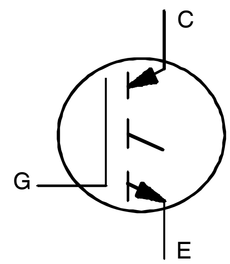
IRG7SC12FPbF

INSULATED GATE BIPOLAR TRANSISTOR

Features
- Low $V_{CE\,(ON)}$ Trench IGBT Technology
- Maximum Junction temperature 150 °C
- 3 µS short circuit SOA
- Square RBSOA
- Positive $V_{CE\,(ON)}$ Temperature co-efficient
- Tight parameter distribution
- Lead Free Package



n-channel

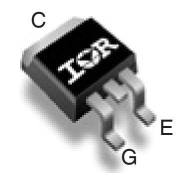
V_{CES} = 600V

I_C = 8A, T_C = 100°C

$t_{SC} \geq 3\mu s$, $T_{J(max)}$ = 150°C

$V_{CE(on)}$ typ. = 1.60V

Benefits
- High Efficiency in a HVAC, Refrigerator applications
- Rugged transient Performance for increased reliability
- Excellent Current sharing in parallel operation
- Low EMI



D^2Pak
IRG7SC12FPbF

G	C	E
Gate	Collector	Emitter

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current	24	A
I_C @ T_C = 100°C	Continuous Collector Current	13	
$I_{NOMINAL}$	Nominal Current	8	
I_{CM}	Pulse Collector Current	24	
I_{LM}	Clamped Inductive Load Current ①	32	
V_{GE}	Gate-to-Emitter Voltage	± 30	V
P_D @ T_C = 25°C	Maximum Power Dissipation	69	W
P_D @ T_C = 100°C	Maximum Power Dissipation	28	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Thermal Resistance Junction-to-Case ③	—	—	1.8	°C/W
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink (flat, greased surface)	—	0.50	—	
$R_{\theta JA}$	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	600	—	—	V	V_{GE} = 0V, I_C = 250μA
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.58	—	V/°C	V_{GE} = 0V, I_C = 1mA (25°C-150°C)
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	1.60	1.85	V	I_C = 8A, V_{GE} = 15V, T_J = 25°C ②
		—	1.60	—		I_C = 8A, V_{GE} = 15V, T_J = 150°C ②
$V_{GE(th)}$	Gate Threshold Voltage	4.5	—	7.0	V	V_{CE} = V_{GE}, I_C = 350μA
$\Delta V_{GE(th)}/\Delta TJ$	Threshold Voltage temp. coefficient	—	-12	—	mV/°C	V_{CE} = V_{GE}, I_C = 1.0mA (25°C - 150°C)
gfe	Forward Transconductance	—	6.2	—	S	V_{CE} = 50V, I_C = 8A, PW = 60μs
I_{CES}	Collector-to-Emitter Leakage Current	—	1.0	20	μA	V_{GE} = 0V, V_{CE} = 600V
		—	80	—		V_{GE} = 0V, V_{CE} = 600V, T_J = 150°C
I_{GES}	Gate-to-Emitter Leakage Current	—	—	±100	nA	V_{GE} = ± 30V

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge (turn-on)	—	34	51	nC	I_C = 8A
Q_{ge}	Gate-to-Emitter Charge (turn-on)	—	6.2	9.3		V_{GE} = 15V
Q_{gc}	Gate-to-Collector Charge (turn-on)	—	16	24		V_{CC} = 400V
E_{on}	Turn-On Switching Loss	—	390	610	μJ	I_C = 8A, V_{CC} = 400V, V_{GE} = 15V
E_{off}	Turn-Off Switching Loss	—	280	440		R_G = 47Ω, L = 1.0mH, L_S = 150nH
E_{total}	Total Switching Loss	—	670	1050		TJ = 25°C
$t_{d(on)}$	Turn-On delay time	—	40	60	ns	I_C = 8A, V_{CC} = 400V, V_{GE} = 15V
t_r	Rise time	—	20	40		R_G = 47Ω, L = 1.0mH, L_S = 150nH
$t_{d(off)}$	Turn-Off delay time	—	210	270		TJ = 25°C
t_f	Fall time	—	120	180		
E_{on}	Turn-On Switching Loss	—	515	—	μJ	I_C = 8A, V_{CC} = 400V, V_{GE} = 15V
E_{off}	Turn-Off Switching Loss	—	570	—		R_G = 47Ω, L=1.0mH, L_S = 150nH
E_{total}	Total Switching Loss	—	1085	—		TJ = 150°C
$t_{d(on)}$	Turn-On delay time	—	30	—	ns	I_C = 8A, V_{CC} = 400V, V_{GE} = 15V
t_r	Rise time	—	20	—		R_G = 47Ω, L = 1.0mH, L_S = 150nH
$t_{d(off)}$	Turn-Off delay time	—	250	—		TJ = 150°C
t_f	Fall time	—	285	—		
C_{ies}	Input Capacitance	—	880	—	pF	V_{GE} = 0V
C_{oes}	Output Capacitance	—	30	—		V_{CC} = 30V
C_{res}	Reverse Transfer Capacitance	—	20	—		f = 1.0Mhz
RBSOA	Reverse Bias Safe Operating Area	FULL SQUARE				T_J = 150°C, I_C = 32A V_{CC} = 480V, Vp ≤ 600V Rg = 47Ω, V_{GE} = +20V to 0V
SCSOA	Short Circuit Safe Operating Area	3	—	—	μs	V_{GE} = 15V,V_{CC} = 400V, Vp ≤ 600V Rg = 47Ω, Rshunt = 33mΩ, V_{GE} = +15V to 0V

Notes:

① V_{CC} = 80% (V_{CES}), V_{GE} = 20V, L = 1.0mH, R_G = 47Ω.
② Pulse width limited by max. junction temperature.
③ R_θ is measured at T_J of approximately 90°C.

