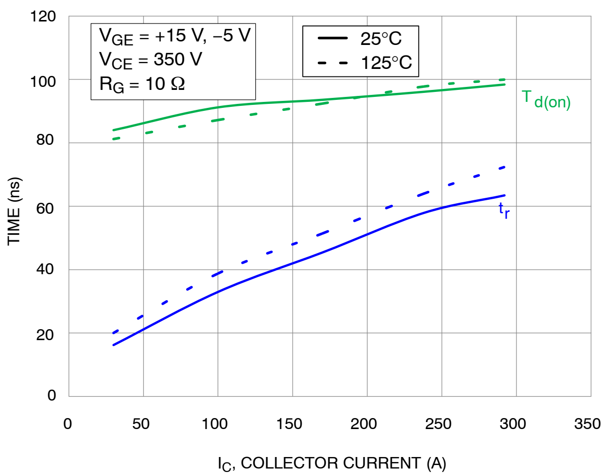


Figure 35. Typical Turn ON Switching Time vs. I_C

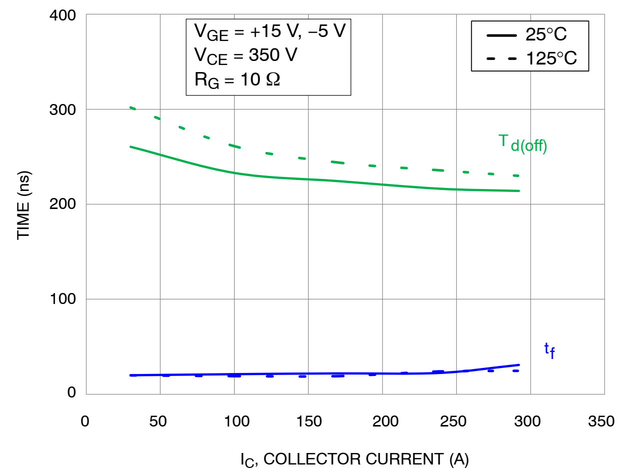


Figure 36. Typical Turn OFF Switching Time vs. I_C

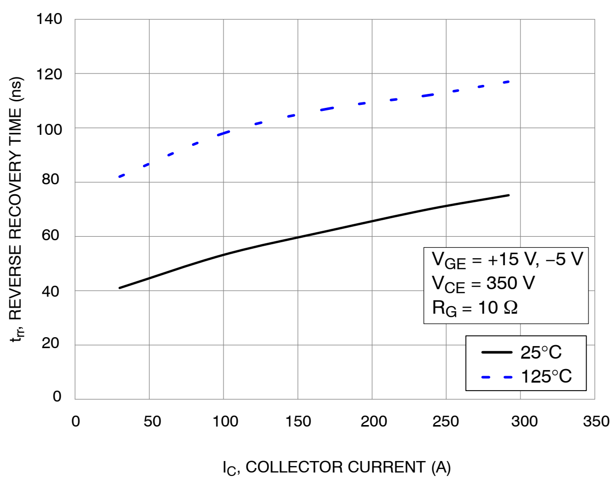


Figure 37. Typical Reverse Recovery Time vs. I_C

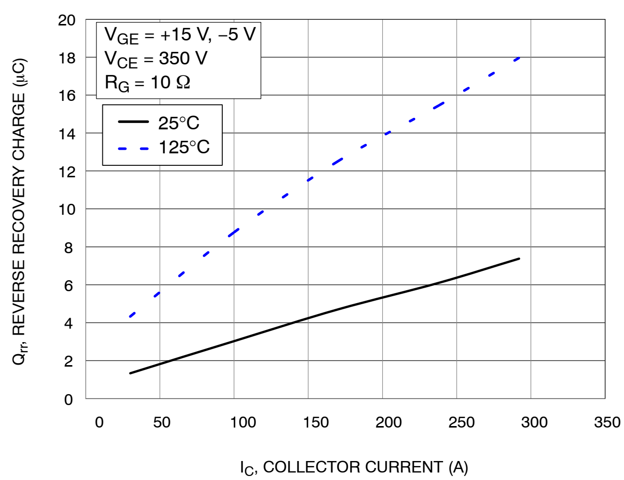


Figure 38. Typical Reverse Recovery Charge vs. I_C

TYPICAL CHARACTERISTICS – NEUTRAL POINT IGBT AND HALF BRIDGE DIODE

