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.

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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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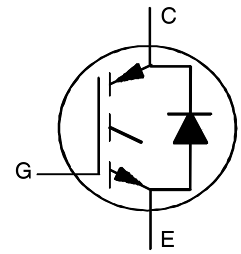
International
IOR Rectifier

IRGS4064DPbF

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE



n-channel

V_{CES} = 600V

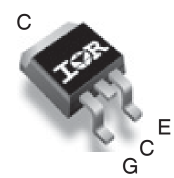
I_C = 10A, T_C = 100°C

t_{sc} > 5µs, T_{jmax} = 175°C

$V_{CE(on)\ typ.}$ = 1.6V

Features
- Low $V_{CE\ (on)}$ Trench IGBT Technology
- Low Switching Losses
- Maximum Junction temperature 175 °C
- 5µs SCSOA
- Square RBSOA
- 100% of The Parts Tested for (I_{LM})
- Positive $V_{CE\ (on)}$ Temperature Coefficient.
- Ultra Fast Soft Recovery Co-pak Diode
- Tighter Distribution of Parameters
- Lead-Free Package

Benefits
- High Efficiency in a Wide Range of Applications
- Suitable for a Wide Range of Switching Frequencies due to Low $V_{CE\ (ON)}$ and Low Switching Losses
- Rugged Transient Performance for Increased Reliability
- Excellent Current Sharing in Parallel Operation
- Low EMI



D^2Pak

G	C	E
Gate	Collector	Emitter

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Breakdown Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current	20	A
I_C @ T_C = 100°C	Continuous Collector Current	10	
I_{CM}	Pulsed Collector Current	40	
I_{LM}	Clamped Inductive Load Current ①	40	
I_F @T_C=25°C	Diode Continuous Forward Current	20	
I_F @T_C=100°C	Diode Continuous Forward Current	10	
I_{FM}	Diode Maximum Forward Current ②	40	
V_{GE}	Continuous Gate-to-Emitter Voltage	±20	V
	Transient Gate-to-Emitter Voltage	±30	
P_D @ T_C =25°	Maximum Power Dissipation	101	W
P_D @ T_C =100°	Maximum Power Dissipation	50	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds	300 (0.063 in. (1.6mm) from case)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case - IGBT ③	–––	–––	1.49	°C/W
$R_{\theta JC}$	Junction-to-Case - Diode ③	–––	–––	3.66	
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	–––	0.50	–––	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount ③	–––	–––	40	
Wt	Weight		1.5		g

02/16/12

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

	Parameter	Min.	Typ.	Max.	Units	Conditions	Ref.Fig
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	600	—	—	V	V_{GE} = 0V, I_C = 100µA ④	CT 6
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.47	—	V/°C	V_{GE} = 0V, I_C = 500µA (25°C-175°C)	
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	1.6	1.91	V	I_C = 10A, V_{GE} = 15V, T_J = 25°C	
		—	1.9	—		I_C = 10A, V_{GE} = 15V, T_J = 150°C	5,6,7,9,
		—	2.0	—		I_C = 10A, V_{GE} = 15V, T_J = 175°C	10 ,11
$V_{GE(th)}$	Gate Threshold Voltage	4.0	—	6.5	V	V_{CE} = V_{GE}, I_C = 275µA	9,10,11,12
$\Delta V_{GE(th)}/\Delta TJ$	Threshold Voltage temp. coefficient	—	-11	—	mV/°C	V_{CE} = V_{GE}, I_C = 1.0mA (25°C - 175°C)	
gfe	Forward Transconductance	—	6.9	—	S	V_{CE} = 50V, I_C = 10A, PW = 80µs	
I_{CES}	Collector-to-Emitter Leakage Current	—	—	25	µA	V_{GE} = 0V, V_{CE} = 600V	8
		—	328	—		V_{GE} = 0V, V_{CE} = 600V, T_J = 175°C	
V_{FM}	Diode Forward Voltage Drop	—	2.5	3.1	V	I_F = 10A	
		—	1.7	—		I_F = 10A, T_J = 175°C	
I_{GES}	Gate-to-Emitter Leakage Current	—	—	±100	nA	V_{GE} = ±20V	

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

	Parameter	Min.	Typ.	Max.⑤	Units	Conditions	Ref.Fig
Q_g	Total Gate Charge (turn-on)	—	21	32	nC	I_C = 10A	24
Q_{ge}	Gate-to-Emitter Charge (turn-on)	—	5.3	8.0		V_{GE} = 15V	CT 1
Q_{gc}	Gate-to-Collector Charge (turn-on)	—	8.9	13		V_{CC} = 400V	
E_{on}	Turn-On Switching Loss	—	29	40	µJ	I_C = 10A, V_{CC} = 400V, V_{GE} = 15V	CT 4
E_{off}	Turn-Off Switching Loss	—	200	281		R_G = 22Ω, L = 1.0mH, T_J = 25°C	
E_{total}	Total Switching Loss	—	229	313		Energy losses include tail & diode reverse recovery	
$t_{d(on)}$	Turn-On delay time	—	27	37	ns	I_C = 10A, V_{CC} = 400V, V_{GE} = 15V	CT 4
t_r	Rise time	—	15	23		R_G = 22Ω, L = 1.0mH, T_J = 25°C	
$t_{d(off)}$	Turn-Off delay time	—	79	90			
t_f	Fall time	—	21	29			
E_{on}	Turn-On Switching Loss	—	99	—	µJ	I_C = 10A, V_{CC} = 400V, V_{GE} = 15V	13, 15
E_{off}	Turn-Off Switching Loss	—	316	—		R_G=22Ω, L=1.0mH, T_J = 175°C ④	CT 4
E_{total}	Total Switching Loss	—	415	—		Energy losses include tail & diode reverse recovery	WF 1, WF 2
$t_{d(on)}$	Turn-On delay time	—	27	—	ns	I_C = 10A, V_{CC} = 400V, V_{GE} = 15V	14, 16
t_r	Rise time	—	16	—		R_G = 22Ω, L = 1.0mH, T_J = 175°C	CT 4
$t_{d(off)}$	Turn-Off delay time	—	98	—			WF 1, WF 2
t_f	Fall time	—	33	—			
C_{ies}	Input Capacitance	—	594	—	pF	V_{GE} = 0V	22
C_{oes}	Output Capacitance	—	49	—		V_{CC} = 30V	
C_{res}	Reverse Transfer Capacitance	—	17	—		f = 1.0Mhz	
RBSOA	Reverse Bias Safe Operating Area	FULL SQUARE				T_J = 175°C, I_C = 40A	4
						V_{CC} = 480V, Vp =600V	CT 2
						Rg = 22Ω, V_{GE} = +15V to 0V	
SCSOA	Short Circuit Safe Operating Area	5	—	—	µs	V_{CC} = 400V, Vp =600V	22, CT 3
						Rg = 22Ω, V_{GE} = +15V to 0V	WF 4
Erec	Reverse Recovery Energy of the Diode	—	191	—	µJ	T_J = 175°C	17, 18, 19
t_{rr}	Diode Reverse Recovery Time	—	62	—	ns	V_{CC} = 400V, I_F = 10A	20, 21
I_{rr}	Peak Reverse Recovery Current	—	16	—	A	V_{GE} = 15V, Rg = 22Ω, L=1.0mH	WF 3

Notes:

① V_{CC} = 80% (V_{CES}), V_{GE} = 15V, L = 28 µH, R_G = 22 Ω.

