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NXH80T120L2Q0PG, NXH80T120L2Q0SG

T-Type, Neutral Point Clamp Module

This high−density, integrated power module combines high−performance IGBTs with rugged anti−parallel diodes for sine wave inverter applications.

Features

- Extremely Efficient Trench IGBT with Fieldstop Technology
- Module Design Offers High Power Density
- Low Inductive Layout
- Q0PACK Package with Press−Fit Pins

Typical Applications

- Solar Inverters
- Uninterruptable Power Supplies

ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
BRIDGE IGBT			
Collector−emitter voltage	V_{CES}	1200	V
Collector current T_h = 80°C	I_C	65	A
Pulsed Collector Current, T_{pulse} Limited by T_{jmax}	I_{CM}	260	A
Gate−emitter voltage	V_{GE}	±20	V
Power Dissapation per IGBT $T_j = T_{jmax}$ T_h = 80°C	P_{total}	146	W
Short Circuit Withstand Time V_{GE} = 15 V, V_{CE} = 600 V, $T_J \le 150$°C	T_{SC}	10	μs
NEUTRAL POINT IGBT			
Collector−emitter voltage (Bridge)	V_{CES}	600	V
Collector current @ T_h = 80°C	I_C	59	A
Pulsed Collector Current, T_{pulse} Limited by T_{jmax}	I_{CM}	235	A
Gate−emitter voltage	V_{GE}	±20	V
Power Dissapation per IGBT $T_j = T_{jmax}$ T_h = 80°C	P_{total}	66	W
Short Circuit Withstand Time V_{GE} = 15 V, V_{CE} = 400 V, $T_J \le 150$°C	T_{SC}	5	μs

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.

ON Semiconductor®

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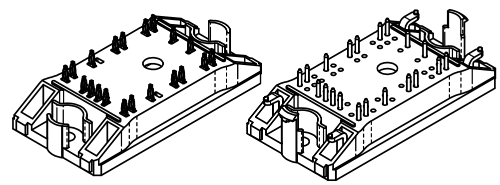
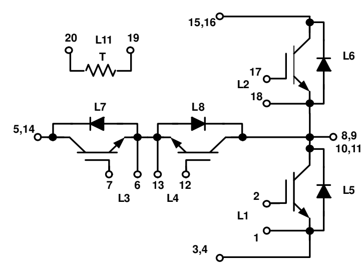
80 A, 1200 V (Bridge)
50 A, 600 V (Neutral Point Clamp)
T – Type Neutral Point Clamp

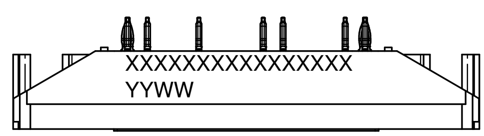


Q0PACK CASE 180AA **Q0PACK CASE 180AB**

SCHEMATIC



MARKING DIAGRAM

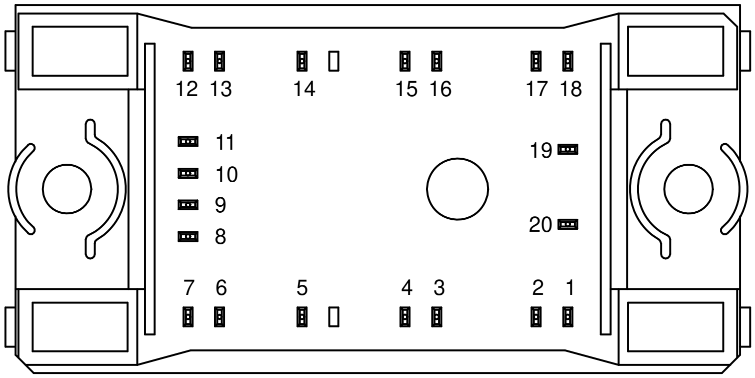


YYWW = Year and Work Week Code

ORDERING INFORMATION

See detailed ordering and shipping information in the dimensions section on page 13 of this data sheet.

PIN ASSIGNMENTS



ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
BRIDGE DIODE			
Peak Repetitive Voltage	V_{RRM}	1200	V
Forward Current, DC @ T_C = 80°C	I_F	41	A
Power Dissipation per Diode $T_j = T_{jmax}$ T_h = 80°C	P_{total}	69	W
Nonrepetitive Peak Surge Current (Surge applied at rated load conditions halfwave, single phase, 60 Hz)	I_{FSM}	300	A
I^2t – value (Surge applied at rated load conditions halfwave, single phase, 60 Hz)	I^2t	373.5	A^2s
NEUTRAL POINT DIODE			
Diode peak repetitive voltage	V_{RRM}	600	V
Forward Current, DC @ T_h = 80°C	I_F	36	A
Power Dissipation per Diode $T_j = T_{jmax}$ T_h = 80°C	P_{total}	51	W
Nonrepetitive Peak Surge Current (Surge applied at rated load conditions halfwave, single phase, 60 Hz)	I_{FSM}	500	A
I^2t – value (Surge applied at rated load conditions halfwave, single phase, 60 Hz)	I^2t	1037.5	A^2s

THERMAL & SAFETY CHARACTERISTICS

Rating	Symbol	Value	Unit
Maximum junction temperature range IGBT Diode	T_J	 175 175	°C
Storage temperature range	T_{stg}	–40 to 150	°C
Operating Temperature under Switching conditions	$T_{VJ\ OP}$	–40 to 150	°C
Isolation test voltage, t = 1 min, 60 Hz	V_{is}	2500	Vac
Creepage distance		12.7	mm
Clearance		12.7	mm

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

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
HALF BRIDGE IGBT CHARACTERISTICS						
Collector–emitter saturation voltage	V_{GE} = 15 V, I_C = 80 A, T_J = 25°C V_{GE} = 15 V, I_C = 80 A, T_J = 150°C	$V_{CE(sat)}$	1.7	2.17 2.20	2.7	V
Gate–emitter threshold voltage	V_{GE} = V_{CE}, I_C = 1.5 mA	$V_{GE(TH)}$	5.0	6.0	6.5	V
Collector–emitter cutoff current	V_{GE} = 0 V, V_{CE} = 1200 V	I_{CES}	–	–	200	μA
Gate leakage current	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	1.2	μA
Turn–on delay time	T_j = 25°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	35	–	ns
Rise time		t_r	–	28	–	
Turn–off delay time		$t_{d(off)}$	–	280	–	
Fall time		t_f	–	28	–	
Turn on switching loss		E_{on}	–	0.670	–	mJ
Turn off switching loss		E_{off}	–	1.3	–	
Turn–on delay time	T_j = 150°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	80	–	ns
Rise time		t_r	–	30	–	
Turn–off delay time		$t_{d(off)}$	–	320	–	
Fall time		t_f	–	230	–	
Turn on switching loss		E_{on}	–	0.975	–	mJ
Turn off switching loss		E_{off}	–	3.00	–	
Input capacitance	V_{CE} =20 V. V_{GE} = 0 V. f = 10 KHz	C_{ies}	–	19940	–	pF
Output capacitance		C_{oes}	–	592	–	
Reverse transfer capacitance		C_{res}	–	383	–	
Gate charge total	V_{CE} = 960 V, I_C = 40 A, V_{GE} = ±15 V	Q_g	–	840	–	nC
Thermal Resistance, chip–to–heatsink	Thermal grease thickness ≤ 50 μm λ = 1 W/mK	$R_{θJH}$		0.65		°C/W
HALF BRIDGE DIODE CHARACTERISTICS						
Forward voltage	V_{GE} = 0 V, I_F = 50 A, T_J = 25°C V_{GE} = 0 V, I_F = 50 A, T_j = 150°C	V_F	– –	1.81 1.90	2.4 –	V
Reverse recovery time	T_j = 25°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	0.12	–	μs
Reverse recovery charge		Q_{rr}	–	4.7	–	μC
Peak reverse recovery current		I_{rrm}	–	135	–	A
Peak rate of fall of recovery current		di/dt_{max}	–	7200	–	A/μs
Reverse recovery energy		E_{rr}	–	1.37	–	mJ
Reverse recovery time	T_j = 150°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	0.14	–	μs
Reverse recovery charge		Q_{rr}	–	7.65	–	μC
Peak reverse recovery current		I_{rrm}	–	138	–	A
Peak rate of fall of recovery current		di/dt_{max}	–	4900	–	A/μs
Reverse recovery energy		E_{rr}	–	2.15	–	mJ
Thermal Resistance, chip–to–heatsink	Thermal grease thickness ≤ 50 μm λ = 1 W/mK	$R_{θJH}$		1.38		°C/W
NEUTRAL POINT CLAMP IGBT CHARACTERISTICS						
Collector–emitter saturation voltage	V_{GE} = 15 V, I_C = 30 A, T_J = 25°C V_{GE} = 15 V, I_C = 30 A, T_J = 150°C	$V_{CE(sat)}$	1.1	1.3 1.3	1.6	V
Gate–emitter threshold voltage	V_{GE} = V_{CE}, I_C = 1.2 mA	$V_{GE(TH)}$	5.0	5.7	6.5	V
Collector–emitter cutoff current	V_{GE} = 0 V, V_{CE} = 600 V	I_{CES}	–	–	100	μA
Gate leakage current	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	0.60	μA