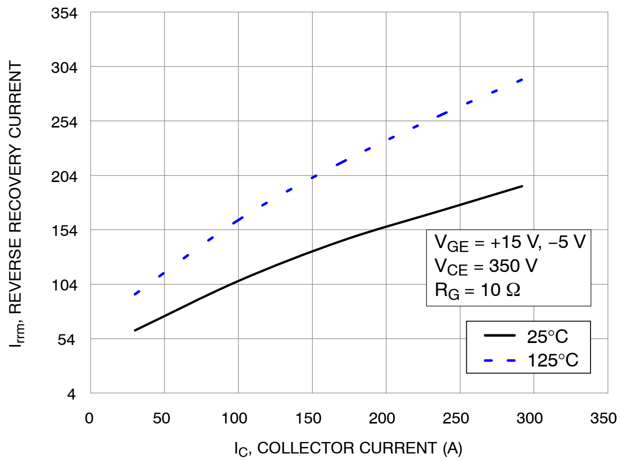


Figure 39. Typical Turn ON Loss vs. I_C

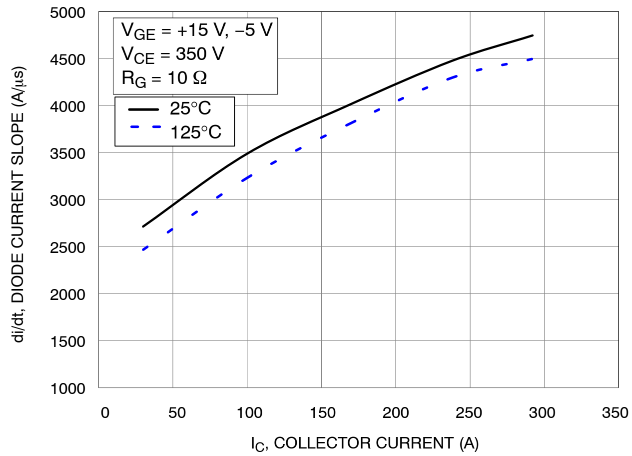


Figure 40. Typical Turn OFF Loss vs. I_C

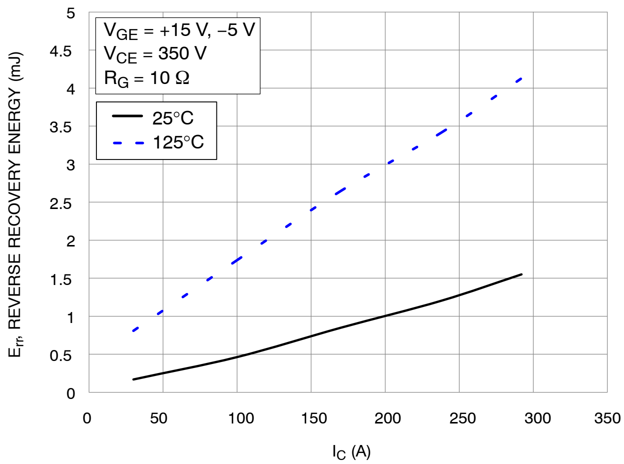


Figure 41. Typical Turn ON Switching Time vs. I_C

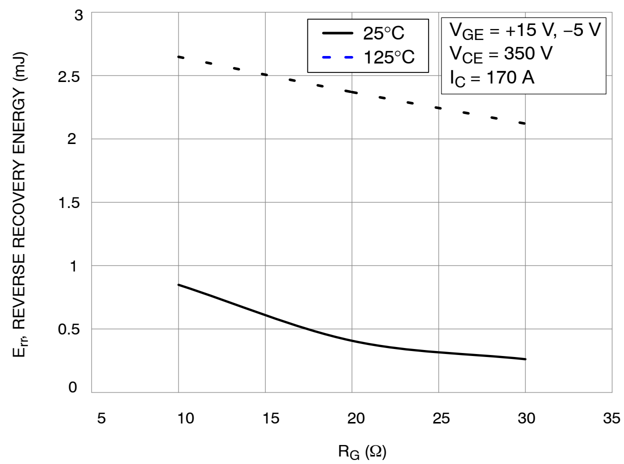


Figure 42. Typical Turn OFF Switching Time vs. I_C

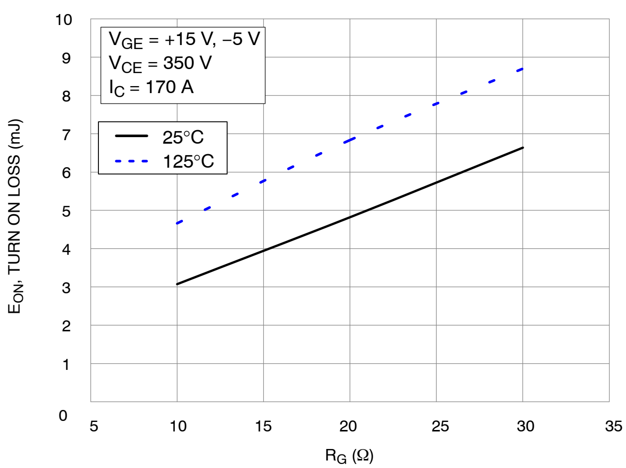


Figure 43. Typical Turn ON Loss vs. R_G

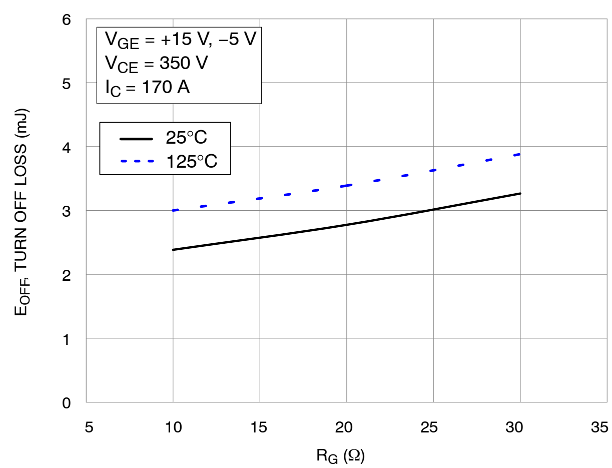


