Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

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Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

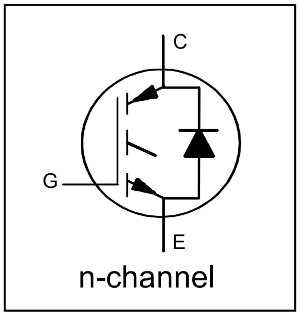
Insulated Gate Bipolar Transistor with Ultrafast Soft Recovery Diode

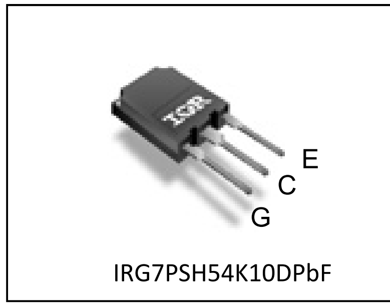
V_{CES} = 1200V

I_C = 65A, T_C = 100°C

$t_{SC} \geq$ 10µs, $T_{J(max)}$ = 150°C

$V_{CE(ON)}$ typ. = 1.9V @ Ic = 50A





G	C	E
Gate	Collector	Emitter

Applications
- Industrial Motor Drive
- UPS
- Solar Inverters
- Welding

Features	→ Benefits
Low $V_{CE(ON)}$ and switching losses	High efficiency in a Wide Range of Applications
10µs Short Circuit SOA	Rugged Transient Performance
Square RBSOA	
Maximum Junction Temperature 150°C	Increased Reliability
Positive $V_{CE\ (ON)}$ Temperature Coefficient	Excellent Current Sharing in Parallel Operation

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
IRG7PSH54K10DPbF	Super-247	Tube	25	IRG7PSH54K10DPbF

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
I_C @ T_C = 25°C	Continuous Collector Current	120	A
I_C @ T_C = 100°C	Continuous Collector Current	65	
I_{CM}	Pulse Collector Current, V_{GE}=20V	200	
I_{LM}	Clamped Inductive Load Current, V_{GE}=20V ①	200	
I_F @ T_C = 25°C	Diode Continuous Forward Current	50	
I_F @ T_C = 100°C	Diode Continuous Forward Current	25	
V_{GE}	Continuous Gate-to-Emitter Voltage	±30	V
P_D @ T_C = 25°C	Maximum Power Dissipation	520	W
P_D @ T_C = 100°C	Maximum Power Dissipation	210	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-40 to +150	C
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	
	Mounting Torque, 6-32 or M3 Screw	10 lbf·in (1.1 N·m)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$ (IGBT)	Thermal Resistance Junction-to-Case-(each IGBT) ②	——	——	0.24	°C/W
$R_{\theta JC}$ (Diode)	Thermal Resistance Junction-to-Case-(each Diode) ②	——	——	0.70	
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink (flat, greased surface)	——	0.24	——	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (typical socket mount)	——	——	40	

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	1200	—	—	V	V_{GE} = 0V, I_C = 250μA ③
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	1.3	—	V/°C	V_{GE} = 0V, I_C = 5mA (25°C-150°C)
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	1.9	2.4	V	I_C = 50A, V_{GE} = 15V, T_J = 25°C
		—	2.4	—		I_C = 50A, V_{GE} = 15V, T_J = 150°C
$V_{GE(th)}$	Gate Threshold Voltage	5.0	—	7.5	V	V_{CE} = V_{GE}, I_C = 2.4mA
$\Delta V_{GE(th)}/\Delta T_J$	Threshold Voltage Temperature Coeff.	—	-15	—	mV/°C	V_{CE} = V_{GE}, I_C = 2.4mA (25°C-150°C)
gfe	Forward Transconductance	—	36	—	S	V_{CE} = 50V, I_C = 50A, PW = 20μs
I_{CES}	Collector-to-Emitter Leakage Current	—	1.0	45	μA	V_{GE} = 0V, V_{CE} = 1200V
		—	1800	—		V_{GE} = 0V, V_{CE} = 1200V, T_J = 150°C
I_{GES}	Gate-to-Emitter Leakage Current	—	—	±200	nA	V_{GE} = ±30V
V_F	Diode Forward Voltage Drop	—	2.5	3.5	V	I_F = 16A
		—	2.1	—		I_F = 16A, T_J = 150°C

Switching Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max④	Units	Conditions
Q_g	Total Gate Charge (turn-on)	—	290	435		I_C = 50A
Q_{ge}	Gate-to-Emitter Charge (turn-on)	—	60	90	nC	V_{GE} = 15V
Q_{gc}	Gate-to-Collector Charge (turn-on)	—	130	195		V_{CC} = 600V
E_{on}	Turn-On Switching Loss	—	4.8	5.7		
E_{off}	Turn-Off Switching Loss		2.8	3.7	mJ	I_C = 50A, V_{CC} = 600V, V_{GE}=15V
E_{total}	Total Switching Loss		7.6	9.4		R_G = 5Ω, T_J = 25°C
$t_{d(on)}$	Turn-On delay time	—	110	130		
t_r	Rise time	—	80	105		Energy losses include tail & diode
$t_{d(off)}$	Turn-Off delay time	—	490	520	ns	reverse recovery ⑤⑥
t_f	Fall time	—	70	90		
E_{on}	Turn-On Switching Loss	—	6.8	—		
E_{off}	Turn-Off Switching Loss	—	4.7	—	mJ	
E_{total}	Total Switching Loss		11.5			I_C = 50A, V_{CC} = 600V, V_{GE}=15V
$t_{d(on)}$	Turn-On delay time	—	85	—		R_G = 5Ω, T_J = 150°C
t_r	Rise time	—	90	—		Energy losses include tail & diode
$t_{d(off)}$	Turn-Off delay time	—	490	—	ns	reverse recovery ⑤⑥
t_f	Fall time	—	290	—		
C_{ies}	Input Capacitance	—	5700	—		V_{GE} = 0V
C_{oes}	Output Capacitance	—	290	—	pF	V_{CC} = 30V
C_{res}	Reverse Transfer Capacitance	—	150	—		f = 1.0Mhz
RBSOA	Reverse Bias Safe Operating Area	FULL SQUARE				T_J = 150°C, I_C = 200A V_{CC} = 960V, Vp ≤ 1200V V_{GE} = +20V to 0V
SCSOA	Short Circuit Safe Operating Area	10	—	—	μs	T_J = 150°C, V_{CC} = 600V, Vp ≤ 1200V V_{GE} = +15V to 0V
Erec	Reverse Recovery Energy of the Diode	—	640	—	μJ	T_J = 150°C
t_{rr}	Diode Reverse Recovery Time	—	170	—	ns	V_{CC} = 600V, I_F = 16A
I_{rr}	Peak Reverse Recovery Current	—	25	—	A	V_{GE} = 15V, Rg = 5Ω

Notes:

① V_{CC} = 80% (V_{CES}), V_{GE} = 20V
② R_θ is measured at T_J of approximately 90°C.
③ Refer to AN-1086 for guidelines for measuring $V_{(BR)CES}$ safely.
④ Maximum limits are based on statistical sample size characterization.
⑤ Pulse width limited by max. junction temperature.
⑥ Values influenced by parasitic L and C in measurement.

