SNXH150B95H3Q2F2PG-N

Product Preview

Q2BOOST

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

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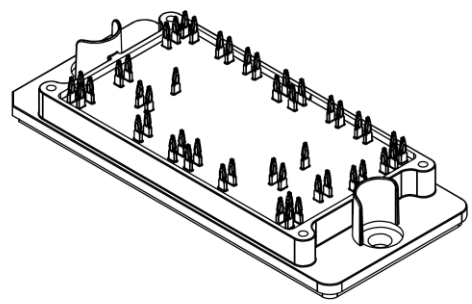
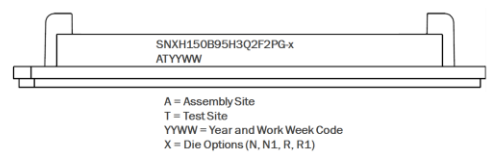
160 A, 1200 V Module



Q2BOOST
CASE 180AR



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

Typical Applications

- Solar Inverters
- Uninterruptable Power Supplies Systems

Table 1. ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
IGBT (T1, T2, T4,T5)			
Collector−emitter Voltage	V_{CES}	950	V
Collector current @ T_h = 80°C (per IGBT)	IC	75	A
Pulsed Collector Current, T_{pulse} Limited by T_{Jmax}	ICM	225	A
Power Dissipation per IGBT $T_J = T_{Jmax}$ T_h = 80°C	Ptot	190	W
Gate−emitter voltage Positive transient gate−emitter voltage (Tpulse = 5 μs, D < 0.10)	V_{GE}	±20 30	V
Maximum Junction Temperature	TJ	175	°C
IGBT (T3, T6)			
Collector−emitter voltage	VCES	950	V
Collector current @ T_h = 80°C (per IGBT)	IC	75	A
Pulsed Collector Current, T_{pulse} Limited by T_{Jmax}	ICM	225	A
Power Dissipation per IGBT $T_J = T_{Jmax}$ T_h = 80°C	Ptot	225	W
Gate−emitter voltage Positive transient gate−emmitter voltage (Tpulse = 5 μs, D < 0.10)	V_{GE}	±20 30	V
Maximum Junction Temperature	TJ	175	°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.

This document contains information on a product under development. ON Semiconductor reserves the right to change or discontinue this product without notice.

ORDERING INFORMATION

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

Table 2. ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
TIGBT INVERSE DIODE (D1, D2, D3, D4, D5, D6)			
Peak Repetitive Reverse Voltage	V_{RRM}	1600	V
Forward Current , DC @ T_h = 80°C (per Diode)	I_F	35	A
Power Dissipation Per Diode $T_J = T_{Jmax}$ T_h = 80°C	P_{tot}	42	W
Maximum Junction Temperature	T_J	150	°C
DIODE (D7+D8, D9+D10)			
Peak Repetitive Reverse Voltage	V_{RRM}	2000	V
Forward Current , DC @ T_h = 80°C (per Diode)	I_F	45	A
Power Dissipation Per Diode $T_J = T_{Jmax}$ T_h = 80°C	P_{tot}	47	W
Maximum Junction Temperature	T_J	150	°C
SILICON CARBIDE SCHOTTKY DIODE (D11, D12, D13, D14)			
Peak Repetitive Reverse Voltage	V_{RRM}	1200	V
Forward Current, DC @ T_h = 80°C (per Diode)	I_F	30	A
Power Dissipation Per Diode $T_J = T_{Jmax}$ T_h = 80°C	P_{tot}	94	W
Maximum Junction Temperature	T_J	175	°C
DIODE (D15, D16)			
Peak Repetitive Reverse Voltage	V_{RRM}	1200	V
Forward Current, DC @ T_h = 80°C (per Diode)	I_F	75	A
Peak Repetitive Forward Current (Rated VR, Square Wave, 20 kHz, T_h = 80°C) Per diode	I_{FRM}	150	A
Nonrepetitive Peak Surge Current (Surge applied at rated load conditions halfwave, single phase, 60 Hz)	I_{FSM}	500	A
Power Dissipation Per Diode $T_J = T_{Jmax}$ T_h = 80°C	P_{tot}	190	W
Maximum Junction Temperature	T_J	175	°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.

Table 3. 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

Table 4. INSULATION PROPERTIES

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

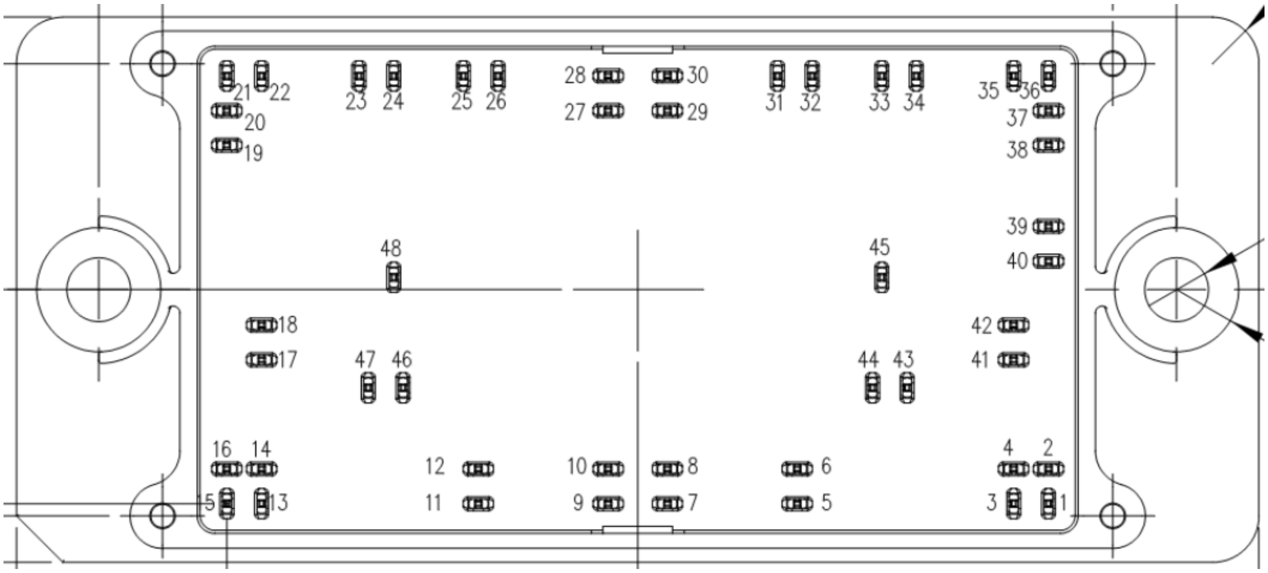


Figure 1. Pin Layout Q2BOOST

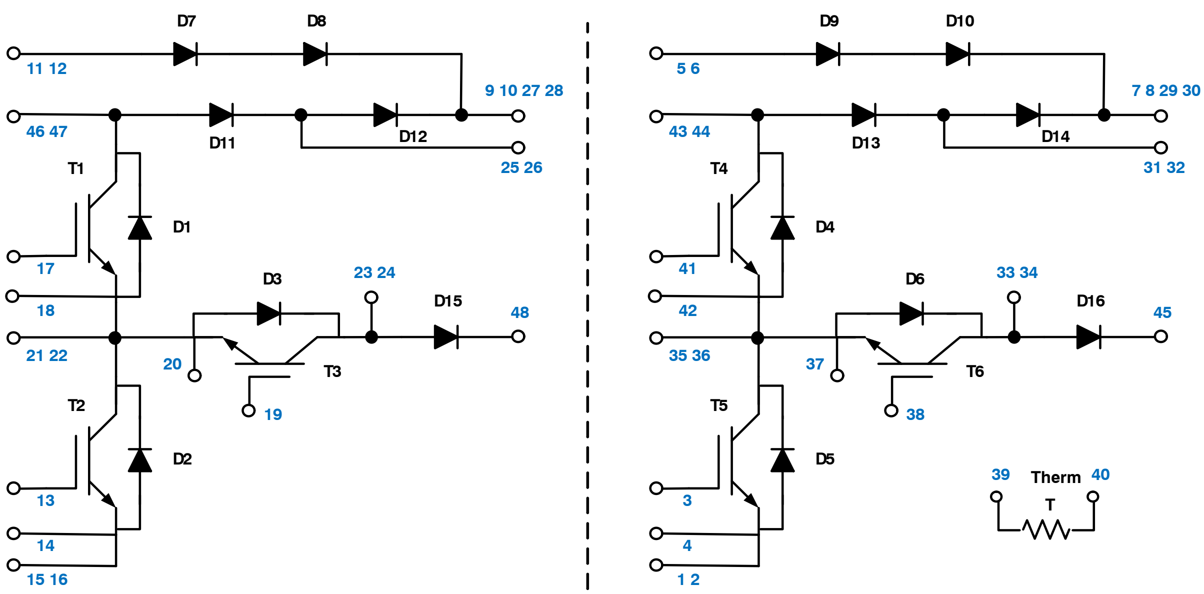


Figure 2. Schematic of Q2BOOST

Table 5. ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
IGBT (T1, T2, T4, T5)						
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 = 75 A, T_J = 150°C	$V_{CE(sat)}$	–	1.80 2.10	2.21 –	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 = 30 A V_{GE} = +15, −8 V, R_G = 14 Ω	td(on)	–	34.2	–	ns
Rise time		tr	–	15	–	
Turn−off delay time		td(off)	–	180	–	
Fall time		tf	–	20	–	
Turn on switching loss		Eon	–	0.38	–	mJ
Turn off switching loss		Eoff	–	0.70	–	
Turn−on delay time	T_J = 125°C V_{CE} = 600 V, I_C = 30 A V_{GE} = +15, −8 V, R_G = 14 Ω	td(on)	–	32	–	ns
Rise time		tr	–	14	–	
Turn−off delay time		td(off)	–	216	–	
Fall time		tf	–	64	–	
Turn on switching loss		Eon	–	0.48	–	mJ
Turn off switching loss		Eoff	–	1.30	–	
Input capacitance	V_{CE} = 20 V. V_{GE} = 0 V. f = 10 kHz	Cies	–	4773	–	pF
Output capacitance		Coes	–	121	–	
Reverse transfer capacitance		Cres	–	27	–	
Gate charge total	V_{CE} = 600 V, I_C = 20 A, V_{GE} = 15 V	Qg	–	143	–	nC
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness = 2.1 Mil ±2%, λ = 2.9 W/mK	RthJH	–	0.782	–	°C/W
IGBT (T3, T6)						
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 = 75 A, T_J = 150°C	$V_{CE(sat)}$	–	1.45 1.51	2.01 –	V
Gate−emitter threshold voltage	V_{GE} = V_{CE} , I_C = 75 mA	$V_{GE(TH)}$	4.03	4.72	5.53	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 = 30 A V_{GE} = +15, −8 V, R_G = 14 Ω	td(on)	–	40	–	ns
Rise time		tr	–	16	–	
Turn−off delay time		td(off)	––	290	–	
Fall time		tf	––	110	–	
Turn on switching loss		Eon	––	0.40	–	mJ
Turn off switching loss		Eoff	––	0.80	–	

