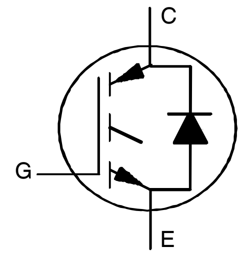
International
IOR Rectifier

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

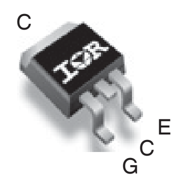
$V_{CE(on)}$ typ. = 1.6V

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
$R_{θJC}$	Junction-to-Case - IGBT ③	–––	–––	1.49	°C/W
$R_{θJC}$	Junction-to-Case - Diode ③	–––	–––	3.66	
$R_{θCS}$	Case-to-Sink, flat, greased surface	–––	0.50	–––	
$R_{θJA}$	Junction-to-Ambient, typical socket mount ③	–––	–––	40	
Wt	Weight		1.5		g

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	
		—	328	—		V_{GE} = 0V, V_{CE} = 600V, T_J = 175°C	8
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 V_{CC} = 480V, Vp =600V Rg = 22Ω, V_{GE} = +15V to 0V	4 CT 2
SCSOA	Short Circuit Safe Operating Area	5	—	—	µs	V_{CC} = 400V, Vp =600V Rg = 22Ω, V_{GE} = +15V to 0V	22, CT 3 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

