

IRG7RC07SDPbF

Optimized for line frequency, 50/60Hz switching frequency

Features

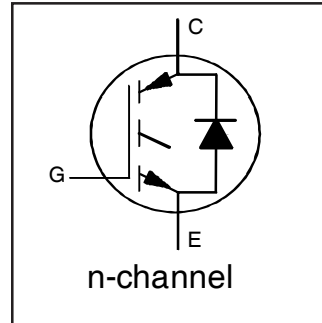
- Standard speed IGBT for switching frequency less than 1KHz
- Very low $V_{CE(ON)}$
- Ultra fast soft recovery diode

Benefits

- High efficiency for line frequency applications
- Higher reliability from reduced conduction losses
- Ultra fast diode optimized for high frequency commutation

Applications

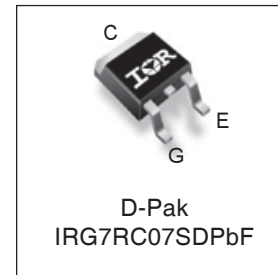
- Solar Inverters (50/60Hz Switch)
- Welding machine output stage
- Steering Switch in BLDC motor
- Induction heating operating in capacitive mode



$$V_{CES} = 600V$$

$$I_C = 8.5A, T_C = 100^{\circ}C$$

$$V_{CE(on)} \text{ typ. } = 1.2V @ I_C = 3A$$



G	C	E
Gate	Collector	Emitter

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
$I_C @ T_C = 25^{\circ}C$	Continuous Collector Current	16	A
$I_C @ T_C = 100^{\circ}C$	Continuous Collector Current	8.5	
I_{CM}	Pulse Collector Current	18	
I_M	Clamped Inductive Load Current ①	6.0	
$I_F @ T_C = 25^{\circ}C$	Diode Continuous Forward Current	16	
$I_F @ T_C = 100^{\circ}C$	Diode Continuous Forward Current	8.5	
I_{FM}	Diode Maximum Forward Current②	16	V
V_{GE}	Gate-to-Emitter Voltage	± 30	
$P_D @ T_C = 25^{\circ}C$	Maximum Power Dissipation	39	W
$P_D @ T_C = 100^{\circ}C$	Maximum Power Dissipation	16	
T_J	Operating Junction and	-55 to +150	$^{\circ}C$
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$ (IGBT)	Thermal Resistance Junction-to-Case-(each IGBT) ③	—	—	3.2	$^{\circ}C/W$
$R_{\theta JC}$ (Diode)	Thermal Resistance Junction-to-Case-(each Diode) ③	—	—	6.1	
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink (flat, greased surface)	—	0.50	—	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (PCB mount Steady state)	—	50	—	

Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	600	—	—	V	$V_{GE} = 0V, I_C = 250\mu A$
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.72	—	V/ $^\circ\text{C}$	$V_{GE} = 0V, I_C = 250\mu A$ (25 $^\circ\text{C}$ -150 $^\circ\text{C}$)
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	1.2	1.5	V	$I_C = 3.0A, V_{GE} = 15V, T_J = 25^\circ\text{C}$
		—	1.2	—		$I_C = 3.0A, V_{GE} = 15V, T_J = 150^\circ\text{C}$
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	5.5	V	$V_{CE} = V_{GE}, I_C = 100\mu A$
$\Delta V_{GE(th)}/\Delta T_J$	Threshold Voltage temp. coefficient	—	-8.3	—	mV/ $^\circ\text{C}$	$V_{CE} = V_{GE}, I_C = 1.0mA$ (25 $^\circ\text{C}$ - 150 $^\circ\text{C}$)
g_{fe}	Forward Transconductance	—	4.3	—	S	$V_{CE} = 50V, I_C = 3.0A$
I_{CES}	Collector-to-Emitter Leakage Current	—	1.0	20	μA	$V_{GE} = 0V, V_{CE} = 600V$
		—	100	—		$V_{GE} = 0V, V_{CE} = 600V, T_J = 150^\circ\text{C}$
V_{FM}	Diode Forward Voltage Drop	—	1.4	1.8	V	$I_F = 3.0A$
		—	1.1	—		$I_F = 3.0A, T_J = 150^\circ\text{C}$
I_{GES}	Gate-to-Emitter Leakage Current	—	—	± 100	nA	$V_{GE} = \pm 30V$

Switching Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge (turn-on)	—	13	20	nC	$I_C = 3.0A$ $V_{GE} = 15V$ ① $V_{CC} = 400V$
Q_{ge}	Gate-to-Emitter Charge (turn-on)	—	2.0	3.0		
Q_{gc}	Gate-to-Collector Charge (turn-on)	—	5.0	7.5		
E_{on}	Turn-On Switching Loss	—	80	170	μJ	$I_C = 3.0A, V_{CC} = 400V, V_{GE} = 15V$ $R_G = 100\Omega, L = 1mH, T_J = 25^\circ\text{C}$ ② Energy losses include tail & diode reverse recovery
E_{off}	Turn-Off Switching Loss	—	620	790		
E_{total}	Total Switching Loss	—	700	960		
$t_{d(on)}$	Turn-On delay time	—	20	40	ns	$I_C = 3.0A, V_{CC} = 400V, V_{GE} = 15V$ $R_G = 100\Omega, L = 1mH, T_J = 25^\circ\text{C}$ ②
t_r	Rise time	—	10	30		
$t_{d(off)}$	Turn-Off delay time	—	580	730		
t_f	Fall time	—	550	670		
E_{on}	Turn-On Switching Loss	—	140	—	μJ	$I_C = 3.0A, V_{CC} = 400V, V_{GE} = 15V$ $R_G = 100\Omega, L = 1mH, T_J = 150^\circ\text{C}$ Energy losses include tail & diode reverse recovery
E_{off}	Turn-Off Switching Loss	—	1100	—		
E_{total}	Total Switching Loss	—	1240	—		
$t_{d(on)}$	Turn-On delay time	—	20	—	ns	$I_C = 3.0A, V_{CC} = 400V, V_{GE} = 15V$ $R_G = 100\Omega, L = 1mH, T_J = 150^\circ\text{C}$
t_r	Rise time	—	15	—		
$t_{d(off)}$	Turn-Off delay time	—	870	—		
t_f	Fall time	—	1020	—		
C_{ies}	Input Capacitance	—	350	—	pF	$V_{GE} = 0V$ $V_{CC} = 30V$ $f = 1.0MHz$
C_{oes}	Output Capacitance	—	22	—		
C_{res}	Reverse Transfer Capacitance	—	7.0	—		
RBSOA	Reverse Bias Safe Operating Area	FULL SQUARE				$T_J = 150^\circ\text{C}, I_C = 6A$ $V_{CC} = 480V, V_p = 600V$ $R_G = 100\Omega, V_{GE} = +20V$ to 0V
E_{rec}	Reverse Recovery Energy of the Diode	—	21	—	μJ	$T_J = 150^\circ\text{C}$
t_{rr}	Diode Reverse Recovery Time	—	64	—	ns	$V_{CC} = 400V, I_F = 3.0A$
I_{rr}	Peak Reverse Recovery Current	—	7.3	—	A	$V_{GE} = 15V, R_G = 100\Omega, L = 1mH$

Notes:

- ① $V_{CC} = 80\% (V_{CES}), V_{GE} = 20V, L = 1mH, R_G = 100\Omega$.
- ② Pulse width limited by max. junction temperature.
- ③ R_G is measured at T_J of approximately 90 $^\circ\text{C}$.
- ④ Max limit based on statistical sample size characterization.