Table 5. ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified) (continued)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
IGBT (T3, T6)						
Turn−on delay time	T_J = 125°C V_{CE} = 600 V, I_C = 30 A V_{GE} = +15, −8 V, R_G = 4 Ω	td(on)	–	42	–	ns
Rise time		tr	–	16	–	
Turn−off delay time		td(off)	–	349	–	
Fall time		tf	–	211	–	
Turn on switching loss		Eon	–	0.58	–	mJ
Turn off switching loss		Eoff	–	3.16	–	
Input capacitance	V_{CE} = 20 V. V_{GE} = 0 V. f = 10 kHz	Cies	–	6377	–	pF
Output capacitance		Coes	–	157	–	
Reverse transfer capacitance		Cres	–	35	–	
Gate charge total	V_{CE} = 600 V, I_C = 20 A, V_{GE} = 15 V	Qg	–	180	–	nC
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness = 2.1 Mil ±2%, λ = 2.9 W/mK	RthJH	–	0.668	–	°C/W
IGBT INVERSE DIODE (D1, D2, D3, D4, D5, D6)						
Forward voltage	IF = 35 A, T_J = 25°C IF = 35 A, T_J = 150°C	VF	– –	1.16 1.12	2.20 –	V
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness = 2.1 Mil ±2%, λ = 2.9 W/mK	RthJH		1.086		°C/W
DIODE (D7+D8, D9+D10)						
Forward voltage	I_F = 45 A, T_J = 25°C I_F = 45A, T_J = 150°C	V_F	– –	2.27 2.17	2.75 –	V
Reverse leakage current	V_R = 2000 V	I_r	–	–	100	uA
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness = 2.1 Mil ±2%, λ = 2.9 W/mK	RthJH	–	0.563	–	°C/W
SIC DIODE (D11, D12, D13, D14)						
Forward voltage	I_F = 30 A, T_J = 25°C I_F = 30 A, T_J = 175°C	V_F	– –	1.4 2.0	1.7 –	V
Reverse leakage current	V_R = 1200 V	I_r	–	–	600	uA
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness = 2.1 Mil ±2%, λ = 2.9 W/mK	RthJH	–	5 0.669	–	°C/W
DIODE (D15, D16)						
Forward voltage	I_F = 75 A, T_J = 25°C I_F = 75A, T_J = 150°C	V_F	– –	2.87 2.67	3.2 –	V
Reverse leakage current	V_{CE} = 1200 V	I_r	–	–	600	uA
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness = 2.1 Mil ±2%, λ = 2.9 W/mK	RthJH	–	0.741	–	°C/W
THERMISTOR CHARACTERISTICS						
Nominal resistance	T = 25°C	R_{25}	–	22	–	kΩ
Nominal resistance	T = 100°C	R_{100}	–	1468	–	kΩ
Deviation of R100		DR/R	−5	–	5	%
Power dissipation		PD	–	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	

ORDERING INFORMATION

Device	Marking	Package	Shipping
SNXH150B95H3Q2F2PG−N	SNXH150B95H3Q2F2PG−N	Q2BOOST (Pb−Free)	12 Units / Blister Tray

TYPICAL CHARACTERISTICS T1, T2, T4, T5

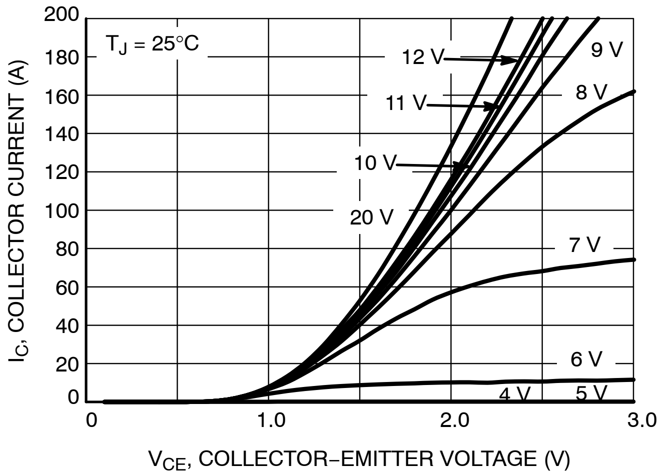


Figure 3. Typical Output Characteristics

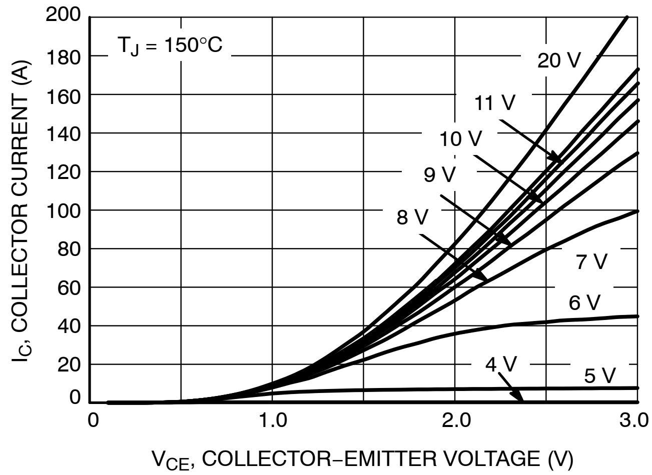


Figure 4. Typical Output Characteristics

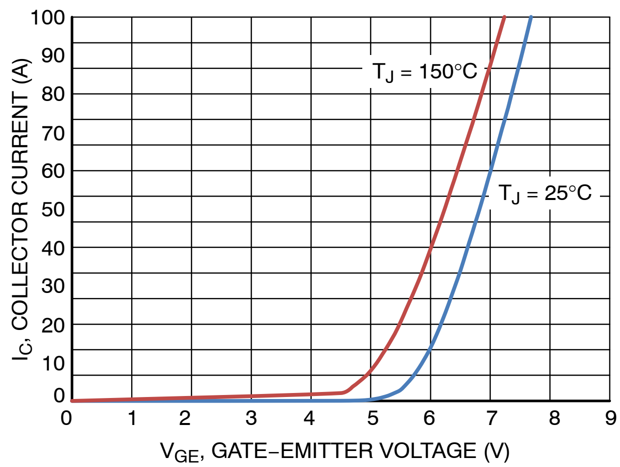


Figure 5. Typical Transfer Characteristics

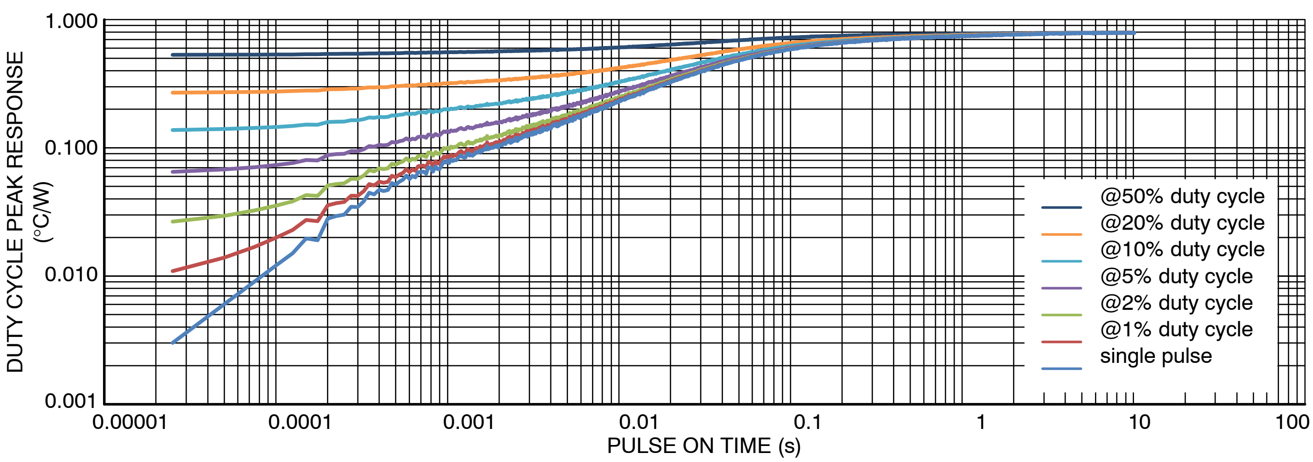


Figure 6. Transient Thermal Impedance (T1, T2, T4, T5)

TYPICAL CHARACTERISTICS T1, T2, T4, T5

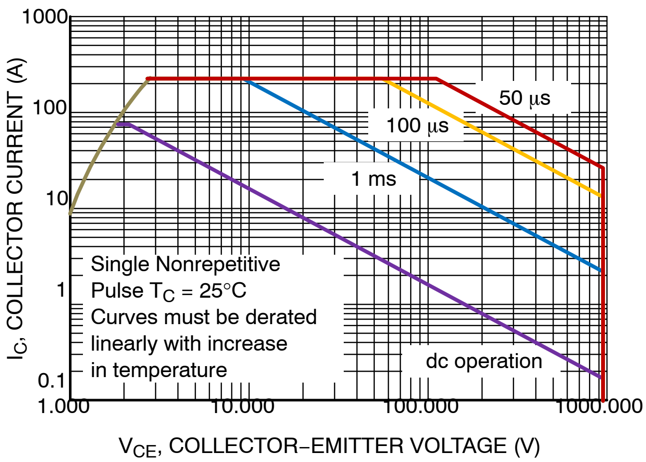


Figure 7. FSBOA (T1, T2, T4, T5)

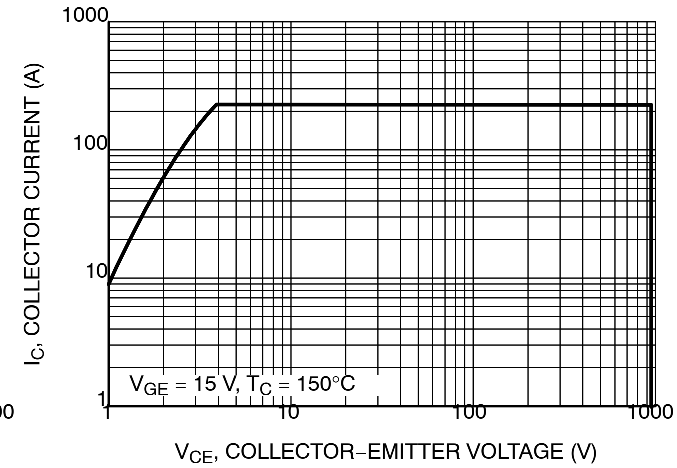


Figure 8. RBSOA (T1, T2, T4, T5)

TYPICAL CHARACTERISTICS (T3, T6)

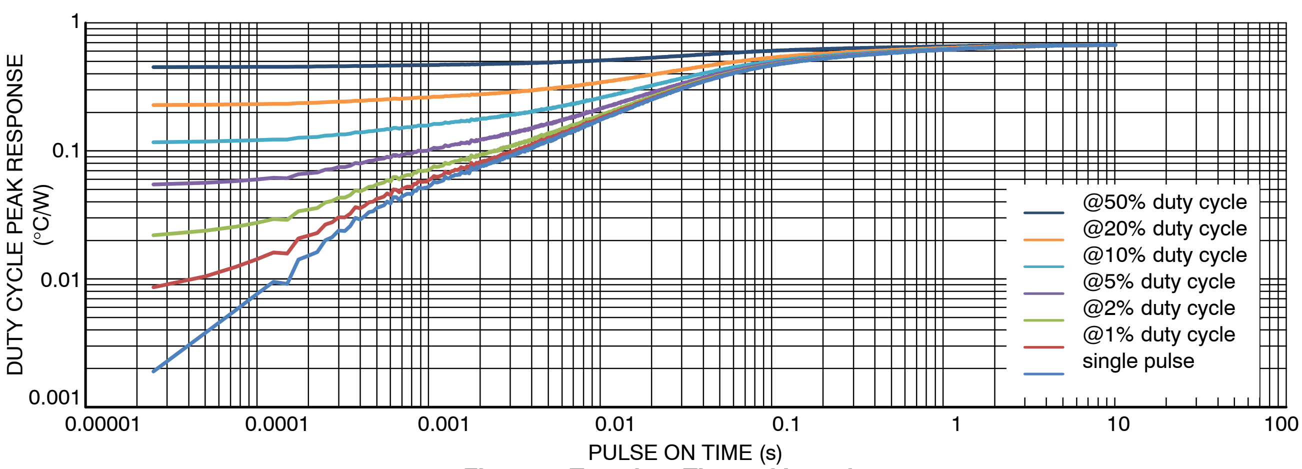


Figure 9. Transient Thermal Impedance (T3, T6)