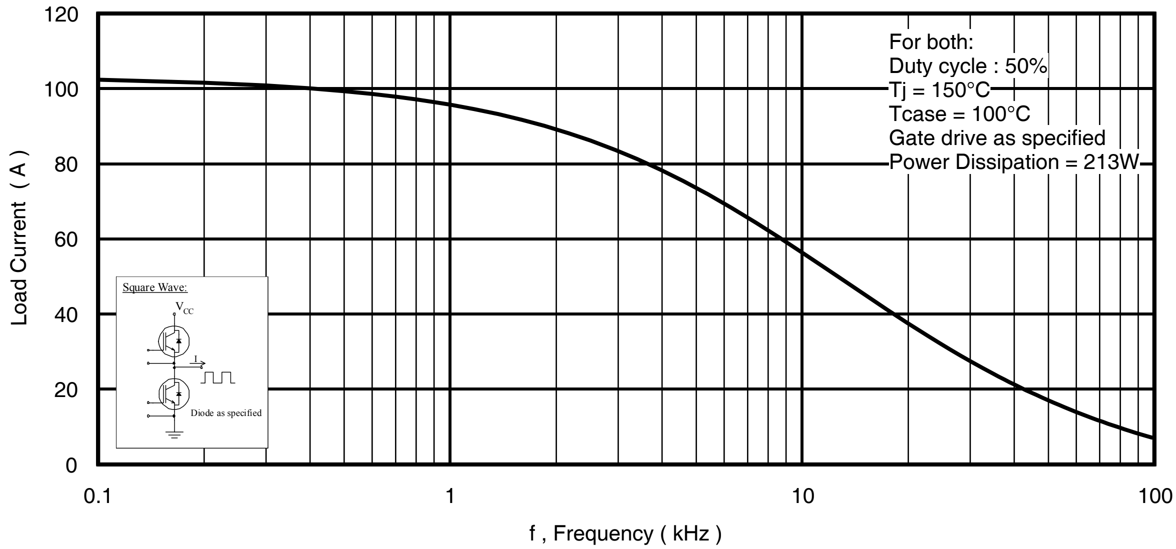


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = IRMS of fundamental)