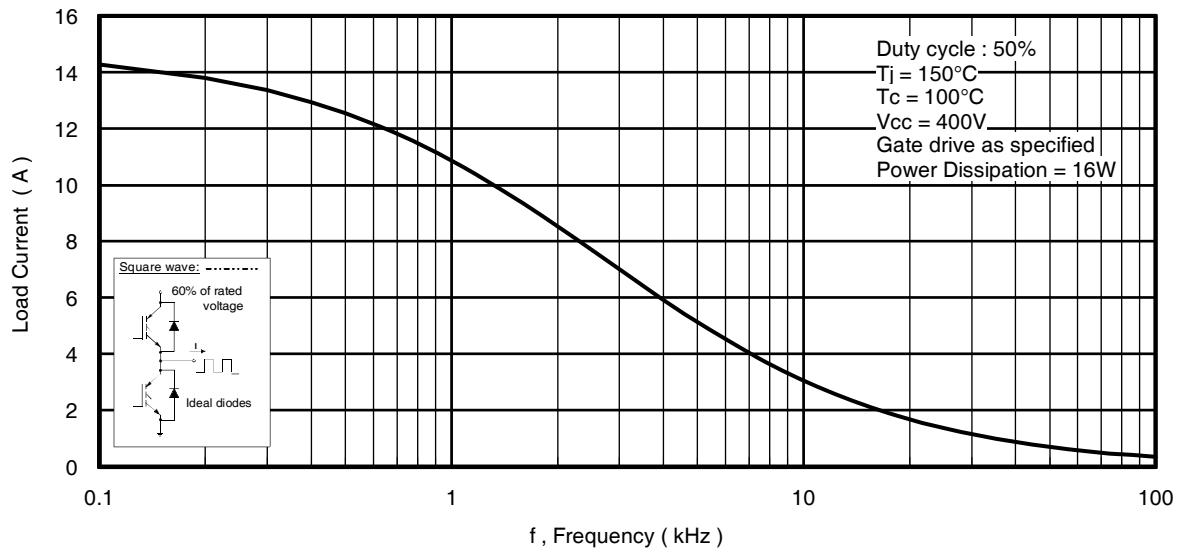


Fig. 1 - Typical Load Current vs. Frequency

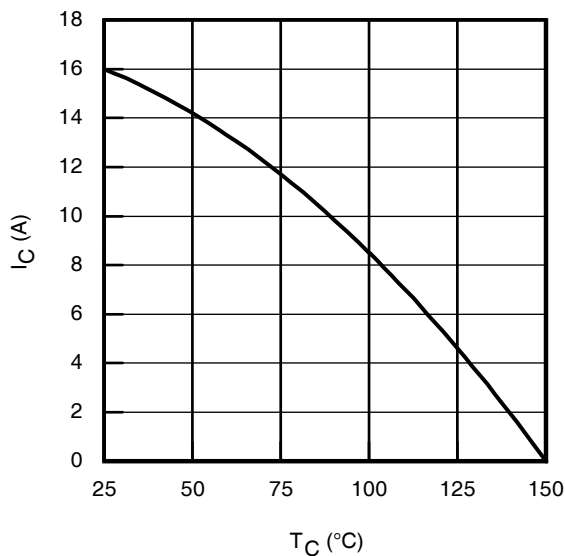


Fig. 2 - Maximum DC Collector Current vs. Case Temperature

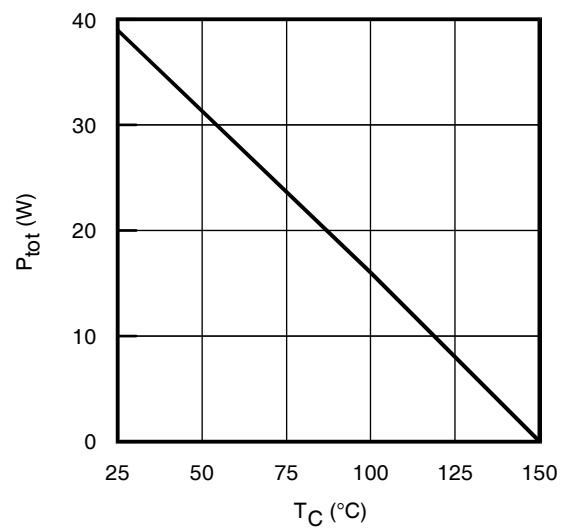


Fig. 3 - Power Dissipation vs. Case Temperature

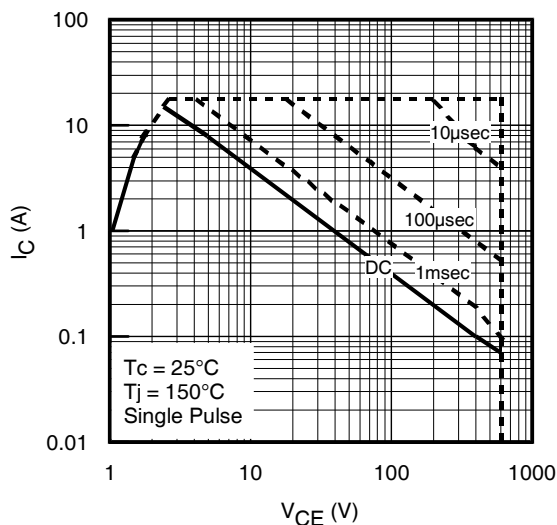


Fig. 4 - Forward SOA
 $T_C = 25^{\circ}\text{C}$, $T_J \leq 150^{\circ}\text{C}$; $V_{GE} = 15\text{V}$