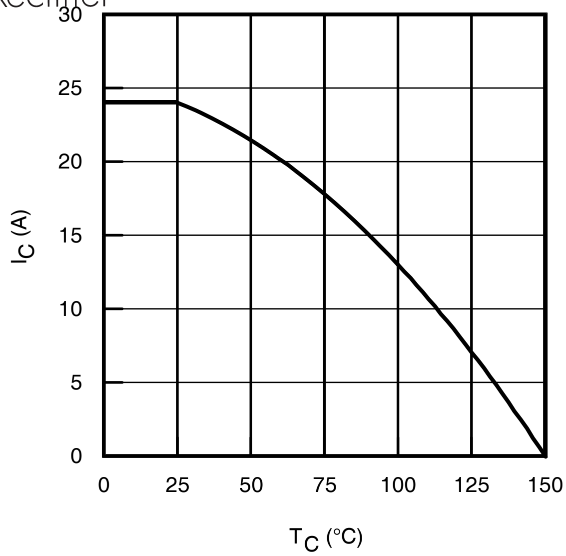


Fig. 1 - Maximum DC Collector Current vs. Case Temperature

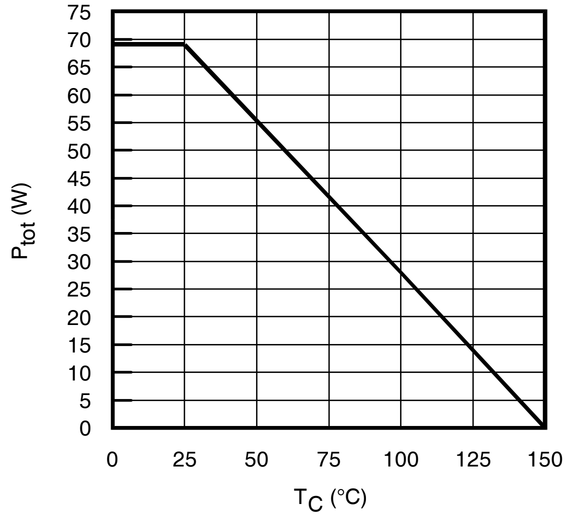


Fig. 2 - Power Dissipation vs. Case Temperature

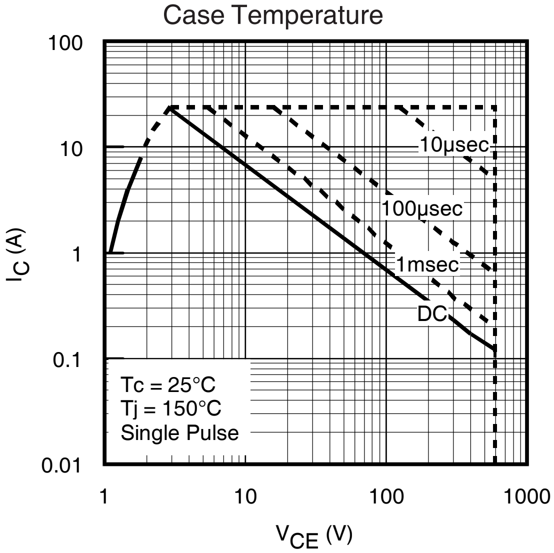


Fig. 3 - Forward SOA
$T_C = 25°C, T_J \leq 150°C; V_{GE} = 15V$

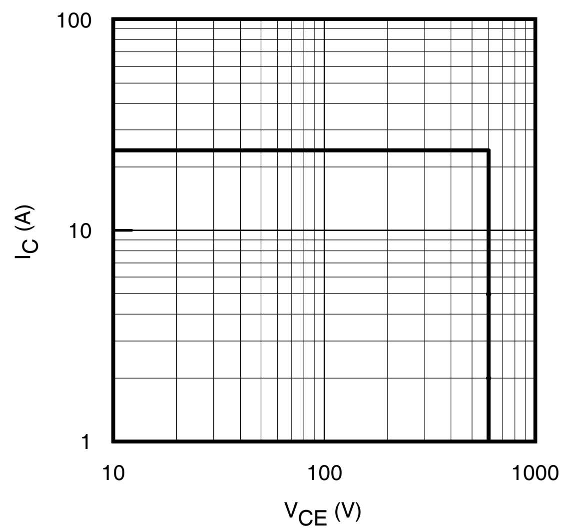


Fig. 4 - Reverse Bias SOA
$T_J = 150°C; V_{GE} = 15V$

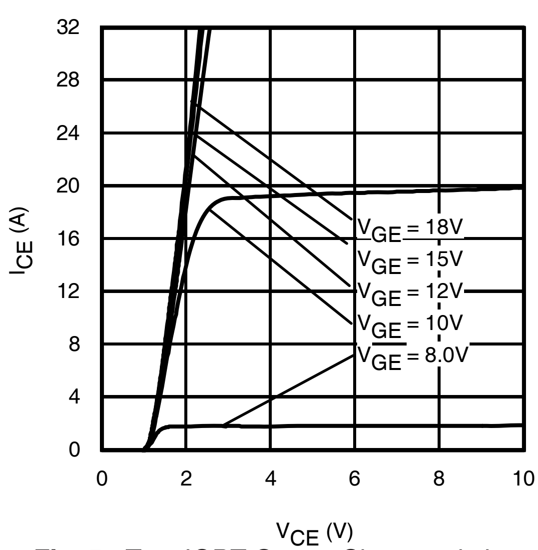


Fig. 5 - Typ. IGBT Output Characteristics
$T_J = -40°C$; tp = 60μs