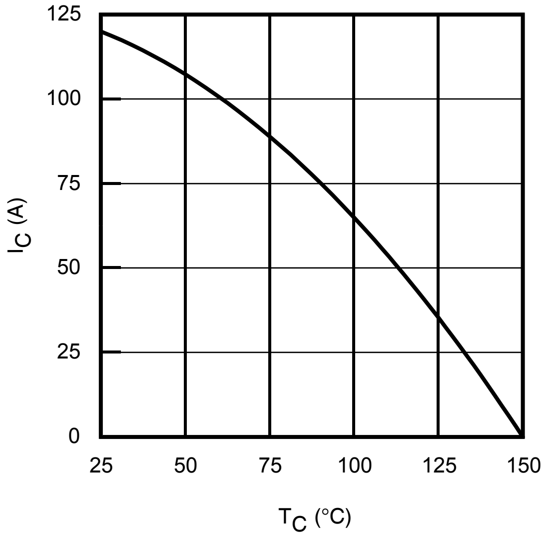


Fig. 2 - Maximum DC Collector Current vs. Case Temperature

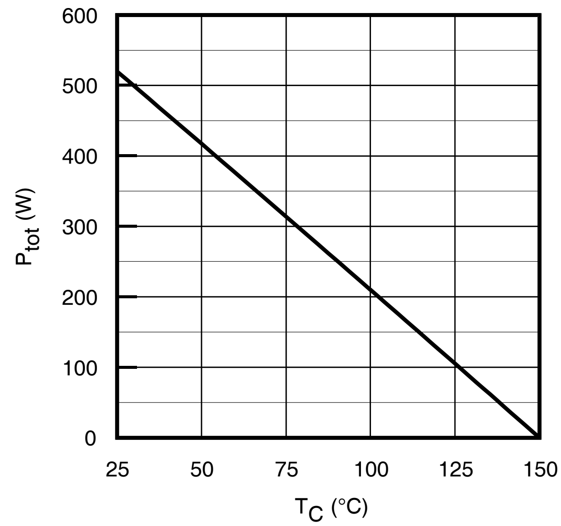


Fig. 3 - Power Dissipation vs. Case Temperature

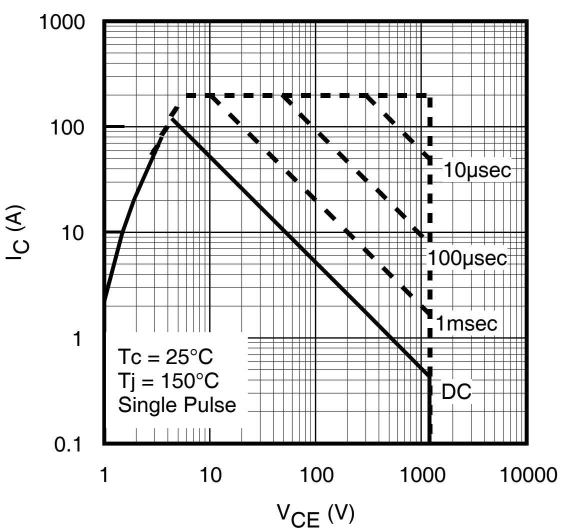


Fig. 4 - Forward SOA
T_C = 25°C, $T_J \leq$ 150°C, V_{GE} =15V

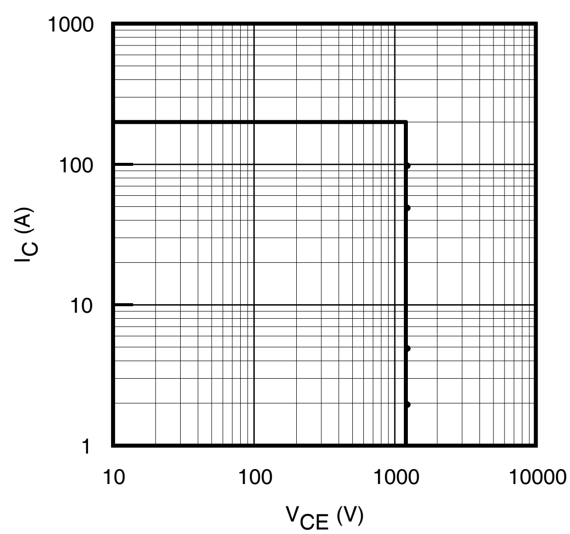


Fig. 5- Reverse Bias SOA
T_J = 150°C; V_{GE} = 20V

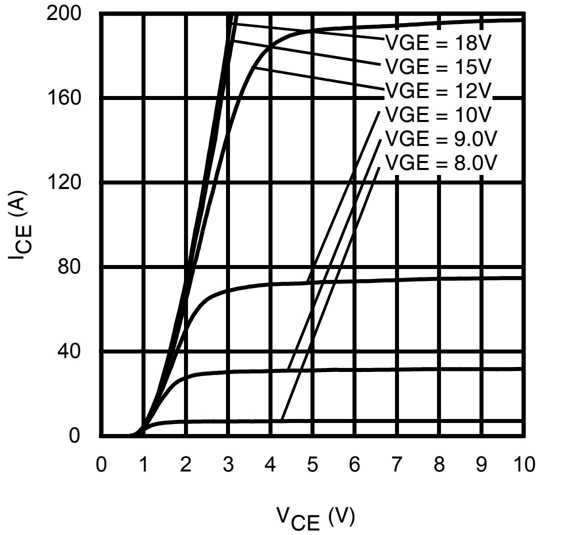


Fig. 6 - Typ. IGBT Output Characteristics
T_J = -40°C; tp = 20µs

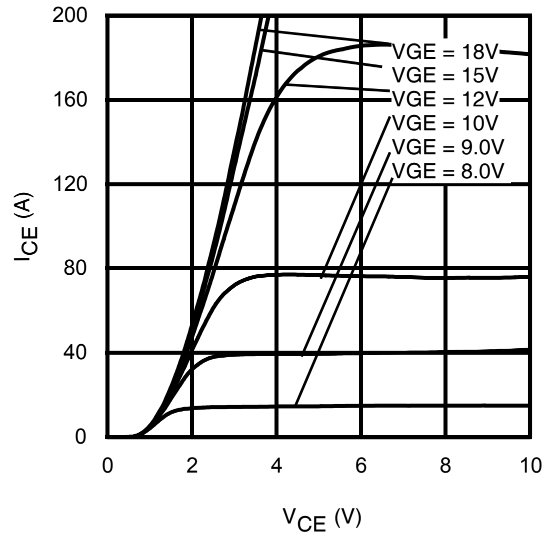


Fig. 7 - Typ. IGBT Output Characteristics
T_J = 25°C; tp = 20µs

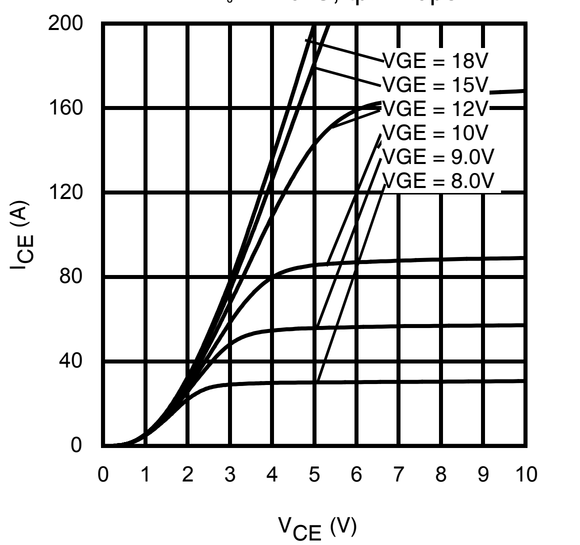


Fig. 8 - Typ. IGBT Output Characteristics
T_J = 150°C; tp = 20µs

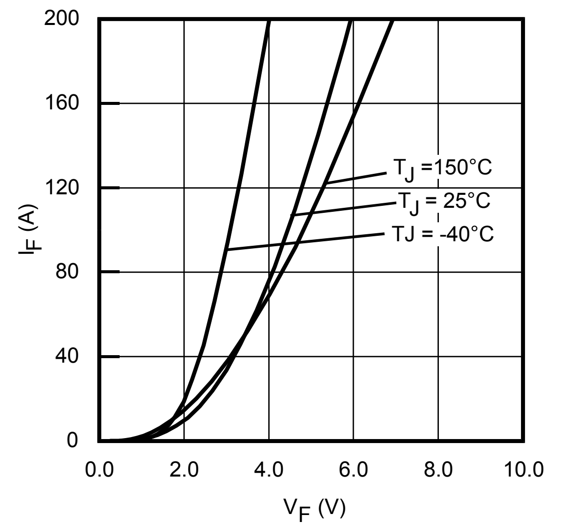


Fig. 9 - Typ. Diode Forward Characteristics
tp = 20µs

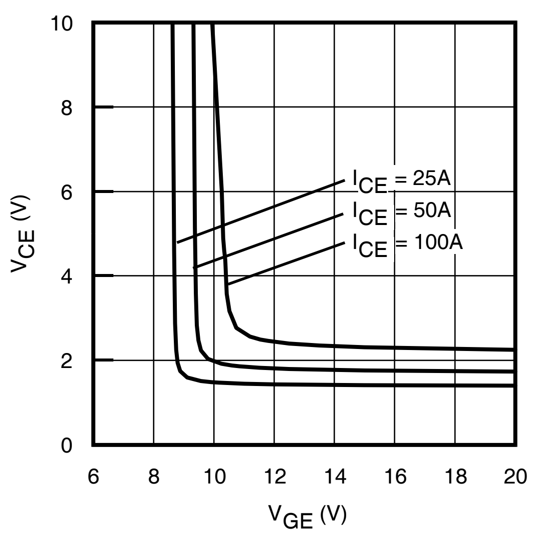