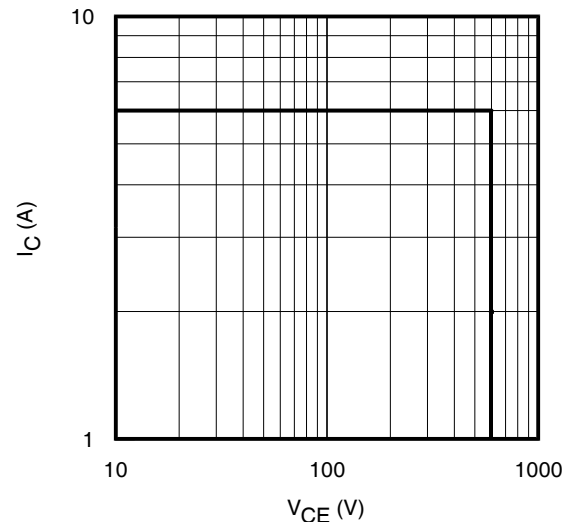


Fig. 5 - Reverse Bias SOA
 $T_J = 150^{\circ}\text{C}$; $V_{GE} = 20\text{V}$

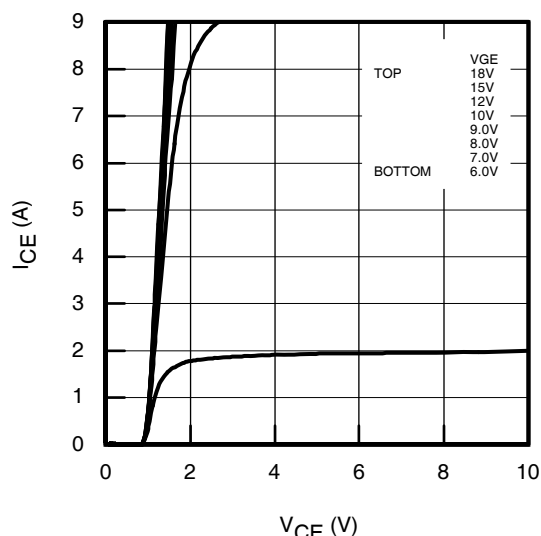


Fig. 6 - Typ. IGBT Output Characteristics
 $T_J = -40^\circ\text{C}$; $t_p = 20\mu\text{s}$

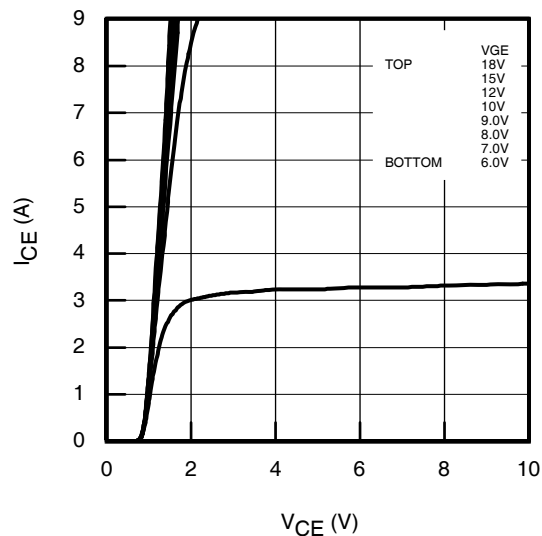


Fig. 7 - Typ. IGBT Output Characteristics
 $T_J = 25^\circ\text{C}$; $t_p = 20\mu\text{s}$

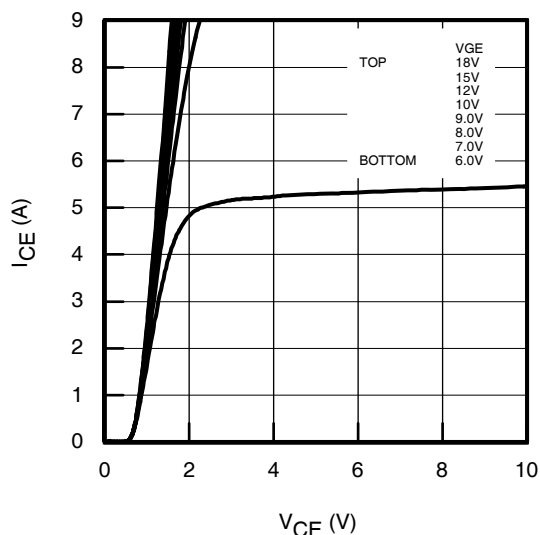


Fig. 8 - Typ. IGBT Output Characteristics
 $T_J = 150^\circ\text{C}$; $t_p = 20\mu\text{s}$