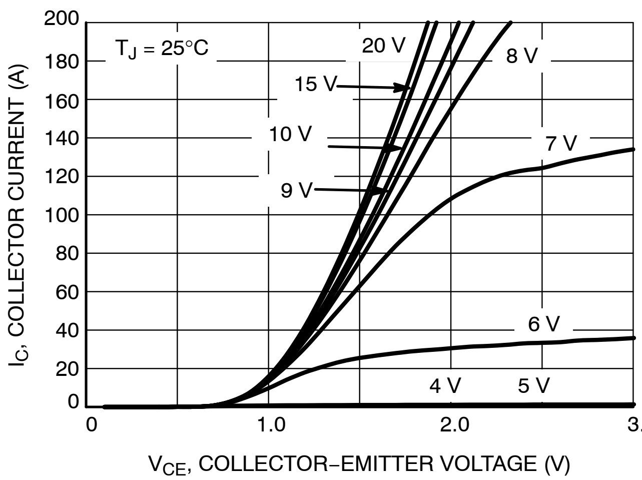


Figure 10. Typical Output Characteristics

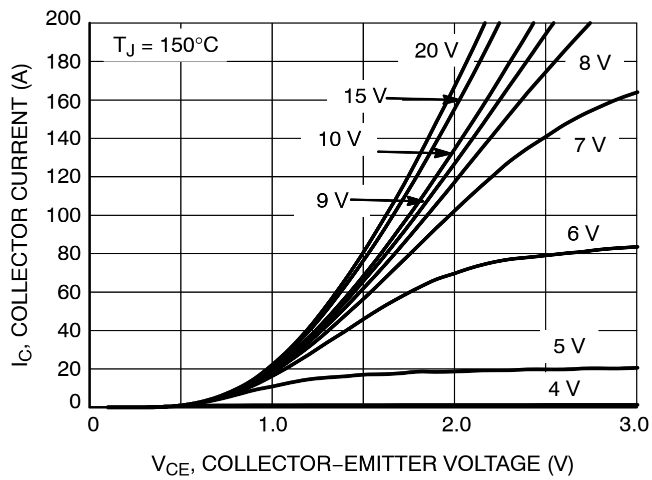


Figure 11. Typical Output Characteristics

TYPICAL CHARACTERISTICS T3, T6

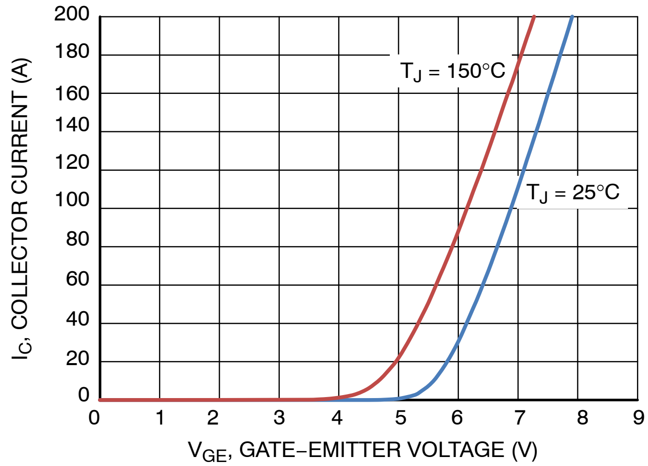


Figure 12. Typical Transfer Characteristics

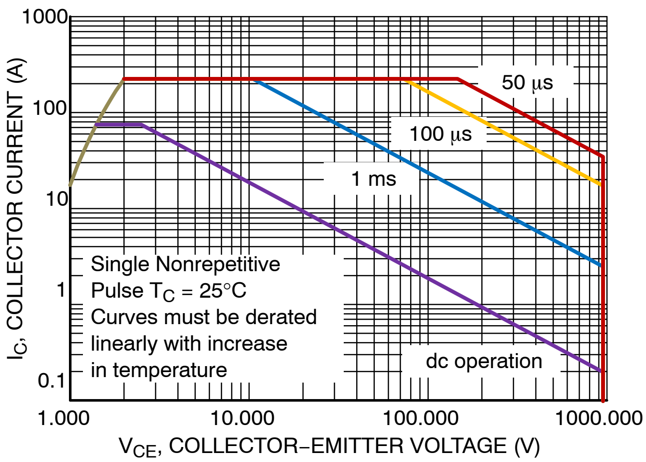


Figure 13. FSBOA (T3, T6)

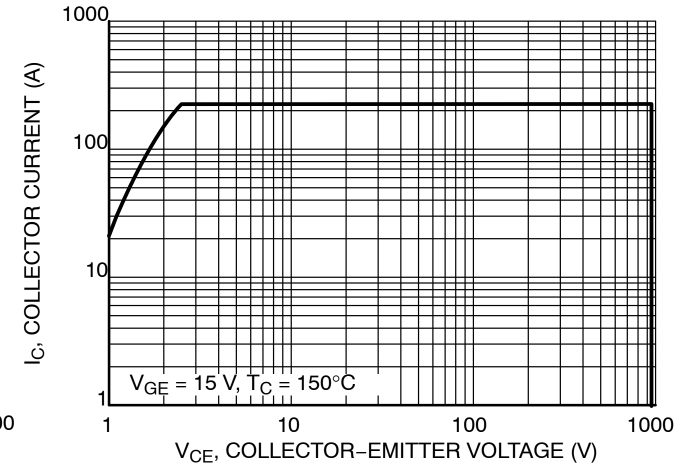


Figure 14. RBSOA (T3, T6)

TYPICAL CHARACTERISTICS D1 − D6

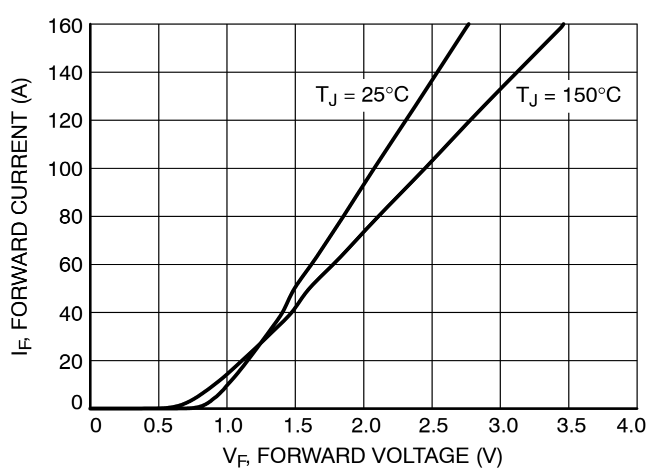


Figure 15. Inverse Diode Forward Characteristics

TYPICAL CHARACTERISTICS D1 − D6

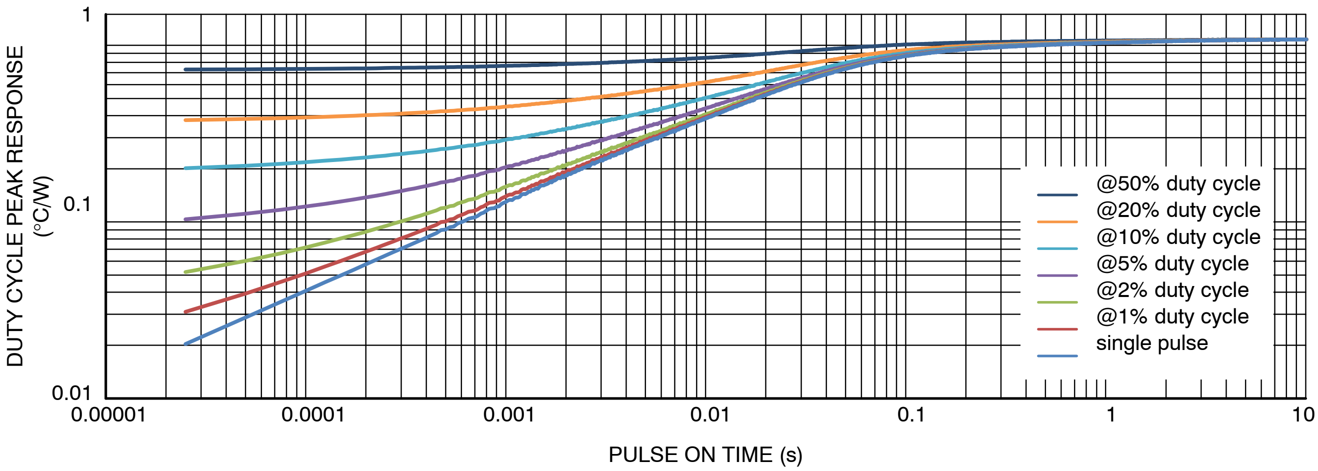


Figure 16. Transient Thermal Impedance (D1 − D6)

TYPICAL CHARACTERISTICS D7+D8, D9+D10

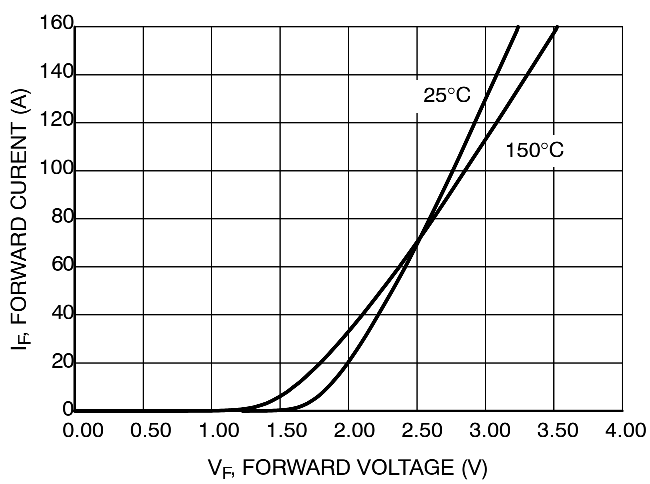


Figure 17. Diode Forward Characteristics

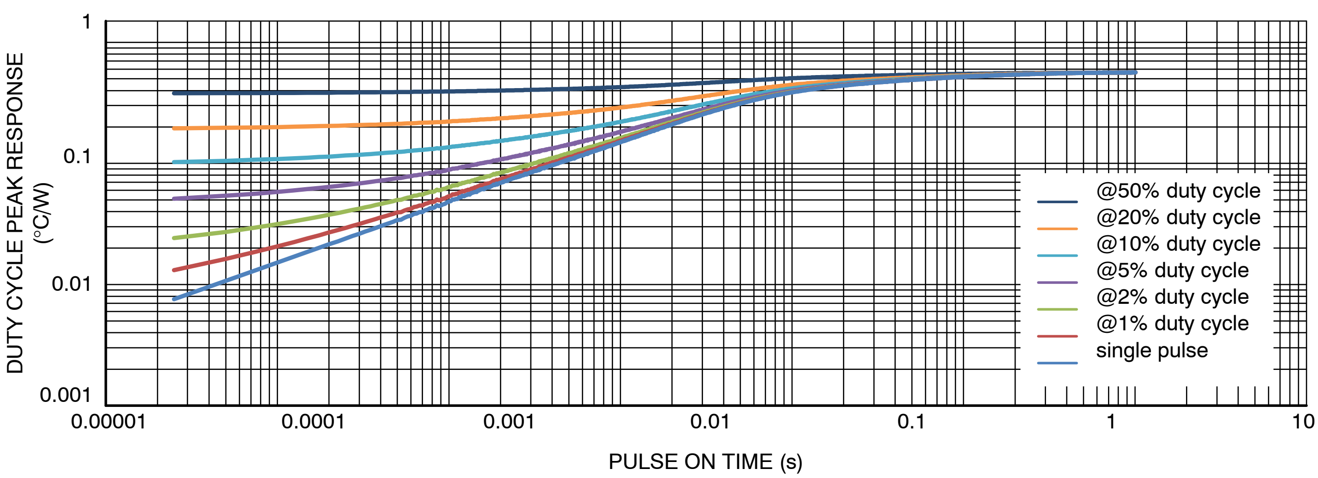


Figure 18. Transient Thermal Impedance (D7+D8, D9+D10)