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

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
NEUTRAL POINT CLAMP IGBT CHARACTERISTICS						
Turn−on delay time	T_j = 25°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	46	–	ns
Rise time		t_r	–	16	–	
Turn−off delay time		$t_{d(off)}$	–	125	–	
Fall time		t_f	–	60	–	
Turn on switching loss		E_{on}	–	0.668	–	mJ
Turn off switching loss		E_{off}	–	0.76	–	
Turn−on delay time	T_j = 150°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	48	–	ns
Rise time		t_r	–	22	–	
Turn−off delay time		$t_{d(off)}$	–	200	–	
Fall time		t_f	–	134	–	
Turn on switching loss		E_{on}	–	1.1	–	mJ
Turn off switching loss		E_{off}	–	2.5	–	
Input capacitance	V_{CE} =20 V. V_{GE} = 0 V. f = 10 KHz	C_{ies}	–	9900	–	pF
Output capacitance		C_{oes}	–	270	–	
Reverse transfer capacitance		C_{res}	–	270	–	
Gate charge total	V_{CE} = 480 V, I_C = 75 A, V_{GE} = ±15 V	Q_g	–	390	–	nC
Thermal Resistance, chip−to−heatsink	Thermal grease thickness ≤ 50 μm λ = 1 W/mK	$R_{θJH}$		1.35		°C/W
NEUTRAL POINT CLAMP DIODE CHARACTERISTICS						
Forward voltage	V_{GE} = 0 V, I_F = 60 A T_j = 25°C V_{GE} = 0 V, I_F = 60 A, T_j = 150°C	V_F	– –	1.7 1.8	2.0 –	V
Reverse recovery time	T_j = 25°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	0.04	–	μs
Reverse recovery charge		Q_{rr}	–	1.1	–	μC
Peak reverse recovery current		I_{rrm}	–	65	–	A
Peak rate of fall of recovery current		di/dt_{max}	–	6600	–	A/μs
Reverse recovery energy		E_{rr}	–	0.384	–	mJ
Reverse recovery time	T_j = 150°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	0.1	–	μs
Reverse recovery charge		Q_{rr}	–	3.3	–	μC
Peak reverse recovery current		I_{rrm}	–	68	–	A
Peak rate of fall of recovery current		di/dt_{max}	–	1733	–	A/μs
Reverse recovery energy		E_{rr}	–	0.74	–	mJ
Thermal Resistance, chip−to−heatsink	Thermal grease thickness ≤ 50 μm λ = 1 W/mK	$R_{θJH}$		1.86		°C/W
THERMISTOR CHARACTERISTICS						
Normal resistance		R		22		kΩ
Nominal resistance	T = 100°C	R		1468		Ω
Deviation of R25		ΔR/R	–5		5	%
Power dissipation		P_D		200		mW
Power dissipation constant				2		mW/K
B−value	B(25/50), tol ±3%				3950	K
B−value	B(25/100), tol ±3%				3998	K
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 – HALF BRIDGE