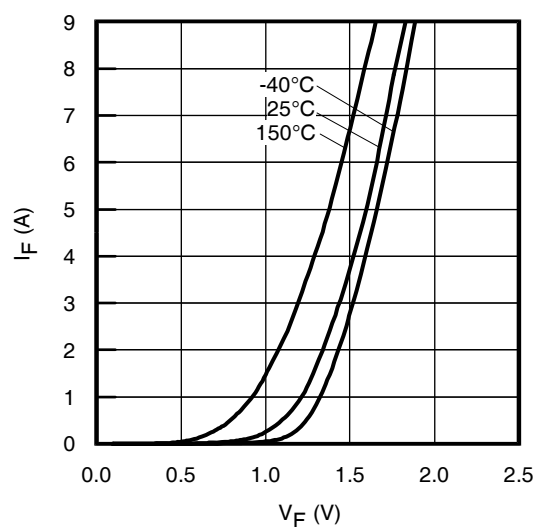


Fig. 9 - Typ. Diode Forward Characteristics
 $t_p = 20\mu\text{s}$

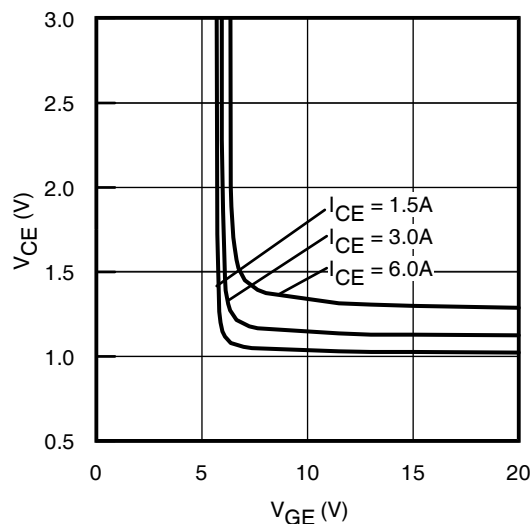


Fig. 10 - Typical V_{CE} vs. V_{GE}
 $T_J = -40^\circ\text{C}$

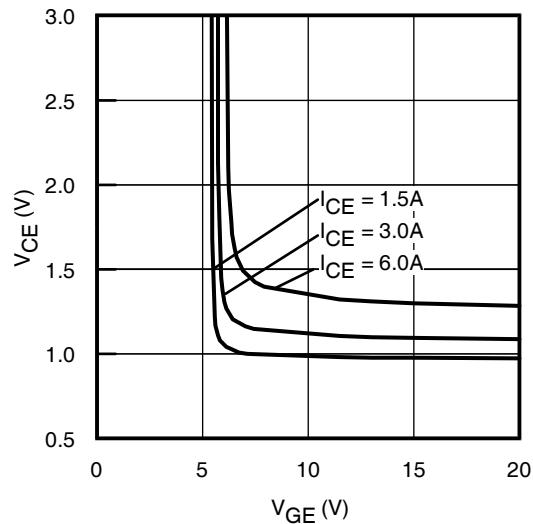


Fig. 11 - Typical V_{CE} vs. V_{GE}
 $T_J = 25^\circ\text{C}$

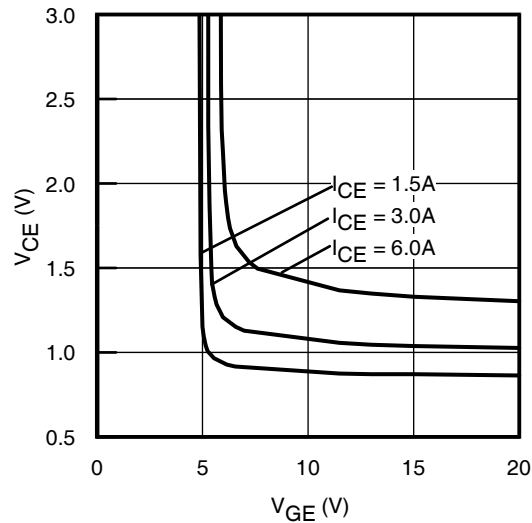


Fig. 12 - Typical V_{CE} vs. V_{GE}
 $T_J = 150^\circ\text{C}$

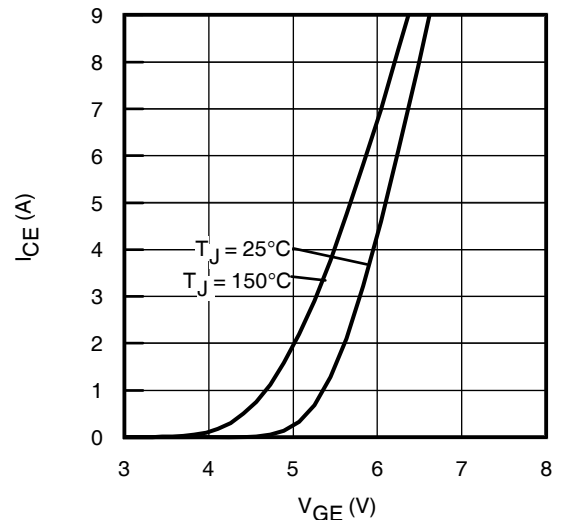


Fig. 13 - Typ. Transfer Characteristics
 $V_{CE} = 50\text{V}$; $t_p = 20\mu\text{s}$

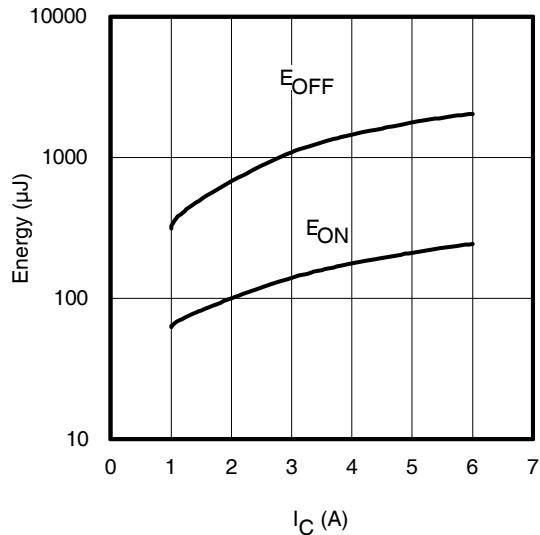


Fig. 14 - Typ. Energy Loss vs. I_C
 $T_J = 150^\circ\text{C}$; $L = 1\text{mH}$; $V_{CE} = 400\text{V}$; $R_G = 100\Omega$; $V_{GE} = 15\text{V}$

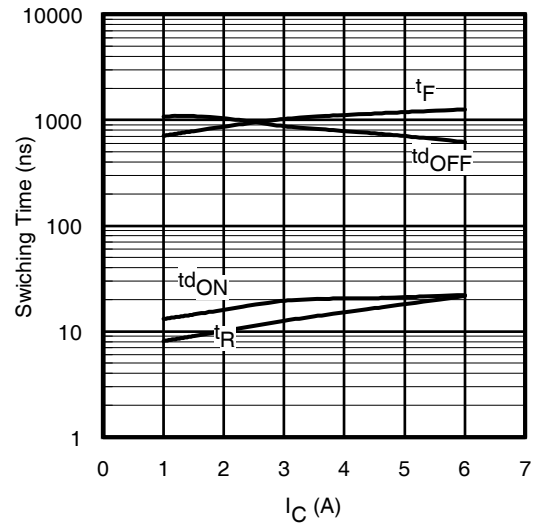


Fig. 15 - Typ. Switching Time vs. I_C
 $T_J = 150^\circ\text{C}$; $L = 1\text{mH}$; $V_{CE} = 400\text{V}$; $R_G = 100\Omega$; $V_{GE} = 15\text{V}$

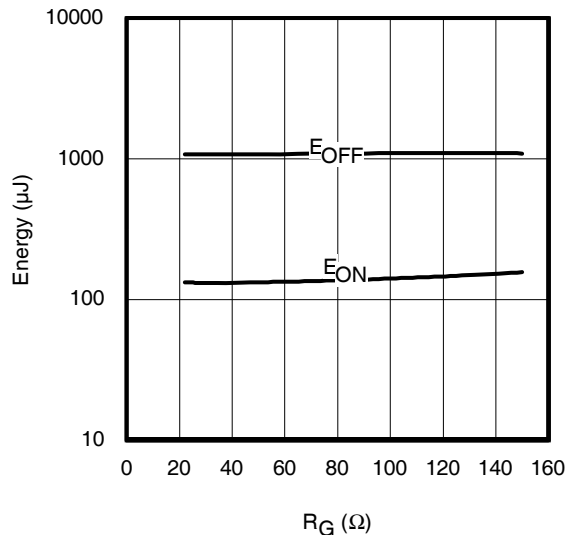


Fig. 16 - Typ. Energy Loss vs. R_G
 $T_J = 150^\circ\text{C}$; $L = 1\text{mH}$; $V_{CE} = 400\text{V}$; $I_{CE} = 3.0\text{A}$; $V_{GE} = 15\text{V}$

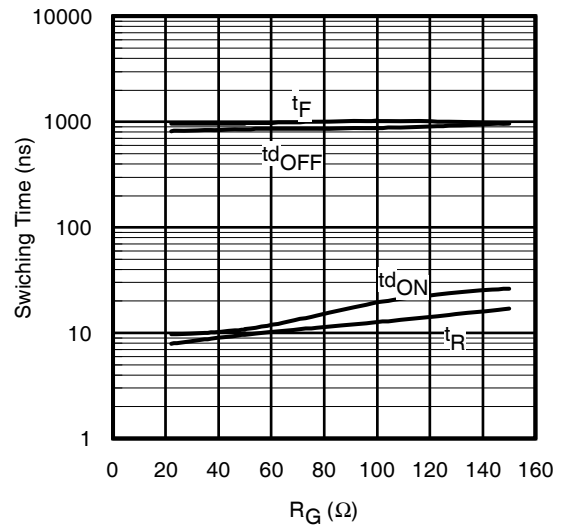


Fig. 17 - Typ. Switching Time vs. R_G
 $T_J = 150^\circ\text{C}$; $L = 1\text{mH}$; $V_{CE} = 400\text{V}$; $I_{CE} = 3.0\text{A}$; $V_{GE} = 15\text{V}$