Fig. 10 - Typical V_{CE} vs. V_{GE}
T_J = -40°C

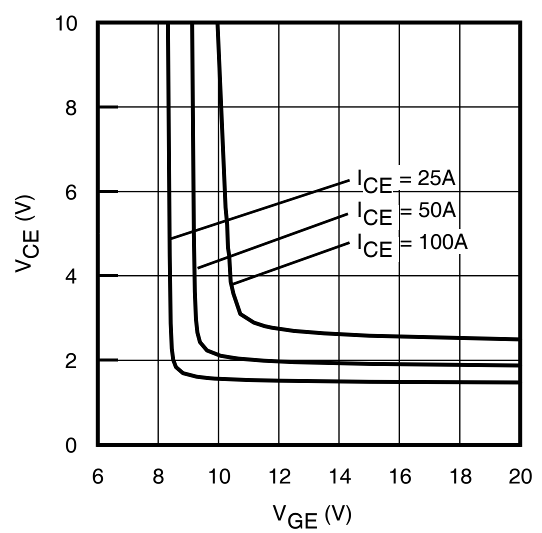


Fig. 11 - Typical V_{CE} vs. V_{GE}
T_J = 25°C

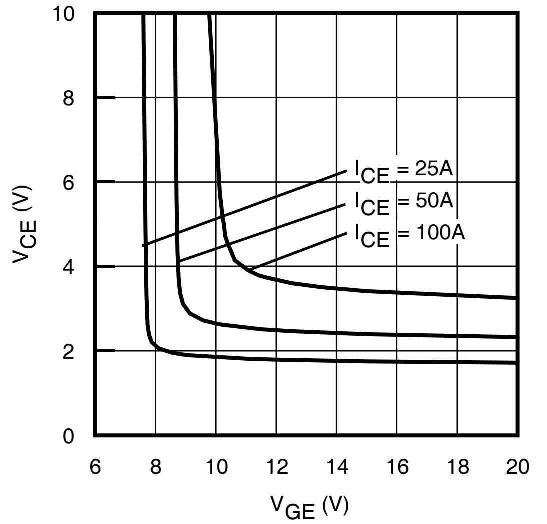


Fig. 12 - Typical V_{CE} vs. V_{GE}
T_J = 150°C

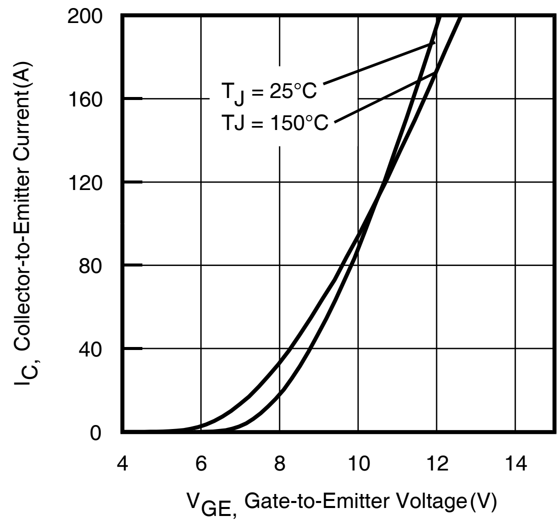


Fig. 13 - Typ. Transfer Characteristics
V_{CE} = 50V; tp = 20µs

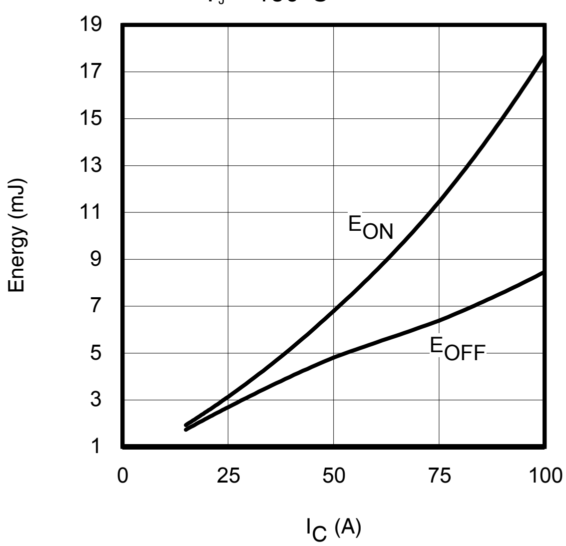


Fig. 14 - Typ. Energy Loss vs. I_C
T_J = 150°C; V_{CE} = 600V, R_G = 5Ω; V_{GE} = 15V

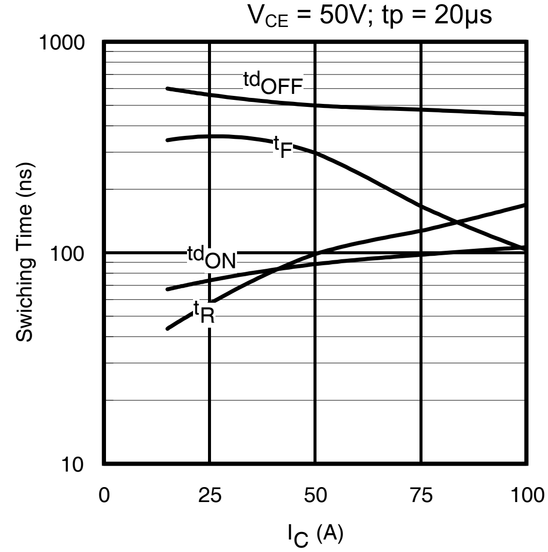


Fig. 15 - Typ. Switching Time vs. I_C
T_J = 150°C; V_{CE} = 600V, R_G = 5Ω; V_{GE} = 15V

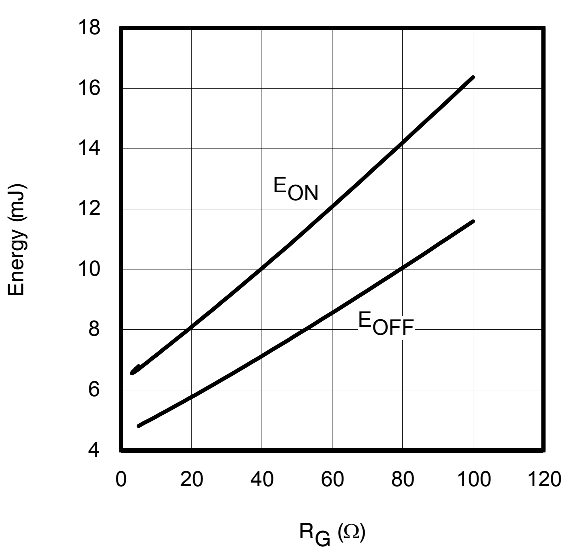


Fig. 16 - Typ. Energy Loss vs. RG
T_J = 150°C; V_{CE} = 600V, I_{CE} = 50A; VGE = 15V

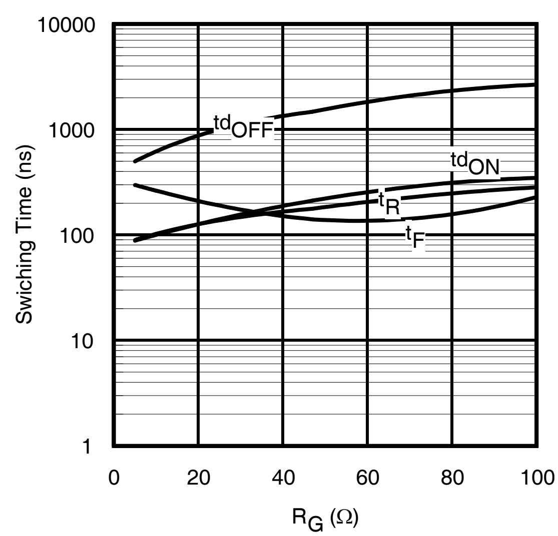


Fig. 17 - Typ. Switching Time vs. RG
T_J = 150°C; V_{CE} = 600V, I_{CE} = 50A; V_{GE} = 15V