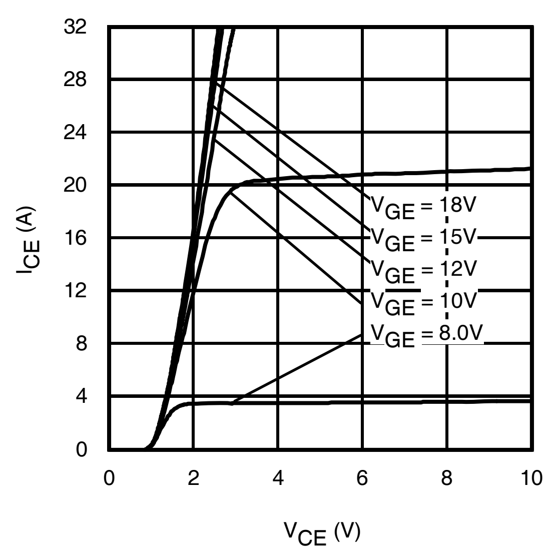


Fig. 6 - Typ. IGBT Output Characteristics
$T_J = 25°C$; tp = 60μs

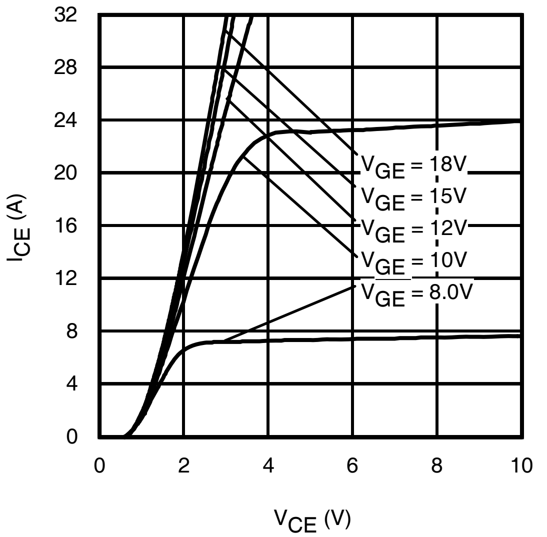


Fig. 7 - Typ. IGBT Output Characteristics
T_J = 150°C; tp = 60µs

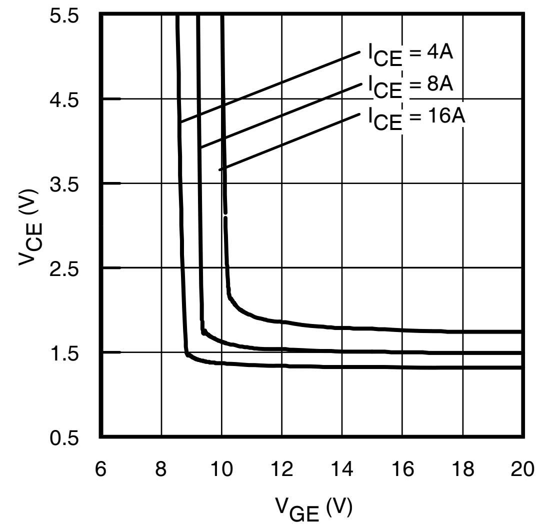


Fig. 8 - Typical V_{CE} vs. V_{GE}
T_J = -40°C

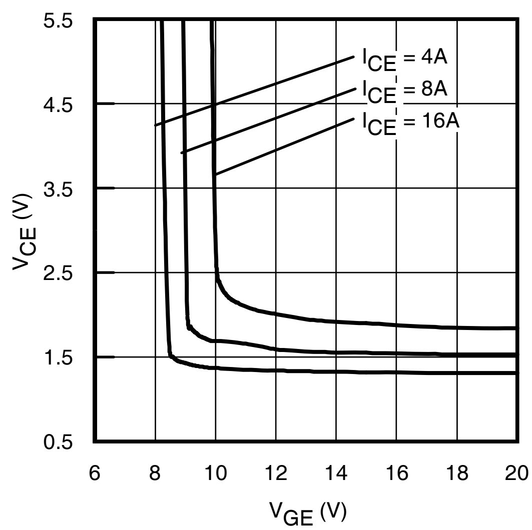


Fig. 9 - Typical V_{CE} vs. V_{GE}
T_J = 25°C

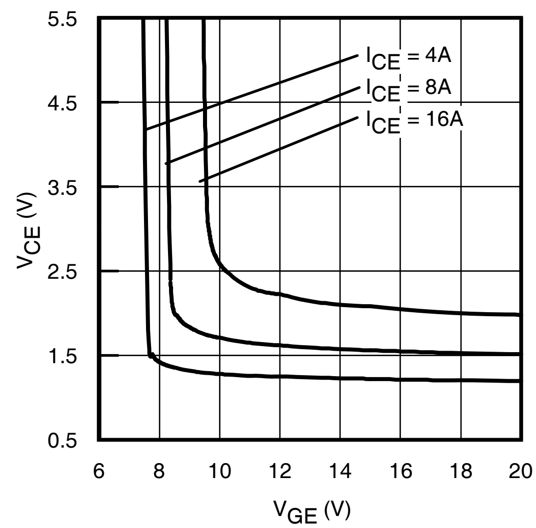


Fig. 10 - Typical V_{CE} vs. V_{GE}
T_J = 150°C

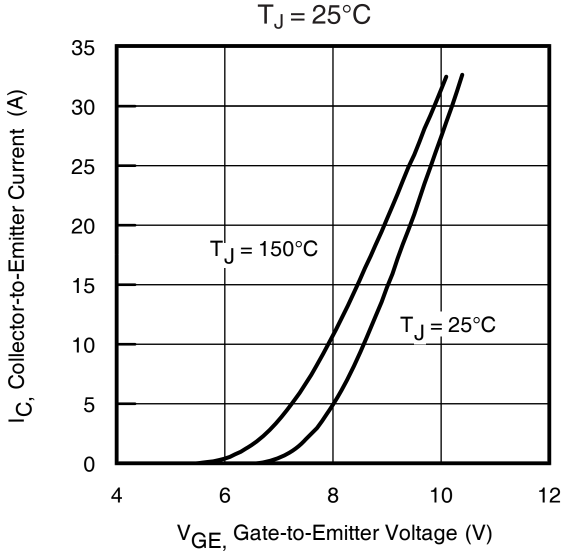


