

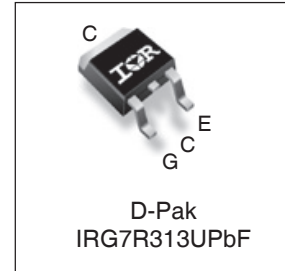
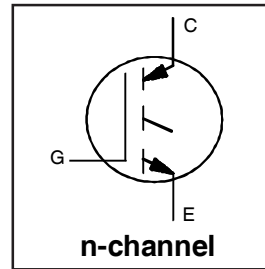
PDP TRENCH IGBT

IRG7R313UPbF

Features

- Advanced Trench IGBT Technology
- Optimized for Sustain and Energy Recovery circuits in PDP applications
- Low $V_{CE(on)}$ and Energy per Pulse (E_{PULSE}^{TM}) for improved panel efficiency
- High repetitive peak current capability
- Lead Free package

Key Parameters		
$V_{CE\ min}$	330	V
$V_{CE(ON)}\ typ.\ @\ I_C = 20A$	1.35	V
$I_{RP}\ max\ @\ T_C = 25^\circ C$	160	A
$T_J\ max$	150	$^\circ C$



G	C	E
Gate	Collector	Emitter

Description

This IGBT is specifically designed for applications in Plasma Display Panels. This device utilizes advanced trench IGBT technology to achieve low $V_{CE(on)}$ and low E_{PULSE}^{TM} rating per silicon area which improve panel efficiency. Additional features are 150 $^\circ C$ operating junction temperature and high repetitive peak current capability. These features combine to make this IGBT a highly efficient, robust and reliable device for PDP applications.

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{GE}	Gate-to-Emitter Voltage	± 30	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current, $V_{GE} @ 15V$	40	A
$I_C @ T_C = 100^\circ C$	Continuous Collector, $V_{GE} @ 15V$	20	
$I_{RP} @ T_C = 25^\circ C$	Repetitive Peak Current ①	160	W
$P_D @ T_C = 25^\circ C$	Power Dissipation	78	
$P_D @ T_C = 100^\circ C$	Power Dissipation	31	
	Linear Derating Factor	0.63	$W/^\circ C$
T_J	Operating Junction and	-40 to + 150	$^\circ C$
T_{STG}	Storage Temperature Range		
	Soldering Temperature for 10 seconds	300	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ②	—	1.6	$^\circ C/W$