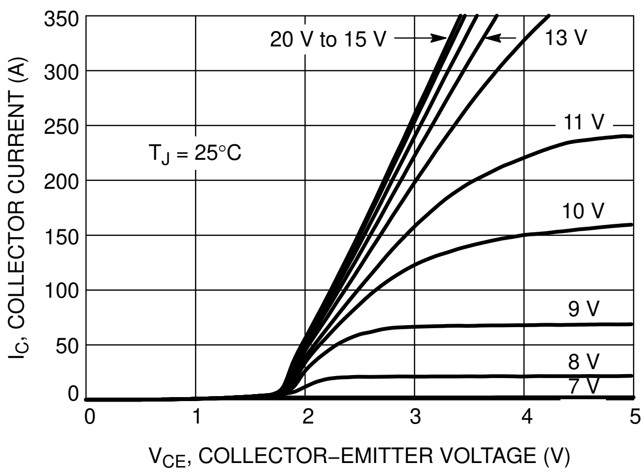


Figure 1. Output Characteristics

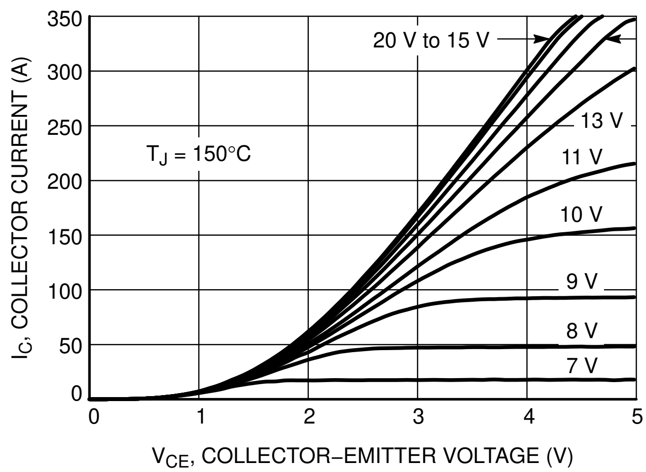


Figure 2. Output Characteristics

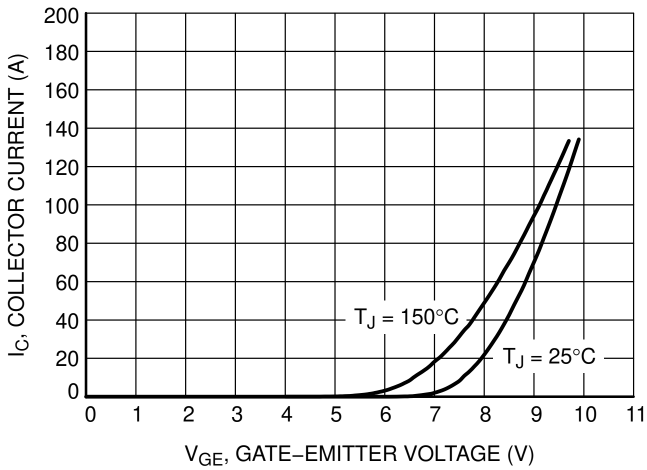


Figure 3. Typical Transfer Characteristics

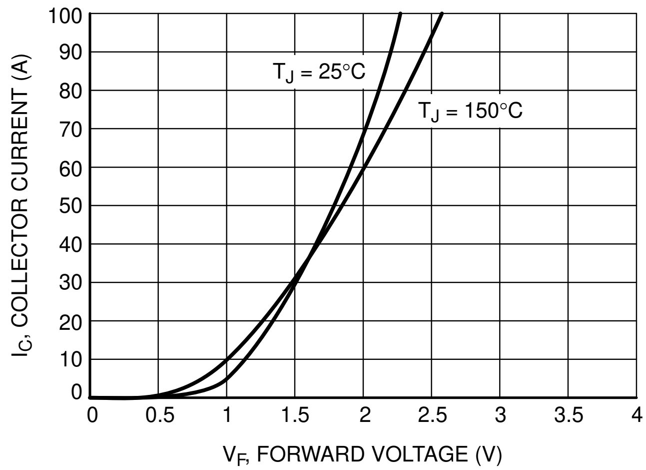


Figure 4. Diode Forward Characteristics

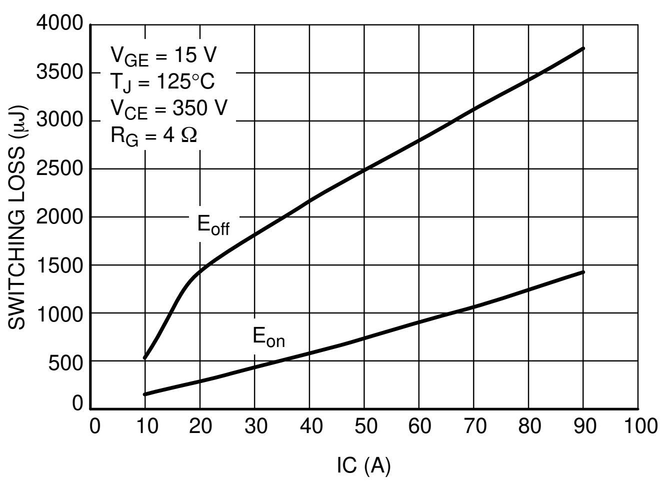


Figure 5. Typical Switching Loss vs. IC

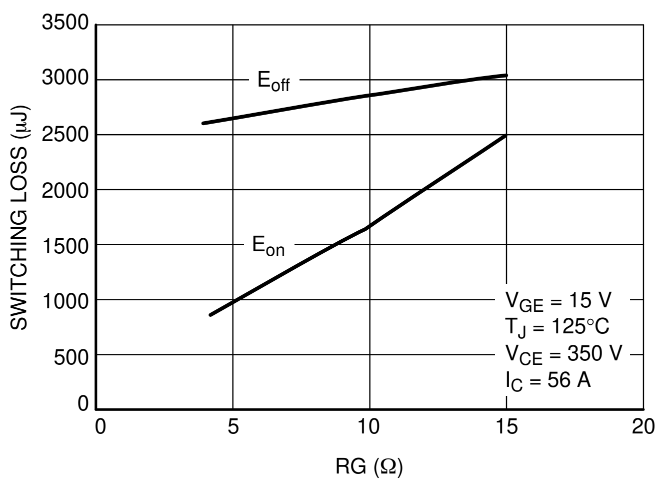


Figure 6. Typical Switching Loss vs. RG

TYPICAL CHARACTERISTICS – HALF BRIDGE

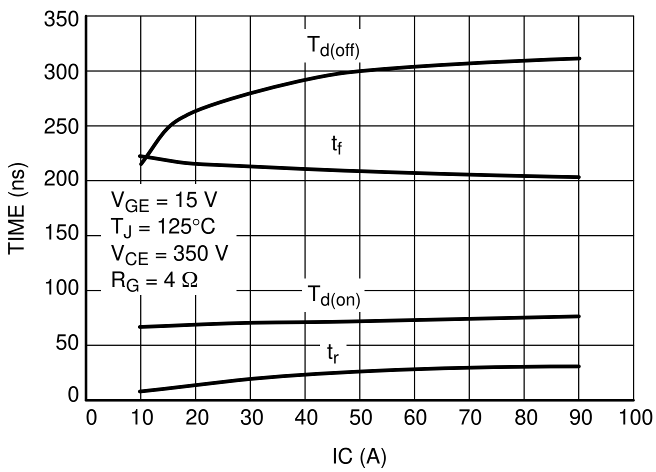


Figure 7. Typical Switching Time vs. IC

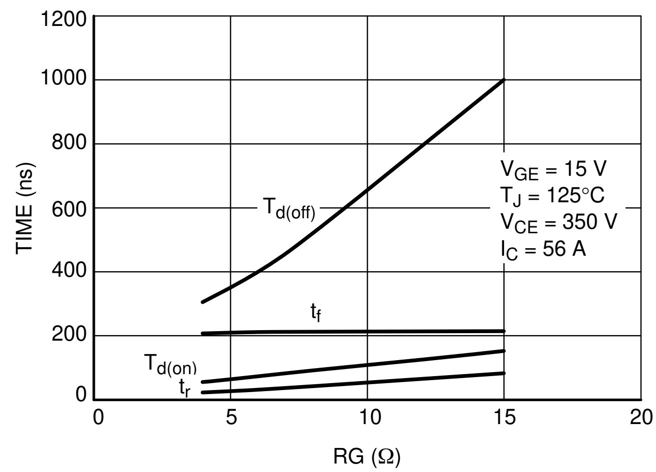


Figure 8. Typical Switching Time vs. RG

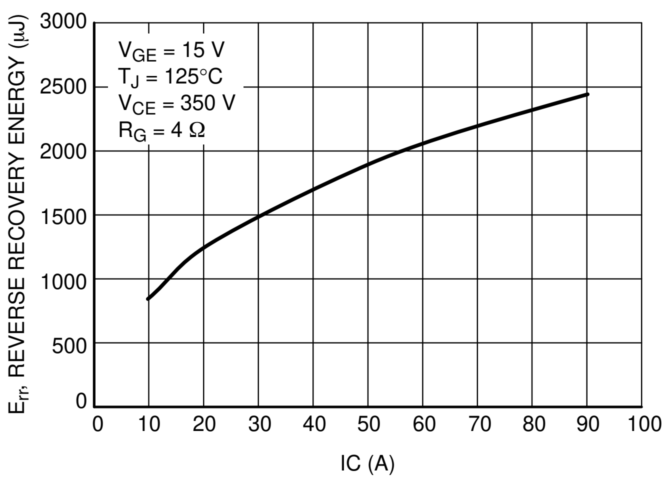


Figure 9. Typical Reverse Recovery Energy Loss vs. IC

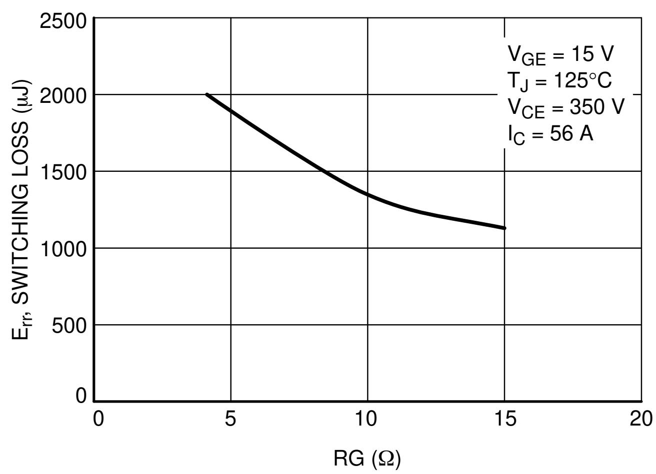


Figure 10. Typical Reverse Recovery Energy Loss vs. RG