Fig. 11 - Typ. Transfer Characteristics
V_{CE} = 50V; tp = 60µs

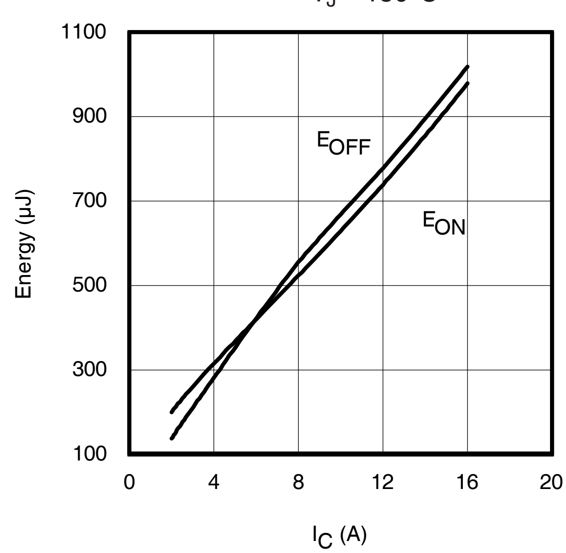


Fig. 12 - Typ. Energy Loss vs. I_C
T_J = 150°C; L = 1.0mH; V_{CE} = 400V, R_G = 47Ω; V_{GE} = 15V

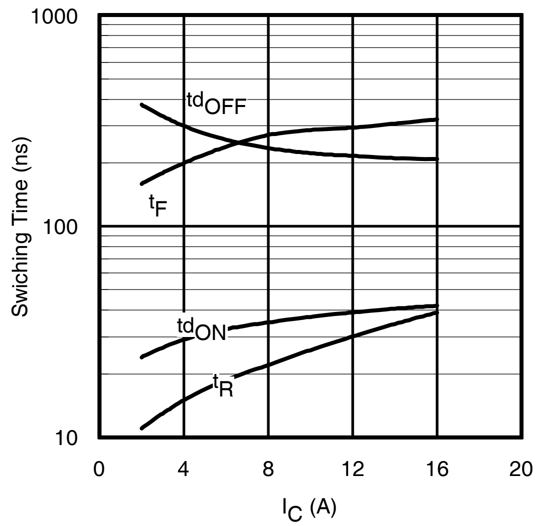


Fig. 13 - Typ. Switching Time vs. I_C
$T_J = 150°C$; L = 1.0mH; $V_{CE} = 400V$, $R_G = 47\Omega$; $V_{GE} = 15V$

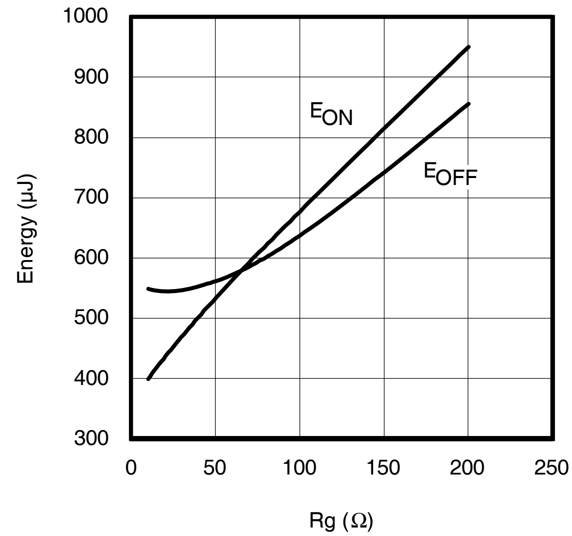


Fig. 14 - Typ. Energy Loss vs. R_G
$T_J = 150°C$; L = 1.0mH; $V_{CE} = 400V$, $I_{CE} = 8A$; $V_{GE} = 15V$