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{CES}	Collector-to-Emitter Breakdown Voltage	330	—	—	V	$V_{GE} = 0V, I_{CE} = 250\mu A$
$\Delta BV_{CES}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.4	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}, I_{CE} = 1\text{mA}$
$V_{CE(on)}$	Static Collector-to-Emitter Voltage	—	1.21	1.45	V	$V_{GE} = 15V, I_{CE} = 12A$ ③
		—	1.35	—		$V_{GE} = 15V, I_{CE} = 20A$ ③
		—	1.75	—		$V_{GE} = 15V, I_{CE} = 40A$ ③
		—	2.14	—		$V_{GE} = 15V, I_{CE} = 60A$ ③
		—	1.41	—		$V_{GE} = 15V, I_{CE} = 20A, T_J = 150^\circ\text{C}$ ③
$V_{GE(th)}$	Gate Threshold Voltage	2.2	—	4.7	V	$V_{CE} = V_{GE}, I_{CE} = 1.0\text{mA}$
$\Delta V_{GE(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	—	-10	—	mV/ $^\circ\text{C}$	
I_{CES}	Collector-to-Emitter Leakage Current	—	1.0	10	μA	$V_{CE} = 330V, V_{GE} = 0V$
		—	25	150		$V_{CE} = 330V, V_{GE} = 0V, T_J = 125^\circ\text{C}$
		—	75	—		$V_{CE} = 330V, V_{GE} = 0V, T_J = 150^\circ\text{C}$
I_{GES}	Gate-to-Emitter Forward Leakage	—	—	100	nA	$V_{GE} = 30V$
	Gate-to-Emitter Reverse Leakage	—	—	-100		$V_{GE} = -30V$
g_{fe}	Forward Transconductance	—	47	—	S	$V_{CE} = 25V, I_{CE} = 12A$
Q_g	Total Gate Charge	—	33	—	nC	$V_{CE} = 240V, I_C = 12A, V_{GE} = 15V$ ③
Q_{gc}	Gate-to-Collector Charge	—	12	—		
$t_{d(on)}$	Turn-On delay time	—	1.0	—		
t_r	Rise time	—	13	—	ns	$I_C = 12A, V_{CC} = 196V$ $R_G = 10\Omega, L = 210\mu H$ $T_J = 25^\circ\text{C}$
$t_{d(off)}$	Turn-Off delay time	—	65	—		
t_f	Fall time	—	68	—		
$t_{d(on)}$	Turn-On delay time	—	11	—	ns	$I_C = 12A, V_{CC} = 196V$ $R_G = 10\Omega, L = 200\mu H, L_S = 150\text{nH}$ $T_J = 150^\circ\text{C}$
t_r	Rise time	—	14	—		
$t_{d(off)}$	Turn-Off delay time	—	86	—		
t_f	Fall time	—	190	—		
t_{st}	Shoot Through Blocking Time	100	—	—	ns	$V_{CC} = 240V, V_{GE} = 15V, R_G = 5.1\Omega$
E_{PULSE}	Energy per Pulse	—	480	—	μJ	$L = 220\text{nH}, C = 0.20\mu F, V_{GE} = 15V$ $V_{CC} = 240V, R_G = 5.1\Omega, T_J = 25^\circ\text{C}$
		—	570	—		$L = 220\text{nH}, C = 0.20\mu F, V_{GE} = 15V$ $V_{CC} = 240V, R_G = 5.1\Omega, T_J = 100^\circ\text{C}$
ESD	Human Body Model	Class 1C (Per JEDEC standard JESD22-A114)				
	Machine Model	Class B (Per EIA/JEDEC standard EIA/JESD22-A115)				
C_{ies}	Input Capacitance	—	880	—	pF	$V_{GE} = 0V$
C_{oes}	Output Capacitance	—	47	—		$V_{CE} = 30V$
C_{res}	Reverse Transfer Capacitance	—	26	—		$f = 1.0\text{MHz}$
L_C	Internal Collector Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.)
L_E	Internal Emitter Inductance	—	7.5	—		from package and center of die contact

Notes:

- ① Half sine wave with duty cycle = 0.05, $t_{on} = 2\mu\text{sec}$.
- ② R_θ is measured at T_J of approximately 90°C .
- ③ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.