Figure 44. Typical Turn OFF vs. R_G

TYPICAL CHARACTERISTICS – NEUTRAL POINT IGBT AND HALF BRIDGE DIODE

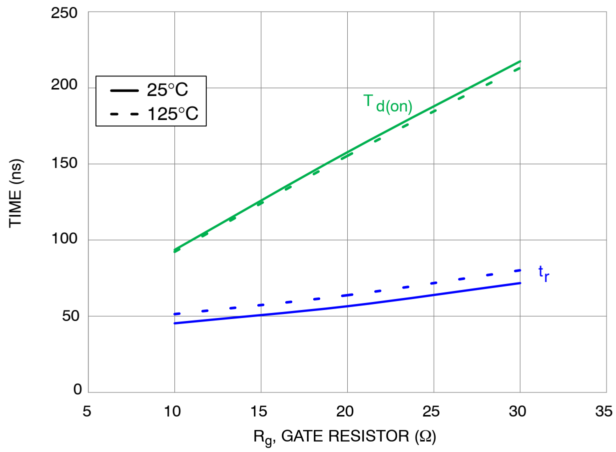


Figure 45. Typical Turn ON Switching Time vs. R_G

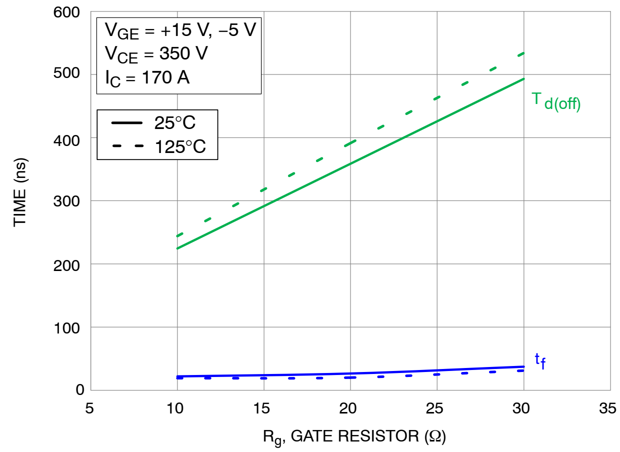


Figure 46. Typical Turn OFF Switching Time vs. R_G

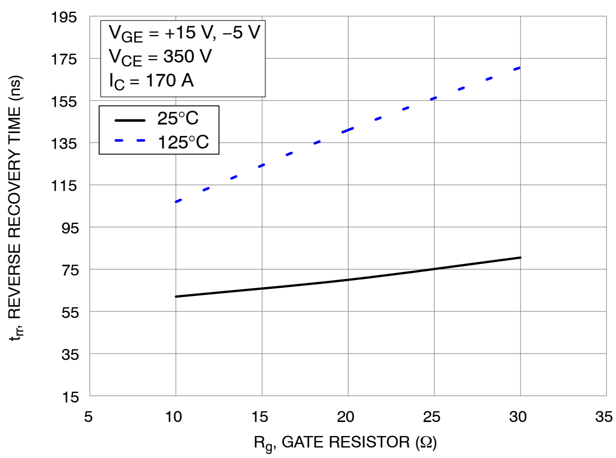


Figure 47. Typical Reverse Recovery Time vs. R_G

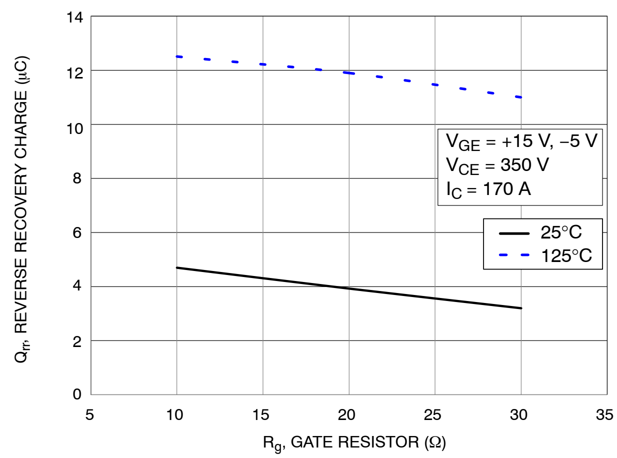