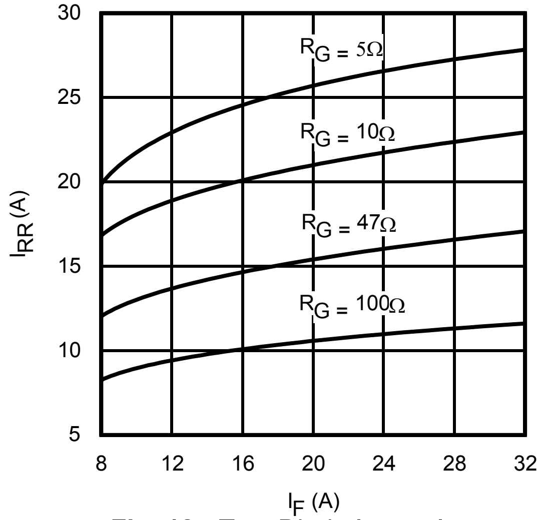


Fig. 18 - Typ. Diode I_{RR} vs. I_F
T_J = 150°C

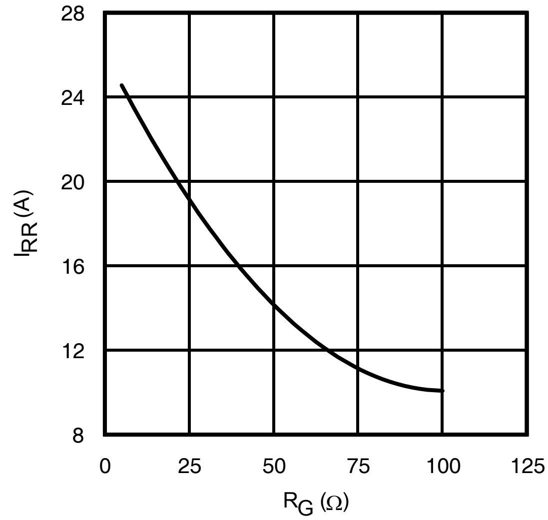


Fig. 19 - Typ. Diode I_{RR} vs. R_G
T_J = 150°C

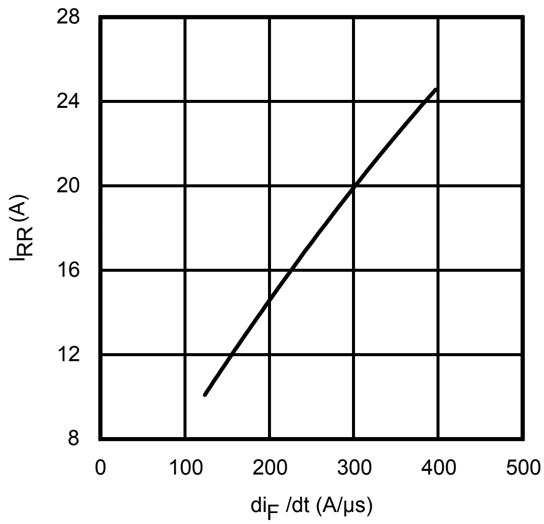


Fig. 20 - Typ. Diode I_{RR} vs. diF/dt
V_{CC} = 600V; V_{GE} = 15V; I_F = 16A; T_J = 150°C