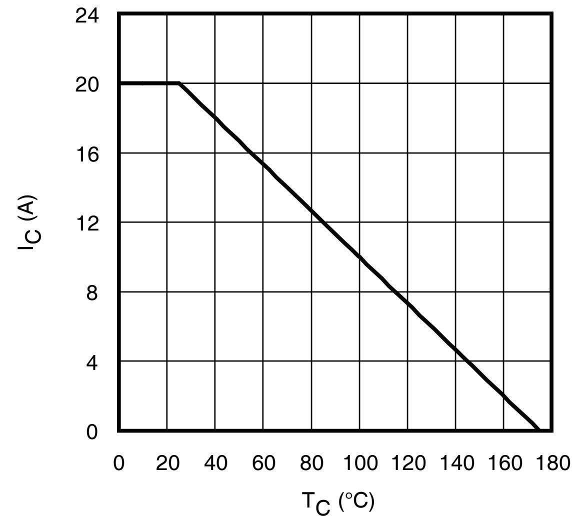


Fig. 1 - Maximum DC Collector Current vs. Case Temperature

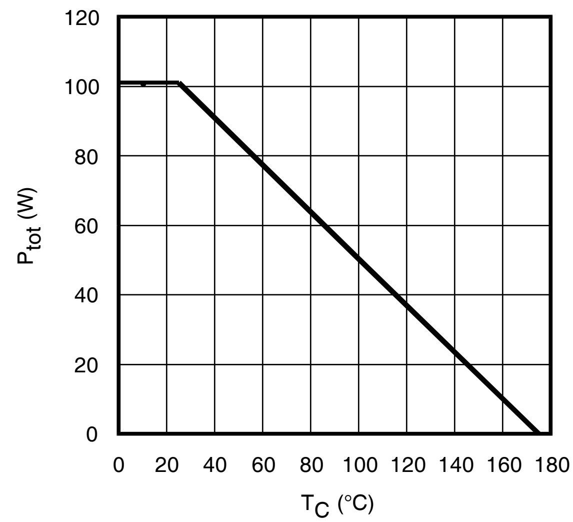


Fig. 2 - Power Dissipation vs. Case Temperature

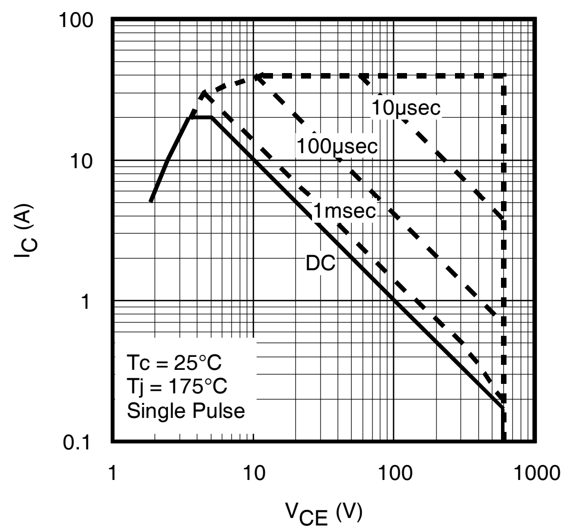


Fig. 3 - Forward SOA, $T_C = 25°C$; $T_J \leq 175°C$

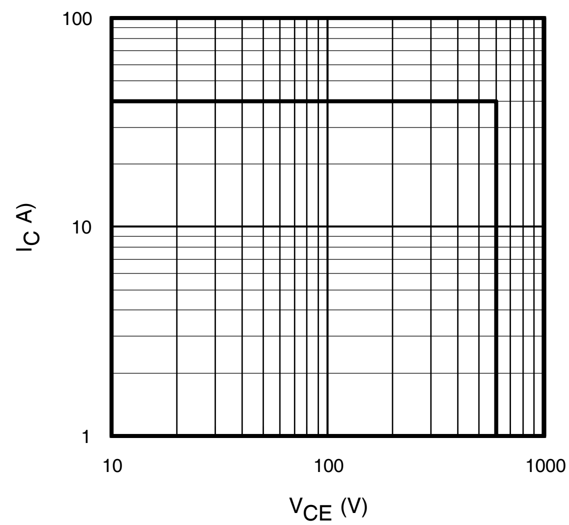


Fig. 4 - Reverse Bias SOA $T_J = 175°C$; $V_{CE} = 15V$

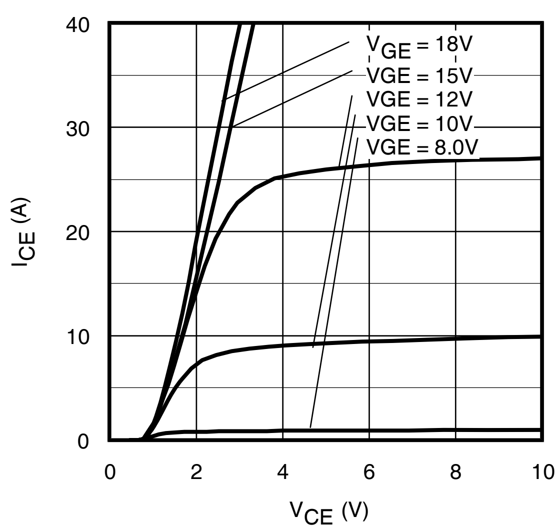


Fig. 5 - Typ. IGBT Output Characteristics $T_J = -40°C$; tp = 80μs

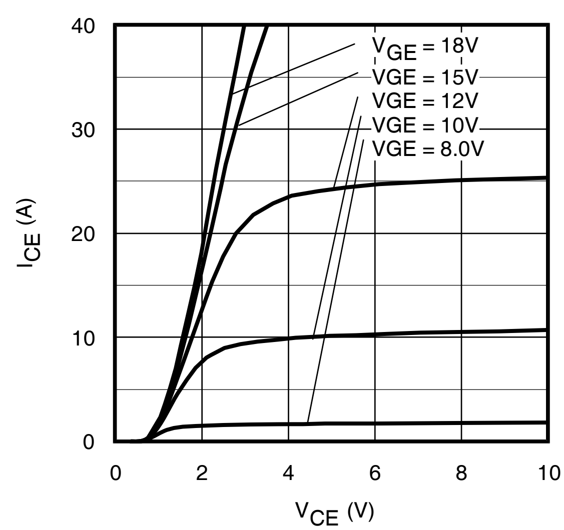


Fig. 6 - Typ. IGBT Output Characteristics $T_J = 25°C$; tp = 80μs

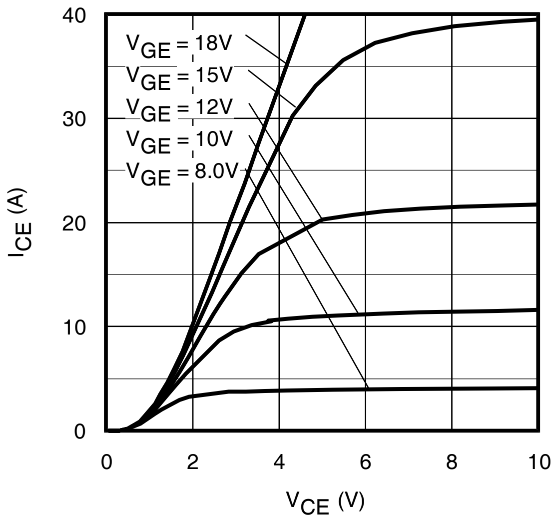


Fig. 7 - Typ. IGBT Output Characteristics
T_J = 175°C; tp = 80µs

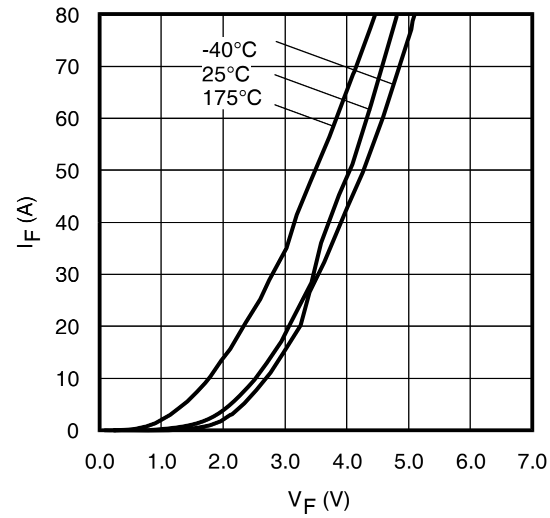


Fig. 8 - Typ. Diode Forward Characteristics
tp = 80µs

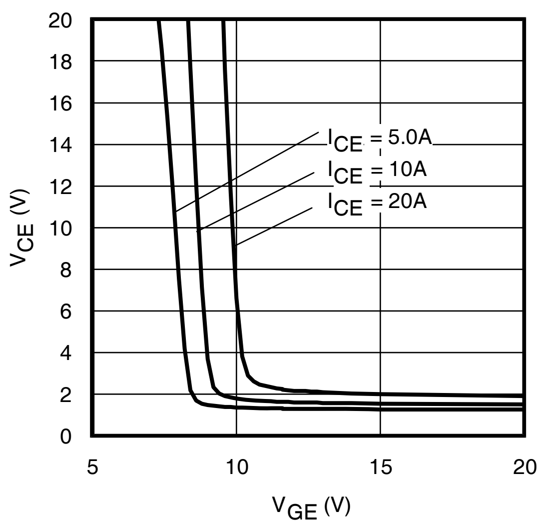


Fig. 9 - Typical V_{CE} vs. V_{GE}