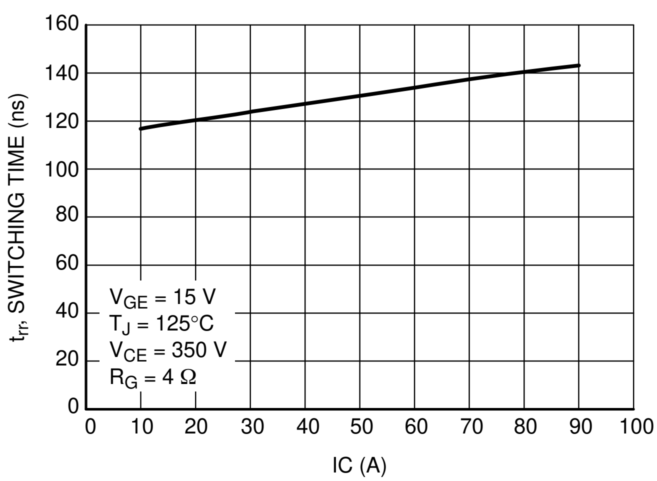


Figure 11. Typical Reverse Recovery Time vs. IC

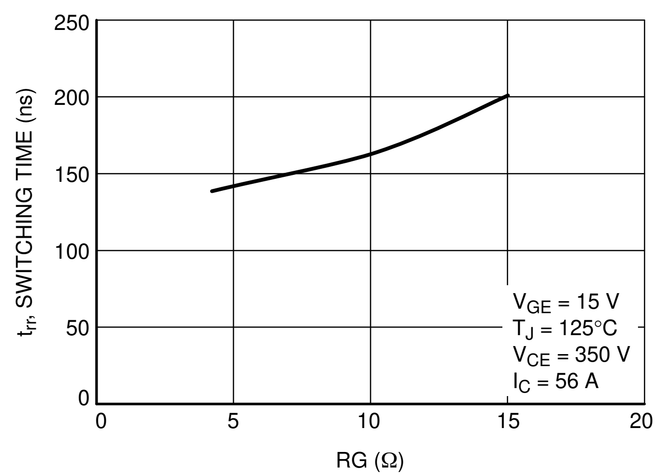


Figure 12. Typical Reverse Recovery Time vs. RG

TYPICAL CHARACTERISTICS – HALF BRIDGE

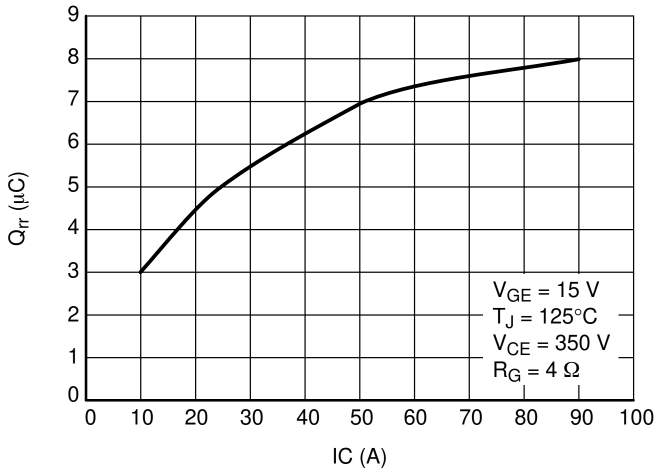


Figure 13. Typical Reverse Recovery Charge vs. IC

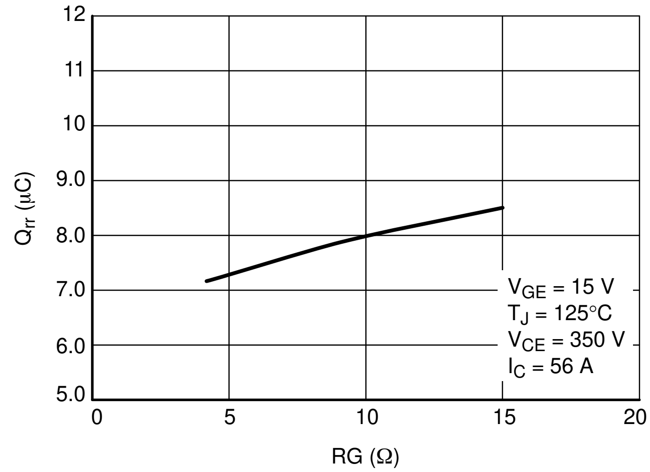


Figure 14. Typical Reverse Recovery Charge vs. RG

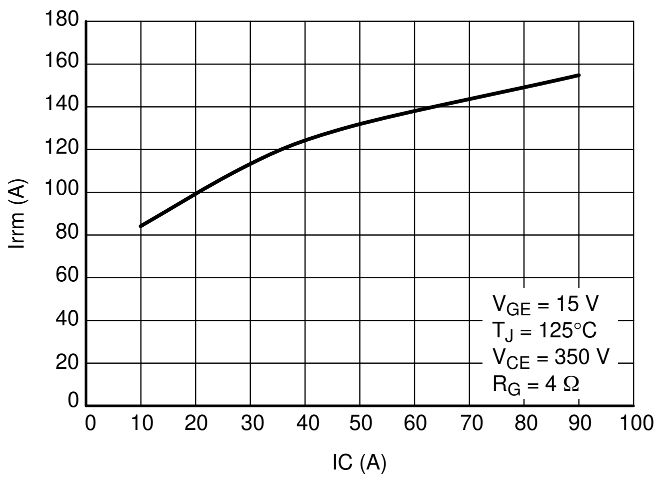


Figure 15. Typical Reverse Recovery Current vs. IC

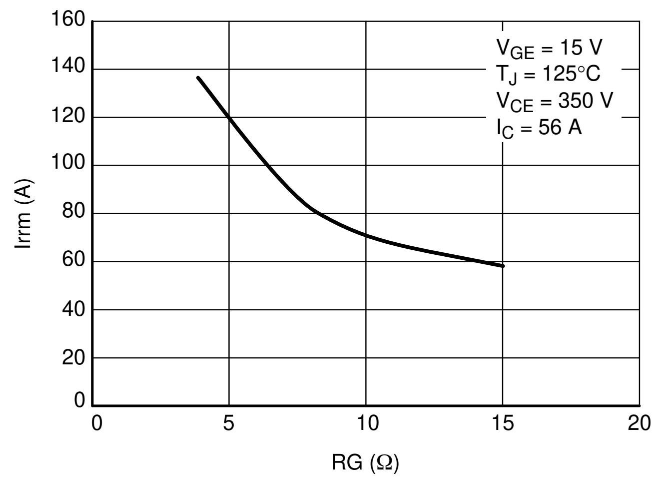


Figure 16. Typical Reverse Recovery Current vs. RG

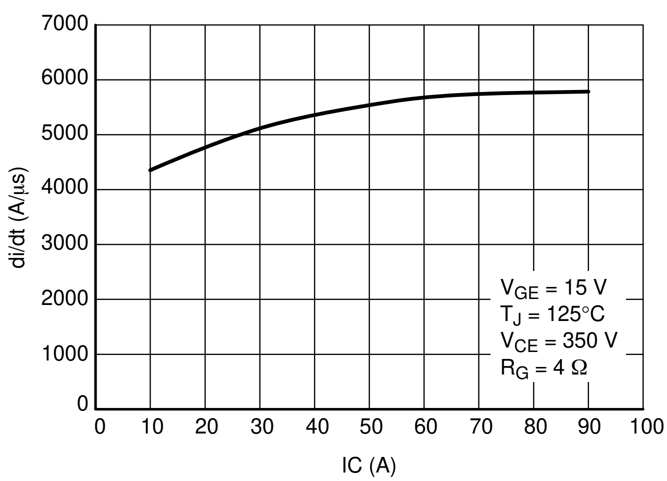


Figure 17. Typical di/dt vs. IC

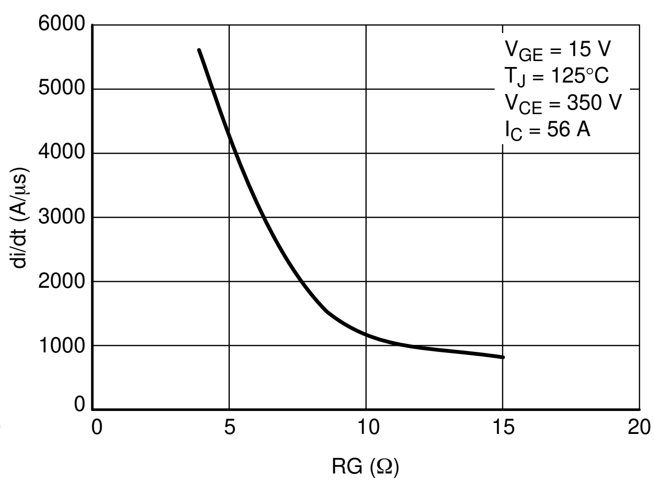


Figure 18. Typical di/dt vs. RG

TYPICAL CHARACTERISTICS − HALF BRIDGE

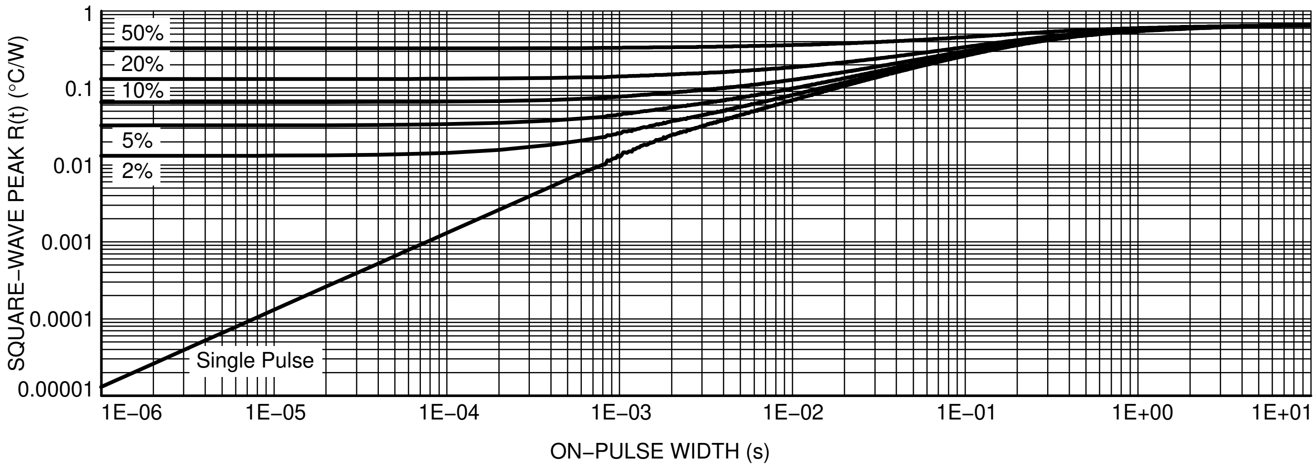


Figure 19. IGBT Transient Thermal Impedance

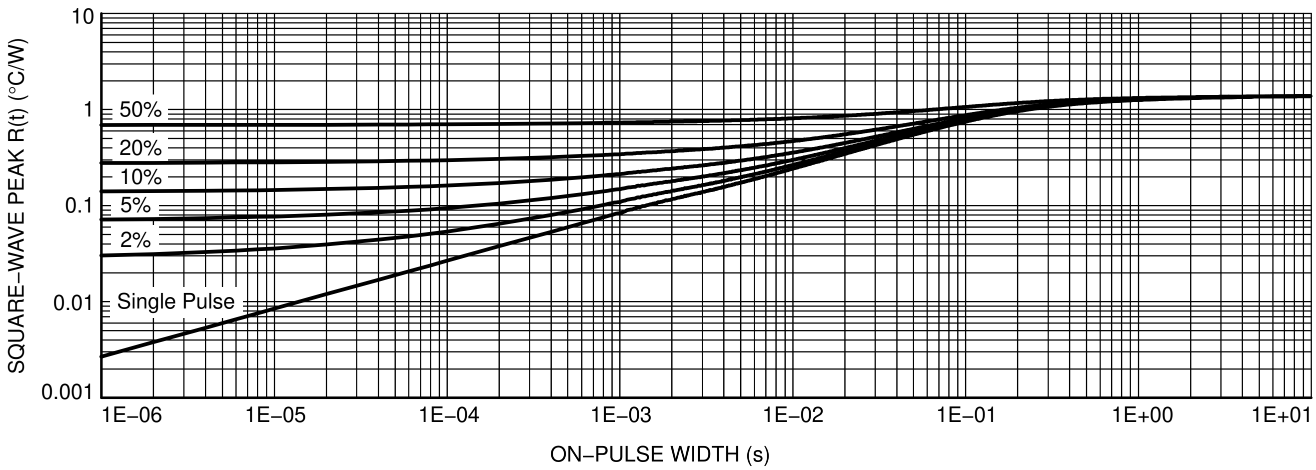