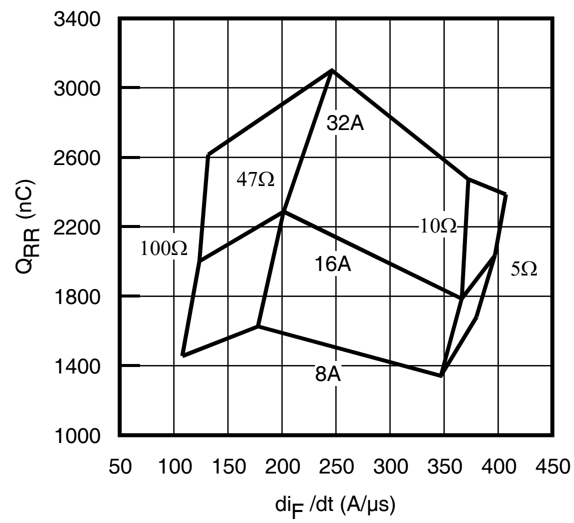


Fig. 21 - Typ. Diode Q_{RR} vs. diF/dt
V_{CC} = 600V; V_{GE} = 15V; T_J = 150°C

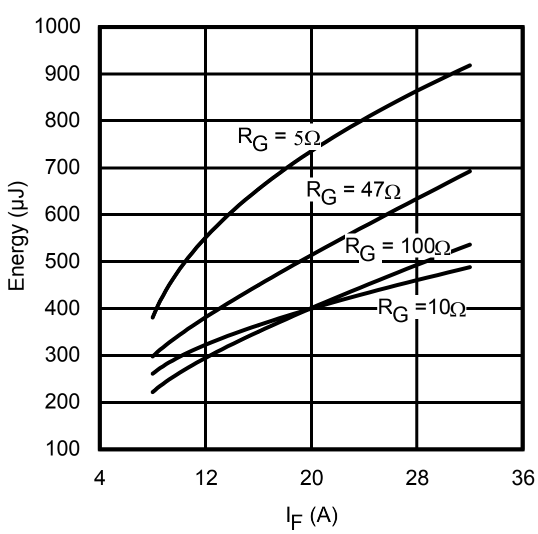


Fig. 22 - Typ. Diode E_{RR} vs. I_F
T_J = 150°C

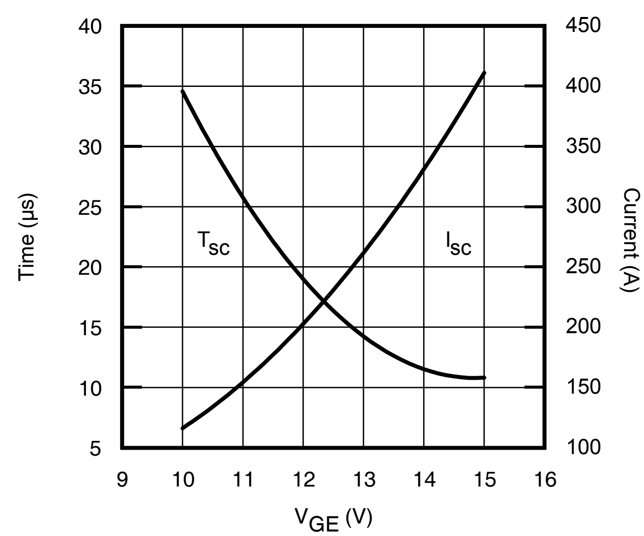


Fig. 23 - V_{CE} vs. Short Circuit Time
V_{cc}= 600V; T_C= 150°C

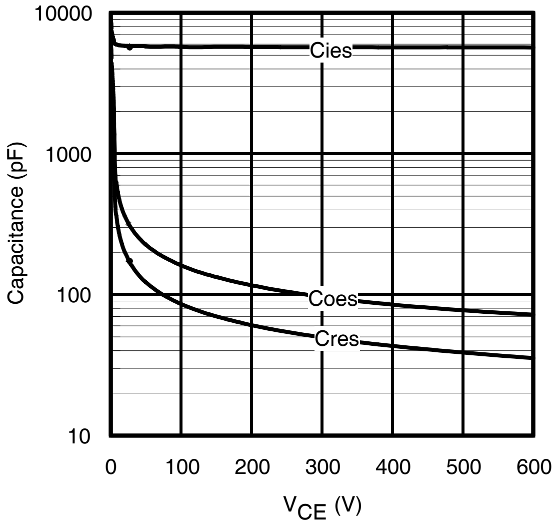


Fig. 24 - Typ. Capacitance vs. V_{CE}
V_{GE}= 0V; f = 1MHz

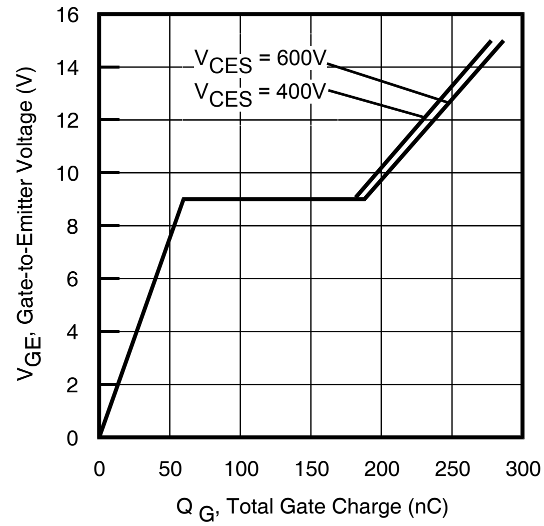
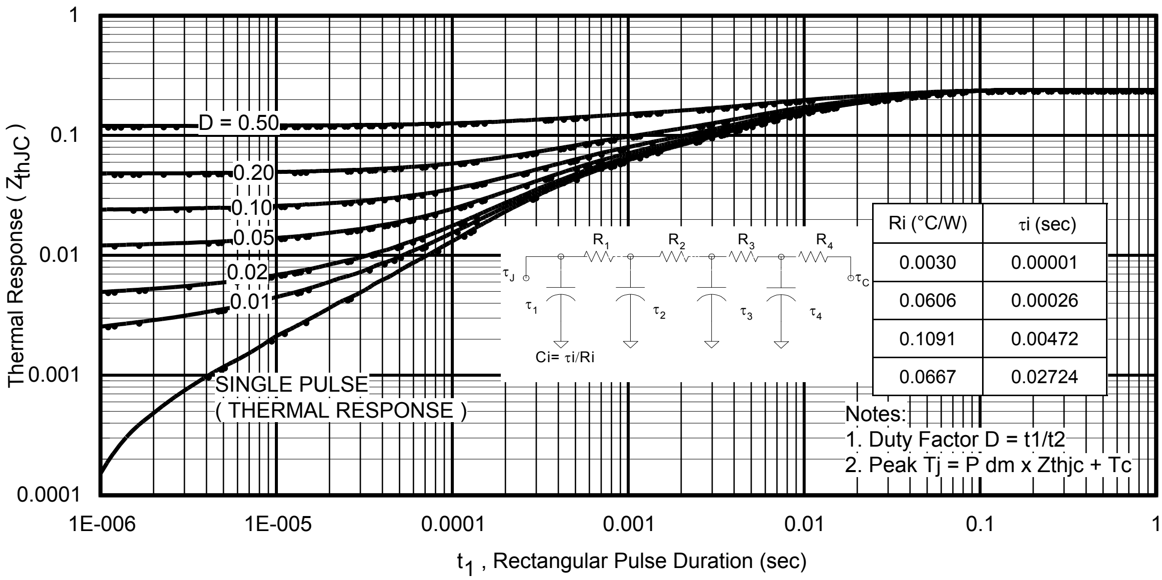
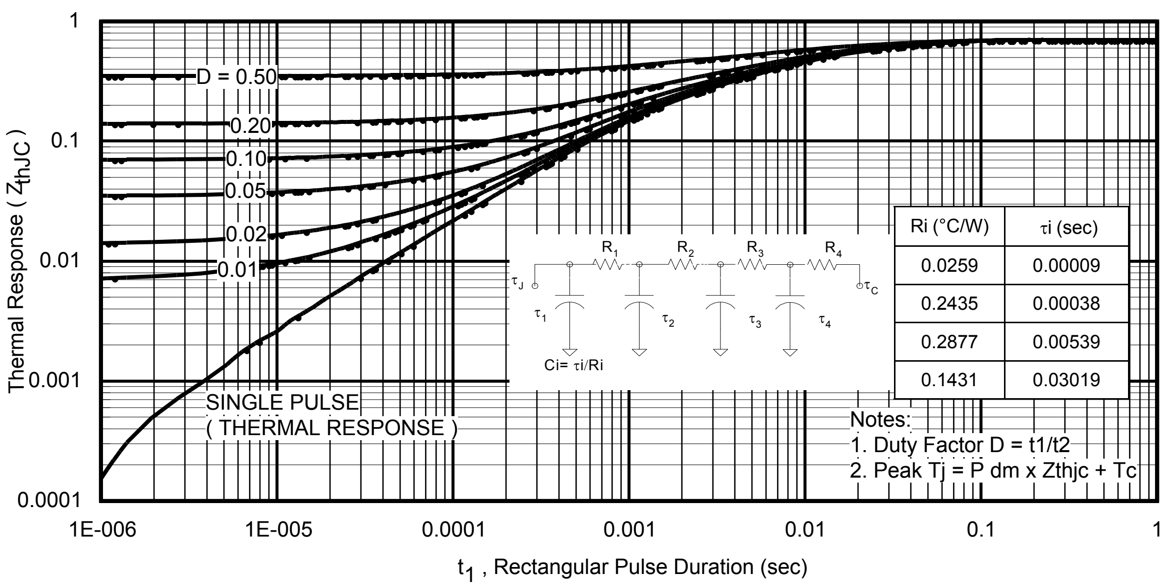


Fig. 25 - Typical Gate Charge vs. V_{GE}
I_{CE} = 50A



Ri (°C/W)	τi (sec)
0.0030	0.00001
0.0606	0.00026
0.1091	0.00472
0.0667	0.02724

Fig. 26 Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)



Ri (°C/W)	τi (sec)
0.0259	0.00009
0.2435	0.00038
0.2877	0.00539
0.1431	0.03019

Fig. 27 Maximum Transient Thermal Impedance, Junction-to-Case (DIODE)

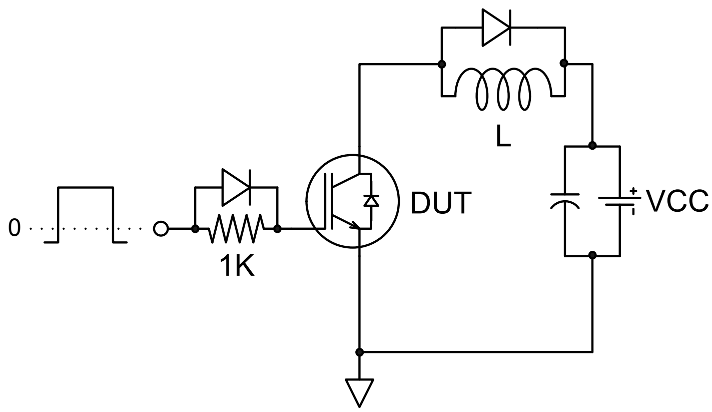


Fig.C.T.1 - Gate Charge Circuit (turn-off)