② Pulse width limited by max. junction temperature.

③ R_θ is measured at T_J approximately 90°C

④ Refer to AN-1086 for guidelines for measuring $V_{(BR)CES}$ safely

⑤ Maximum limits are based on statistical sample size characterization

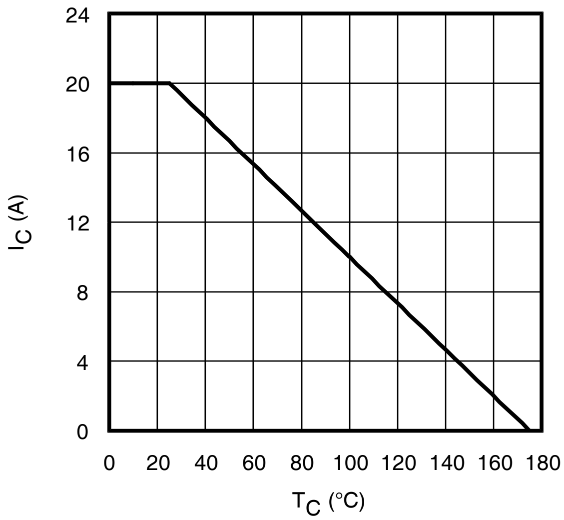


Fig. 1 - Maximum DC Collector Current vs. Case Temperature

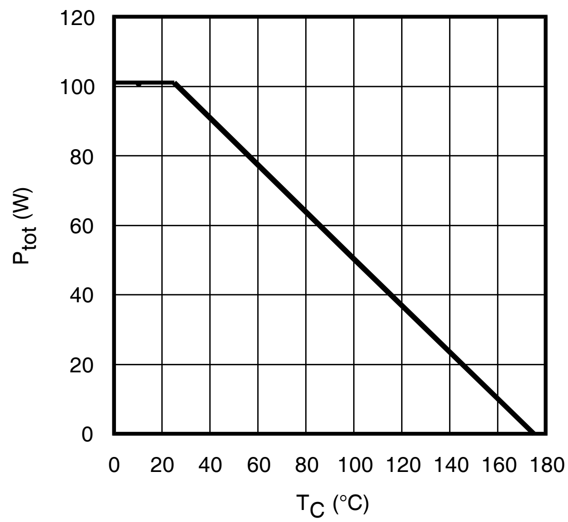


Fig. 2 - Power Dissipation vs. Case Temperature

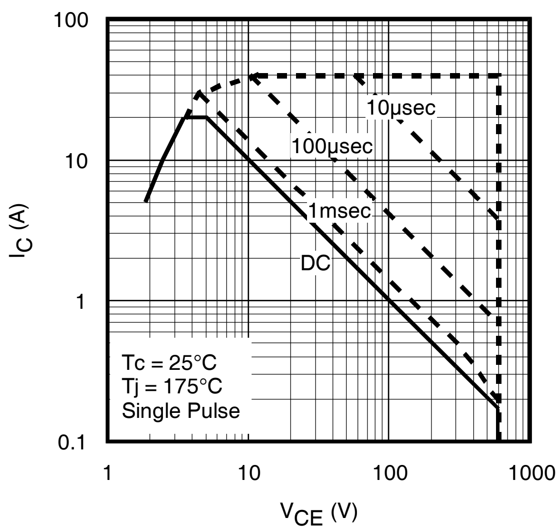


Fig. 3 - Forward SOA, T_C = 25°C; $T_J \leq$ 175°C

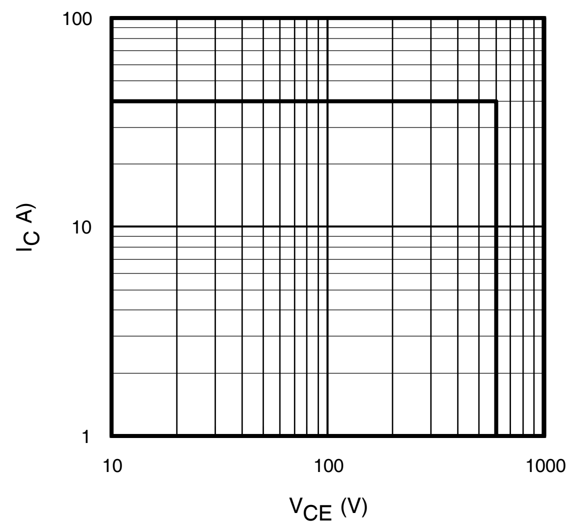


Fig. 4 - Reverse Bias SOA T_J = 175°C; V_{CE} = 15V

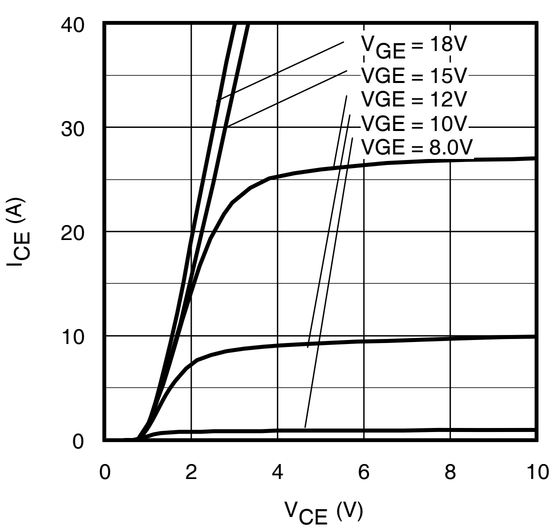


Fig. 5 - Typ. IGBT Output Characteristics T_J = -40°C; tp = 80µs

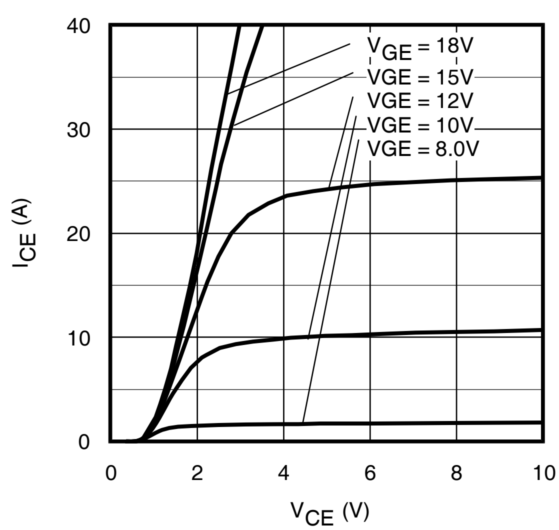