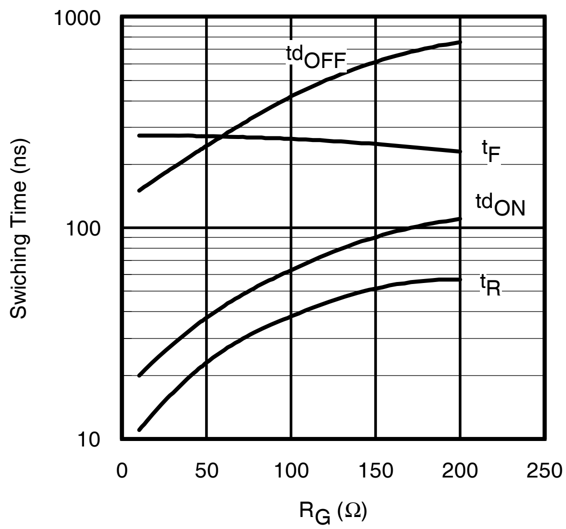


Fig. 15 - Typ. Switching Time vs. R_G
$T_J = 150°C$; L = 1mH; $V_{CE} = 400V$, $I_{CE} = 8A$; $V_{GE} = 15V$

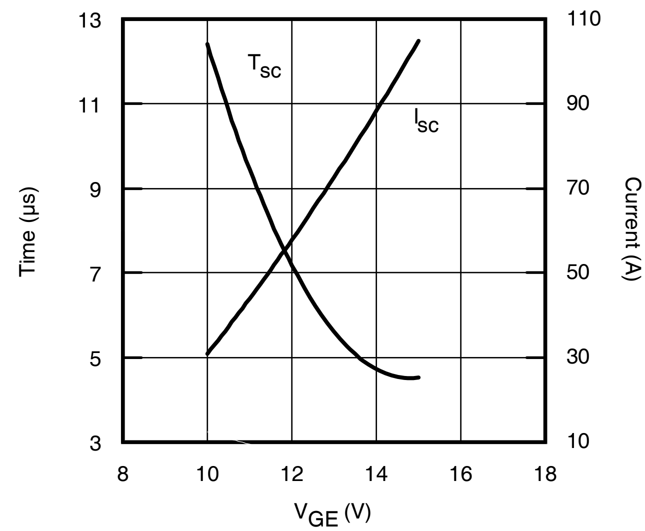


Fig. 16 - V_{GE} vs. Short Circuit Time
$V_{CC} = 400V$; $T_C = 25°C$

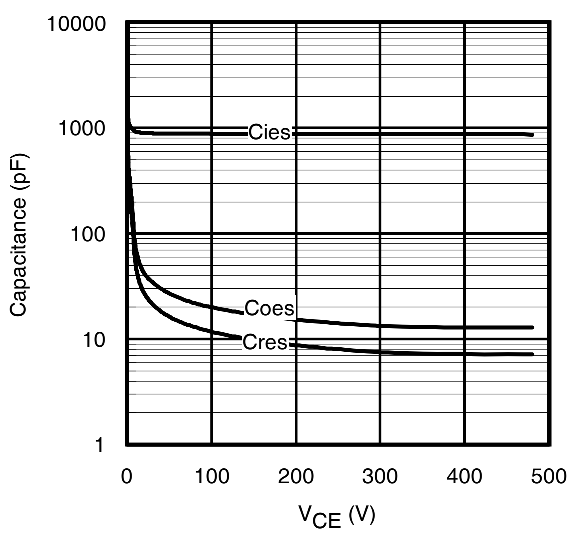


Fig. 17 - Typ. Capacitance vs. V_{CE}
V_{GE}= 0V; f = 1MHz

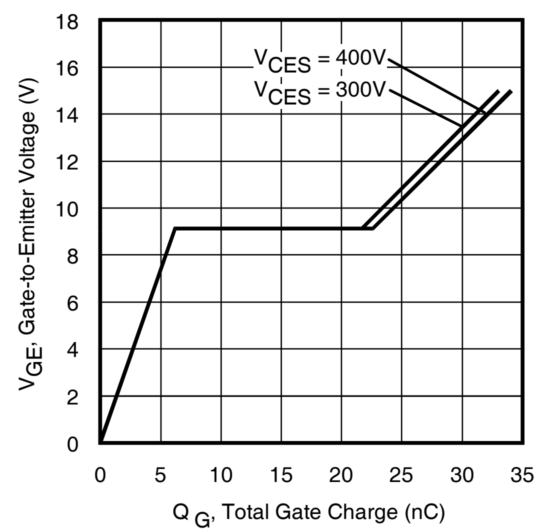


Fig. 18 - Typical Gate Charge vs. V_{GE}
$I_{CE} = 8A$; L = 2.4mH

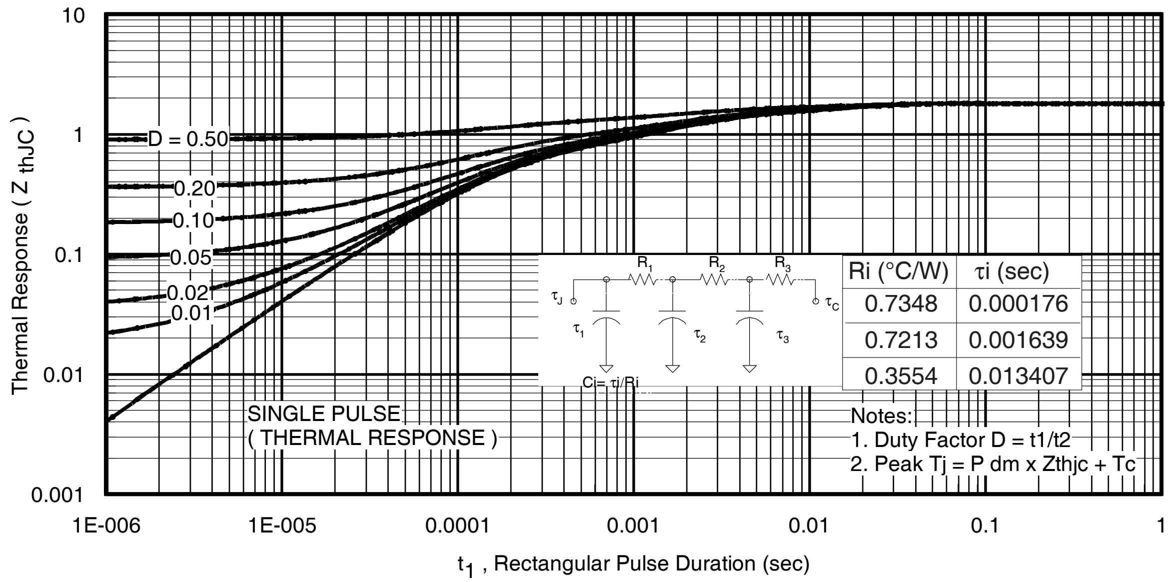


Fig 19. Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)

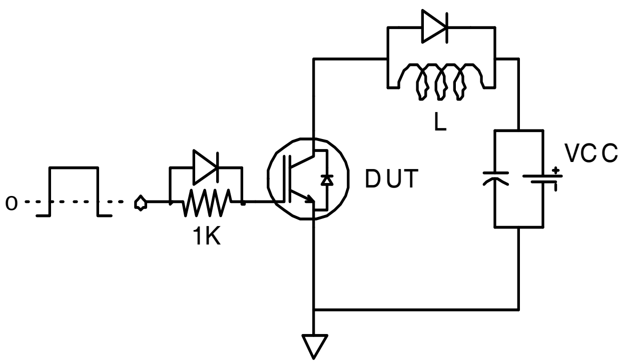


Fig.C.T.1 - Gate Charge Circuit (turn-off)