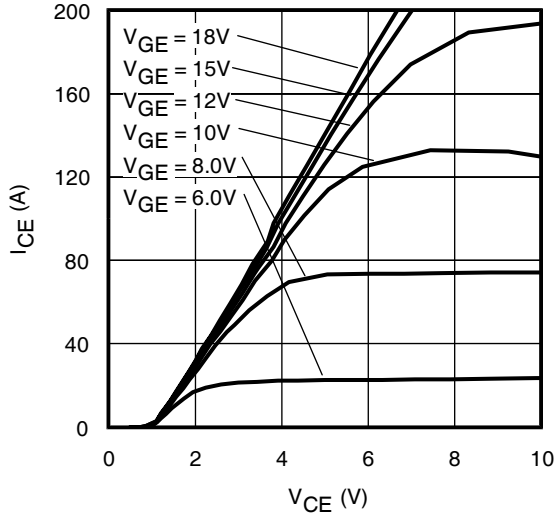


Fig 1. Typical Output Characteristics @ 25°C

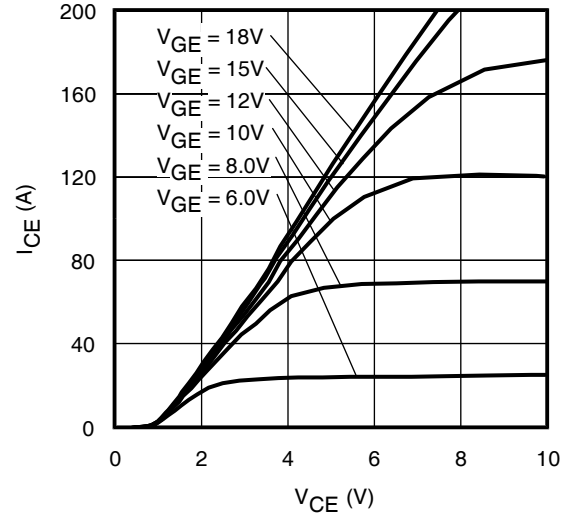


Fig 2. Typical Output Characteristics @ 75°C

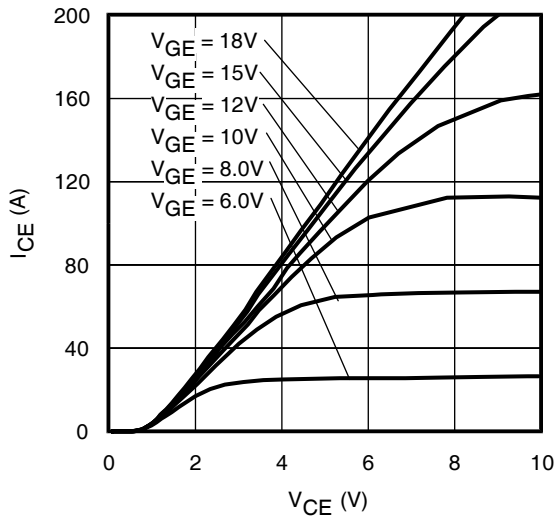


Fig 3. Typical Output Characteristics @ 125°C

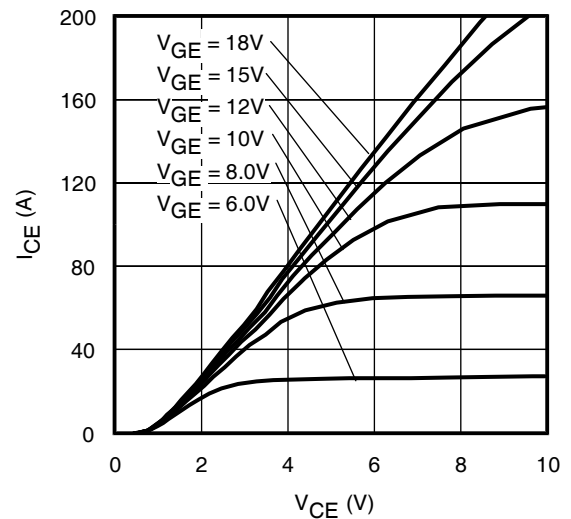


Fig 4. Typical Output Characteristics @ 150°C