Fig. 6 - Typ. IGBT Output Characteristics T_J = 25°C; tp = 80µs

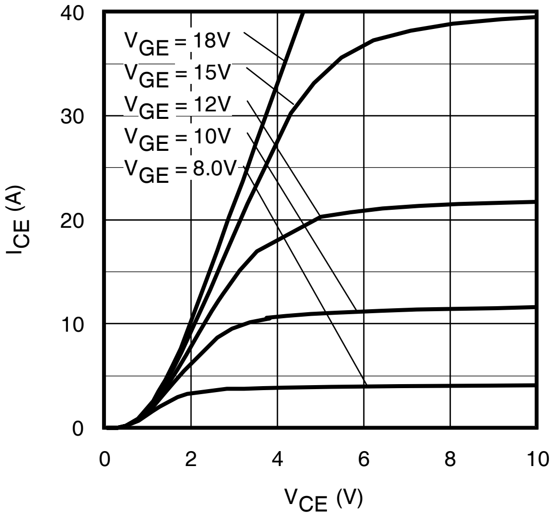


Fig. 7 - Typ. IGBT Output Characteristics
T_J = 175°C; tp = 80µs

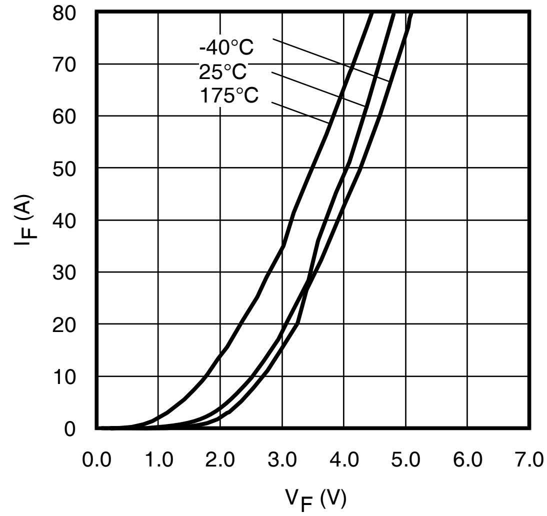


Fig. 8 - Typ. Diode Forward Characteristics
tp = 80µs

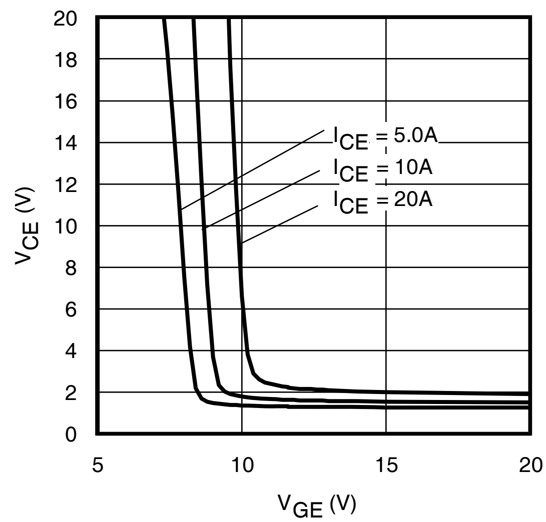


Fig. 9 - Typical V_{CE} vs. V_{GE}
T_J = -40°C

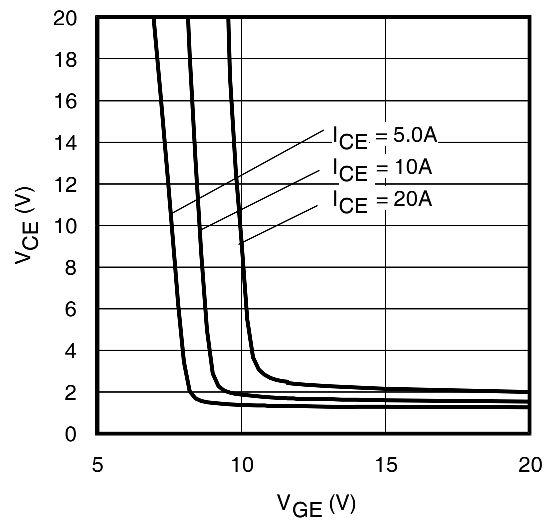


Fig. 10 - Typical V_{CE} vs. V_{GE}
T_J = 25°C

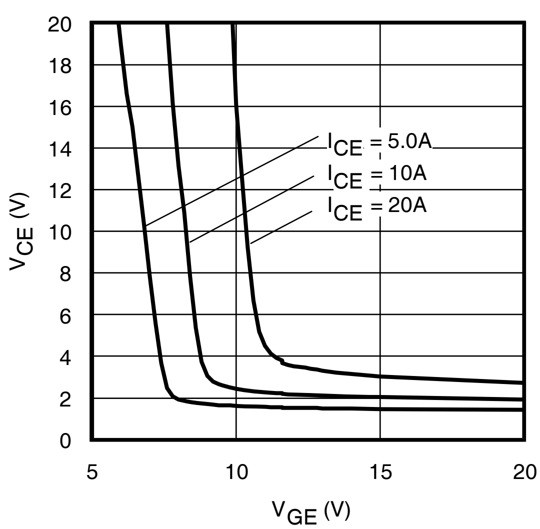


Fig. 11 - Typical V_{CE} vs. V_{GE}
T_J = 175°C

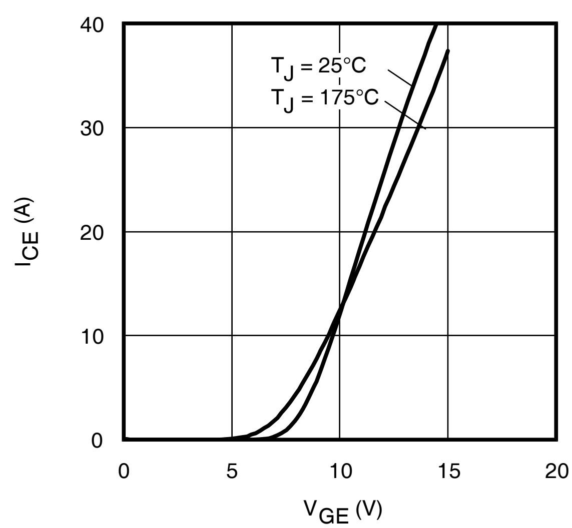


Fig. 12 - Typ. Transfer Characteristics
V_{CE} = 50V; tp = 10µs

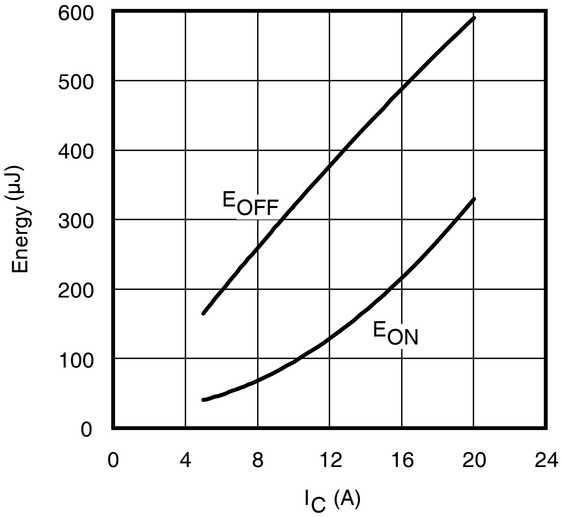


Fig. 13 - Typ. Energy Loss vs. I_C
$T_J = 175°C$; $L = 1mH$; $V_{CE} = 400V$, $R_G = 22\Omega$; $V_{GE} = 15V$.