TYPICAL CHARACTERISTICS D11 − D14

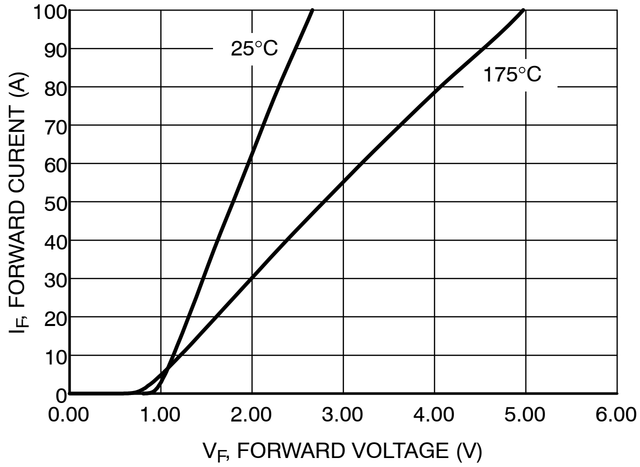


Figure 19. Diode Forward Characteristics

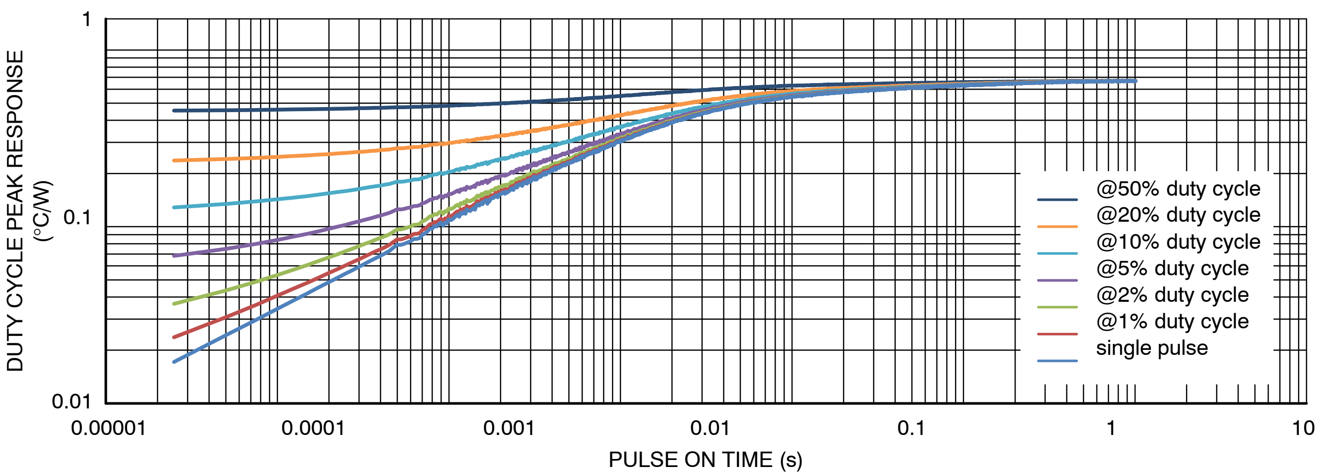


Figure 20. Transient Thermal Impedance (D11 − D14)

TYPICAL CHARACTERISTICS D15 − D16

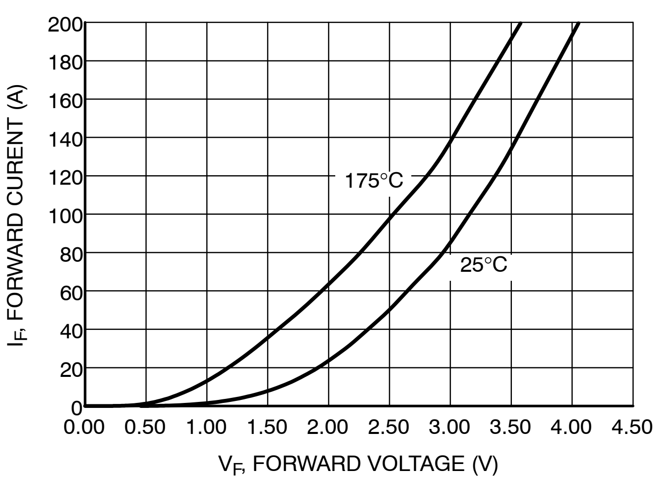


Figure 21. Diode Forward Characteristics

TYPICAL CHARACTERISTICS D15 − D16

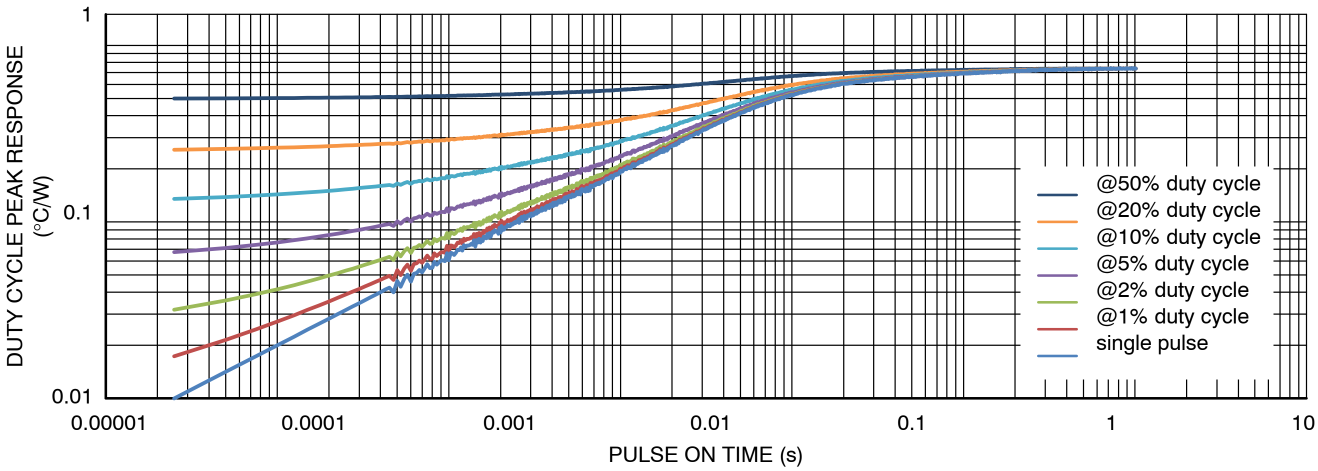


Figure 22. Transient Thermal Impedance (D15 − D16)