T_J = -40°C

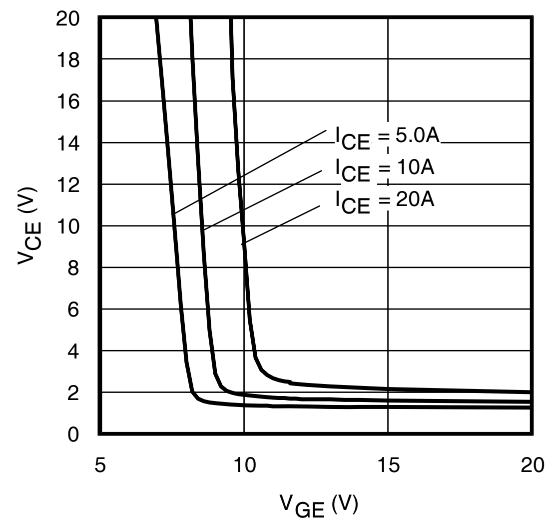


Fig. 10 - Typical V_{CE} vs. V_{GE}
T_J = 25°C

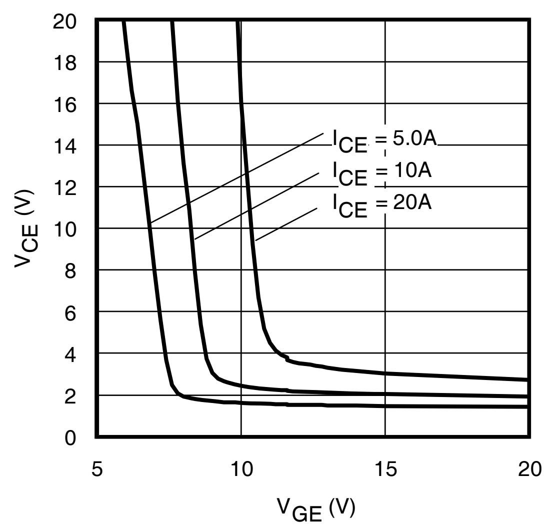


Fig. 11 - Typical V_{CE} vs. V_{GE}
T_J = 175°C

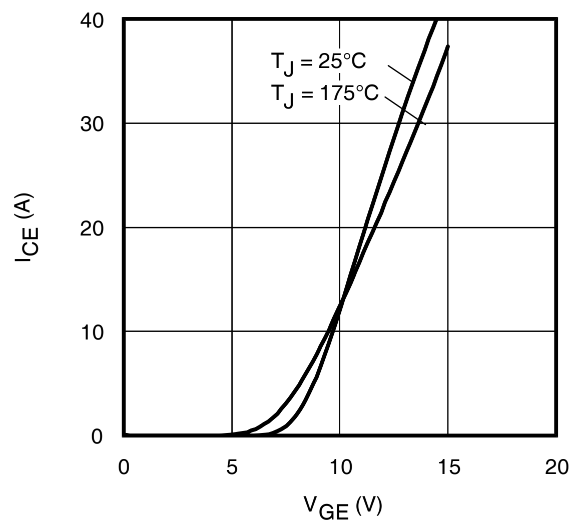


Fig. 12 - Typ. Transfer Characteristics
V_{CE} = 50V; tp = 10µs

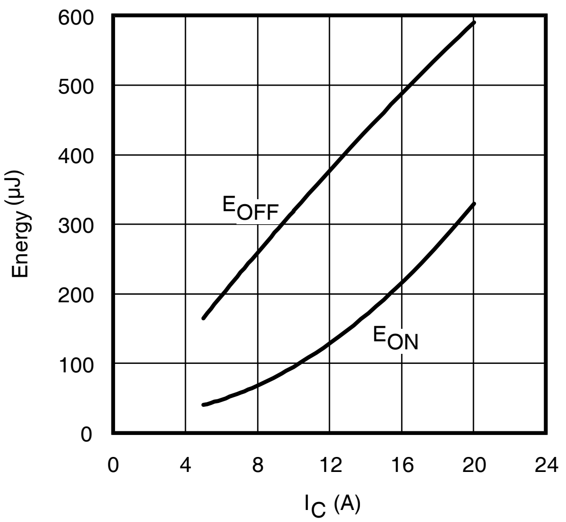


Fig. 13 - Typ. Energy Loss vs. I_C
T_J = 175°C; L = 1mH; V_{CE} = 400V, R_G = 22Ω; V_{GE} = 15V.

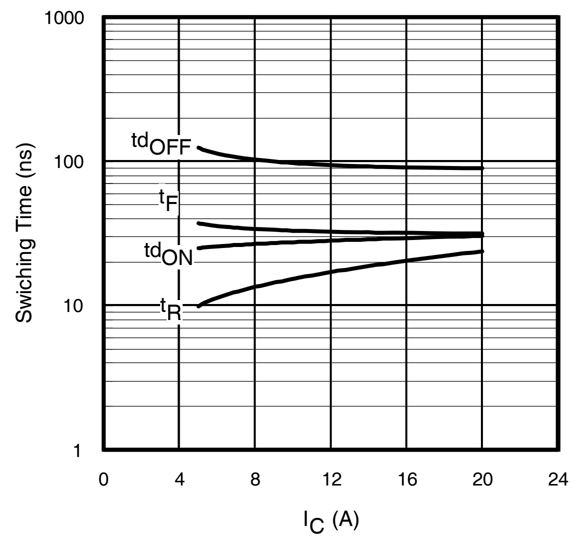


Fig. 14 - Typ. Switching Time vs. I_C
T_J = 175°C; L=1mH; V_{CE}= 400V
R_G= 22Ω; V_{GE}= 15V

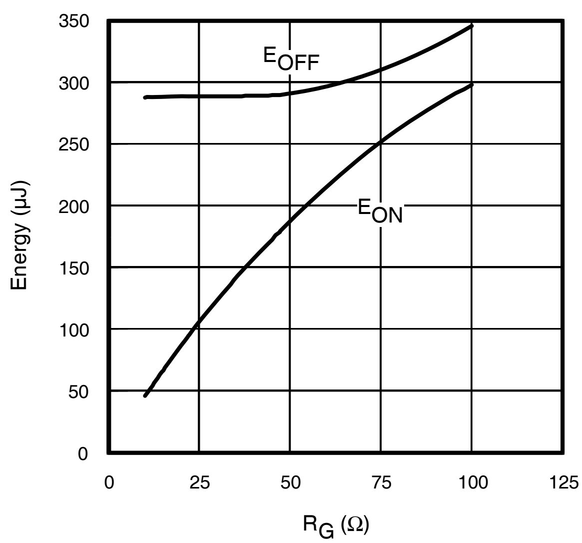


Fig. 15 - Typ. Energy Loss vs. R_G
T_J = 175°C; L = 1mH; V_{CE} = 400V, I_{CE} = 10A; V_{GE} = 15V

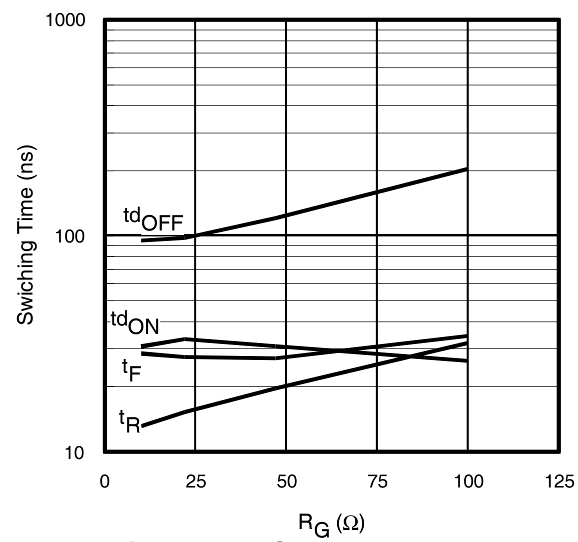


Fig. 16- Typ. Switching Time vs. R_G
T_J = 175°C; L=1mH; V_{CE}= 400V
I_{CE}= 10A; V_{GE}= 15V