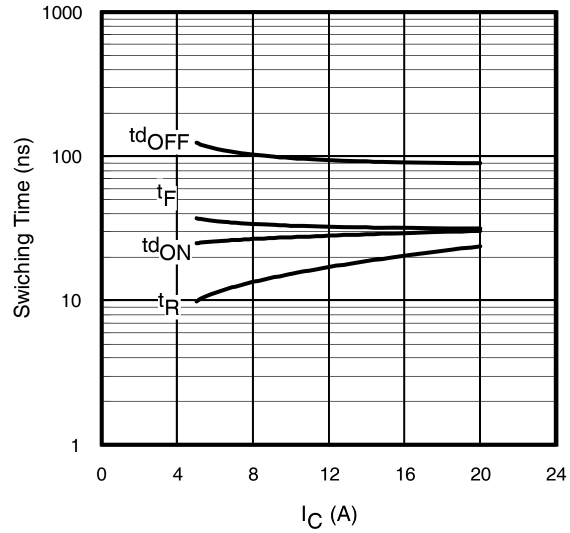


Fig. 14 - Typ. Switching Time vs. I_C
$T_J = 175°C$; $L=1mH$; $V_{CE}= 400V$
$R_G= 22\Omega$; $V_{GE}= 15V$

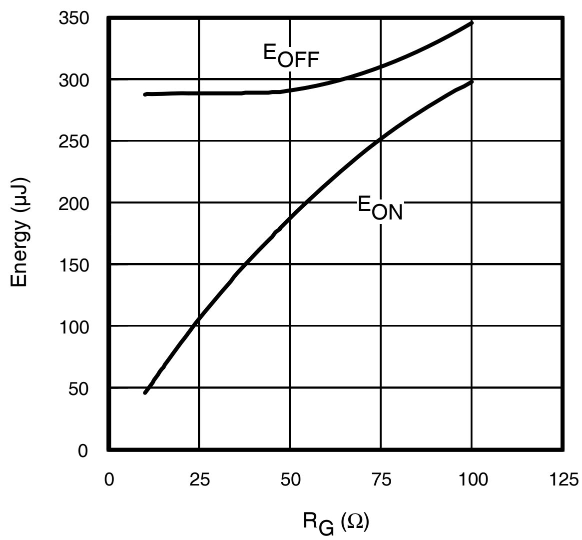


Fig. 15 - Typ. Energy Loss vs. R_G
$T_J = 175°C$; $L = 1mH$; $V_{CE} = 400V$, $I_{CE} = 10A$; $V_{GE} = 15V$

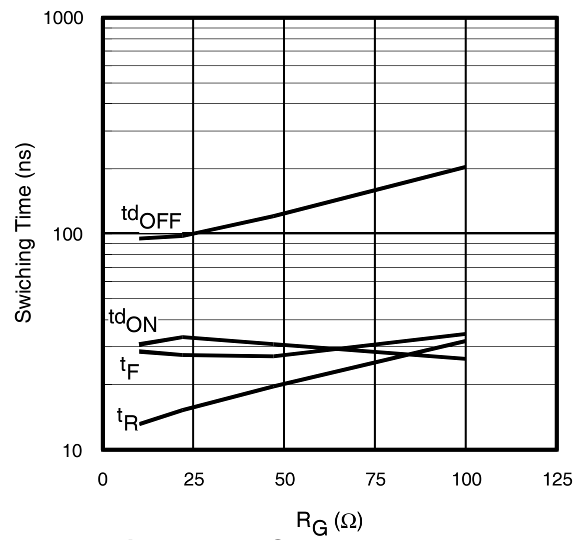


Fig. 16- Typ. Switching Time vs. R_G
$T_J = 175°C$; $L=1mH$; $V_{CE}= 400V$
$I_{CE}= 10A$; $V_{GE}= 15V$

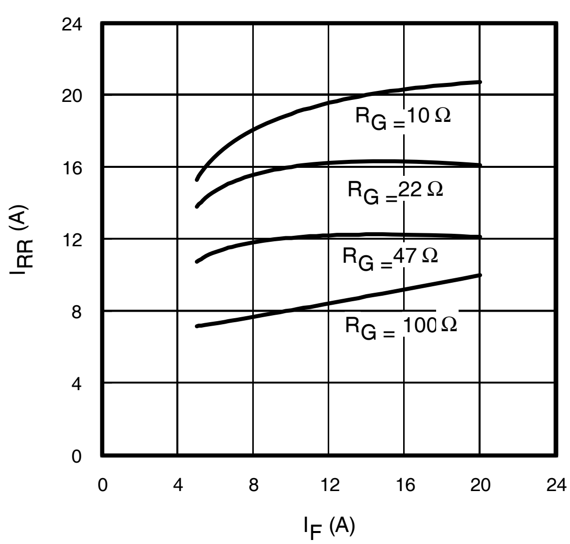


Fig. 17 - Typical Diode I_{RR} vs. I_F
$T_J = 175°C$

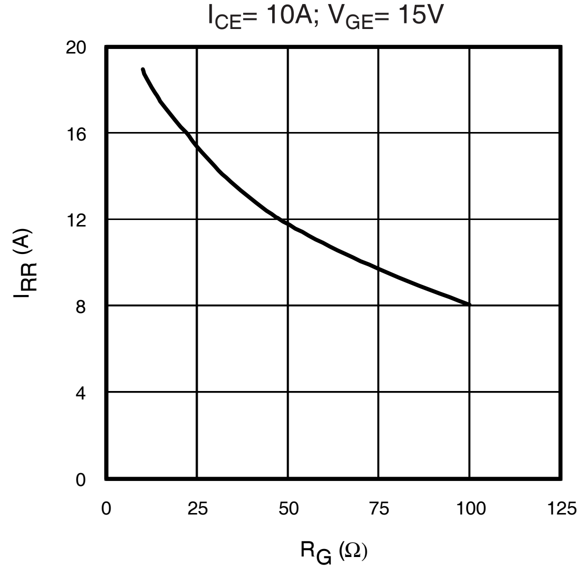


Fig. 18 - Typical Diode I_{RR} vs. R_G
$T_J = 175°C$; $I_F = 10A$

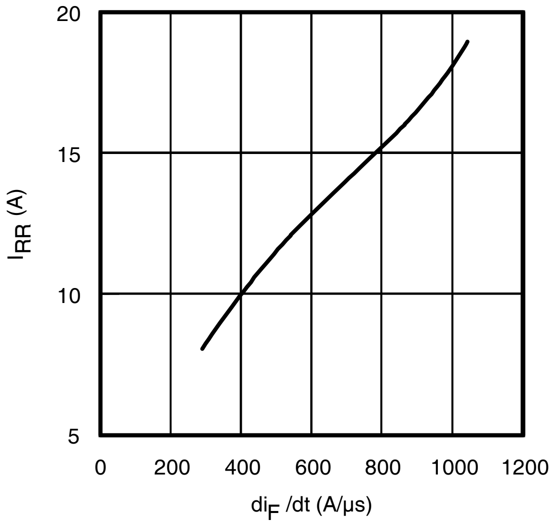


Fig. 19- Typical Diode I_{RR} vs. di_F/dt
V_{CC}= 400V; V_{GE}= 15V;
I_{CE}= 10A; T_J = 175°C