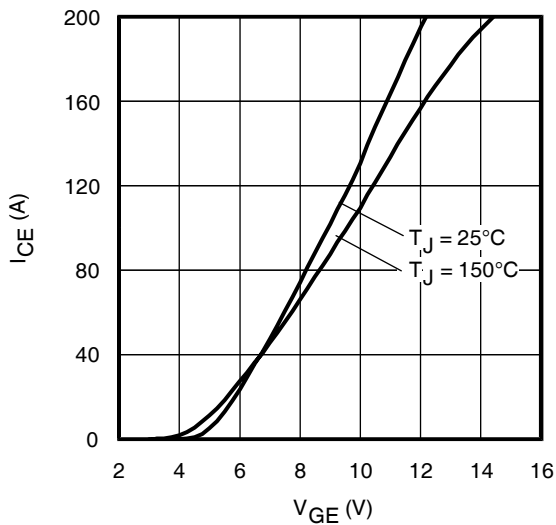


Fig 5. Typical Transfer Characteristics

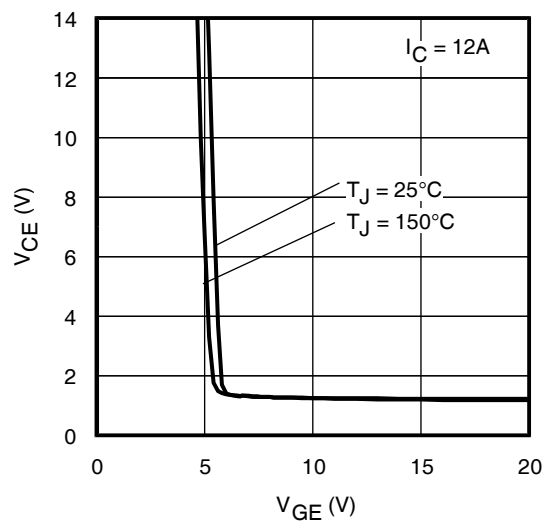


Fig 6. $V_{CE(ON)}$ vs. Gate Voltage

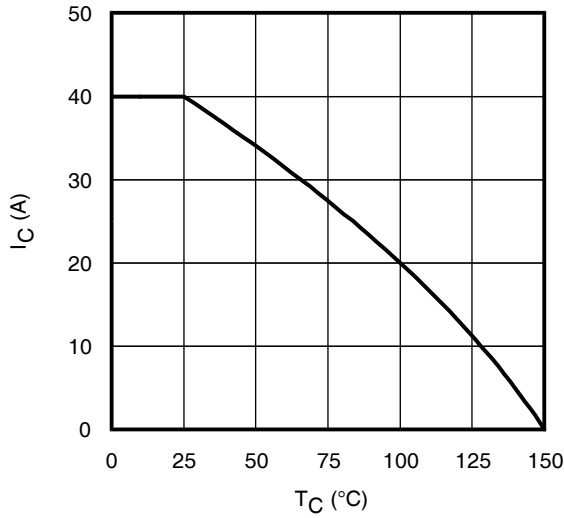


Fig 7. Maximum Collector Current vs. Case Temperature

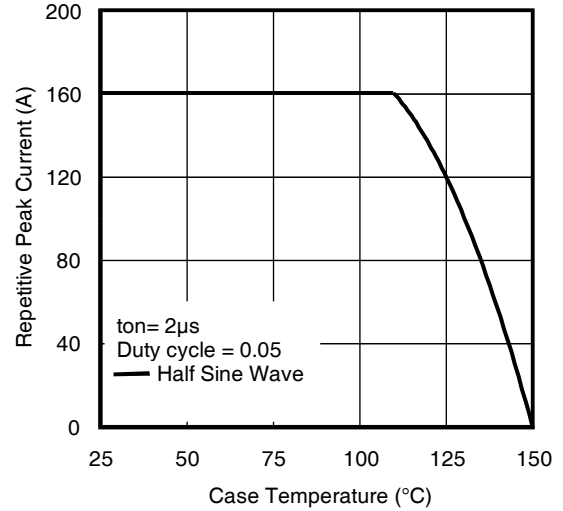


Fig 8. Typical Repetitive Peak Current vs. Case Temperature

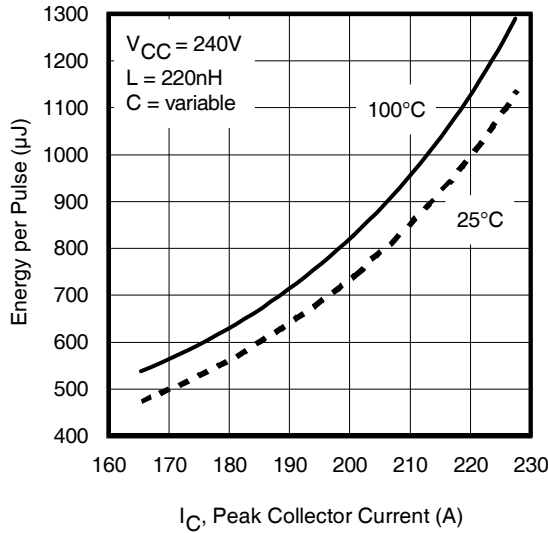