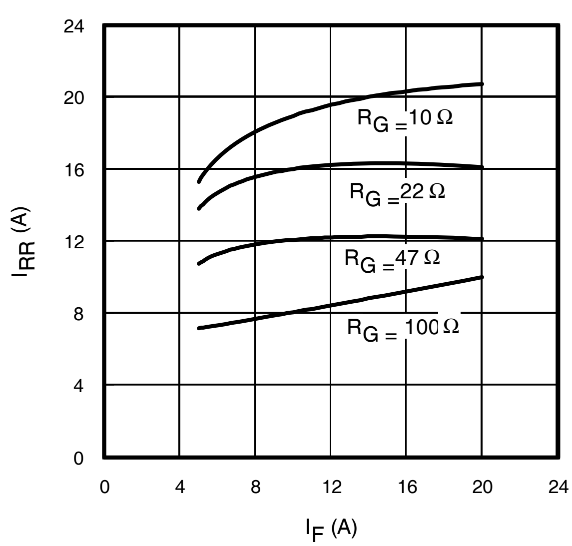


Fig. 17 - Typical Diode I_{RR} vs. I_F
T_J = 175°C

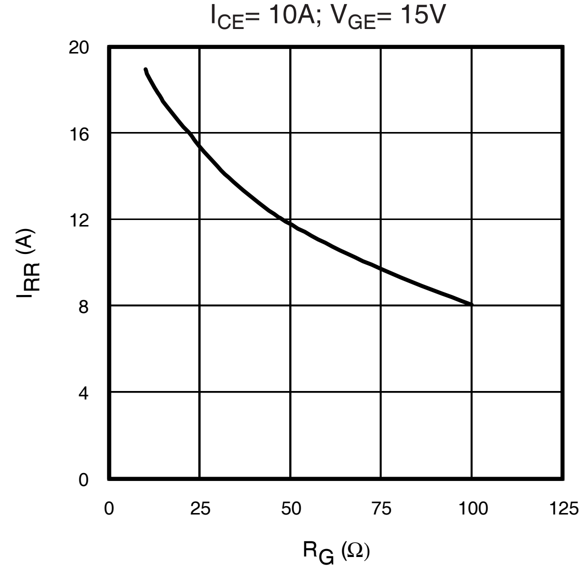


Fig. 18 - Typical Diode I_{RR} vs. R_G
T_J = 175°C; I_F = 10A

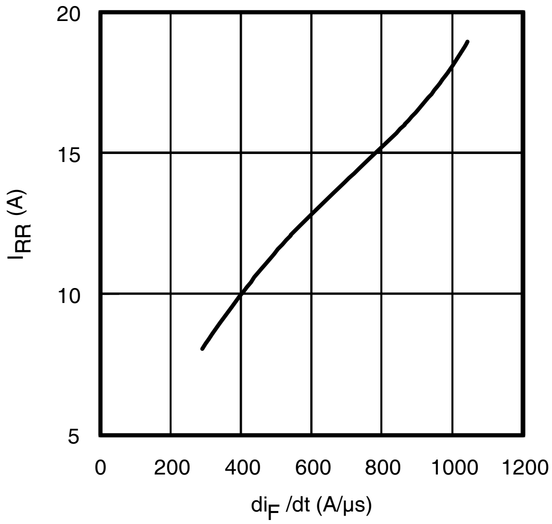


Fig. 19- Typical Diode I_{RR} vs. di_F/dt
V_{CC}= 400V; V_{GE}= 15V;
I_{CE}= 10A; T_J = 175°C