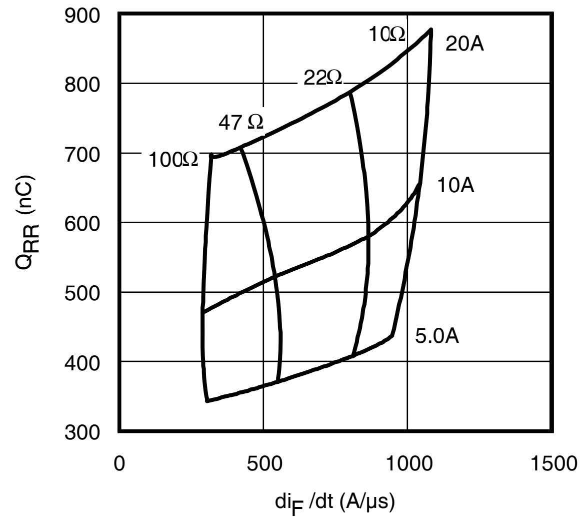


Fig. 20 - Typical Diode Q_{RR}
V_{CC}= 400V; V_{GE}= 15V; T_J = 175°C

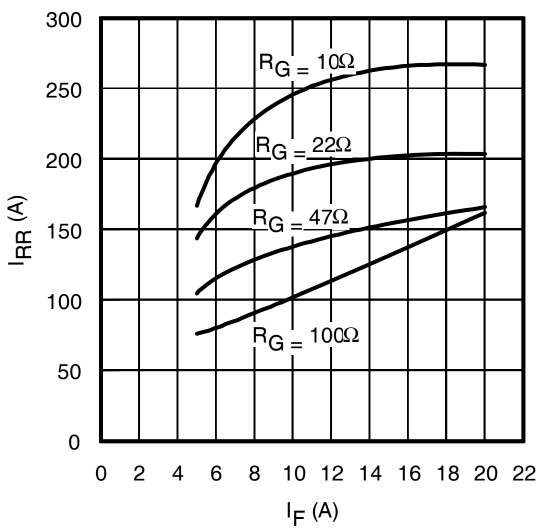


Fig. 21 - Typical Diode E_{RR} vs. I_F
T_J = 175°C

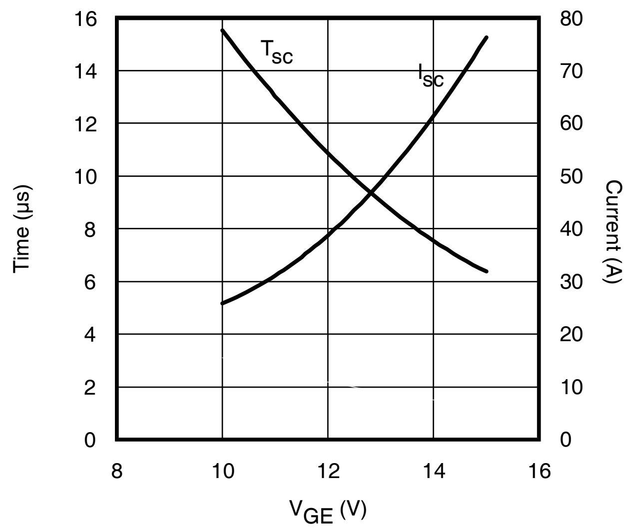


Fig. 22- Typ. V_{GE} vs Short Circuit Time
V_{CC}=400V, T_C =25°C

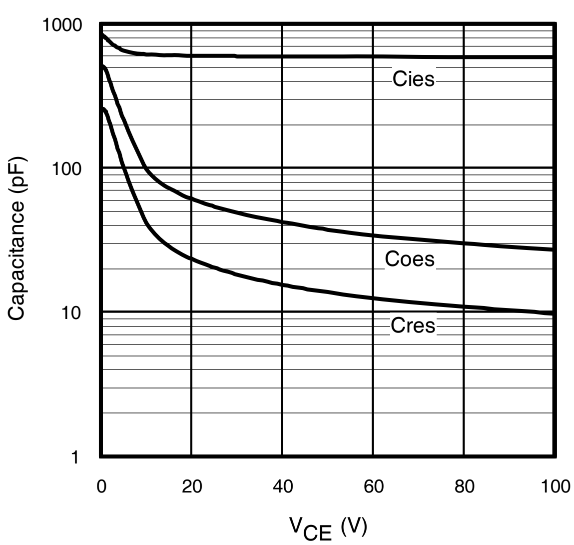


Fig. 23- Typ. Capacitance vs. V_{CE}
V_{GE}= 0V; f = 1MHz

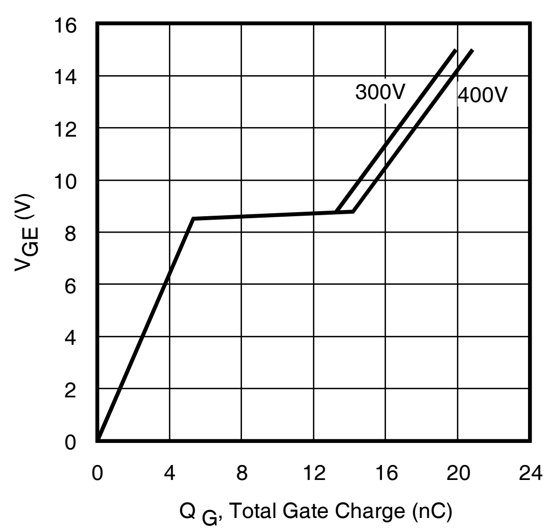


Fig. 24 - Typical Gate Charge vs. V_{GE}
I_{CE} = 10A, L=600µH

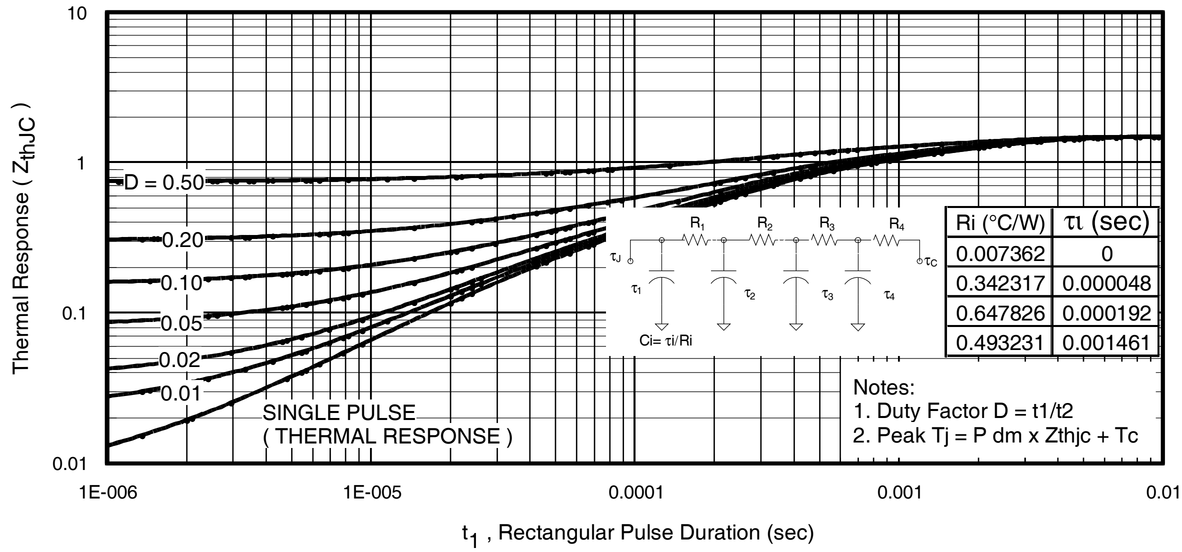


Fig 25. Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)