TYPICAL SWITCHING CHARACTERISTICS T1/T2 &T4/T5 IGBT COMUTATES D11/D13 DIODE

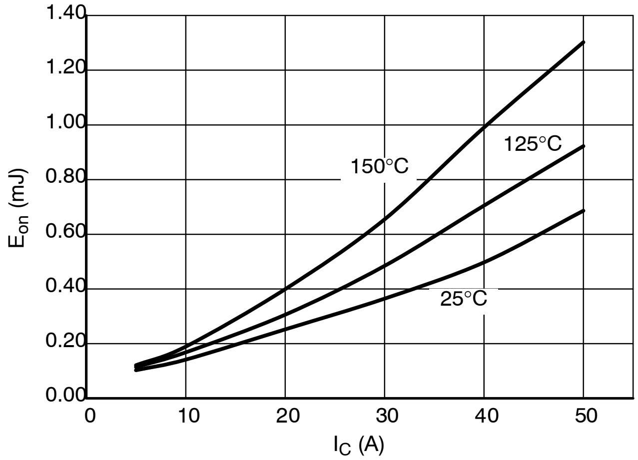


Figure 23. Typical Switching Loss E_{on} vs. I_C

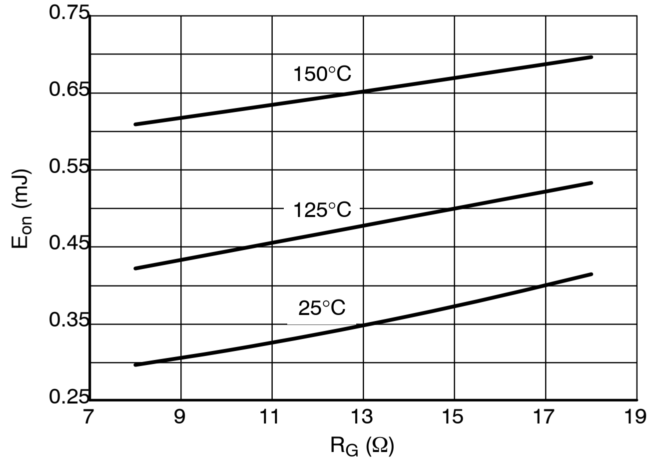


Figure 24. Typical Switching Loss E_{on} vs. R_G

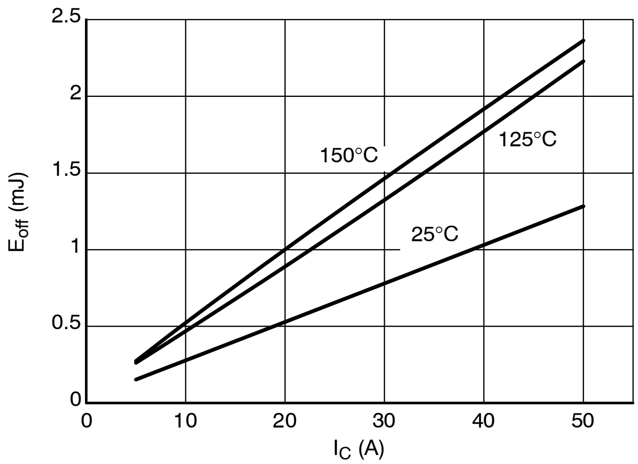


Figure 25. Typical Switching Loss E_{off} vs. I_C

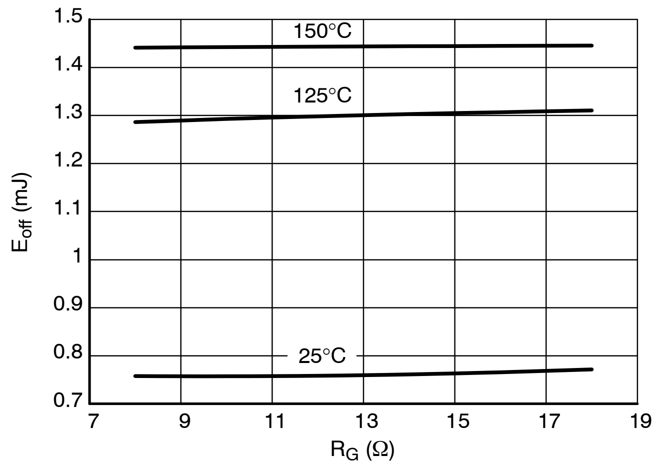


Figure 26. Typical Switching Loss E_{off} vs. R_G

TYPICAL SWITCHING CHARACTERISTICS T1/T2 &T4/T5 IGBT COMUTATES D11/D13 DIODE

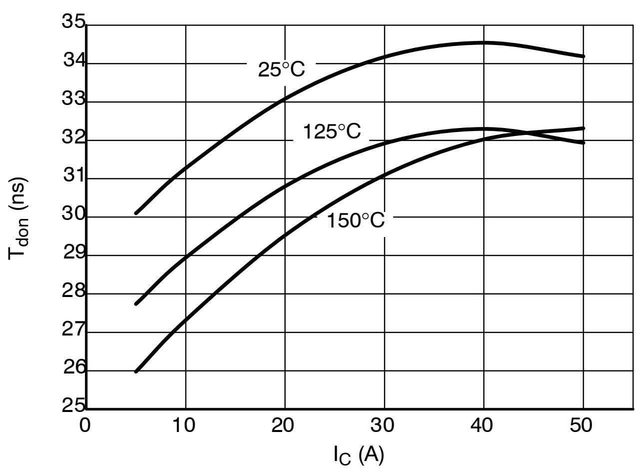


Figure 27. Typical Switching Time T_{don} vs. I_C

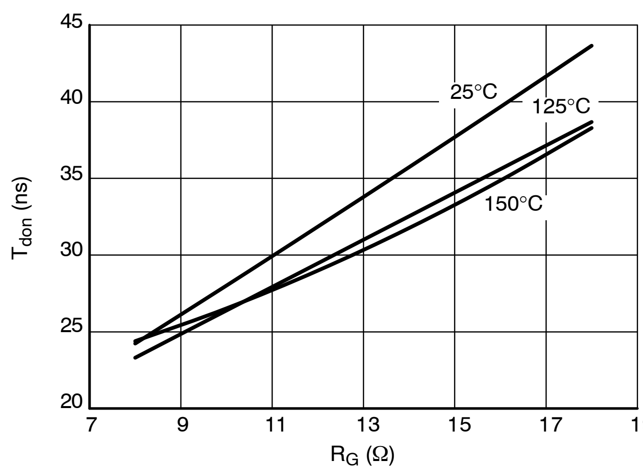


Figure 28. Typical Switching Time T_{don} vs. R_G

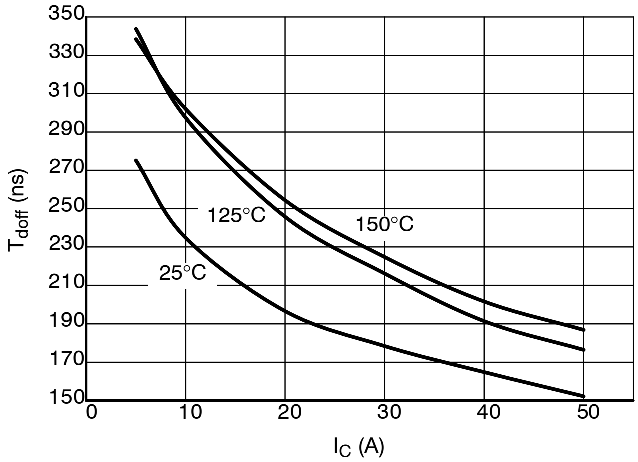


Figure 29. Typical Switching Time T_{doff} vs. I_C

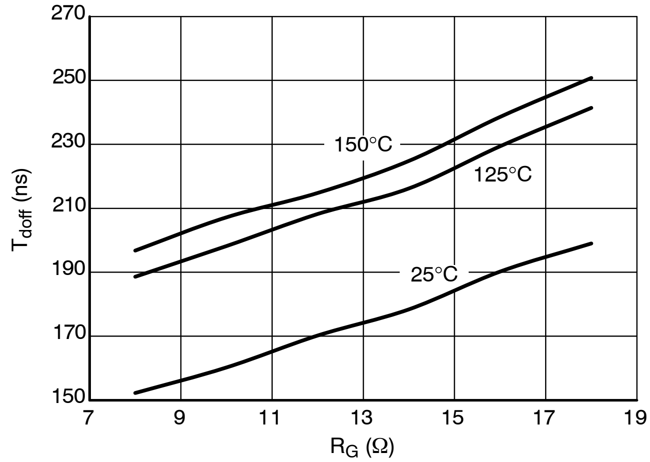


Figure 30. Typical Switching Time T_{doff} vs. R_G

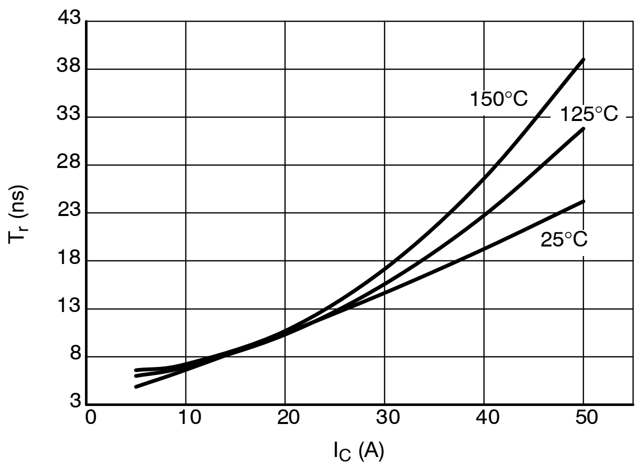


Figure 31. Typical Switching Time T_{ron} vs. I_C

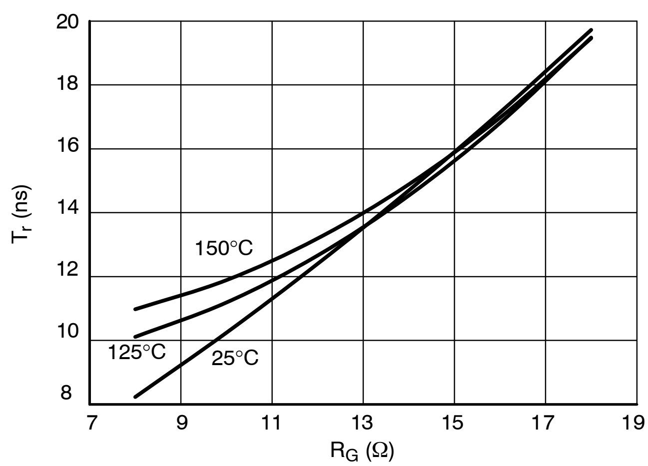


Figure 32. Typical Switching Time T_{ron} vs. R_G

TYPICAL SWITCHING CHARACTERISTICS T1/T2 &T4/T5 IGBT COMUTATES D11/D13 DIODE

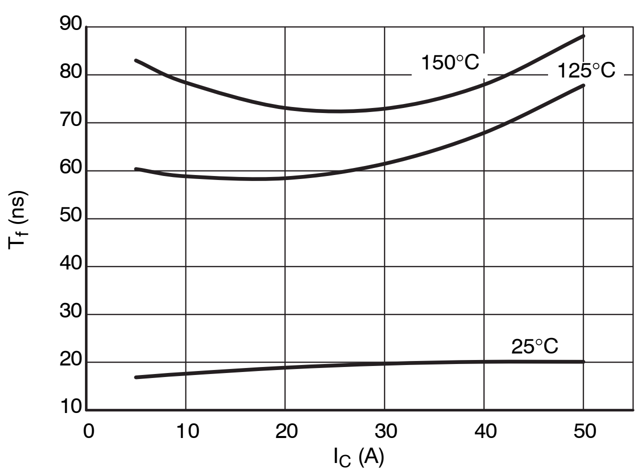


Figure 33. Typical Switching Time T_f vs. I_C

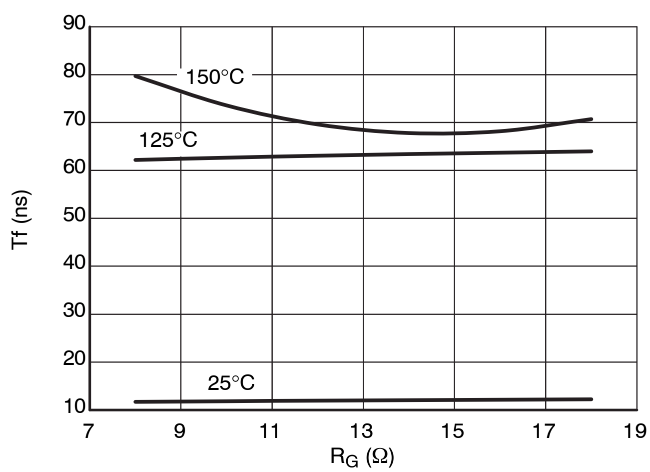


Figure 34. Typical Switching Time T_f vs. R_G

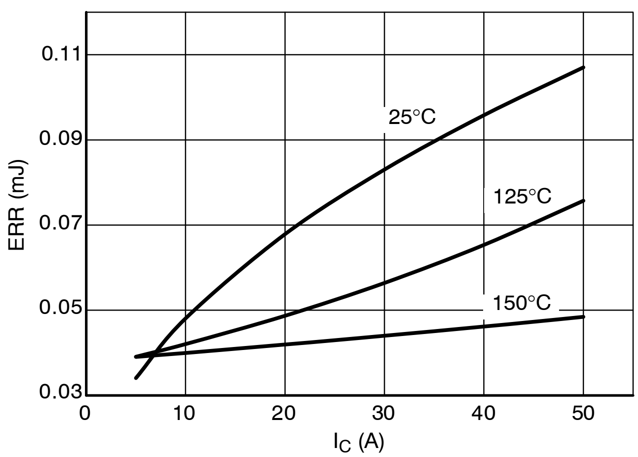


Figure 35. Typical Reverse Recovery Energy vs. I_C

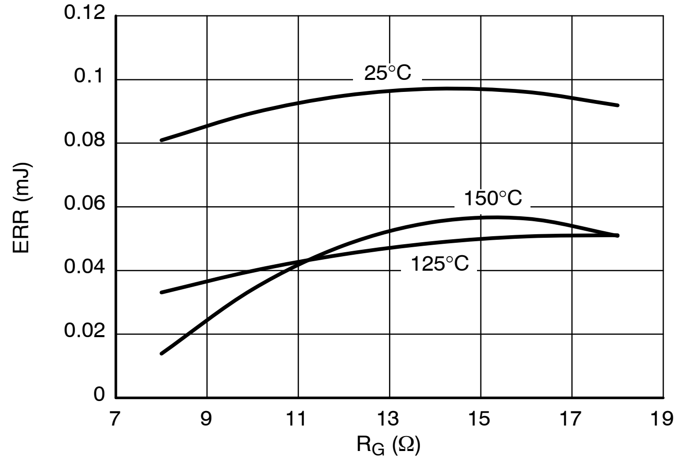


Figure 36. Typical Reverse Recovery Energy vs. R_G

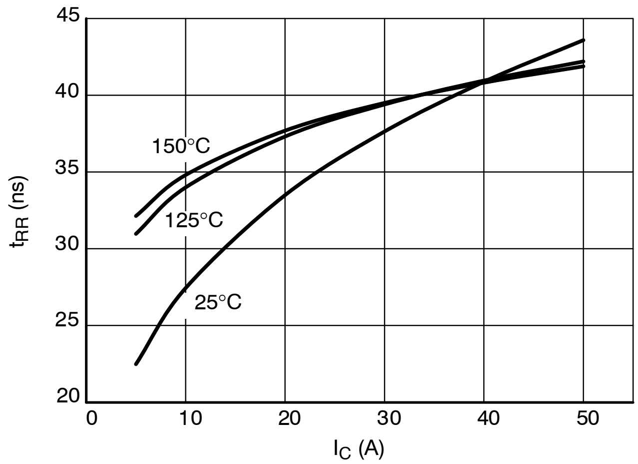


Figure 37. Typical Reverse Recovery Time vs. I_C

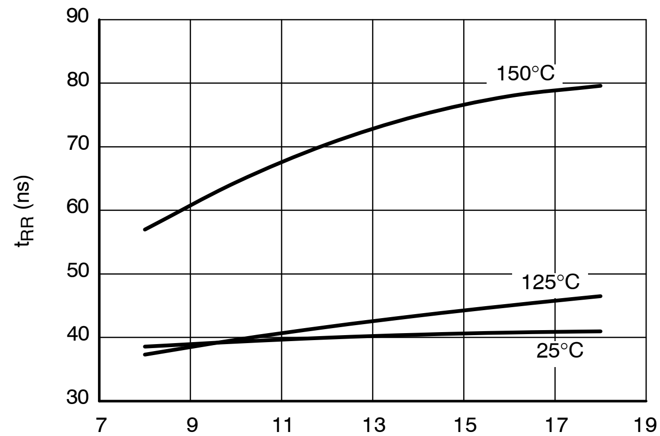


Figure 38. Typical Reverse Recovery Time vs. R_G