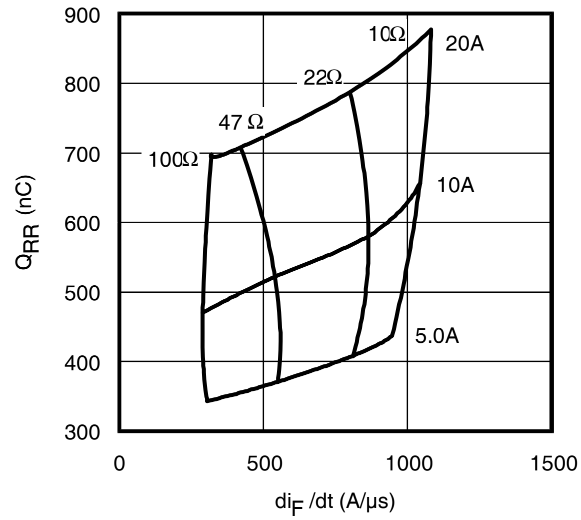


Fig. 20 - Typical Diode Q_{RR}
V_{CC}= 400V; V_{GE}= 15V; T_J = 175°C

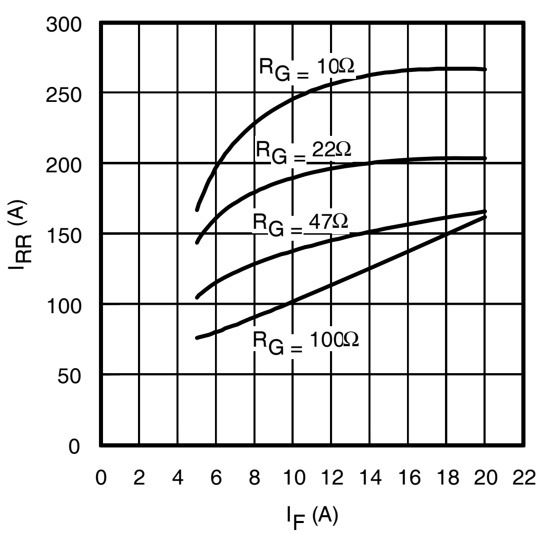


Fig. 21 - Typical Diode E_{RR} vs. I_F
T_J = 175°C

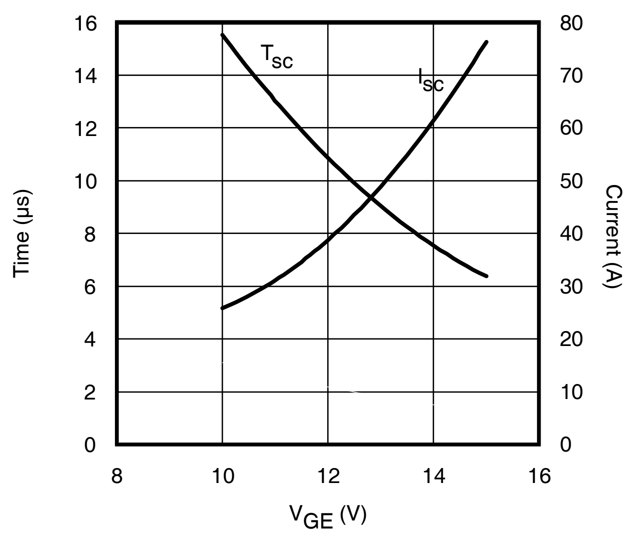


Fig. 22- Typ. V_{GE} vs Short Circuit Time
V_{CC}=400V, T_C =25°C

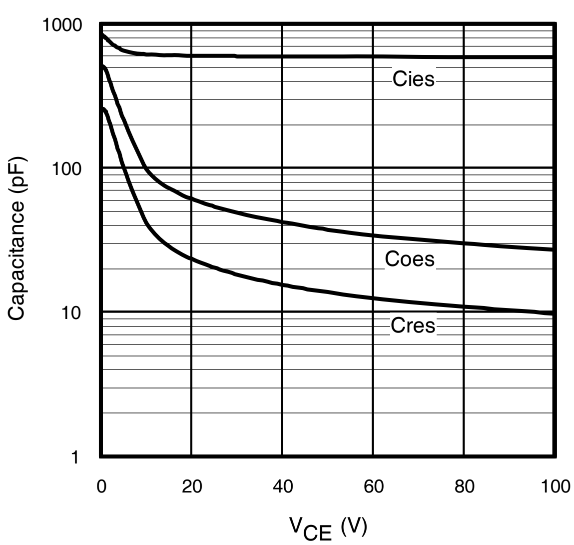


Fig. 23- Typ. Capacitance vs. V_{CE}
V_{GE}= 0V; f = 1MHz

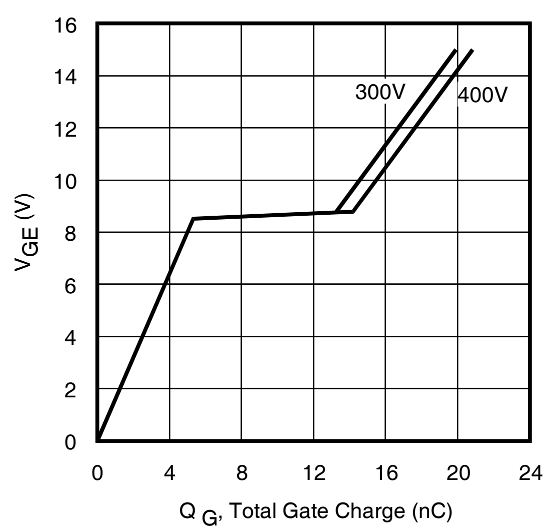


Fig. 24 - Typical Gate Charge vs. V_{GE}
I_{CE} = 10A, L=600µH

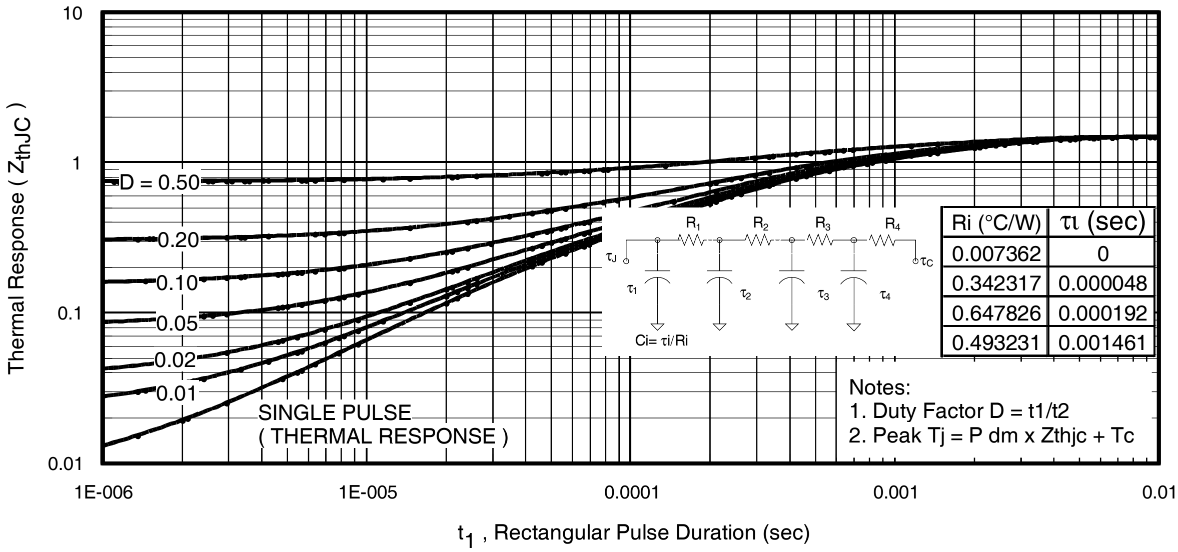


Fig 25. Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)