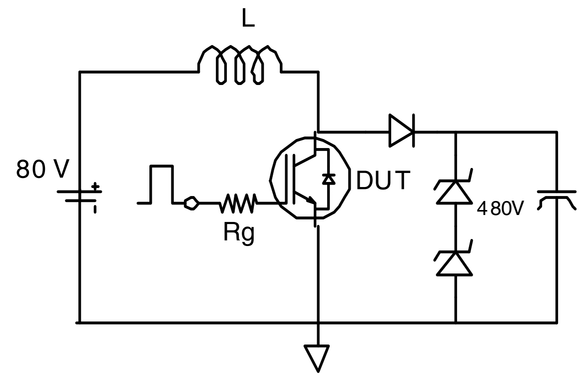


Fig.C.T.2 - RBSOA Circuit

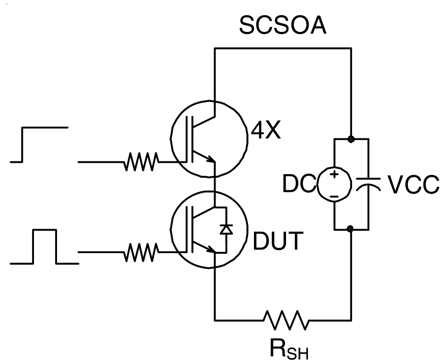


Fig.C.T.3 - S.C. SOA Circuit

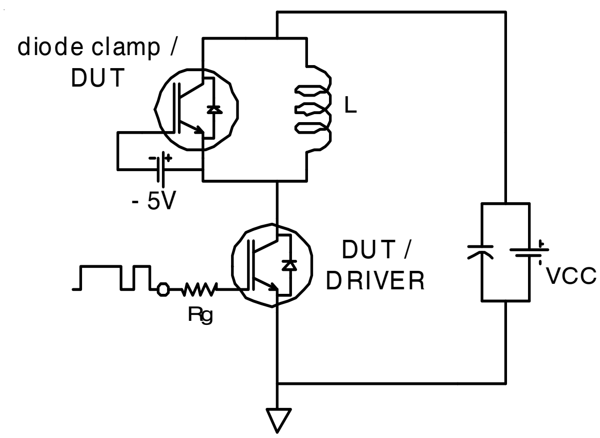


Fig.C.T.4 - Switching Loss Circuit

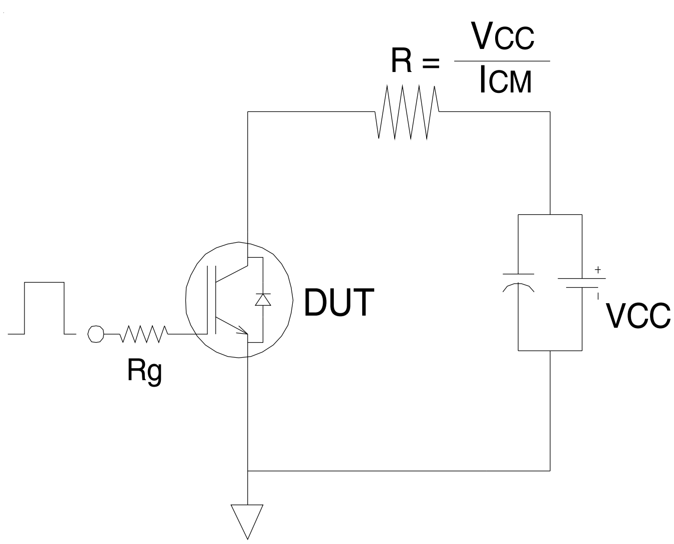


Fig.C.T.5 - Resistive Load Circuit