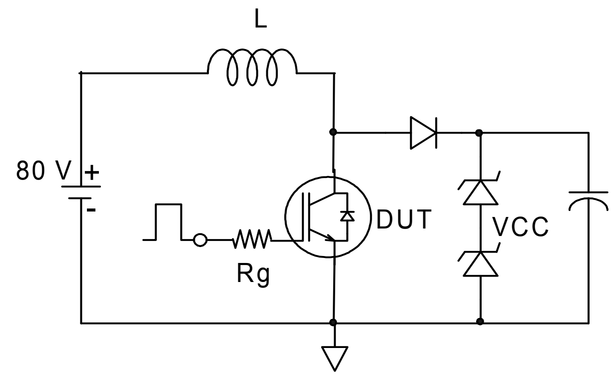


Fig.C.T.2 - RBSOA Circuit

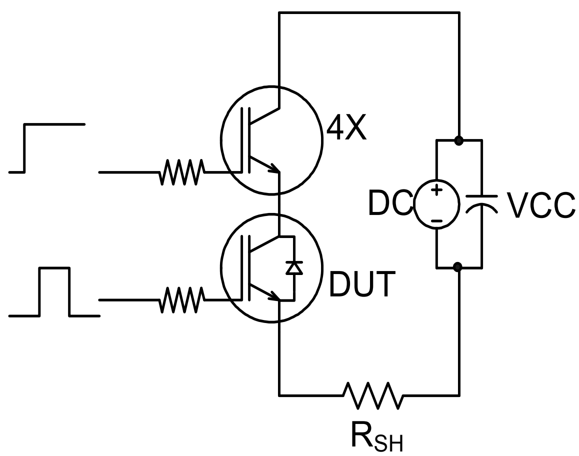


Fig.C.T.3 - S.C. SOA Circuit

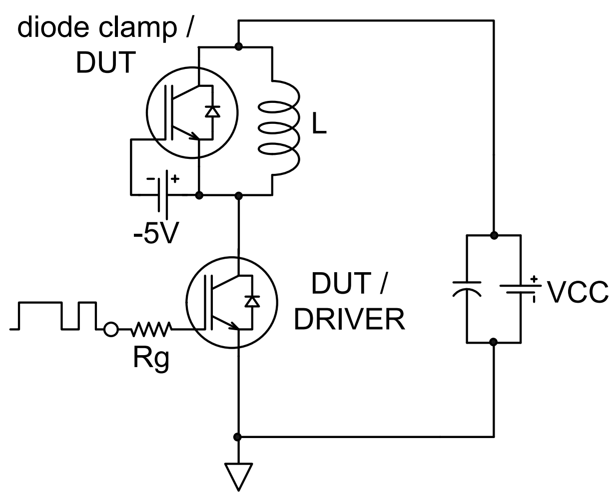


Fig.C.T.4 - Switching Loss Circuit

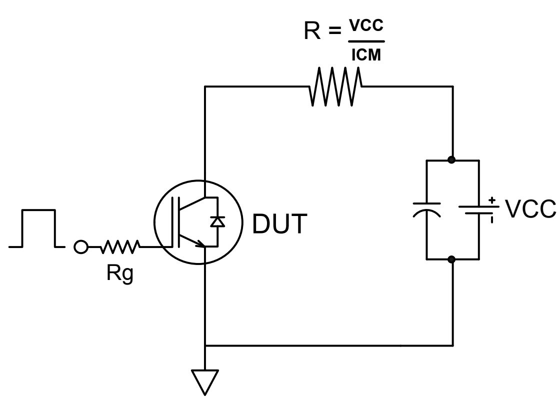


Fig.C.T.5 - Resistive Load Circuit

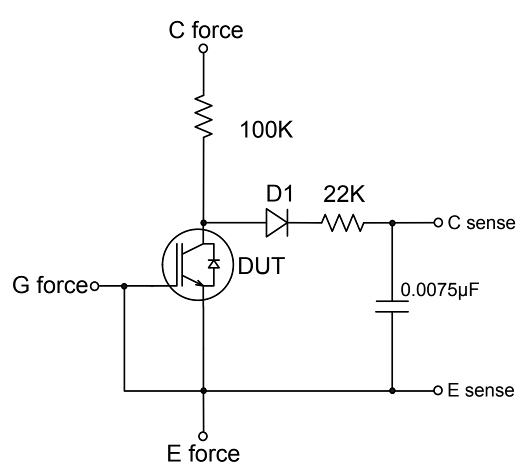


Fig.C.T.6 - BVCES Filter Circuit

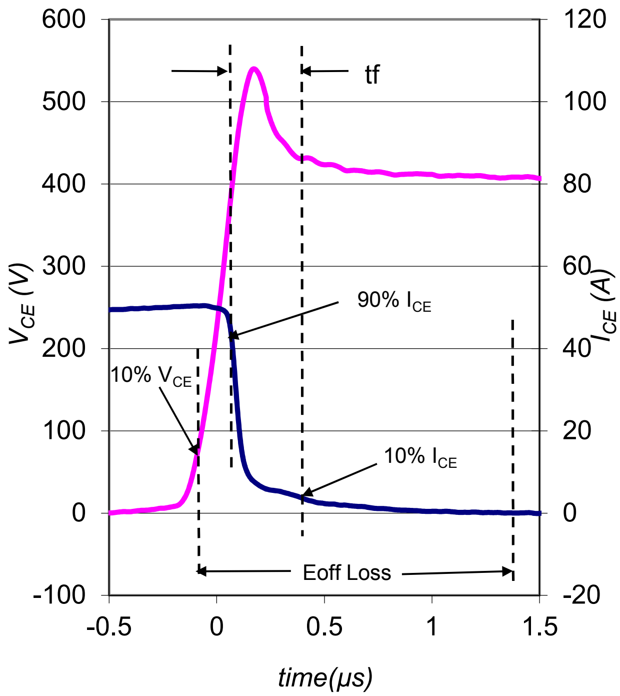


Fig. WF1 - Typ. Turn-off Loss Waveform
@ TJ = 150°C using Fig. CT.4

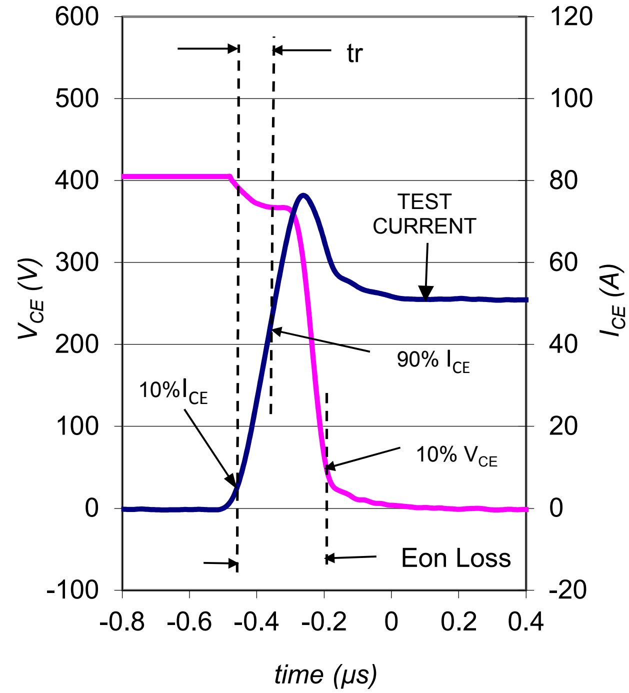


Fig. WF2 - Typ. Turn-on Loss Waveform
@ TJ = 150°C using Fig. CT.4

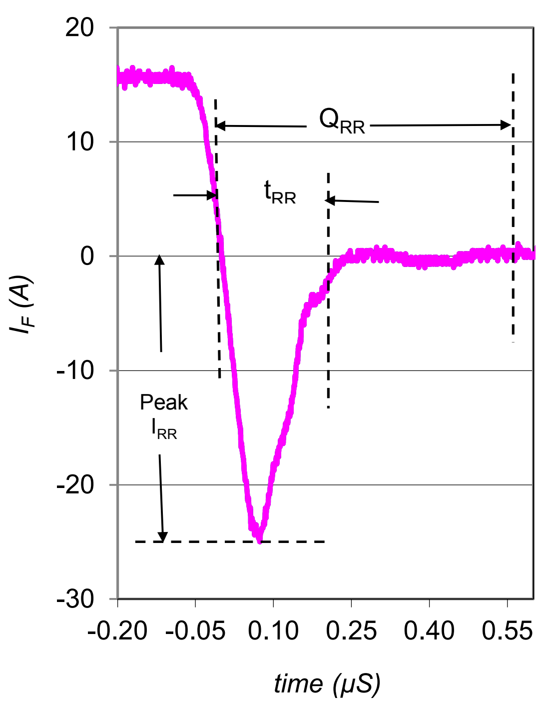


Fig. WF3 - Typ. Diode Recovery Waveform
@ T_J = 150°C using Fig. CT.4

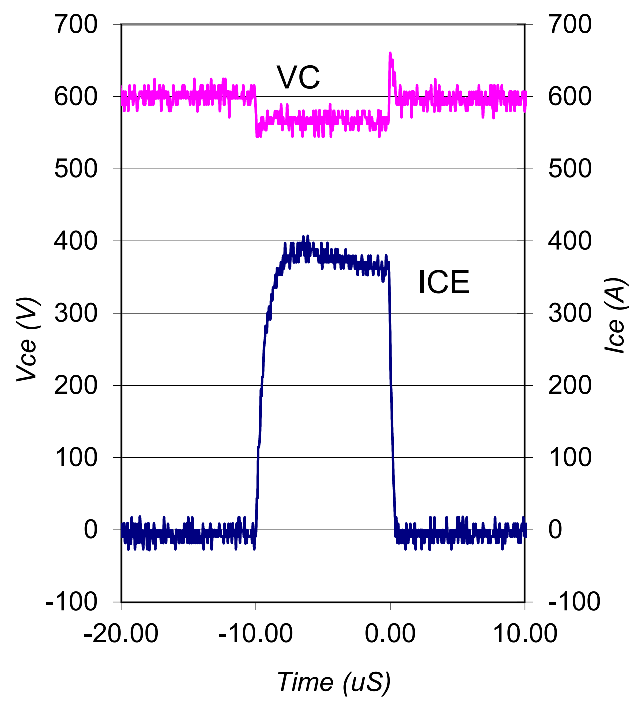
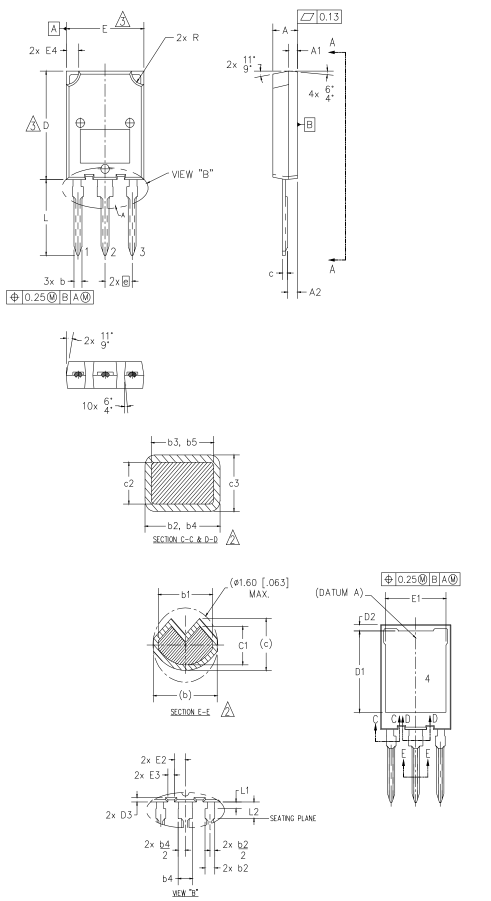


Fig. WF4 - Typ. S.C. Waveform
@ TJ = 150°C using Fig. CT.3

Super -247(TO-274AA) Package Outline

Dimensions are shown in millimeters (inches)



NOTES:
1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M-1994
2. DIMENSIONS b1, b3, b5, c1 & c3 APPLY TO BASE METAL ONLY.
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTER EXTREMES OF THE PLASTIC BODY.
4.- ALL DIMENSIONS SHOWN IN MILLIMETERS.
5.- CONTROLLING DIMENSION: MILLIMETER.
6.- OUTLINE CONFORMS TO JEDEC OUTLINE TO-274AA

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.50	5.50	.177	.217	
A1	1.45	2.15	.057	.085	
A2	1.65	2.35	.065	.093	
b	1.45	1.60	.054	.063	
b1	1.40	1.50	.055	.059	2