Figure 48. Typical Reverse Recovery Charge vs. R_G

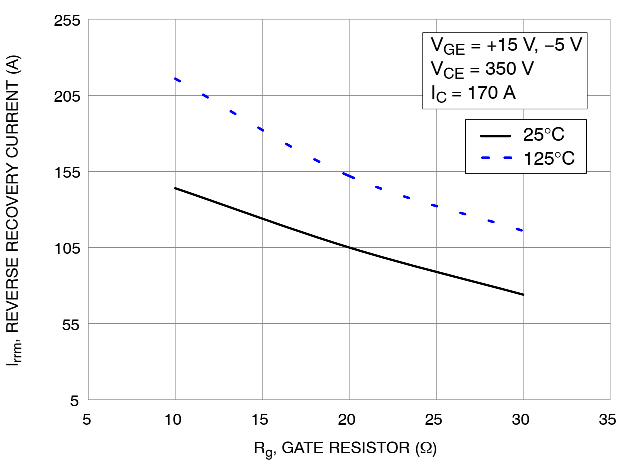


Figure 49. Typical Reverse Recovery Peak Current vs. R_G

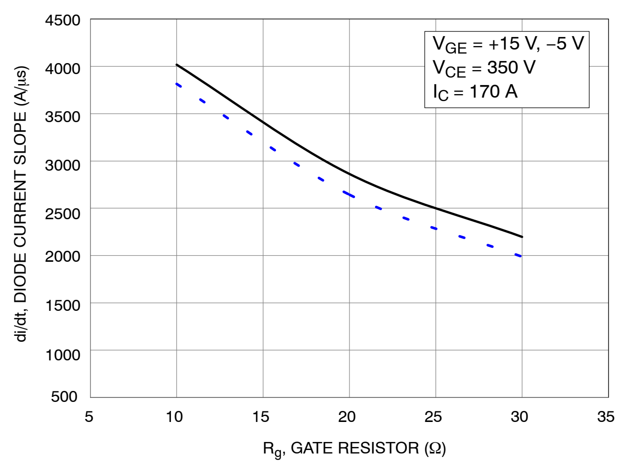


Figure 50. Typical Di/Dt vs. R_G

TYPICAL CHARACTERISTICS – NEUTRAL POINT IGBT AND HALF BRIDGE DIODE

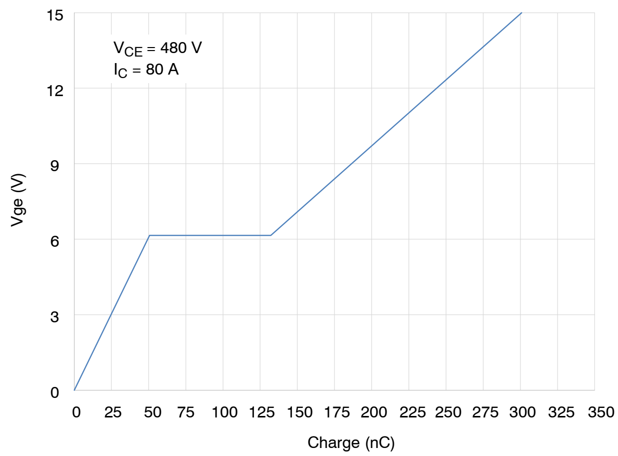


Figure 51. Gate Voltage vs. Gate Charge

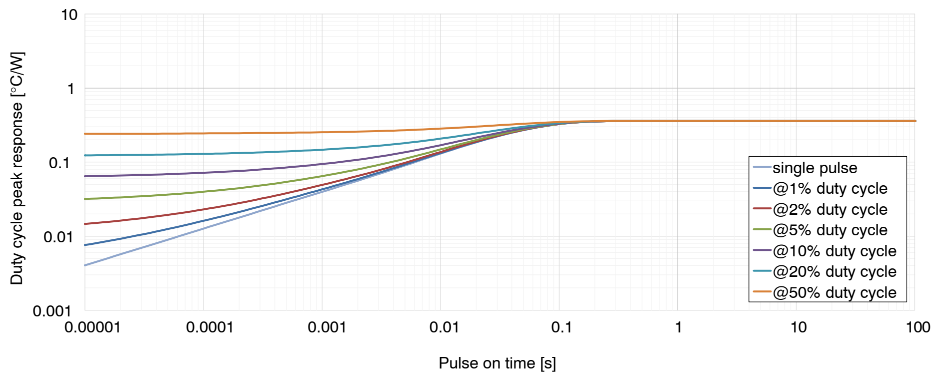


Figure 52. IGBT Transient Thermal Impedance