TYPICAL SWITCHING CHARACTERISTICS T1/T2 &T4/T5 IGBT COMUTATES D11/D13 DIODE

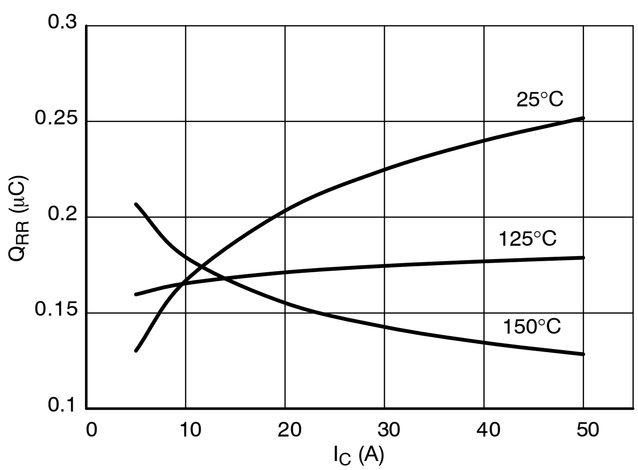


Figure 39. Typical Reverse Recovery Charge vs. I_C

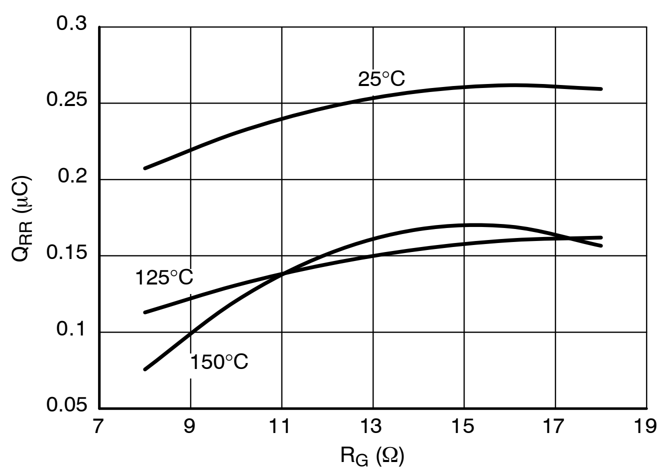


Figure 40. Typical Reverse Recovery Charge vs. R_G

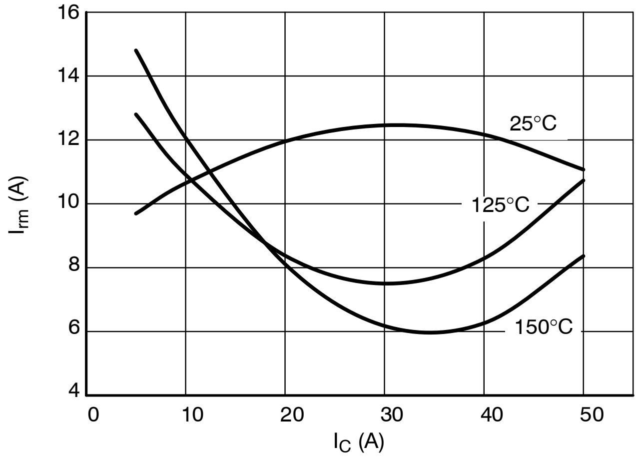


Figure 41. Typical Reverse Recovery Current vs. I_C

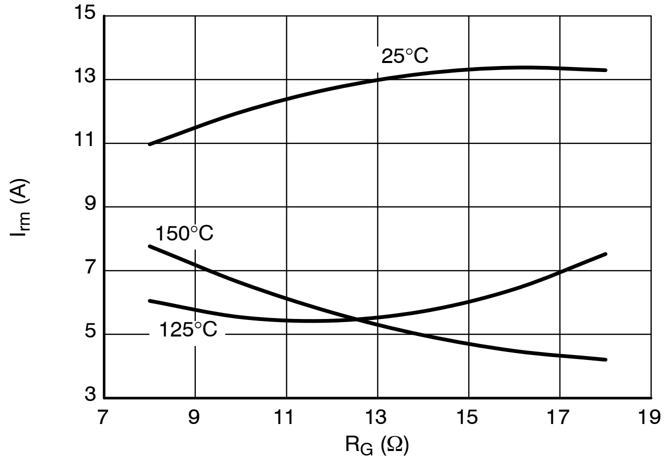


Figure 42. Typical Reverse Recovery Current vs. R_G

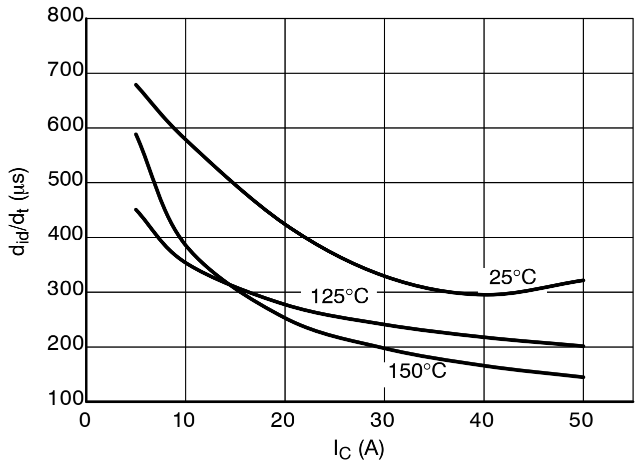


Figure 43. Typical d_{id}/d_t vs. I_C

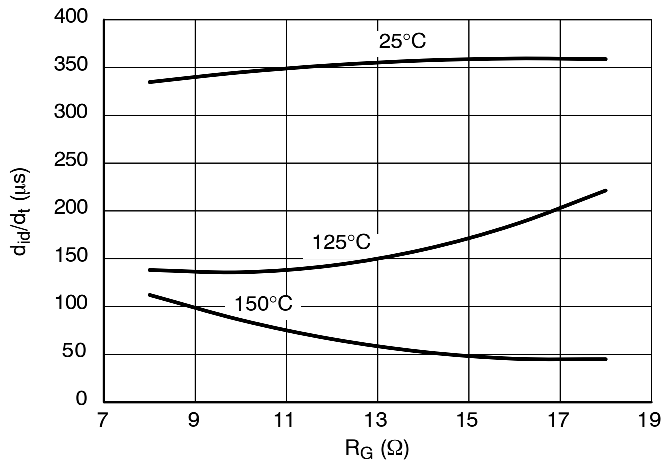


Figure 44. Typical d_{id}/d_t vs. R_G

TYPICAL SWITCHING CHARACTERISTICS T3 IGBT COMUTATES D12 DIODE

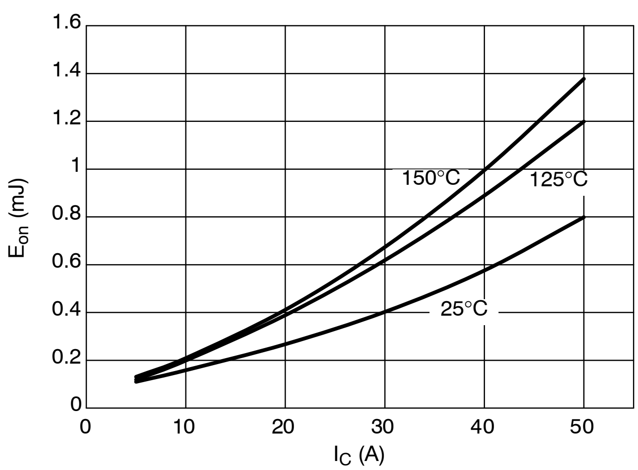


Figure 45. Typical Switching Loss E_{on} vs. I_C

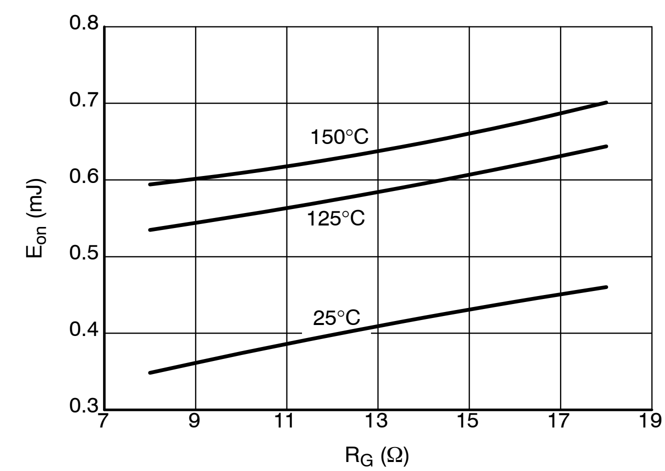


Figure 46. Typical Switching Loss E_{on} vs. R_G

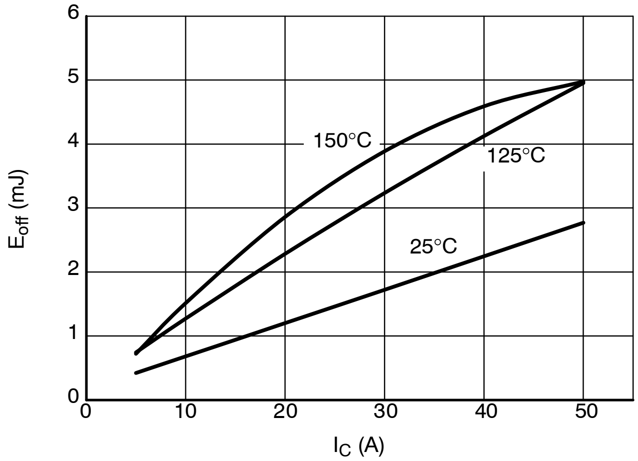


Figure 47. Typical Switching Loss E_{off} vs. I_C

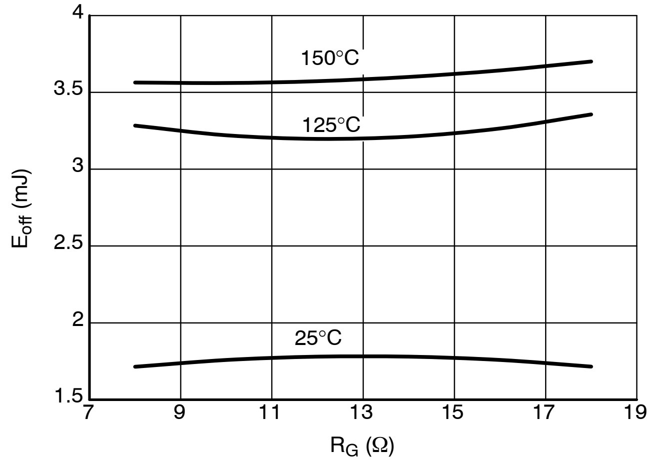


Figure 48. Typical Switching Loss E_{off} vs. R_G

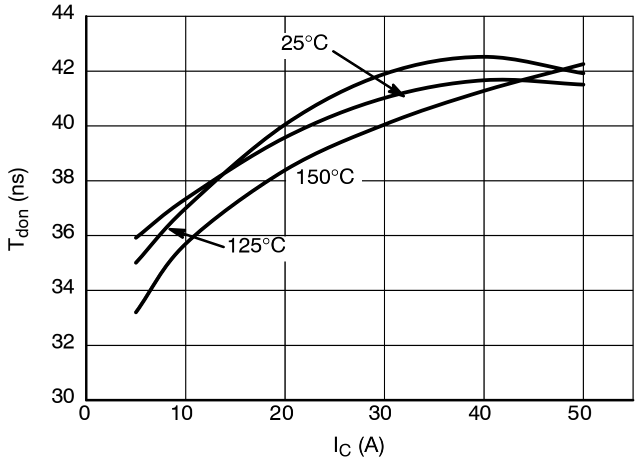


Figure 49. Typical Switching Time T_{don} vs. I_C

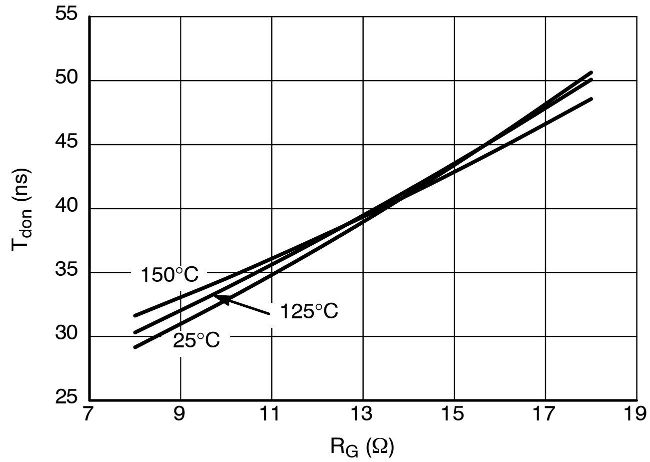


Figure 50. Typical Switching Time T_{don} vs. R_G

TYPICAL SWITCHING CHARACTERISTICS T3 IGBT COMUTATES D12 DIODE

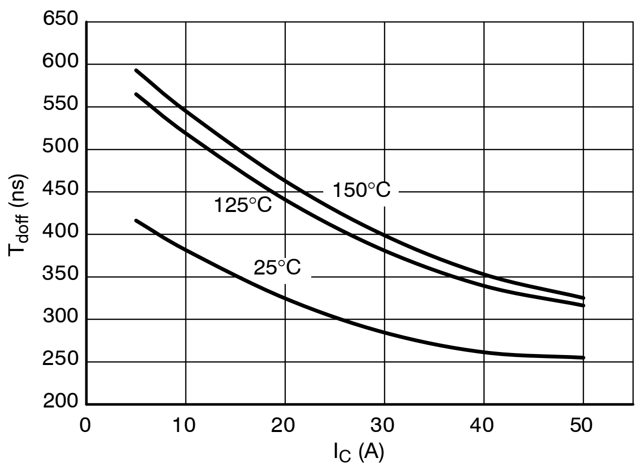


Figure 51. Typical Switching Time T_{doff} vs. I_C

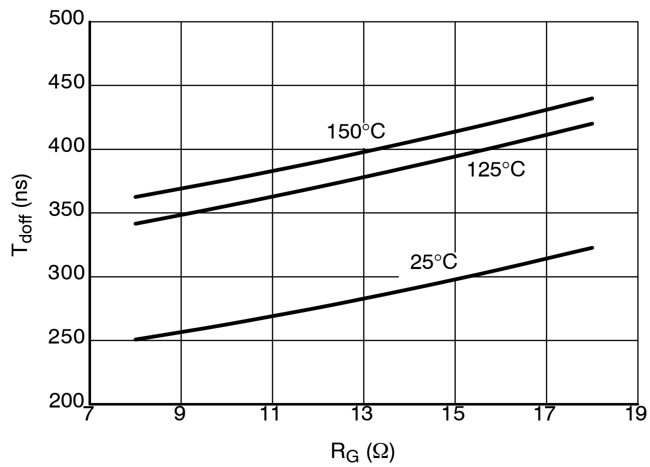


Figure 52. Typical Switching Time T_{doff} vs. R_G

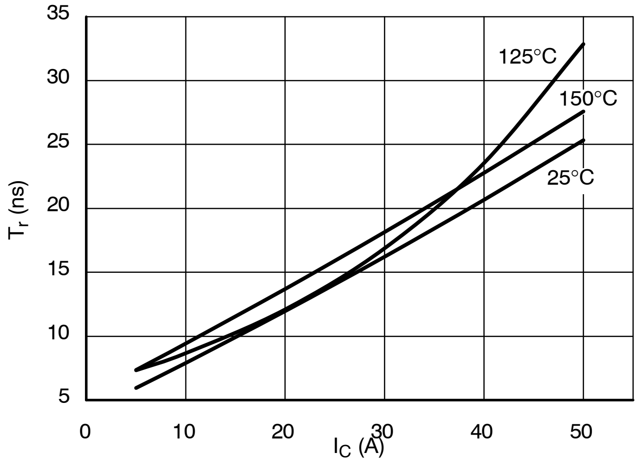


Figure 53. Typical Switching Time T_{ron} vs. I_C

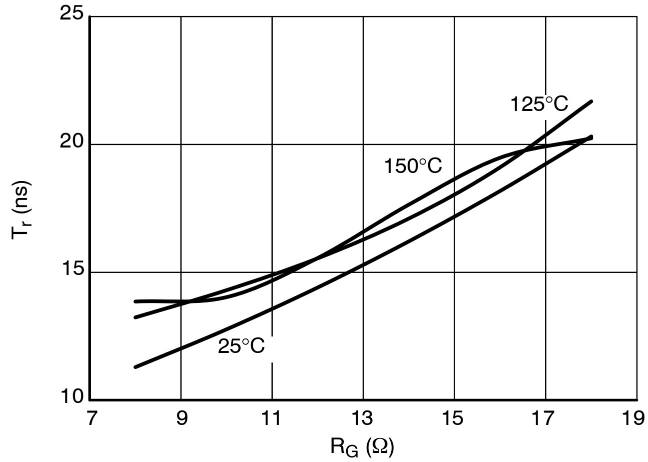


Figure 54. Typical Switching Time T_{ron} vs. R_G

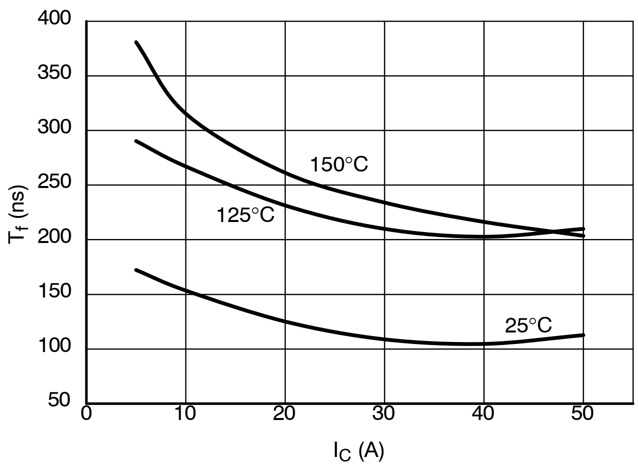