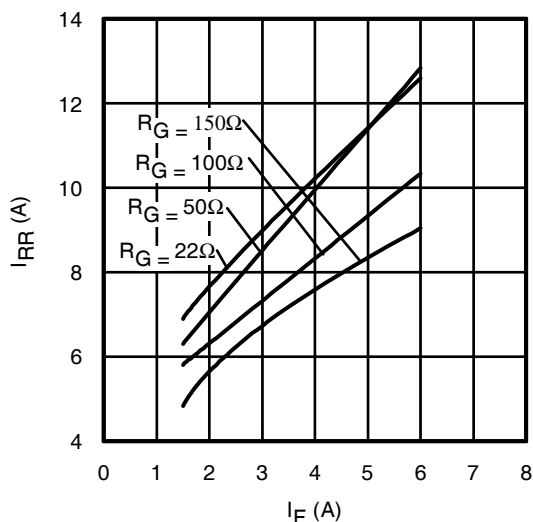


Fig. 18 - Typ. Diode I_{RR} vs. I_F
 $T_J = 150^\circ\text{C}$

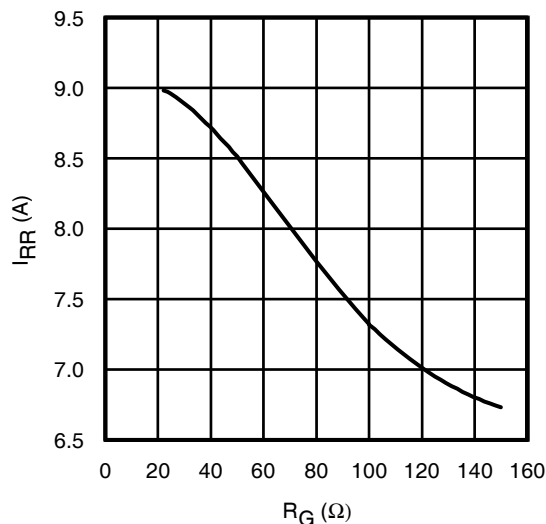


Fig. 19 - Typ. Diode I_{RR} vs. R_G
 $T_J = 150^\circ\text{C}$

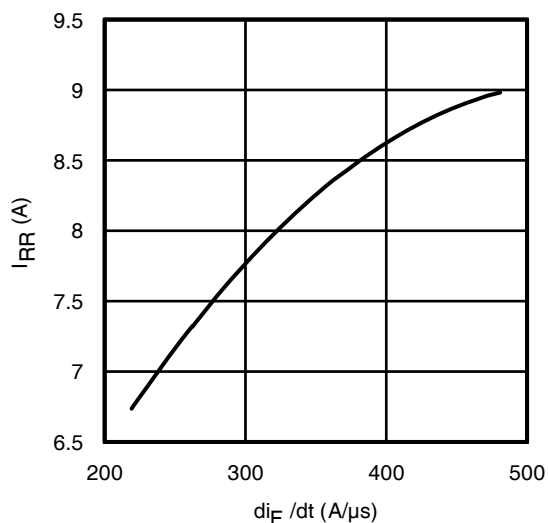


Fig. 20 - Typ. Diode I_{RR} vs. di_F/dt
 $V_{CC} = 400\text{V}$; $V_{GE} = 15\text{V}$; $I_F = 3.0\text{A}$; $T_J = 150^\circ\text{C}$

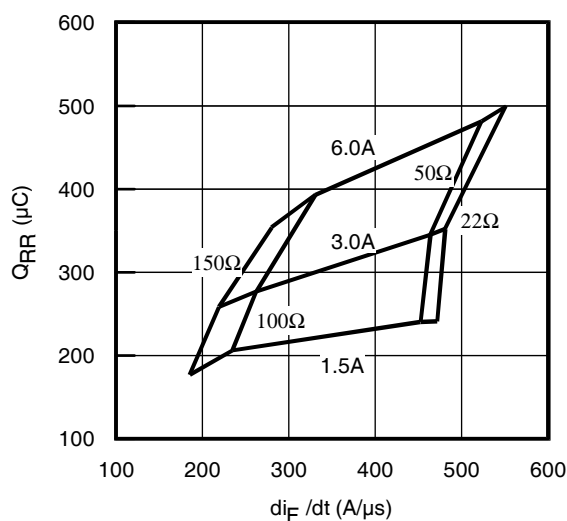


Fig. 21 - Typ. Diode Q_{RR} vs. di_F/dt
 $V_{CC} = 400\text{V}$; $V_{GE} = 15\text{V}$; $T_J = 150^\circ\text{C}$