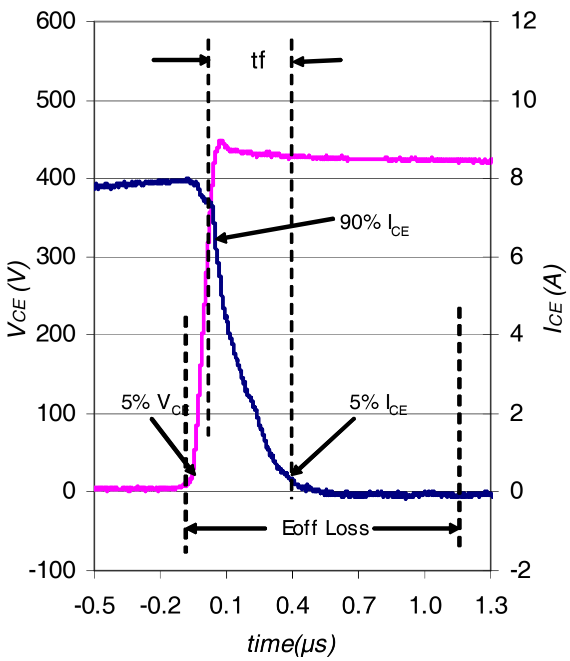


Fig. WF1 - Typ. Turn-off Loss Waveform
@ T_J = 150°C using Fig. CT.4

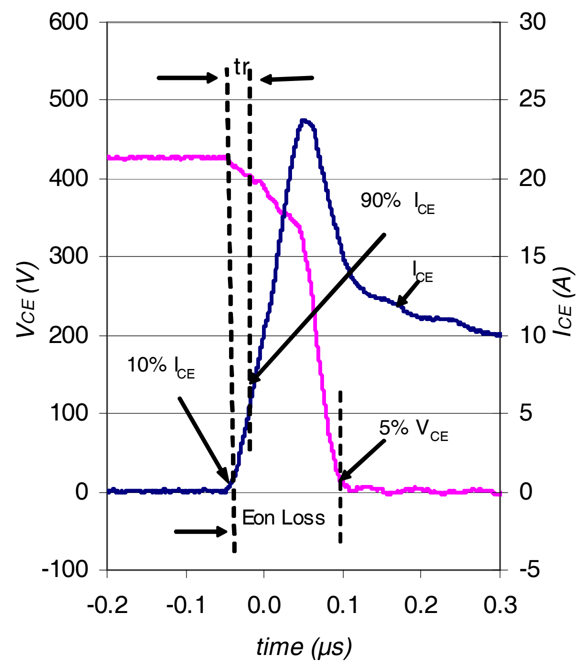


Fig. WF2 - Typ. Turn-on Loss Waveform
@ T_J = 150°C using Fig. CT.4

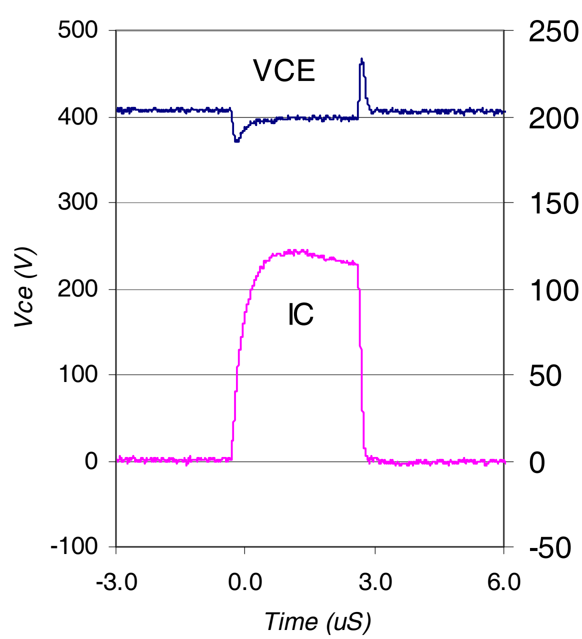
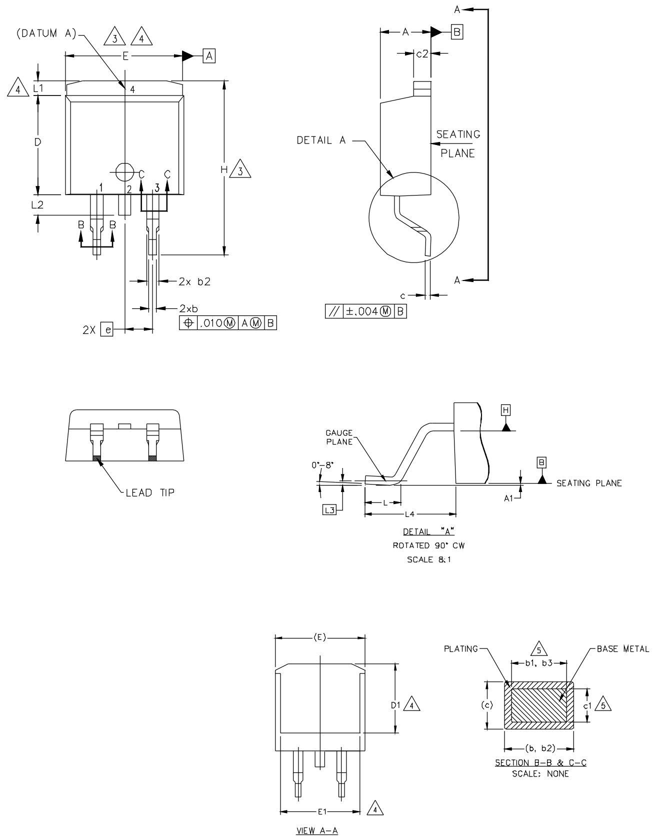