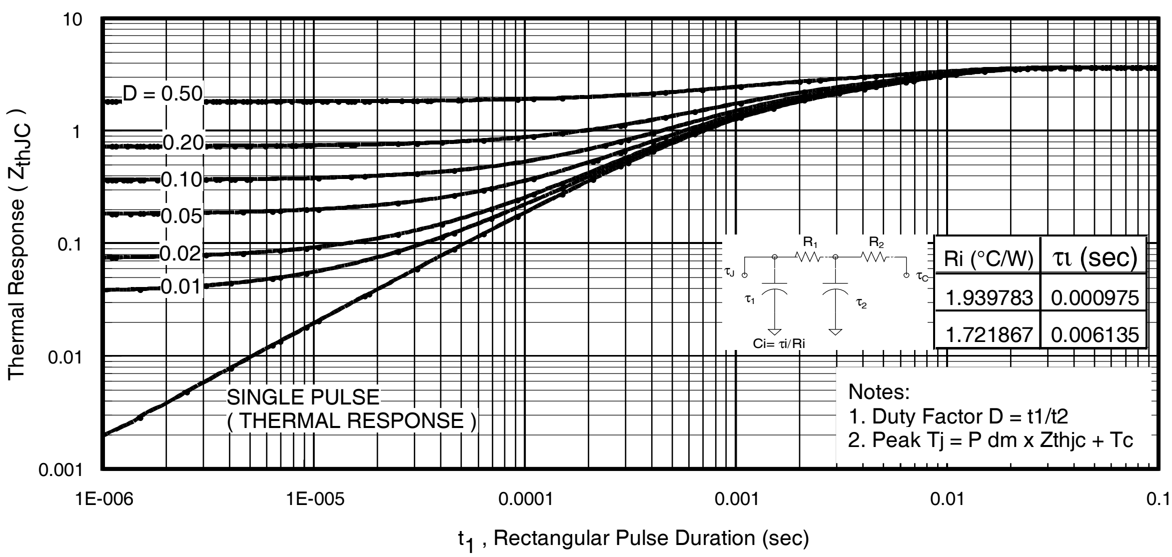


Fig. 26. Maximum Transient Thermal Impedance, Junction-to-Case (DIODE)

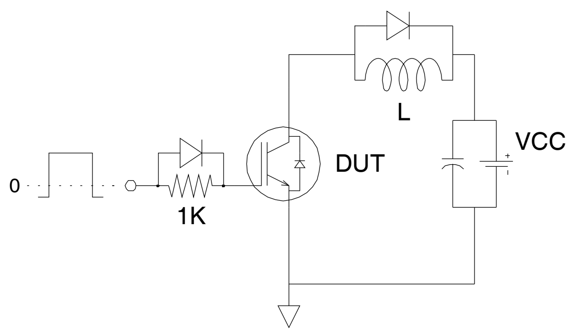


Fig.C.T.1 - Gate Charge Circuit (turn-off)