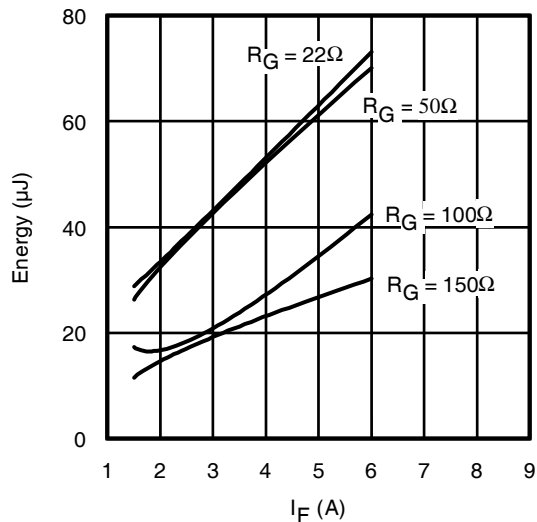


Fig. 22 - Typ. Diode E_{RR} vs. I_F
 $T_J = 150^\circ\text{C}$

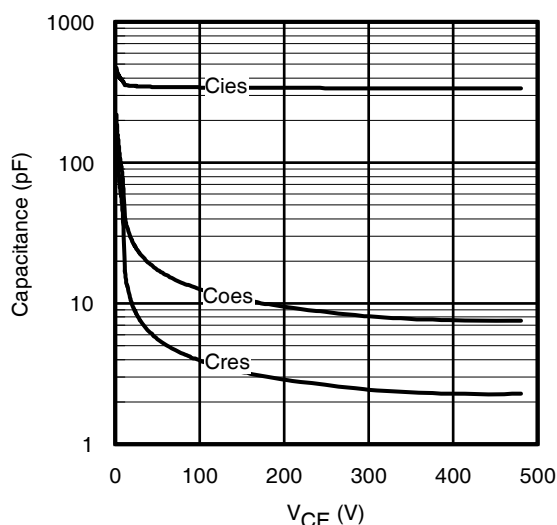


Fig. 23 - Typ. Capacitance vs. V_{CE}
 $V_{GE} = 0V$; $f = 1MHz$

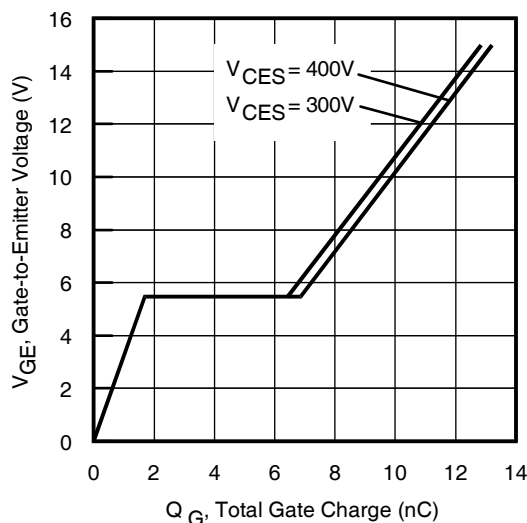


Fig. 24- Typical Gate Charge vs. V_{GE}
 $I_{CE} = 3.0A$

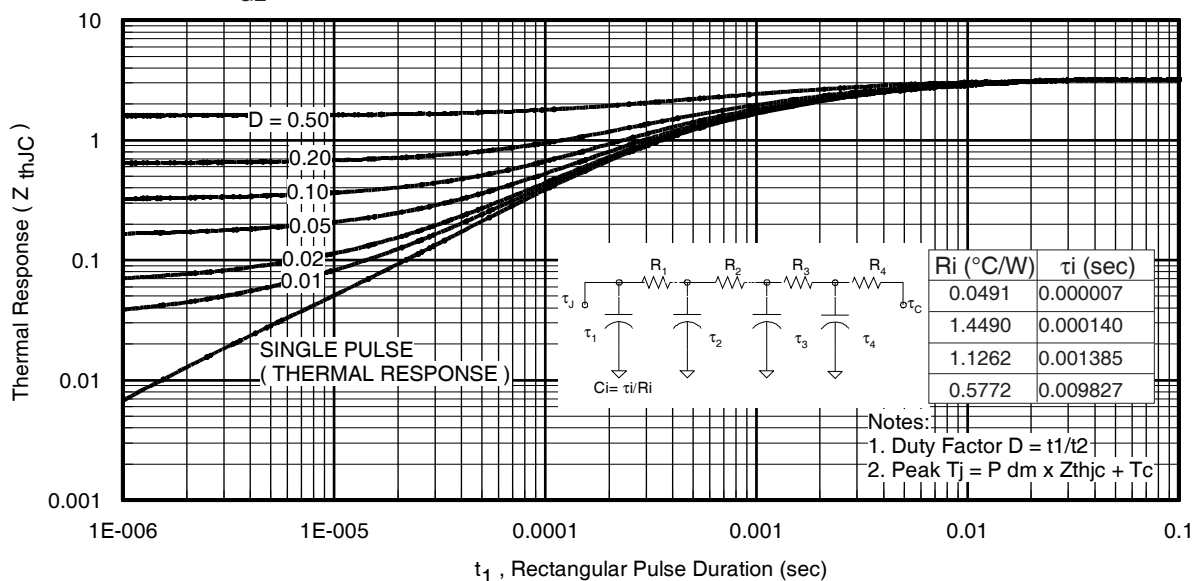


Fig. 25. Maximum Transient Thermal Impedance, Junction-to-Case (IGBT)

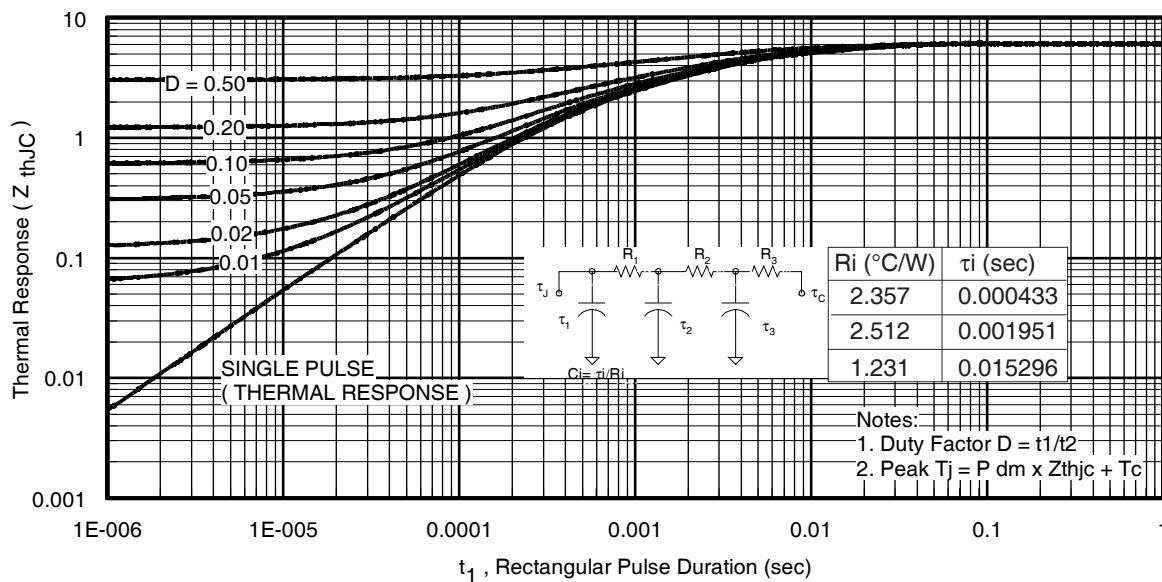


Fig. 26. Maximum Transient Thermal Impedance, Junction-to-Case (DIODE)

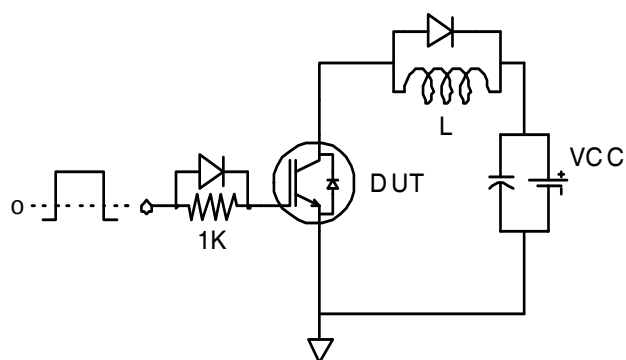


Fig.C.T.1 - Gate Charge Circuit (turn-off)