Fig. WF3 - Typ. S.C. Waveform
@ T_J = 25°C using Fig. CT.3

D²Pak (TO-263AB) 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	0.00	0.254	.000	.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
L2	1.27	1.78	–	.070	
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

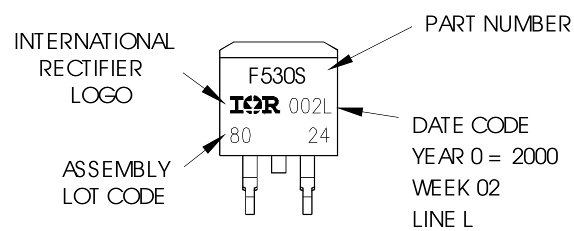
1.– ANODE *
2, 4.– CATHODE
3.– ANODE

* PART DEPENDENT.

D²Pak (TO-263AB) 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"



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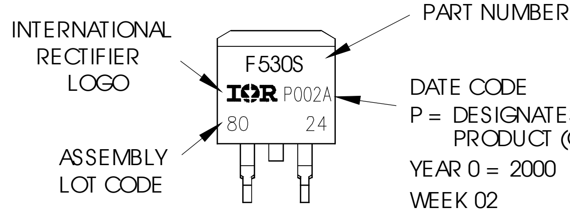
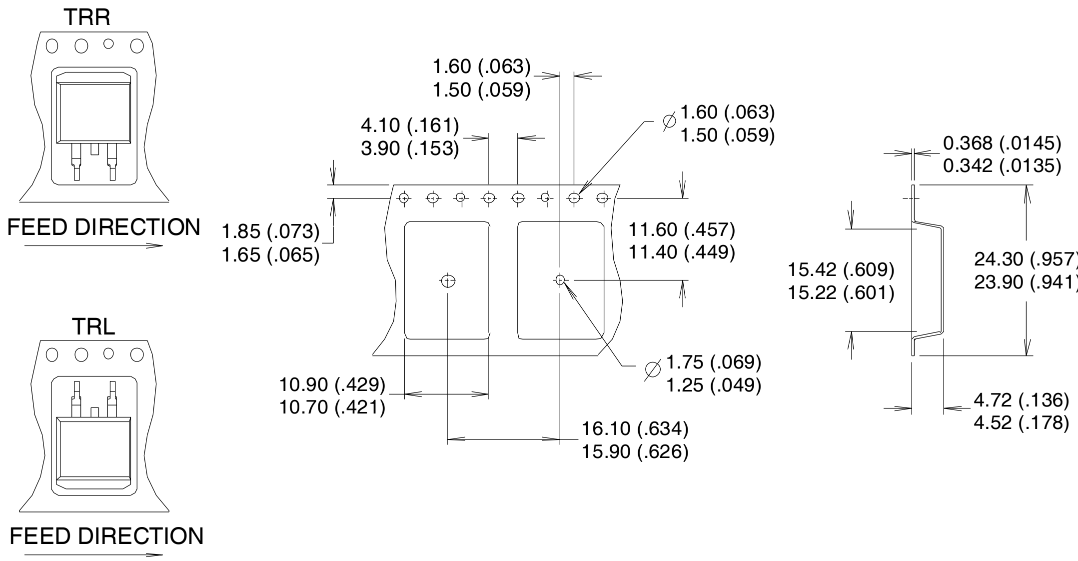
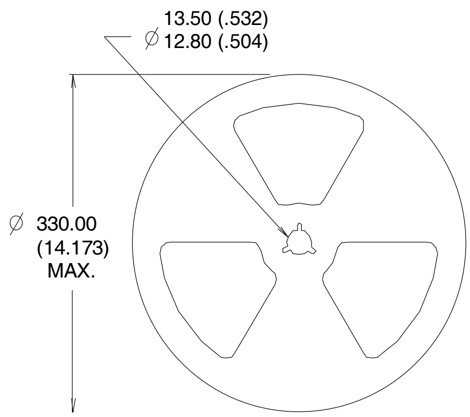


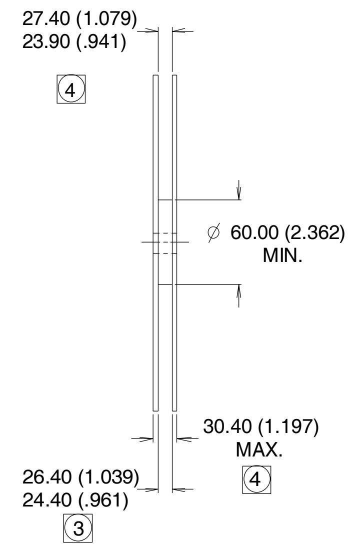
Note: For the most current drawing please refer to IR website at http://www.irf.com/package/pkhexfet.html

D²Pak (TO-263AB) Tape & Reel Information

Dimensions are shown in millimeters (inches)







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

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

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

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TAC Fax: (310) 252-7903
Visit us at www.irf.com for sales contact information. 03/2011