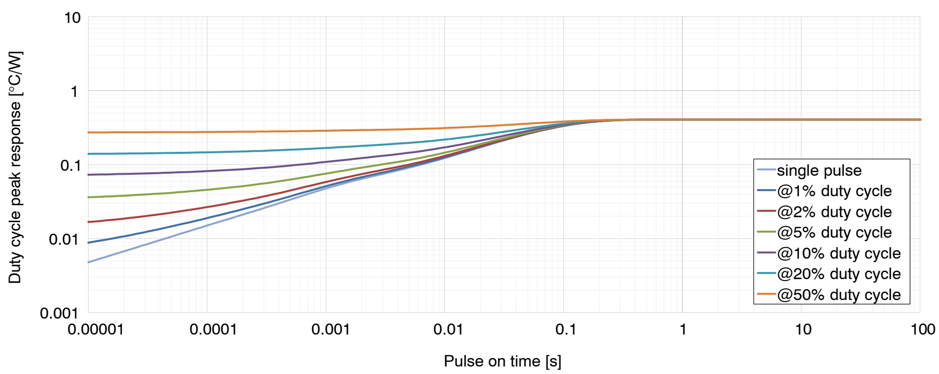


Figure 53. Diode Transient Thermal Impedance

TYPICAL CHARACTERISTICS – NEUTRAL POINT IGBT AND HALF BRIDGE DIODE

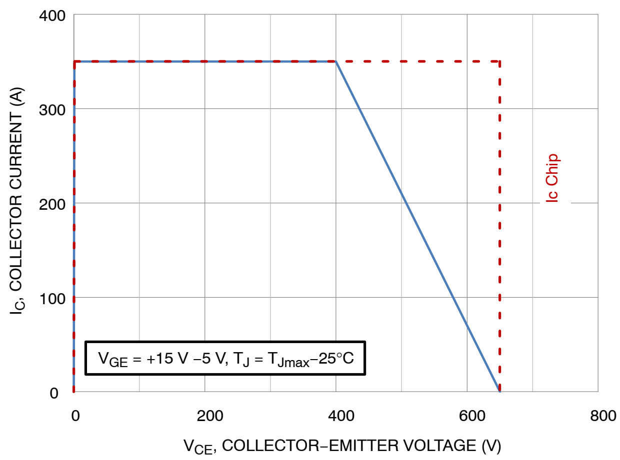


Figure 54. NP IGBT RBSOA

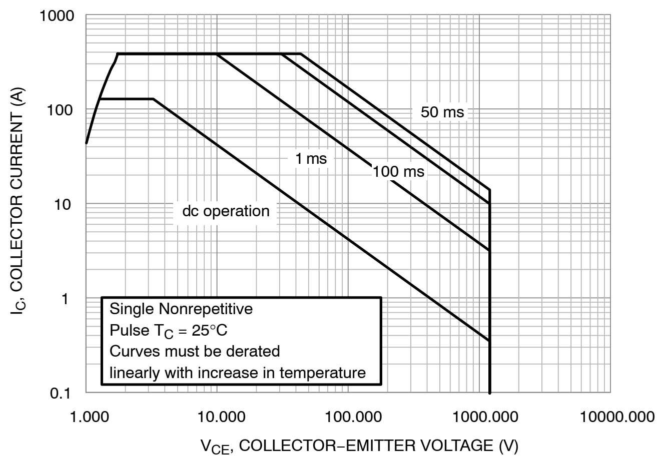


Figure 55. NP IGBT FBSOA

TYPICAL CHARACTERISTICS – HALF BRIDGE INVERSE DIODE

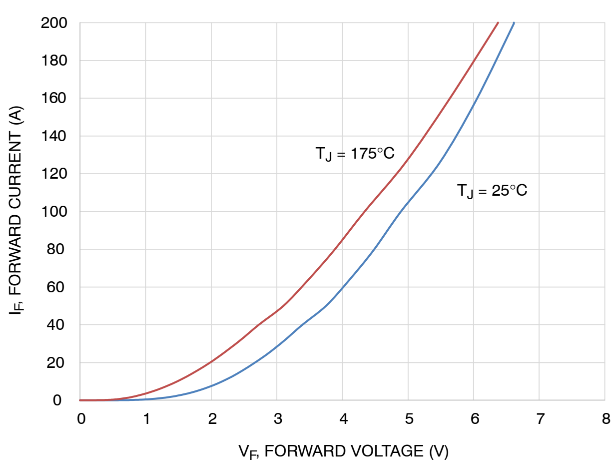


Figure 56. Diode Forward Characteristic

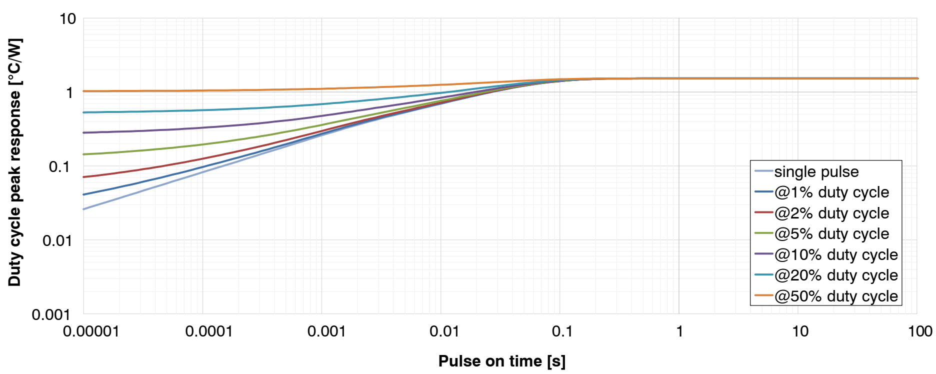