Figure 20. Diode Transient Thermal Impedance

TYPICAL CHARACTERISTICS – NEUTRAL POINT

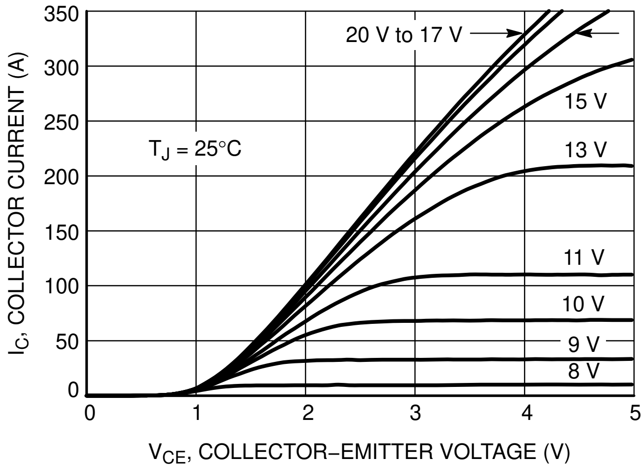


Figure 21. Output Characteristics

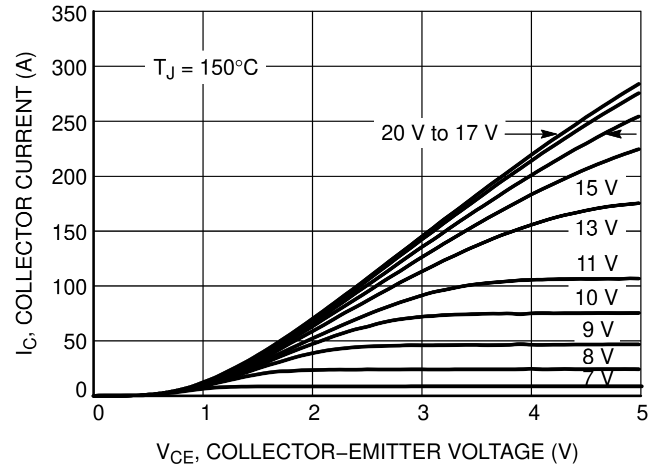


Figure 22. Output Characteristics

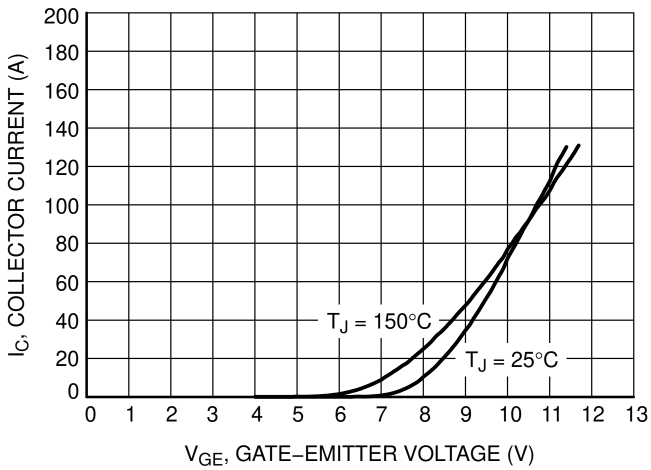


Figure 23. Typical Transfer Characteristics

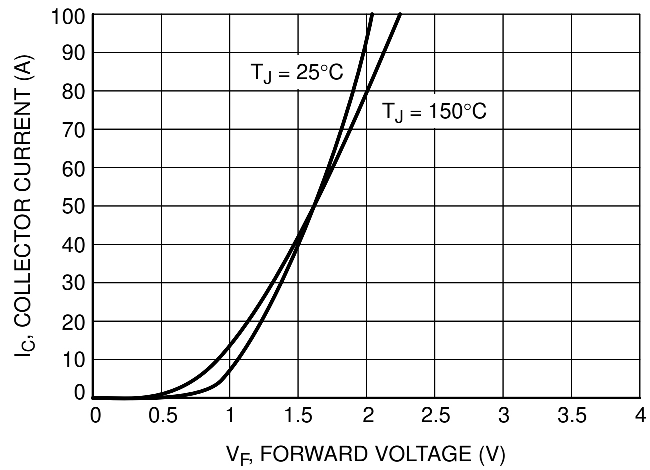


Figure 24. Diode Forward Characteristics

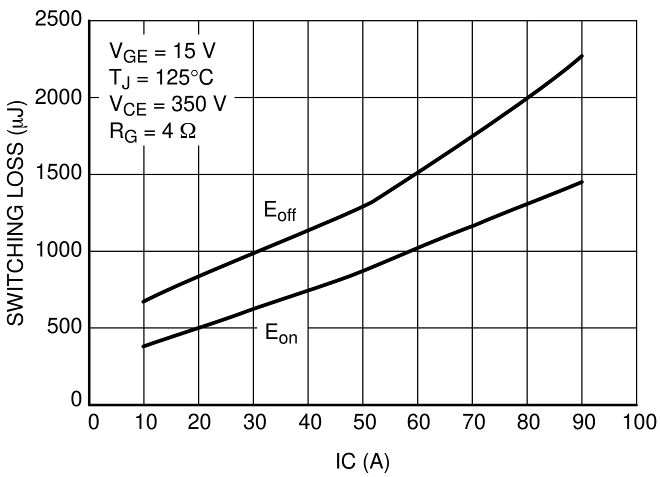


Figure 25. Typical Switching Loss vs. IC

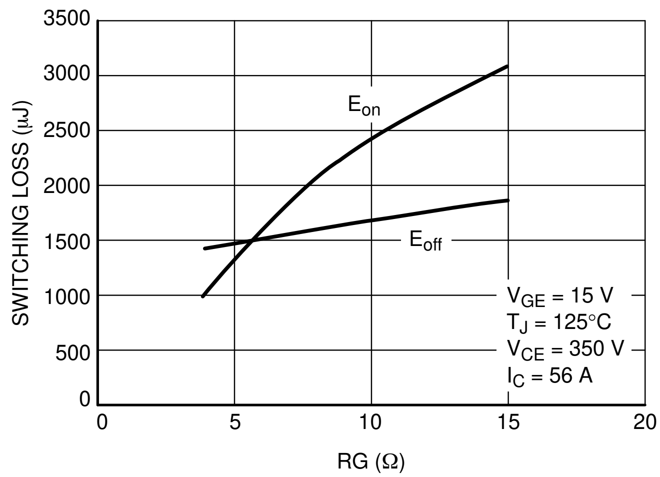


Figure 26. Typical Switching Loss vs. RG

TYPICAL CHARACTERISTICS – NEUTRAL POINT

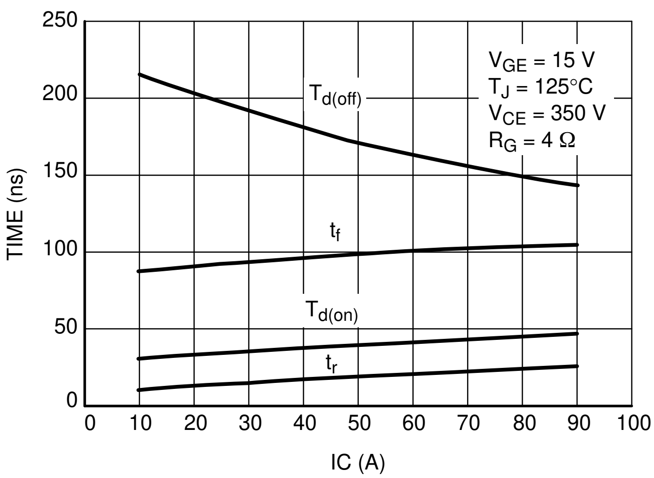


Figure 27. Typical Switching Time vs. IC

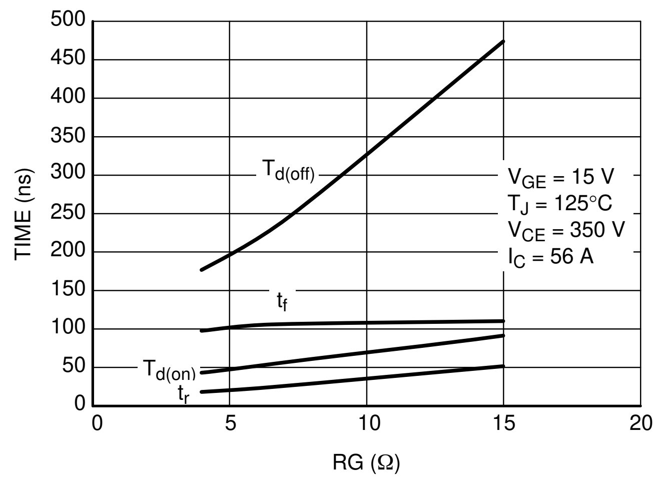


Figure 28. Typical Switching Time vs. RG

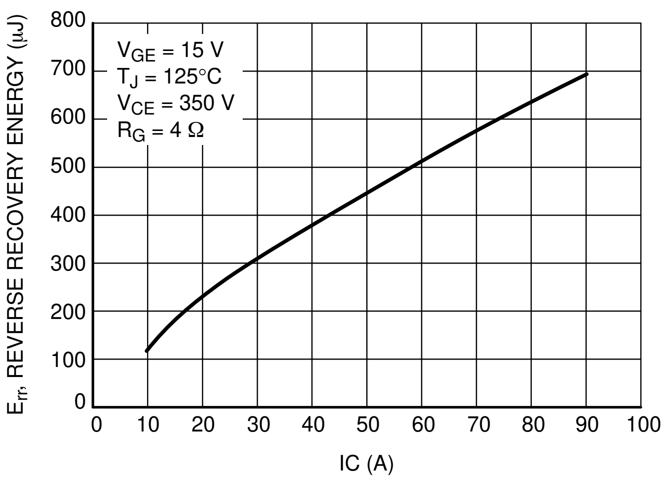


Figure 29. Typical Reverse Recovery Energy Loss vs. IC