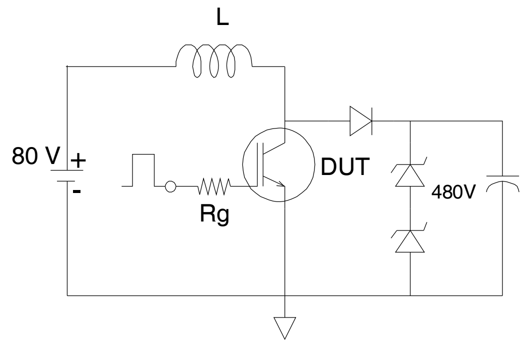


Fig.C.T.2 - RBSOA Circuit

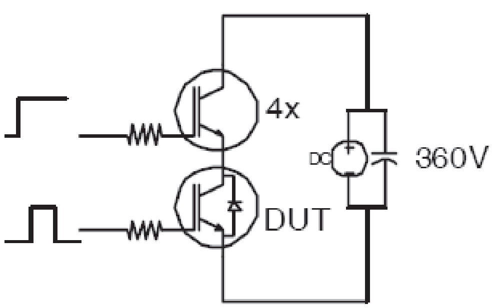


Fig.C.T.3 - S.C.SOA Circuit

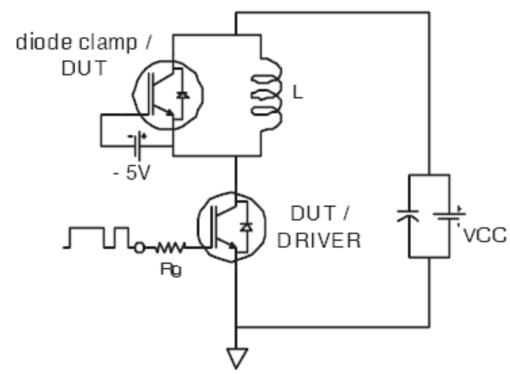


Fig.C.T.4 - Switching Loss Circuit

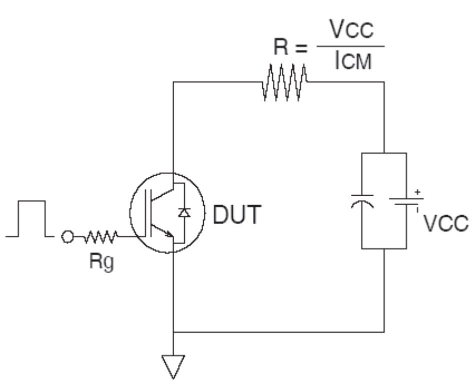


Fig.C.T.5 - Resistive Load Circuit

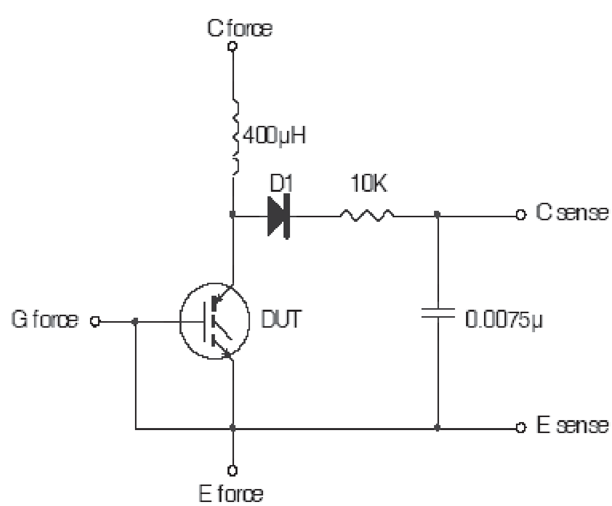


Fig.C.T.6 - Typical Filter Circuit for $V_{(BR)CES}$ Measurement

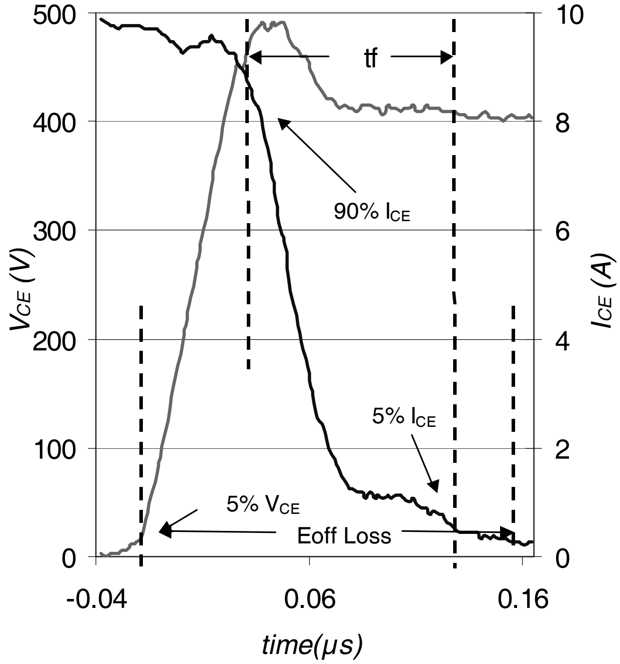


Fig. WF1 - Typ. Turn-off Loss Waveform
@ T_J = 175°C using Fig. CT.4

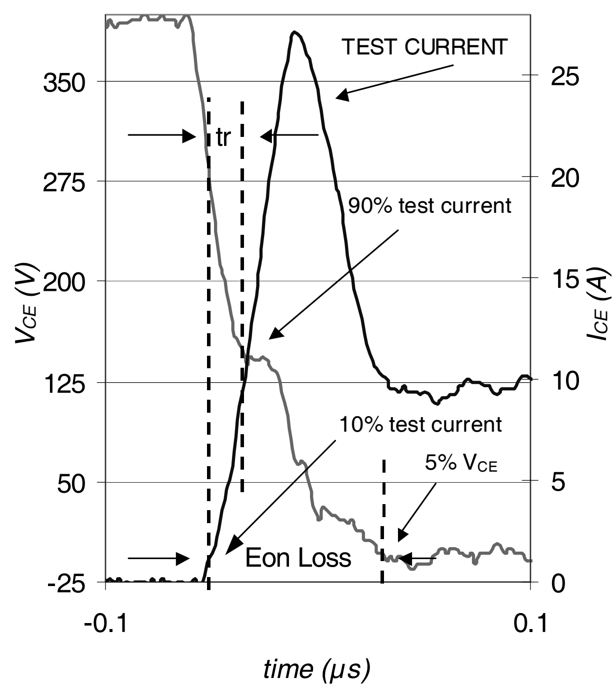
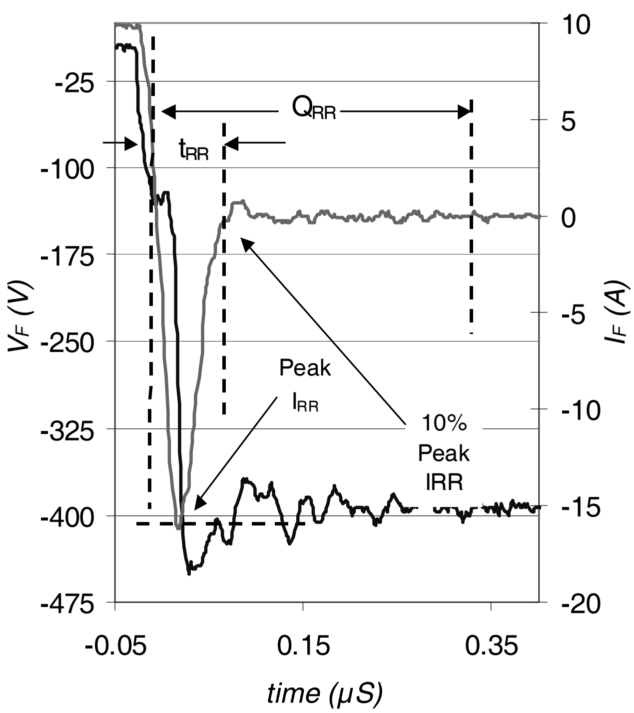
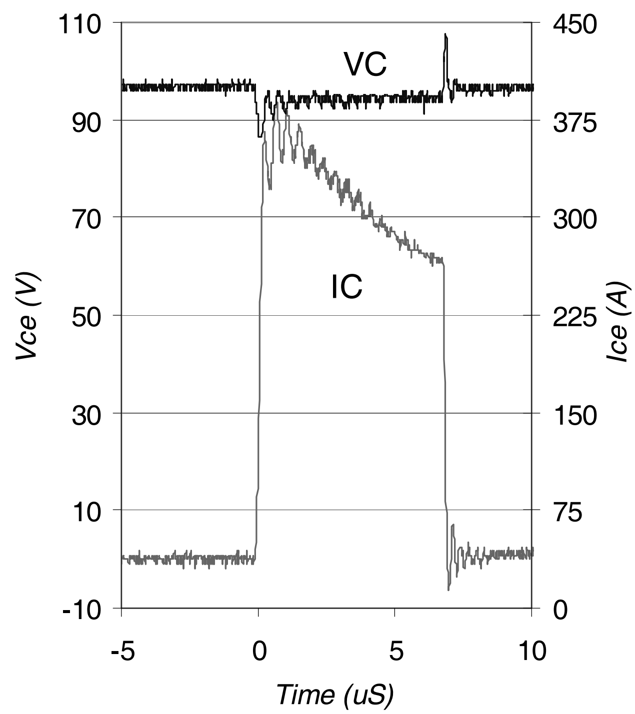