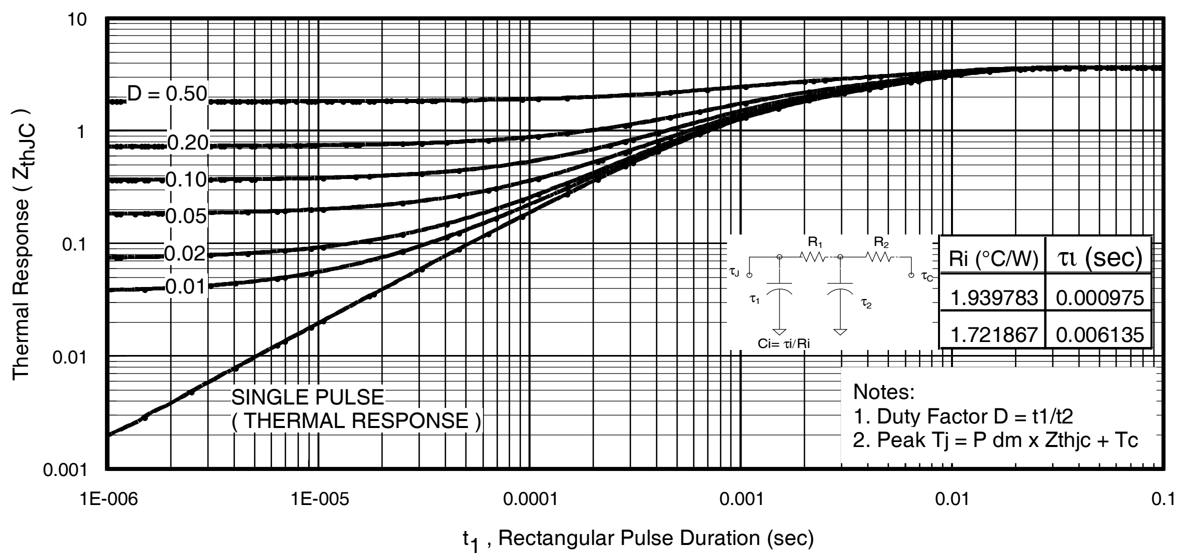


Fig. 26. Maximum Transient Thermal Impedance, Junction-to-Case (DIODE)

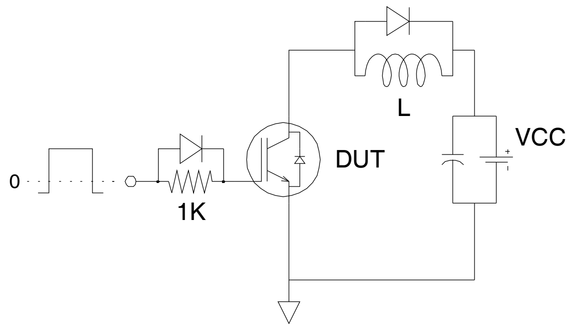


Fig.C.T.1 - Gate Charge Circuit (turn-off)