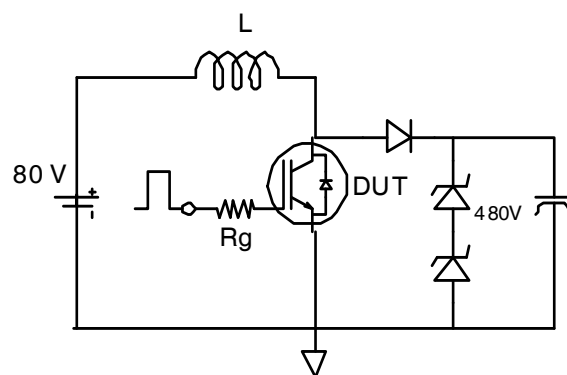


Fig.C.T.2 - RBSOA Circuit

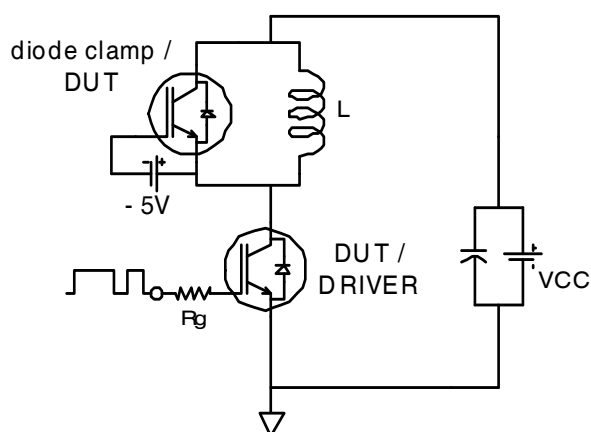


Fig.C.T.3 - Switching Loss Circuit

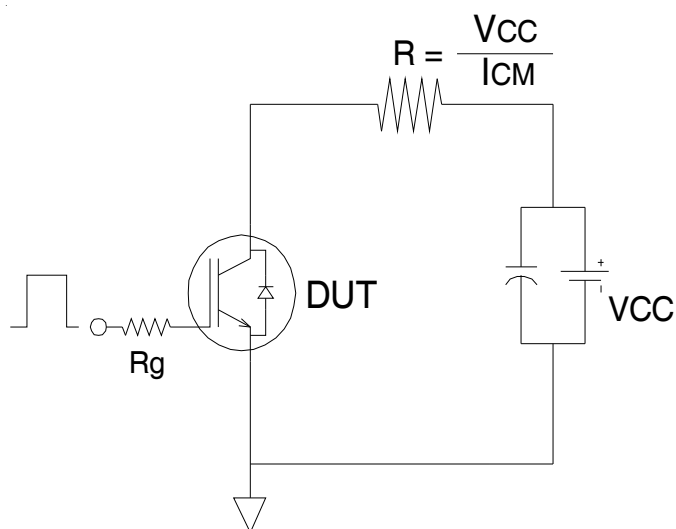


Fig.C.T.4 - Resistive Load Circuit

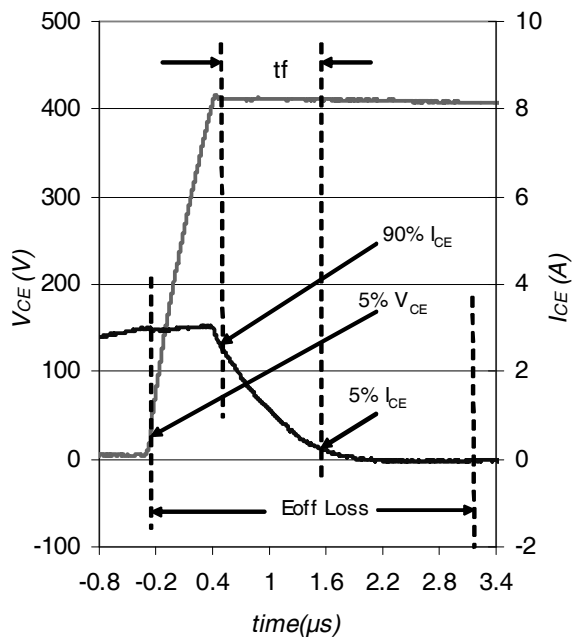


Fig. WF1 - Typ. Turn-off Loss Waveform
@ $T_J = 150^\circ\text{C}$ using Fig. CT.3

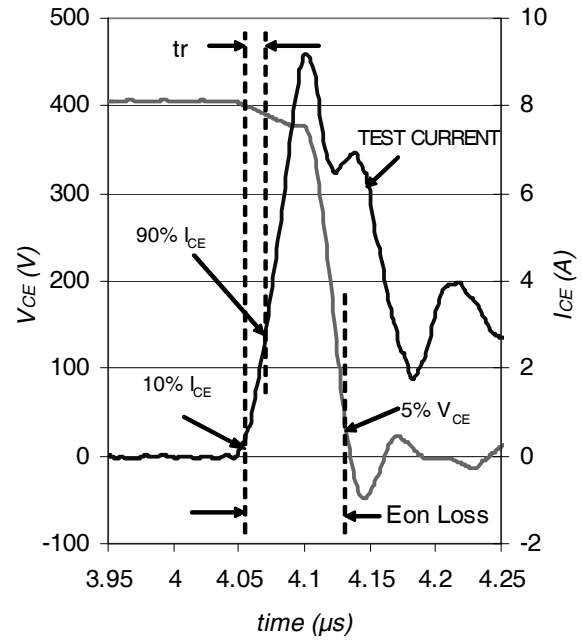


Fig. WF2 - Typ. Turn-on Loss Waveform
@ $T_J = 150^\circ\text{C}$ using Fig. CT.3

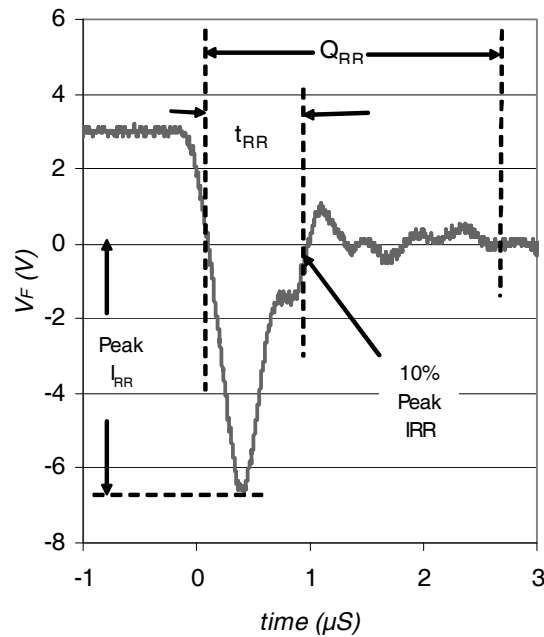
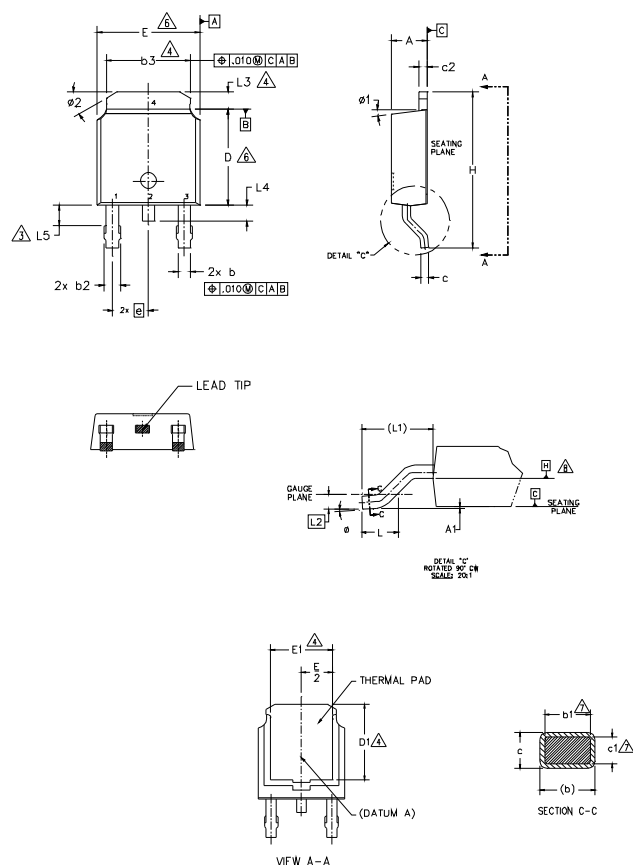