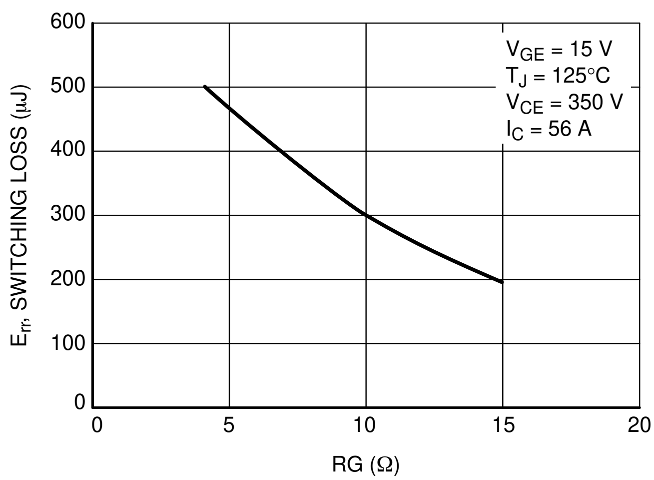


Figure 30. Typical Reverse Recovery Energy Loss vs. RG

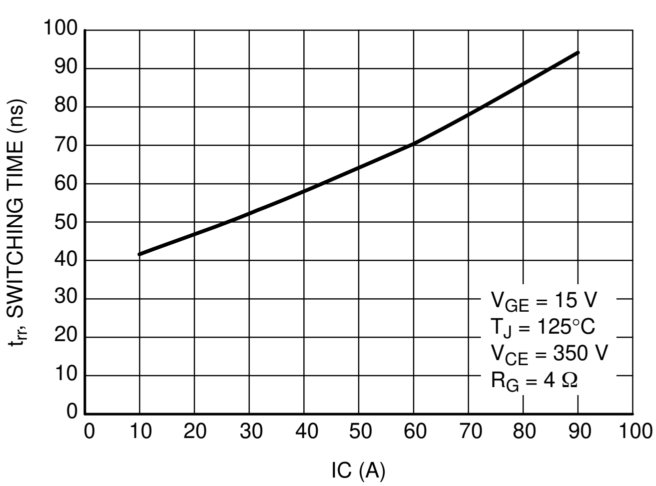


Figure 31. Typical Reverse Recovery Time vs. IC

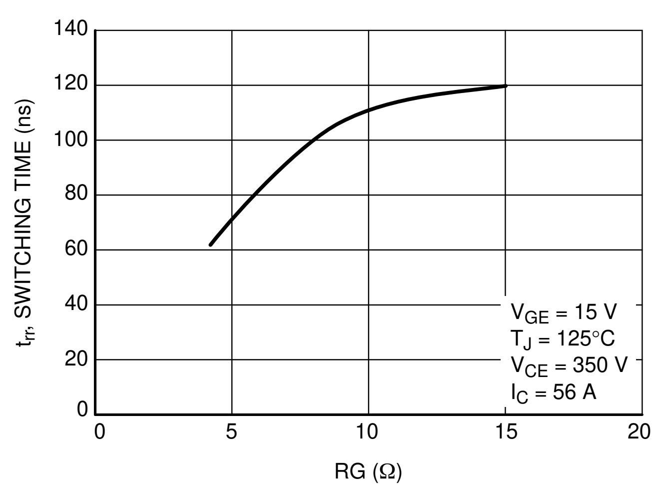


Figure 32. Typical Reverse Recovery Time vs. RG

TYPICAL CHARACTERISTICS – NEUTRAL POINT

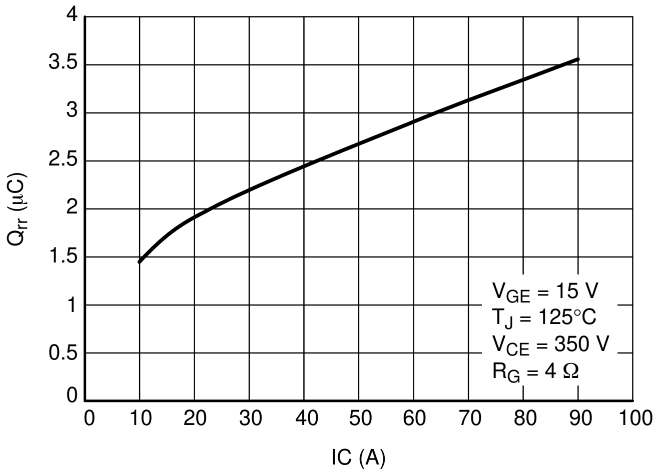


Figure 33. Typical Reverse Recovery Charge vs. IC

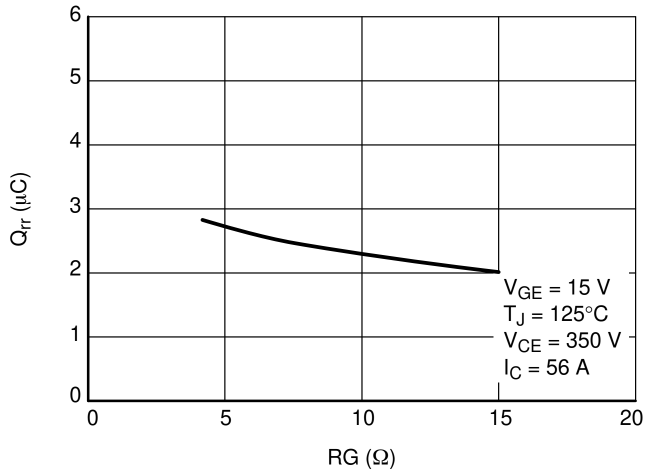


Figure 34. Typical Reverse Recovery Charge vs. RG

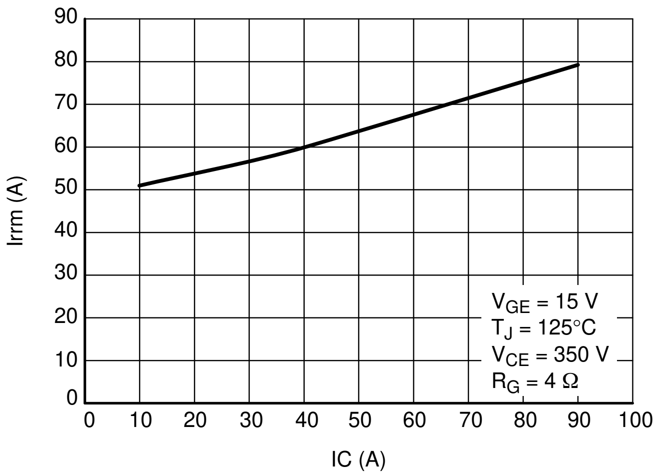


Figure 35. Typical Reverse Recovery Current vs. IC

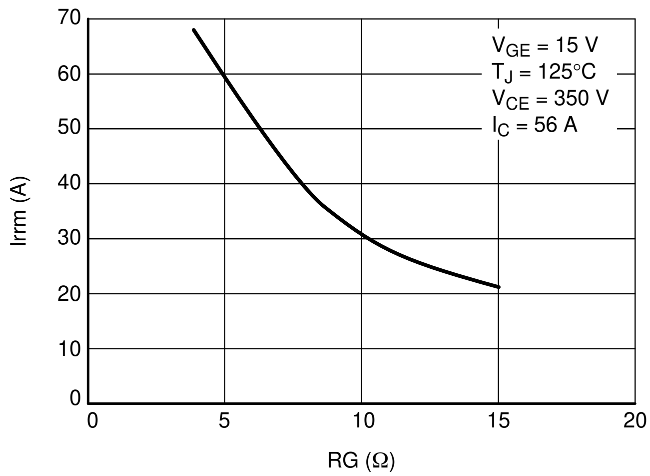


Figure 36. Typical Reverse Recovery Current vs. RG

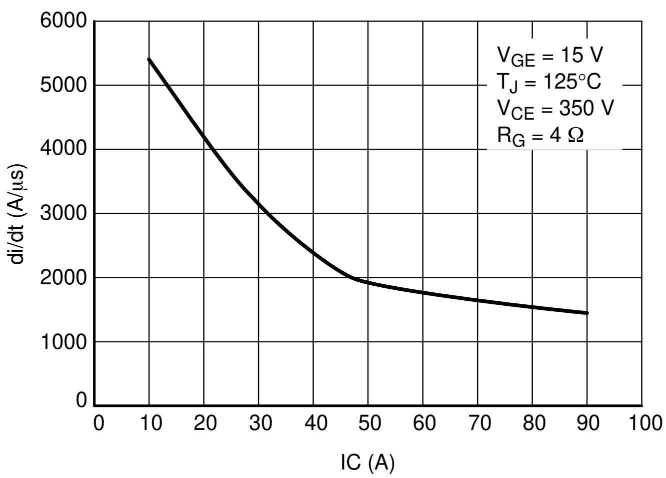


Figure 37. Typical di/dt vs. IC

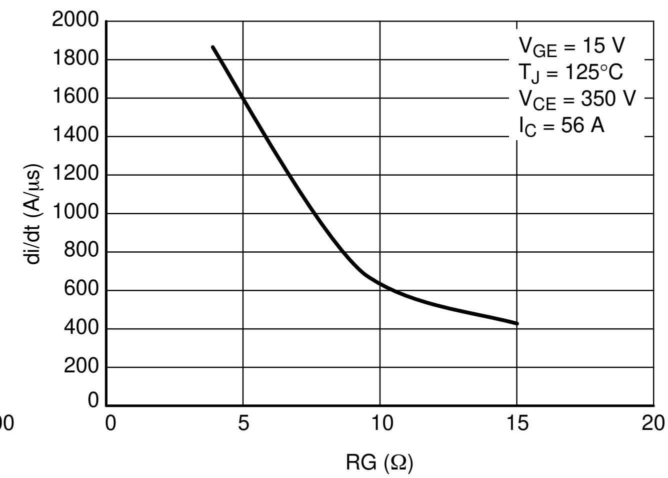


Figure 38. Typical di/dt vs. RG

TYPICAL CHARACTERISTICS – NEUTRAL POINT

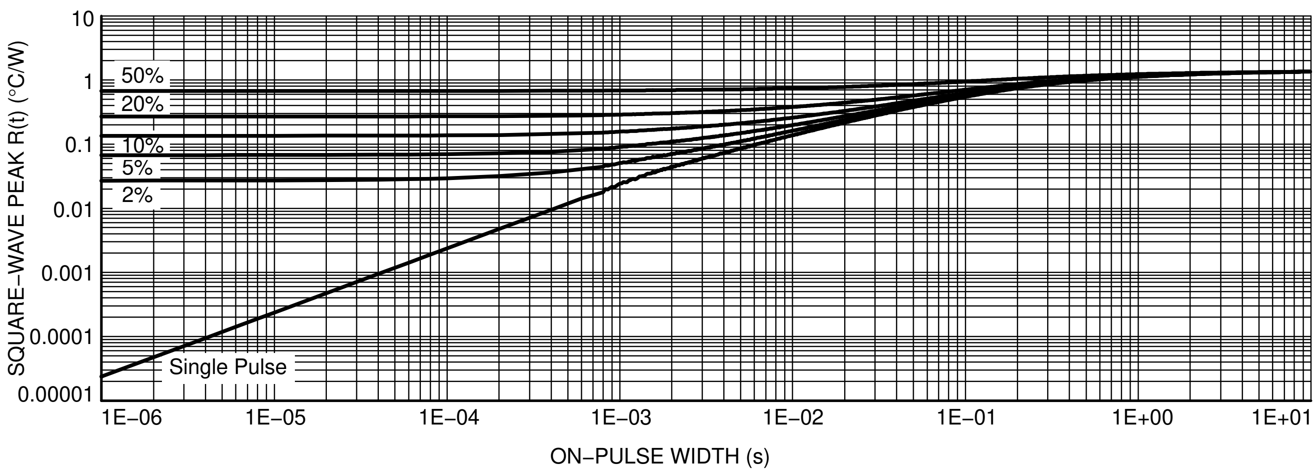