Figure 57. Diode Transient Thermal Impedance

TYPICAL CHARACTERISTICS – NEUTRAL POINT INVERSE DIODE

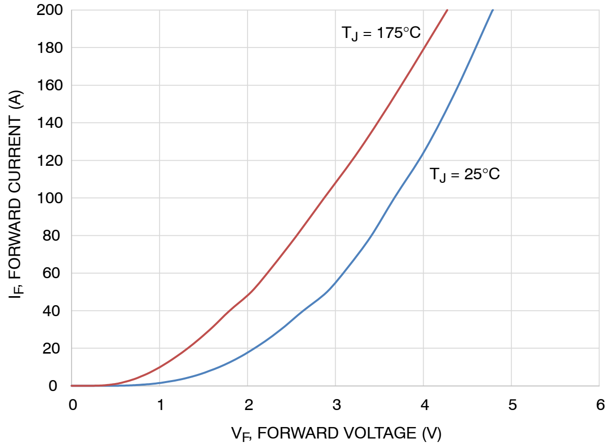


Figure 58. Diode Forward Characteristic

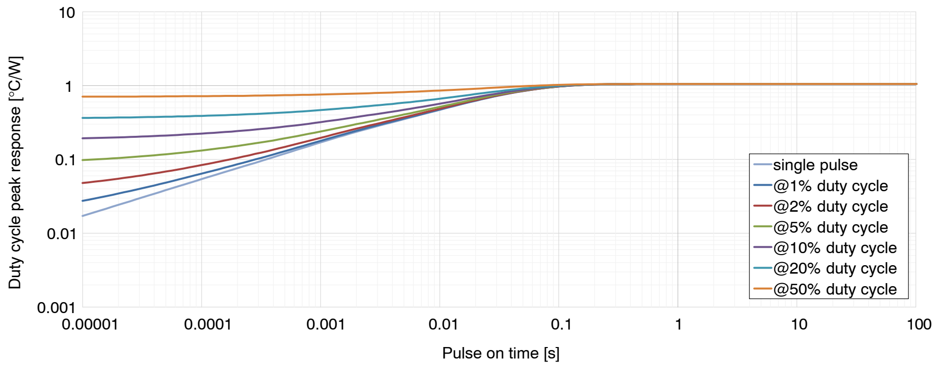


Figure 59. Diode Transient Thermal Impedance

TYPICAL CHARACTERISTICS – THERMISTOR

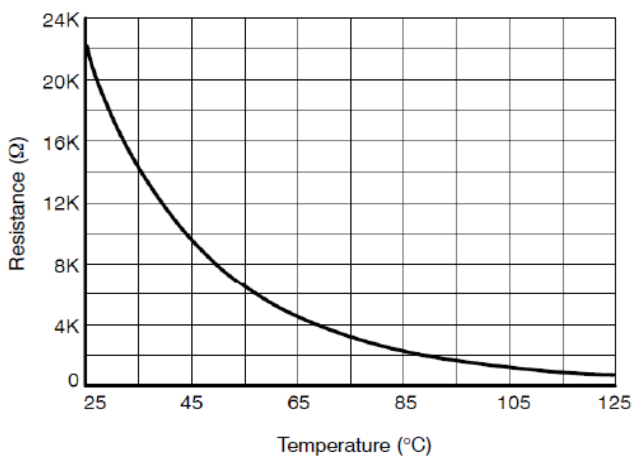
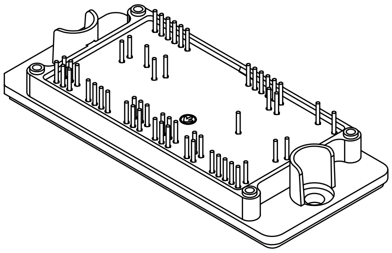
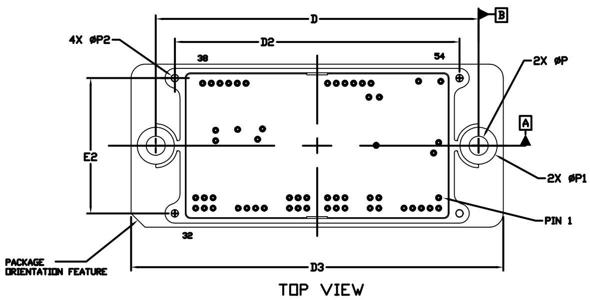