Fig. WF3 - Typ. Diode Recovery Waveform
@ $T_J = 150^\circ\text{C}$ using Fig. CT.3

D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

- 1.- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
- 2.- DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
- 3.- LEAD DIMENSION UNCONTROLLED IN L5.
- 4.- DIMENSION D1, E1, L3 & b3 ESTABLISH A MINIMUM MOUNTING SURFACE FOR THERMAL PAD.
- 5.- SECTION C-C DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .005 AND 0.10 [0.13 AND 0.25] FROM THE LEAD TIP.
- 6.- DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005 [0.13] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
- 7.- DIMENSION b1 & c1 APPLIED TO BASE METAL ONLY.
- 8.- DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
- 9.- OUTLINE CONFORMS TO JEDEC OUTLINE TO-252AA.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	2.18	2.39	.086	.094	7
A1	—	0.13	—	.005	
b	0.64	0.89	.025	.035	
b1	0.65	0.79	.025	.031	4
b2	0.76	1.14	.030	.045	
b3	4.95	5.46	.195	.215	
c	0.46	0.61	.018	.024	7
c1	0.41	0.56	.016	.022	
c2	0.46	0.89	.018	.035	
D	5.97	6.22	.235	.245	6
D1	5.21	—	.205	—	
E	6.35	6.73	.250	.265	4
E1	4.32	—	.170	—	
e	2.29 BSC		.090 BSC		4
H	9.40	10.41	.370	.410	
L	1.40	1.78	.055	.070	
L1	2.74 BSC		.108 REF.		3
L2	0.51 BSC		.020 BSC		
L3	0.89	1.27	.035	.050	
L4	—	1.02	—	.040	3
L5	1.14	1.52	.045	.060	
Ø	0"	10"	0"	10"	
Ø1	0"	15"	0"	15"	
Ø2	25"	35"	25"	35"	

LEAD ASSIGNMENTS

HEXFET

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

IGBT & CoPAK

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

D-Pak (TO-252AA) Part Marking Information

EXAMPLE: THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 1234
ASSEMBLED ON WW 16, 2001
IN THE ASSEMBLY LINE "A"

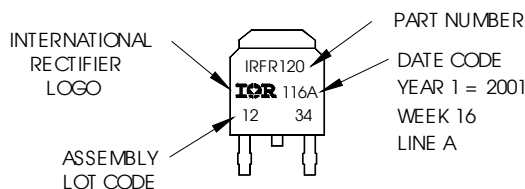
Note: "P" in assembly line position
indicates "Lead-Free"

"P" in assembly line position indicates
"Lead-Free" qualification to the consumer-level

OR

INTERNATIONAL
RECTIFIER
LOGO

ASSEMBLY
LOT CODE



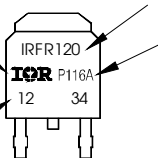
ASSEMBLY
LOT CODE

PART NUMBER

DATE CODE
YEAR 1 = 2001
WEEK 16
LINE A

INTERNATIONAL
RECTIFIER
LOGO

ASSEMBLY
LOT CODE



PART NUMBER

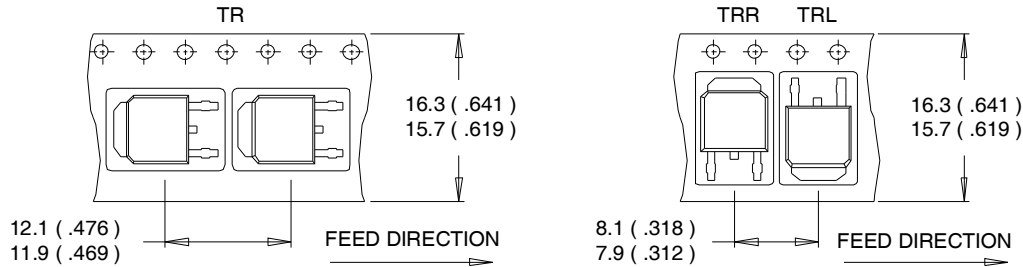
DATE CODE
P = DESIGNATES LEAD-FREE
PRODUCT (OPTIONAL)
P̄ = DESIGNATES LEAD-FREE
PRODUCT QUALIFIED TO THE
CONSUMER LEVEL (OPTIONAL)

YEAR 1 = 2001
WEEK 16
A = ASSEMBLY SITE CODE

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

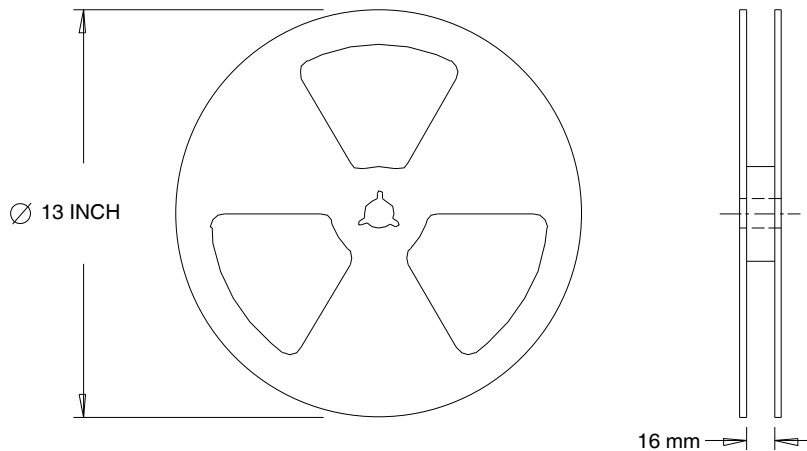
D-Pak (TO-252AA) Tape & Reel Information

Dimensions are shown in millimeters (inches)



NOTES :

1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



NOTES :

1. OUTLINE CONFORMS TO EIA-481.

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

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
IR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105

TAC Fax: (310) 252-7903

Visit us at www.irf.com for sales contact information. 03/2012