Fig. WF2 - Typ. Turn-on Loss Waveform
@ T_J = 175°C using Fig. CT.4

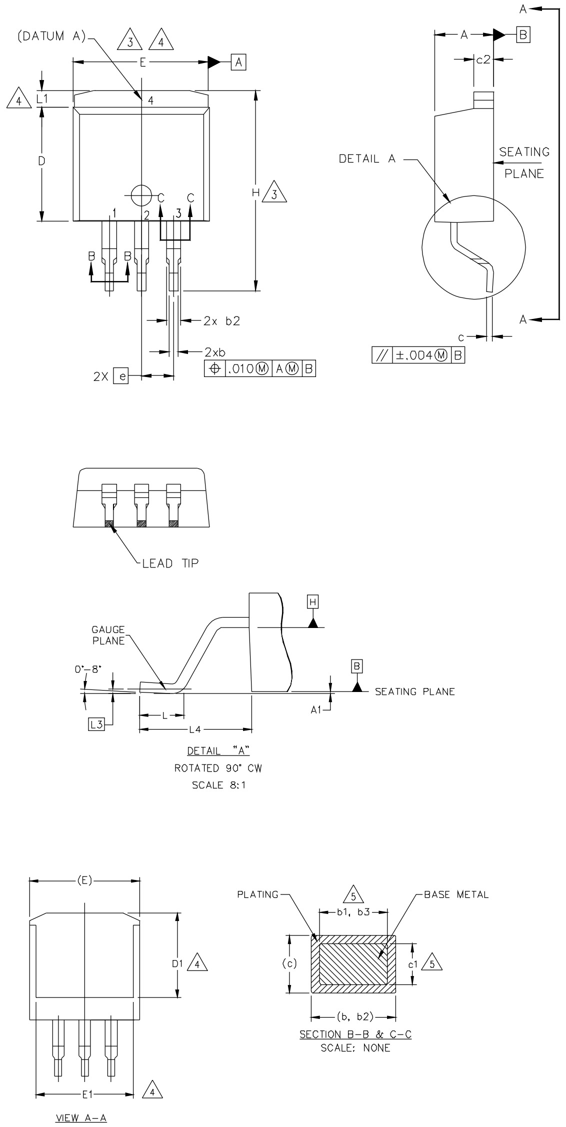


WF.3- Typ. Reverse Recovery Waveform
@ T_J = 175°C using CT.4



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

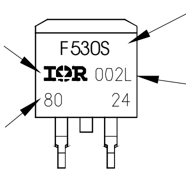
1.– ANODE *
2, 4.– CATHODE
3.– ANODE

* 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"



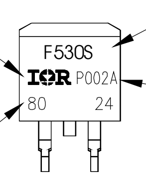
INTERNATIONAL RECTIFIER LOGO

ASSEMBLY LOT CODE

PART NUMBER

DATE CODE
YEAR 0 = 2000
WEEK 02
LINE L

OR



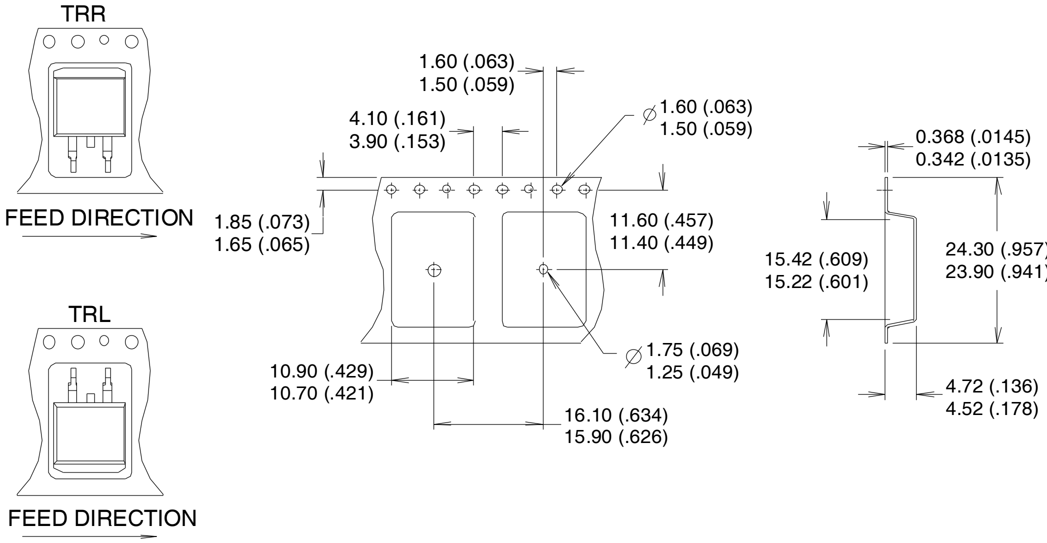
INTERNATIONAL RECTIFIER LOGO

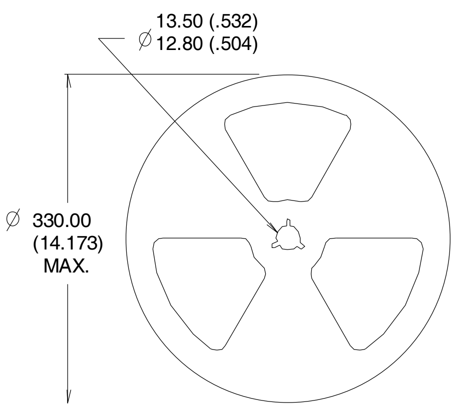
ASSEMBLY LOT CODE

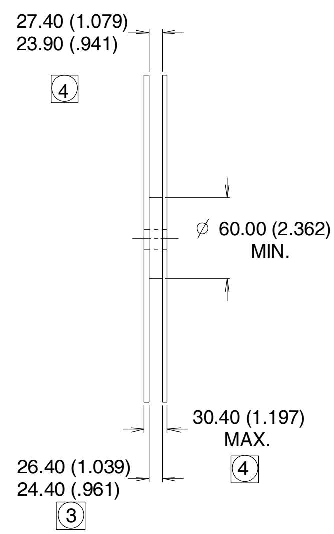
PART NUMBER

DATE CODE
P = DESIGNATES LEAD - FREE PRODUCT (OPTIONAL)
YEAR 0 = 2000
WEEK 02
A = ASSEMBLY SITE CODE

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.

International
IOR Rectifier
IR WORLD HEADQUARTERS: 101N.Sepulveda blvd, El Segundo, California 90245, USA Tel: (310) 252-7105
TAC Fax: (310) 252-7903
Visit us at www.irf.com for sales contact information.02/2012

Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.

Как с нами связаться

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Факс: 8 (812) 320-02-42
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