Figure 39. IGBT Transient Thermal Impedance

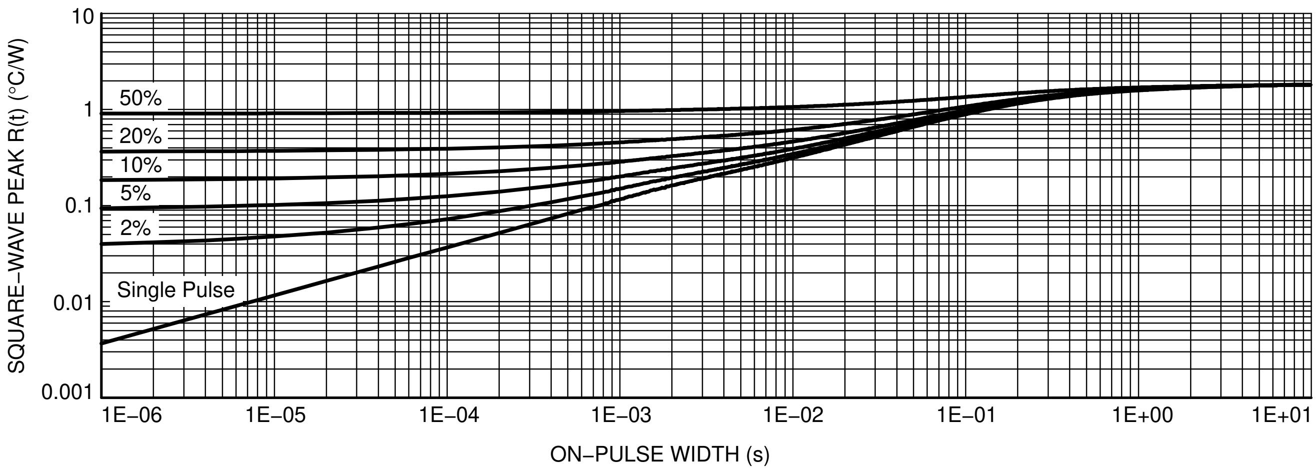


Figure 40. Diode Transient Thermal Impedance

THERMISTOR CHARACTERISTICS

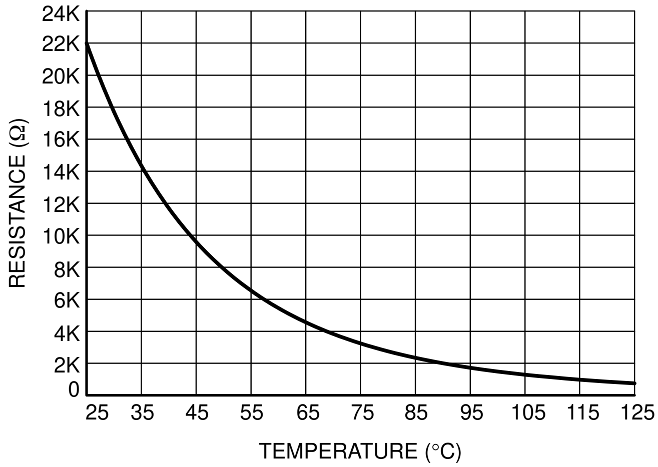


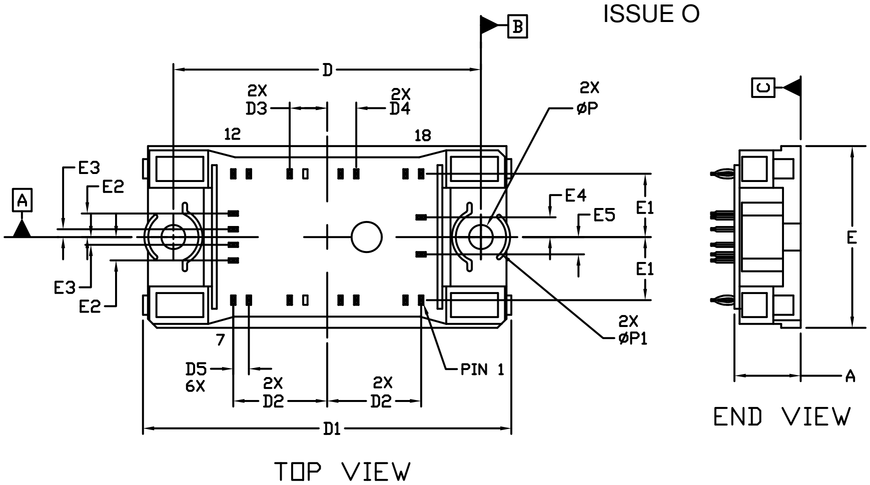
Figure 41. Thermistor Characteristics

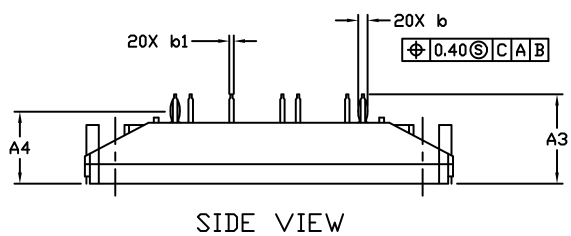
ORDERING INFORMATION

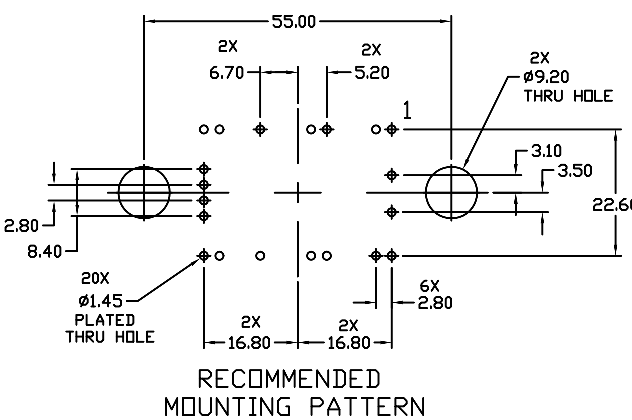
Orderable Part Number	Package	Shipping
NXH80T120L2Q0PG (Press Fit Pin)	Q0PACK – Case 180AA (Pb−Free and Halide−Free)	24 Units / Blister Tray
NXH80T120L2Q0SG (Solder Pin)	Q0PACK – Case 180AB (Pb−Free and Halide−Free)	24 Units / Blister Tray

PACKAGE DIMENSIONS

PIM20, 55x32.5 / Q0PACK
CASE 180AA
ISSUE O







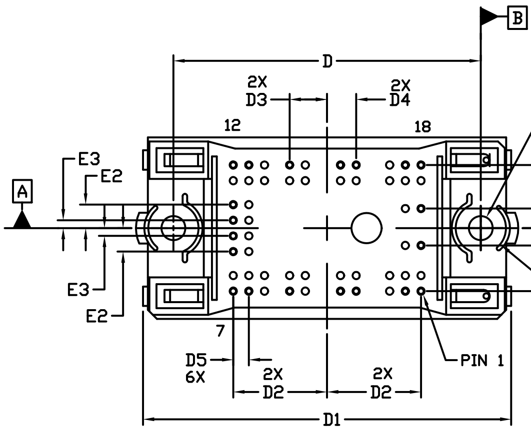
NOTES:

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.

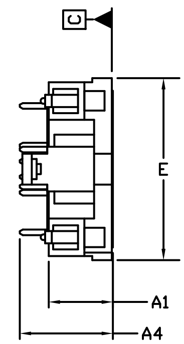
	MILLIMETERS	
DIM	MIN.	NOM.
A	11.33	12.33