Figure 55. Typical Switching Time T_f vs. I_C

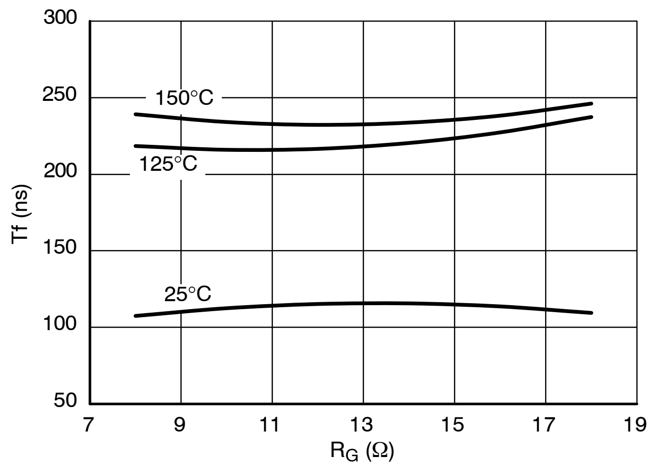


Figure 56. Typical Switching Time T_f vs. R_G

TYPICAL SWITCHING CHARACTERISTICS T3 IGBT COMUTATES D12 DIODE

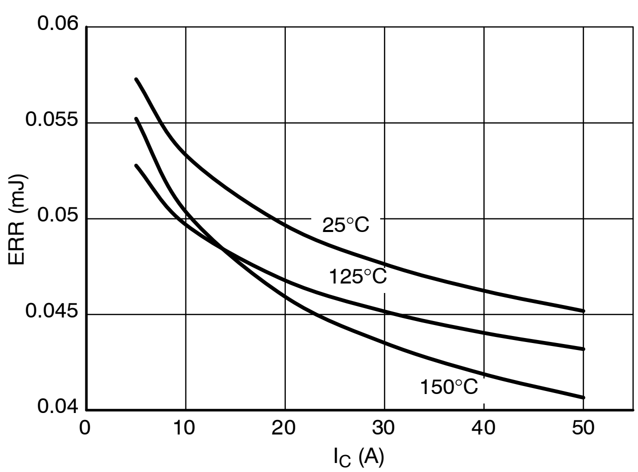


Figure 57. Typical Reverse Recovery Energy vs. I_C

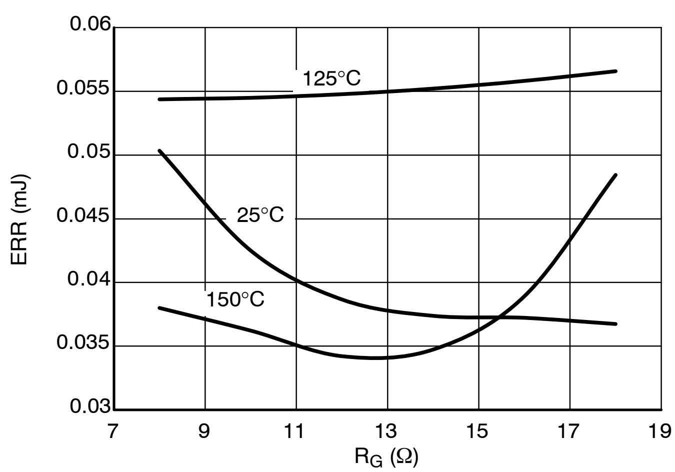


Figure 58. Typical Reverse Recovery Energy vs. R_G

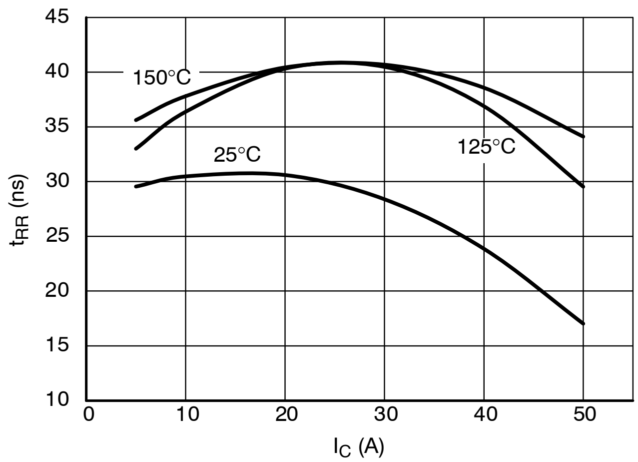


Figure 59. Typical Reverse Recovery Time vs. I_C

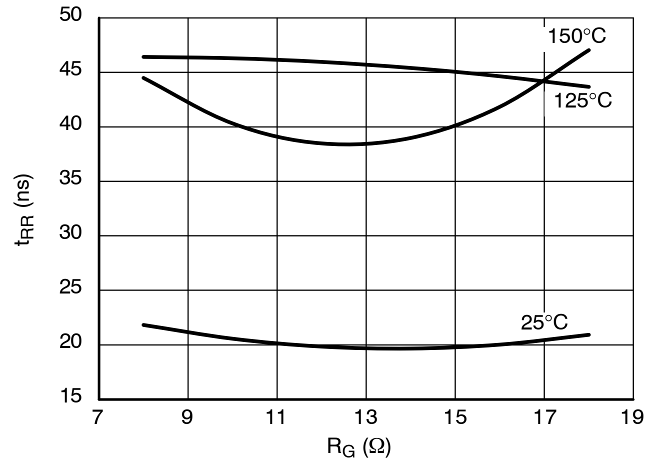


Figure 60. Typical Reverse Recovery Time vs. R_G

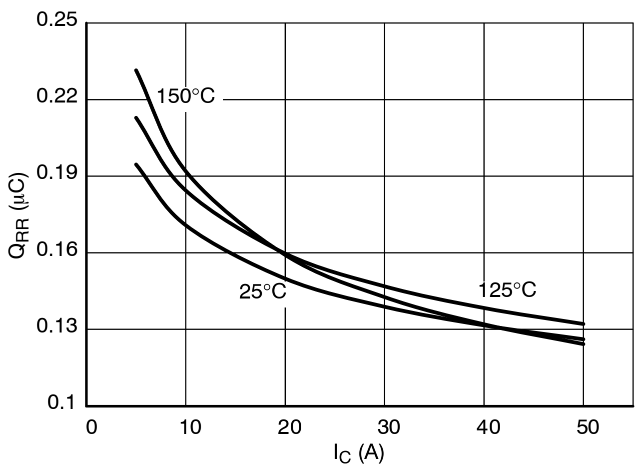


Figure 61. Typical Reverse Recovery Charge vs. I_C

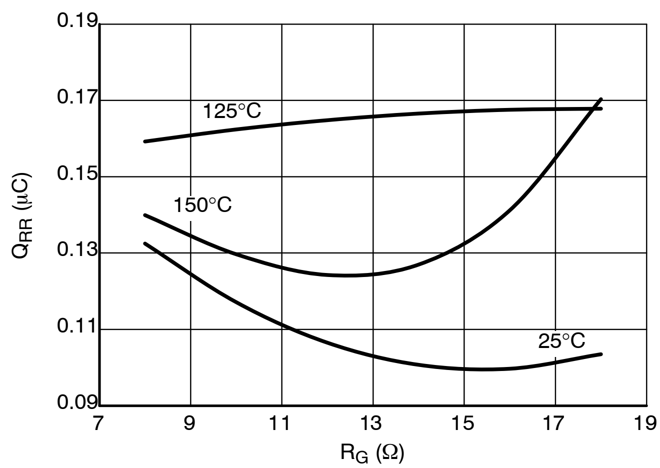


Figure 62. Typical Reverse Recovery Charge vs. R_G

TYPICAL SWITCHING CHARACTERISTICS T3 IGBT COMUTATES D12 DIODE

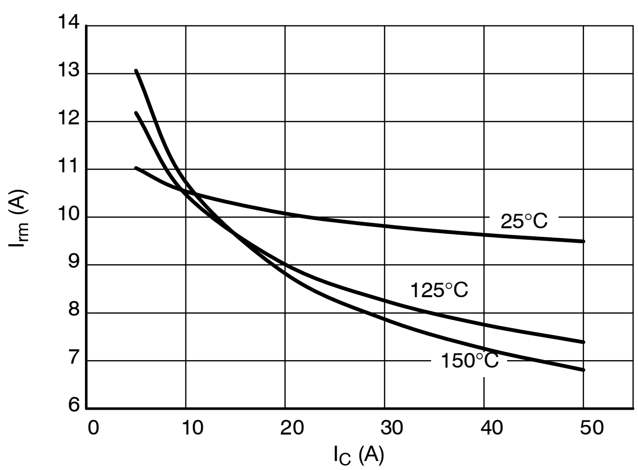


Figure 63. Typical Reverse Recovery Current vs. I_C

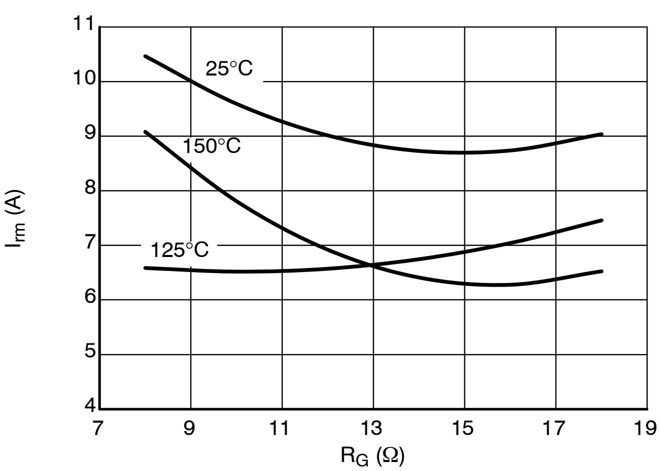


Figure 64. Typical Reverse Recovery Current vs. R_G

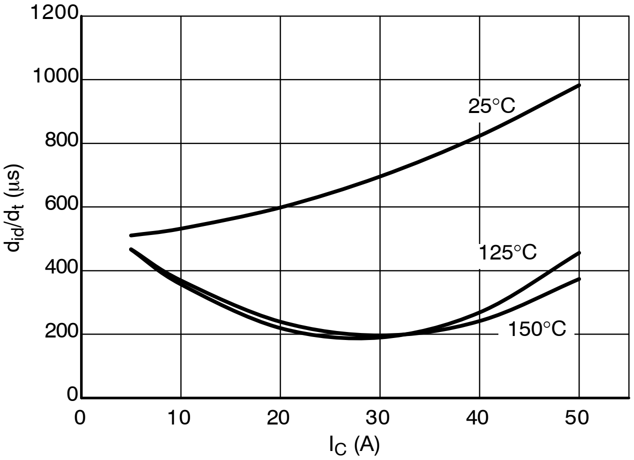


Figure 65. Typical d_{id}/d_t vs. I_C

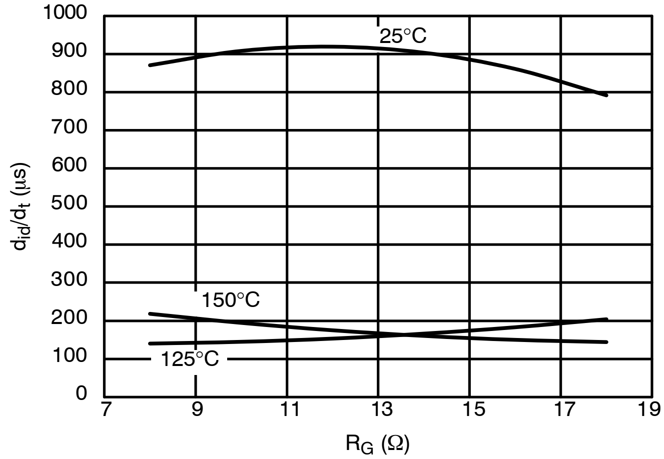
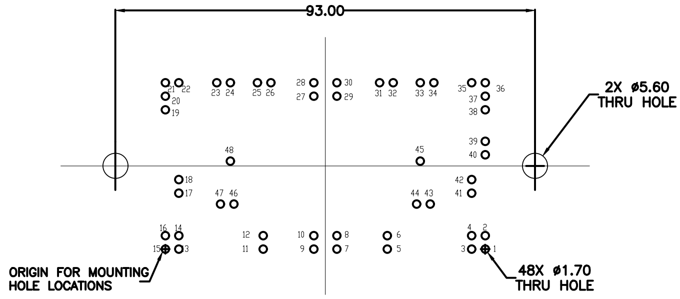


Figure 66. Typical d_{id}/d_t vs. R_G

PACKAGE DIMENSIONS

PIM48 107.2x47
CASE 180AR
ISSUE O

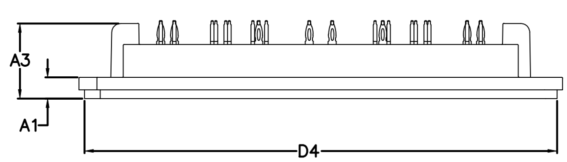
DATE 08 JUN 2018



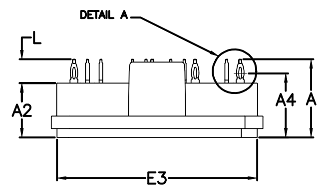
RECOMMENDED MOUNTING PATTERN

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 PIN 15. 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.

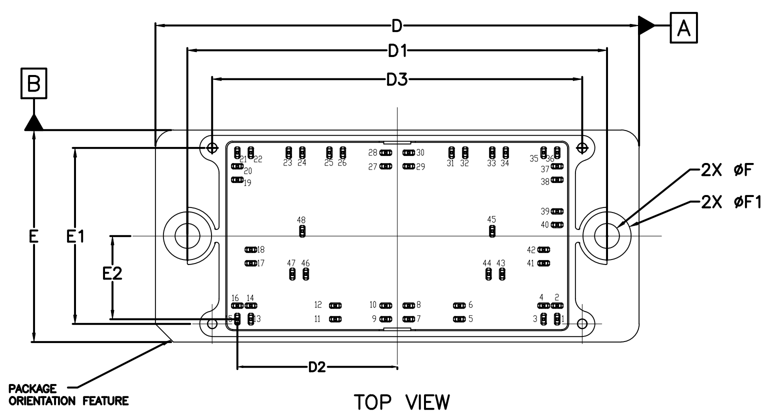


SIDE VIEW

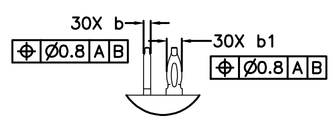


END VIEW

DIM	MILLIMETERS MIN.	NOM.	MAX.
A	16.90	17.30	17.70
A1	4.50	4.70	4.90
A2	11.70	12.00	12.30