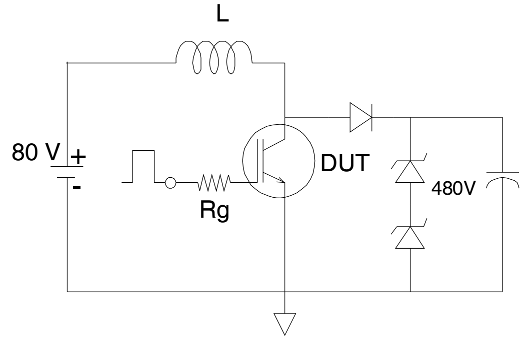


Fig.C.T.2 - RBSOA Circuit

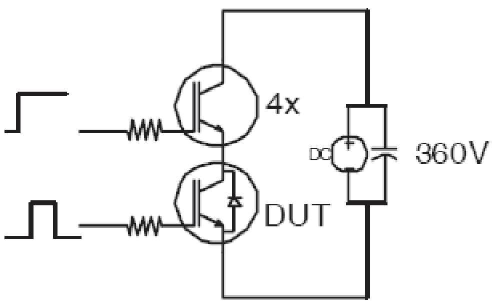


Fig.C.T.3 - S.C.SOA Circuit

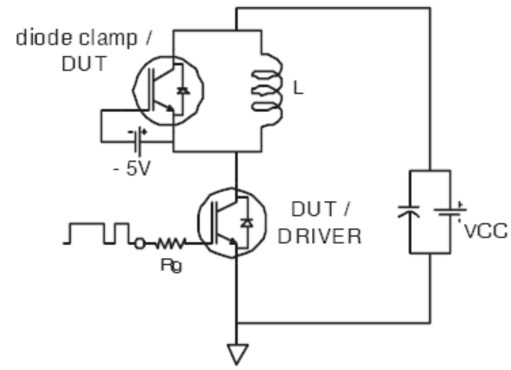


Fig.C.T.4 - Switching Loss Circuit

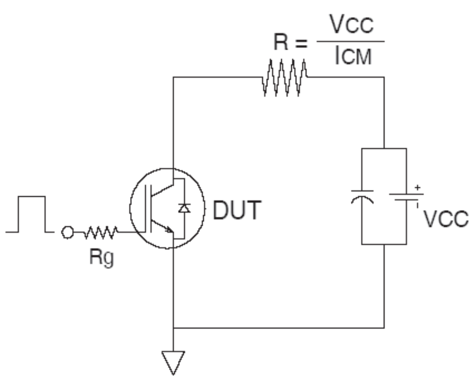


Fig.C.T.5 - Resistive Load Circuit

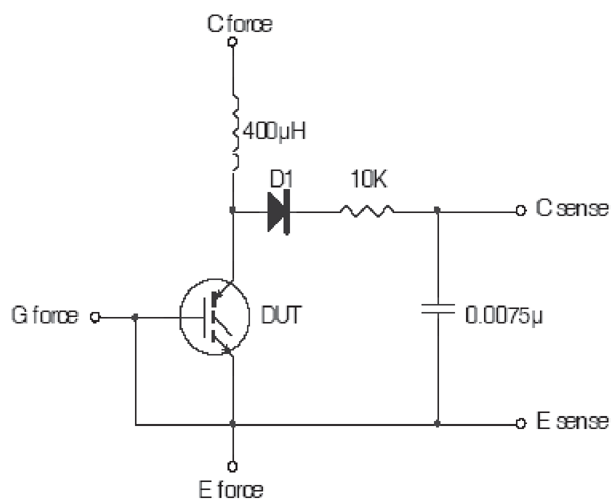


Fig.C.T.6 - Typical Filter Circuit for $V_{(BR)CES}$ Measurement

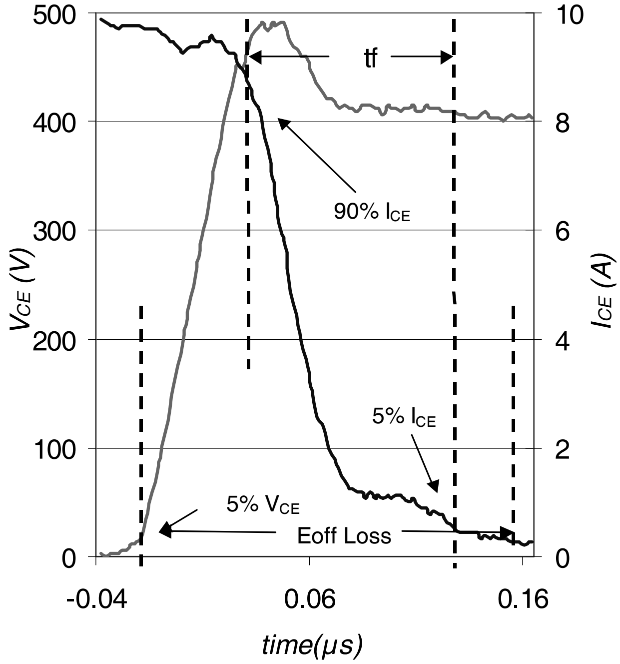


Fig. WF1 - Typ. Turn-off Loss Waveform
@ T_J = 175°C using Fig. CT.4

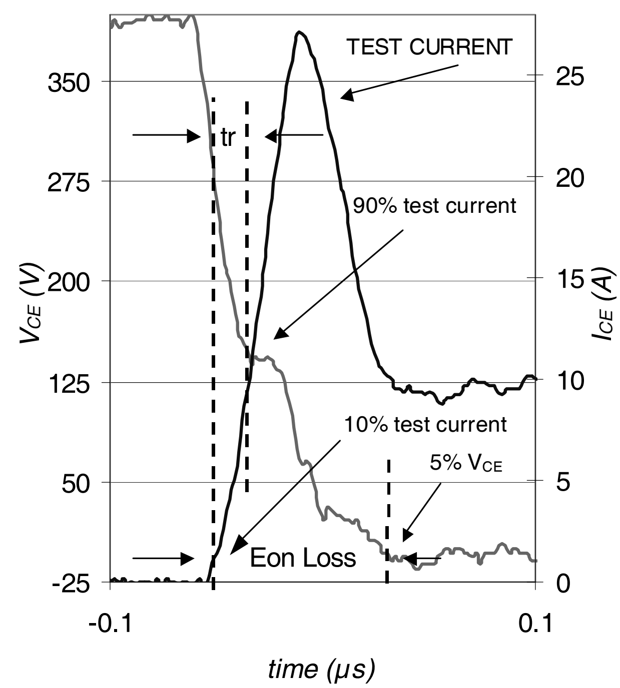
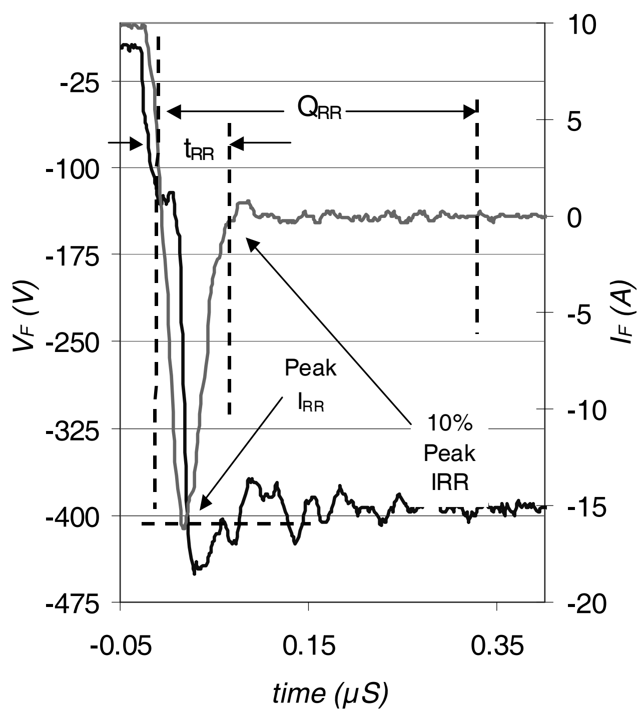
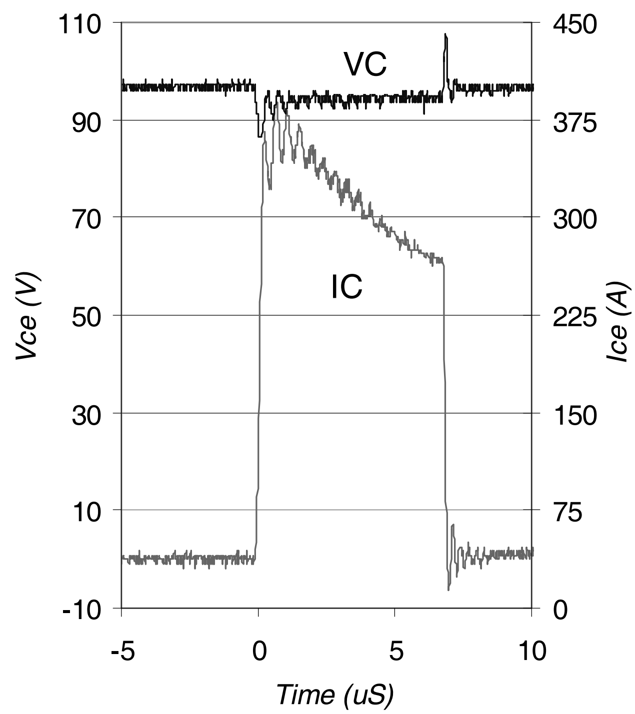