A3	15.50	16.50
A4	12.88 BSC	
b	1.61	1.71
b1	0.75	0.85
D	54.80	55.20
D1	65.70	70.10
D2	16.80 BSC	
D3	6.70 BSC	
D4	5.20 BSC	
D5	2.80 BSC	
E	32.30	32.70
E1	11.30 BSC	
E2	4.20 BSC	
E3	1.40 BSC	
E4	3.50 BSC	
E5	3.10 BSC	
P	4.10	4.50
P1	8.50	9.50

PACKAGE DIMENSIONS

PIM20, 55x32.5 / Q0PACK
CASE 180AB
ISSUE O



TOP VIEW

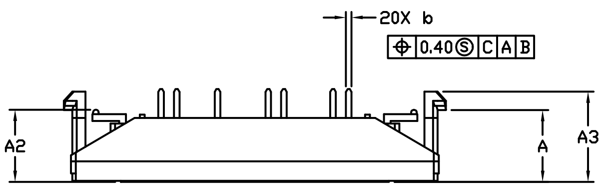


END VIEW

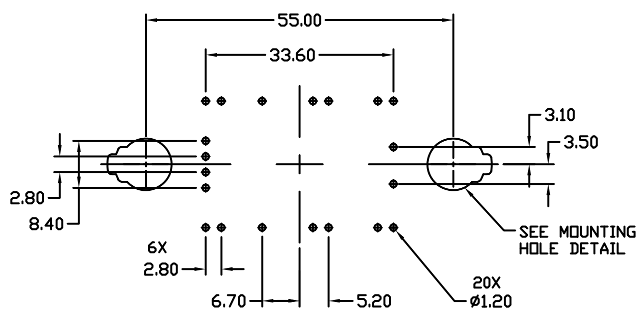
NOTES:

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

	MILLIMETERS	
DIM	MIN.	NOM.
A	13.10	14.10
A1	10.75	11.75
A2	12.20	13.20
A3	15.45	16.45
A4	16.40 REF	
b	0.95	1.05
D	54.80	55.20
D1	65.70	70.10
D2	16.80 BSC	
D3	6.70 BSC	
D4	5.20 BSC	
D5	2.80 BSC	
E	32.00	33.00
E1	11.30 BSC	
E2	4.20 BSC	
E3	1.40 BSC	
E4	3.50 BSC	
E5	3.10 BSC	
P	4.10	4.50
P1	8.50	9.50



SIDE VIEW



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MOUNTING PATTERN

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