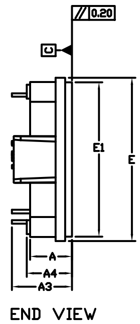
Figure 60. Thermistor Characteristics



PIM56, 93x47 (SOLDER PIN)
CASE 180AK
ISSUE B

DATE 08 NOV 2017

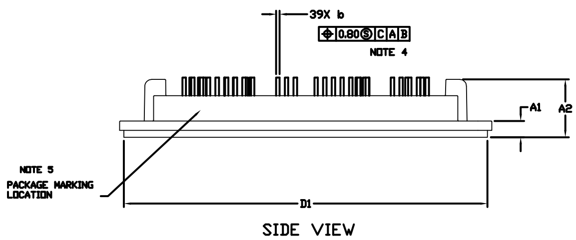


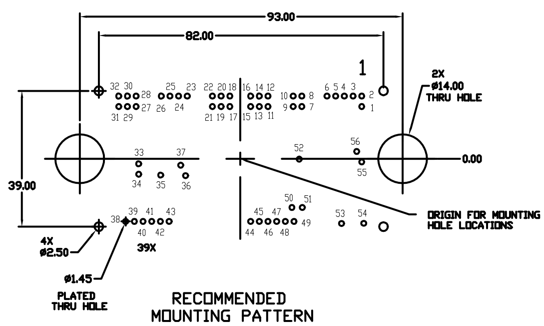


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS b APPLIES TO THE PLATED TERMINALS AND IS MEASURED BETWEEN 1.00 AND 3.00 FROM THE TERMINAL TIP.
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 WITH THE PACKAGE ORIENTATION FEATURE.