Fig. WF2 - Typ. Turn-on Loss Waveform
@ T_J = 175°C using Fig. CT.4

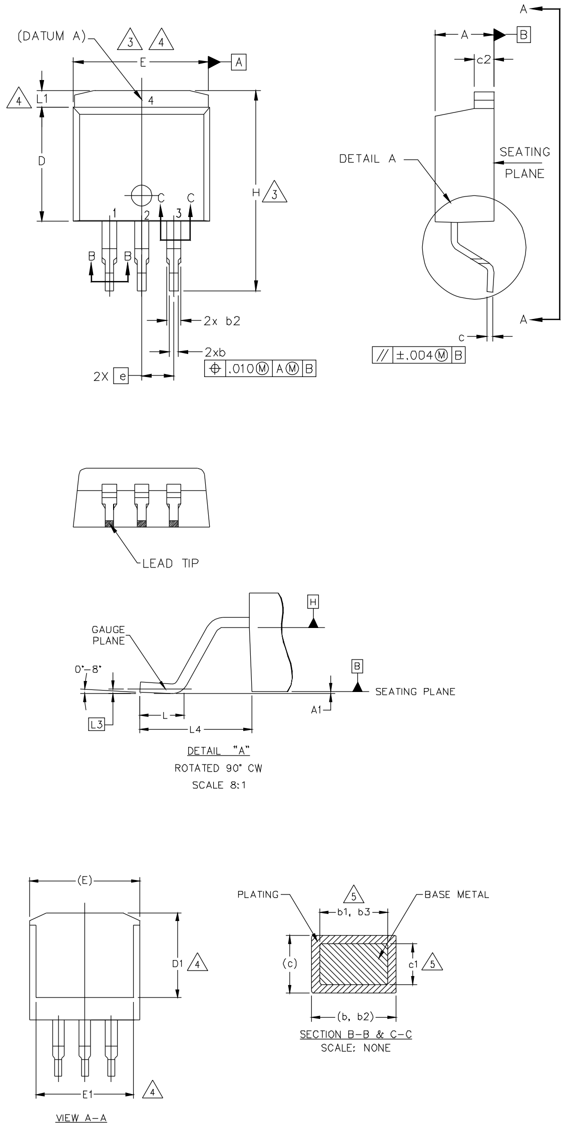


WF.3- Typ. Reverse Recovery Waveform
@ T_J = 175°C using CT.4



WF.4- Typ. Short Circuit Waveform
@ T_J = 25°C using CT.3

D²Pak Package Outline (Dimensions are shown in millimeters (inches))



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
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 OUTMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
5. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
6. DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
7. CONTROLLING DIMENSION: INCH.
8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-263AB.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	–	0.254	–	.010	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	5
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86	–	.270		4
E	9.65	10.67	.380	.420	3,4
E1	6.22	–	.245		4
e	2.54 BSC		.100 BSC		
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1	–	1.65	–	.066	4
L3	0.25 BSC		.010 BSC		
L4	4.78	5.28	.188	.208	

LEAD ASSIGNMENTS

HEXFET

1.– GATE
2, 4.– DRAIN
3.– SOURCE

IGBTs, CoPACK

1.– GATE
2, 4.– COLLECTOR
3.– EMITTER

DIODES

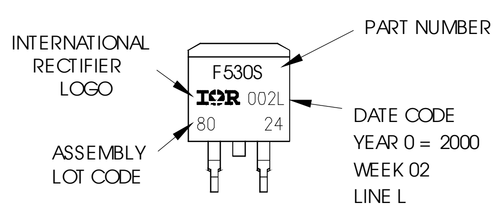
1.– ANODE *
2, 4.– CATHODE
3.– ANODE

* PART DEPENDENT.

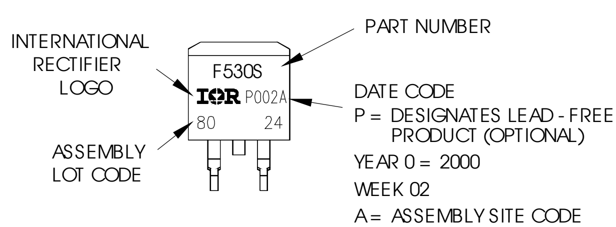
D²Pak Part Marking Information

EXAMPLE: THIS IS AN IRF530S WITH LOT CODE 8024
ASSEMBLED ON WW 02, 2000
IN THE ASSEMBLY LINE "L"

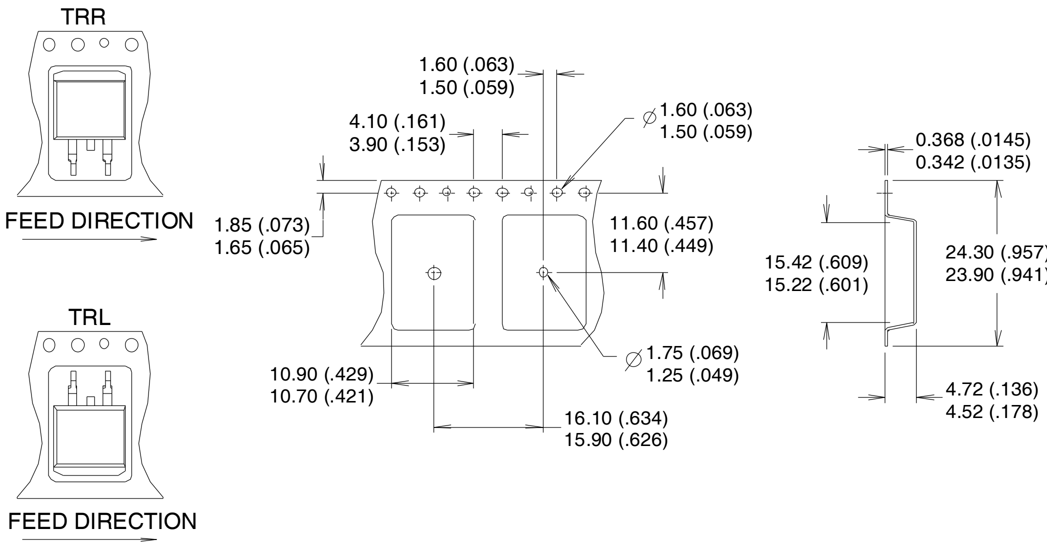
Note: "P" in assembly line position indicates "Lead – Free"

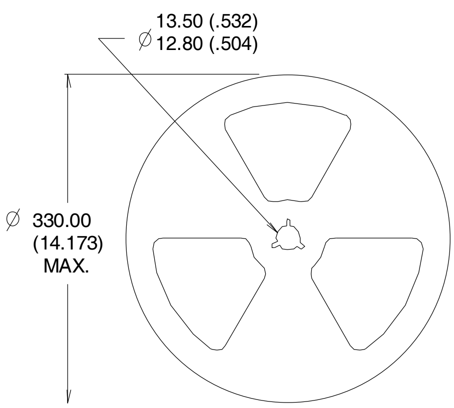


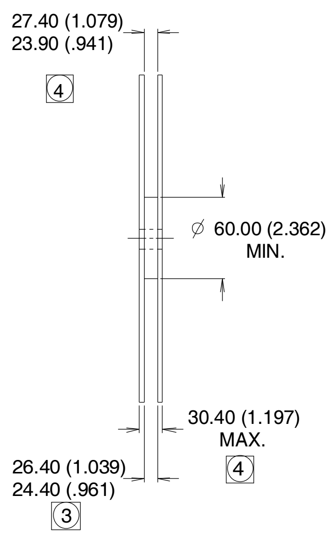
OR



D^2Pak Tape & Reel Information







NOTES :
1. COMFORMS TO EIA-418.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION MEASURED @ HUB.
4. INCLUDES FLANGE DISTORTION @ OUTER EDGE.

Data and specifications subject to change without notice.
This product has been designed and qualified for Industrial market.
Qualification Standards can be found on IR's Web site.

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