b2	2.00	2.40	.079	.094	
b3	1.95	2.35	.077	.093	2
b4	3.00	3.15	.118	.124	
b5	2.95	3.35	.116	.132	2
c	1.10	1.30	.043	.051	
c1	0.90	1.10	.035	.043	2
c2	0.65	0.85	.026	.033	
c3	0.50	0.70	.020	.028	2
D	19.80	20.80	.780	.819	3
D1	15.50	16.10	.610	.634	
D2	0.70	1.30	.028	.051	
D3	0.75	1.25	.030	.049	
E	15.10	16.10	.594	.634	3
E1	13.30	13.90	.524	.547	
E2	2.25	2.70	.089	.109	
E3	1.20	1.70	.047	.067	
E4	2.00	3.00	.079	.118	
e	5.45 BSC		.215 BSC		
L	13.80	14.80	.535	.583	
L1	1.00	1.60	.039	.063	
L2	3.85	4.25	.152	.167	
R	2.00	3.00	.079	.118	

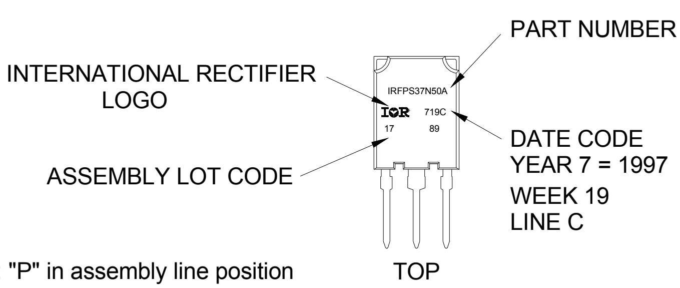
LEAD ASSIGNMENTS

MOSFET
1.- GATE
2.- DRAIN
3.- SOURCE
4.- DRAIN

IGBT
1.- GATE
2.- COLLECTOR
3.- EMITTER
4.- COLLECTOR

Super -247 (TO-274AA)Part Marking Information

EXAMPLE: THIS IS AN IRFPS37N50A WITH
ASSEMBLY LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"



Note: "P" in assembly line position indicates "Lead-Free"

Super -247 package is not recommended for Surface Mount Application.

Note: For the most current drawing please refer to IR website at http://www.irf.com/package/

Qualification Information†

Qualification Level	Industrial (per JEDEC JESD47F) ††	
Moisture Sensitivity Level	Super-247	N/A
RoHS Compliant	Yes	

† Qualification standards can be found at International Rectifier's web site: http://www.irf.com/product-info/reliability/

†† Applicable version of JEDEC standard at the time of product release.

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