DIM	MILLIMETERS MIN.	MILLIMETERS MAX.
A	11.80	12.20
A1	4.50	4.90
A2	16.50	16.90
A3	16.70	17.70
A4	12.80	13.20
b	0.95	1.05
D	92.80	93.20
D1	104.60	104.90
D2	81.80	82.20
D3	106.90	107.50
E	46.75	47.25
E1	44.30	44.50
E2	38.80	39.20
P	5.40	5.60
P1	10.60	10.80
P2	2.20	2.40





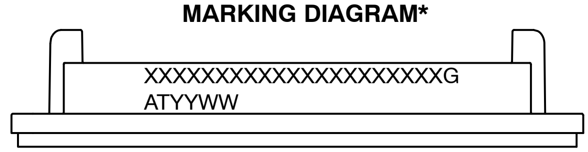
NOTE 4

PIN	PIN POSITION X	PIN POSITION Y	PIN	PIN POSITION X	PIN POSITION Y
1	35.00	−15.00	29	−32.50	−15.00
2	35.00	−18.00	30	−32.50	−18.00
3	32.50	−18.00	31	−35.00	−15.00
4	30.00	−18.00	32	−35.00	−18.00
5	27.50	−18.00	33	−29.25	1.45
6	25.00	−18.00	34	−29.25	4.45
7	17.75	−15.00	35	−22.90	4.70
8	17.75	−18.00	36	−15.75	4.85
9	15.25	−15.00	37	−17.15	1.85
10	15.25	−18.00	38	−33.00	18.00
11	8.00	−15.00	39	−30.50	18.00
12	8.00	−18.00	40	−28.00	18.00
13	5.50	−15.00	41	−25.50	18.00
14	5.50	−18.00	42	−23.00	18.00
15	3.00	−15.00	43	−20.50	18.00
16	3.00	−18.00	44	3.00	18.00
17	−3.00	−15.00	45	5.50	18.00
18	−3.00	−18.00	46	8.00	18.00
19	−5.50	−15.00	47	10.50	18.00
20	−5.50	−18.00	48	13.00	18.00
21	−8.00	−15.00	49	15.50	18.00
22	−8.00	−18.00	50	14.90	14.00
23	−15.25	−18.00	51	17.90	14.00
24	−17.75	−18.00	52	17.00	0.10
25	−20.25	−18.00	53	29.20	18.60
26	−22.75	−18.00	54	35.60	18.55
27	−30.00	−15.00	55	35.00	0.90
28	−30.00	−18.00	56	33.55	−2.10

MOUNTING HOLE POSITION

PIN	PIN POSITION X	PIN POSITION Y	PIN	PIN POSITION X	PIN POSITION Y
1	35.00	15.00	29	−32.50	15.00
2	35.00	18.00	30	−32.50	18.00
3	32.50	18.00	31	−35.00	15.00
4	30.00	18.00	32	−35.00	18.00
5	27.50	18.00	33	−29.25	−1.45
6	25.00	18.00	34	−29.25	−4.45
7	17.75	15.00	35	−22.90	−4.70
8	17.75	18.00	36	−15.75	−4.85
9	15.25	15.00	37	−17.15	−1.85
10	15.25	18.00	38	−33.00	−18.00
11	8.00	15.00	39	−30.50	−18.00
12	8.00	18.00	40	−28.00	−18.00
13	5.50	15.00	41	−25.50	−18.00
14	5.50	18.00	42	−23.00	−18.00
15	3.00	15.00	43	−20.50	−18.00
16	3.00	18.00	44	3.00	−18.00
17	−3.00	15.00	45	5.50	−18.00
18	−3.00	18.00	46	8.00	−18.00
19	−5.50	15.00	47	10.50	−18.00
20	−5.50	18.00	48	13.00	−18.00
21	−8.00	15.00	49	15.50	−18.00
22	−8.00	18.00	50	14.90	−14.00
23	−15.25	18.00	51	17.90	−14.00
24	−17.75	18.00	52	17.00	−0.10
25	−20.25	18.00	53	29.20	−18.60
26	−22.75	18.00	54	35.60	−18.55
27	−30.00	15.00	55	35.00	−0.90
28	−30.00	18.00	56	33.55	2.10

GENERIC MARKING DIAGRAM*



XXXXX = Specific Device Code
G = Pb−Free Package
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.

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