A3	16.40	16.70	17.00
A4	13.97	14.18	14.39
b	0.60	0.80	1.00
b1	1.61	1.66	1.71
D	106.80	107.20	107.60
D1	92.90	93.00	93.10
D2		35.45 REF	
D3	81.80	82.00	82.20
D4	104.35	104.75	105.15
E	46.60	47.00	47.40
E1	38.80	39.00	39.20
E2		18.45 REF	
E3	44.00	44.40	44.80
F	5.40	5.50	5.60
F1		5.35 REF	
L	4.90	5.30	5.70



TOP VIEW



DETAIL A

NOTE 4

PIN	PIN POSITION X	Y	PIN	PIN POSITION X	Y	PIN	PIN POSITION X	Y
1	70.9	0.0	17	3.0	12.4	33	56.5	36.9
2	70.9	3.0	18	3.0	15.4	34	59.5	36.9
3	67.9	0.0	19	0.0	30.9	35	67.9	36.9
4	67.9	3.0	20	0.0	33.9	36	70.9	36.9
5	49.2	0.0	21	0.0	36.9	37	70.9	33.9
6	49.2	3.0	22	3.0	36.9	38	70.9	30.9
7	38.0	0.0	23	11.4	36.9	39	70.9	23.9
8	38.0	3.0	24	14.4	36.9	40	70.9	20.9
9	32.9	0.0	25	20.4	36.9	41	67.9	12.4
10	32.9	3.0	26	23.4	36.9	42	67.9	15.4
11	21.7	0.0	27	32.9	33.9	43	58.7	10.0
12	21.7	3.0	28	32.9	36.9	44	55.7	10.0
13	3.0	0.0	29	38.0	33.9	45	56.5	19.5
14	3.0	3.0	30	38.0	36.9	46	15.2	10.0
15	0.0	0.0	31	47.5	36.9	47	12.2	10.0
16	0.0	3.0	32	50.5	36.9	48	14.4	19.5

PIN	MOUNTING HOLE POSITION X	Y	PIN	MOUNTING HOLE POSITION X	Y	PIN	MOUNTING HOLE POSITION X	Y
1	70.9	0.0	17	3.0	12.4	33	56.5	36.9
2	70.9	3.0	18	3.0	15.4	34	59.5	36.9
3	67.9	0.0	19	0.0	30.9	35	67.9	36.9
4	67.9	3.0	20	0.0	33.9	36	70.9	36.9
5	49.2	0.0	21	0.0	36.9	37	70.9	33.9
6	49.2	3.0	22	3.0	36.9	38	70.9	30.9
7	38.0	0.0	23	11.4	36.9	39	70.9	23.9
8	38.0	3.0	24	14.4	36.9	40	70.9	20.9
9	32.9	0.0	25	20.4	36.9	41	67.9	12.4
10	32.9	3.0	26	23.4	36.9	42	67.9	15.4
11	21.7	0.0	27	32.9	33.9	43	58.7	10.0
12	21.7	3.0	28	32.9	36.9	44	55.7	10.0
13	3.0	0.0	29	38.0	33.9	45	56.5	19.5
14	3.0	3.0	30	38.0	36.9	46	15.2	10.0
15	0.0	0.0	31	47.5	36.9	47	12.2	10.0
16	0.0	3.0	32	50.5	36.9	48	14.4	19.5

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