Fig 9. Typical E_{PULSE} vs. Collector Current

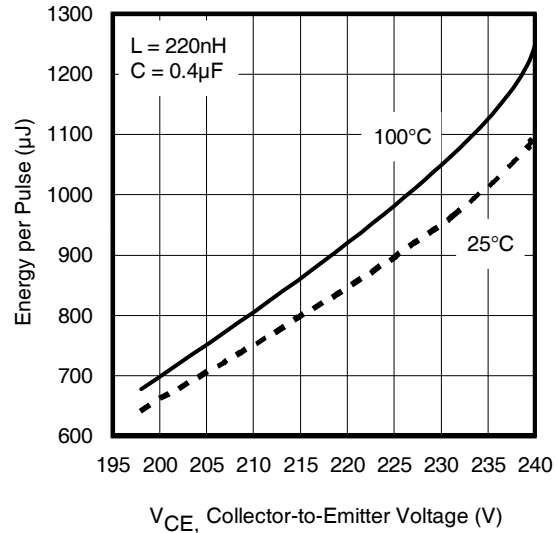


Fig 10. Typical E_{PULSE} vs. Collector-to-Emitter Voltage

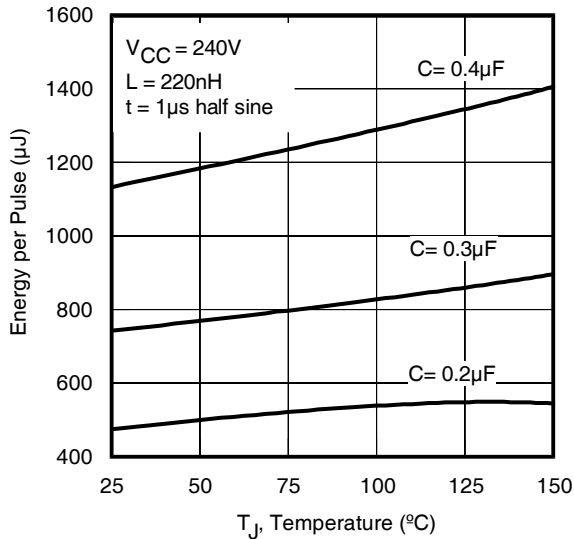


Fig 11. E_{PULSE} vs. Temperature

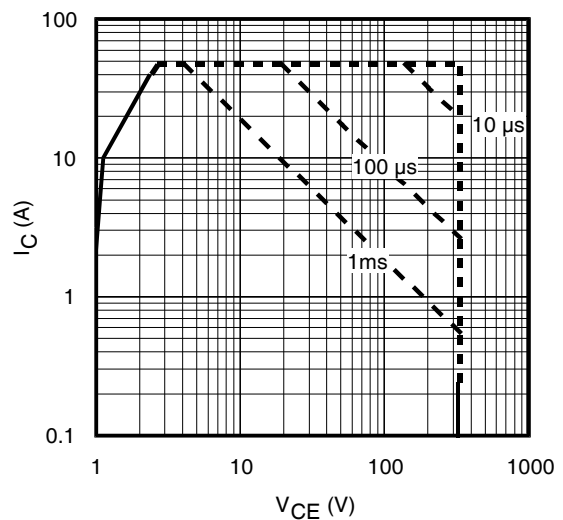


Fig 12. Forward Bias Safe Operating Area

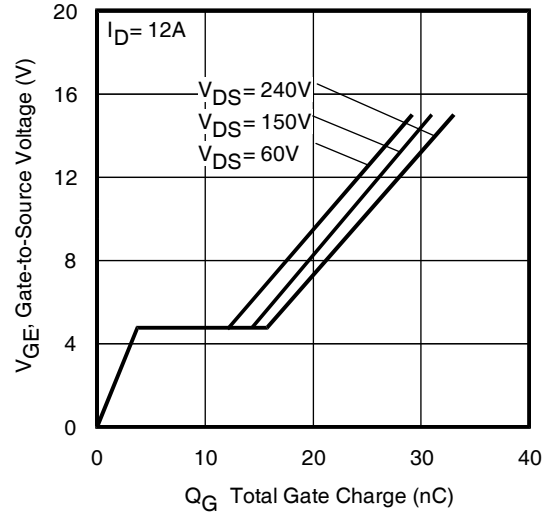
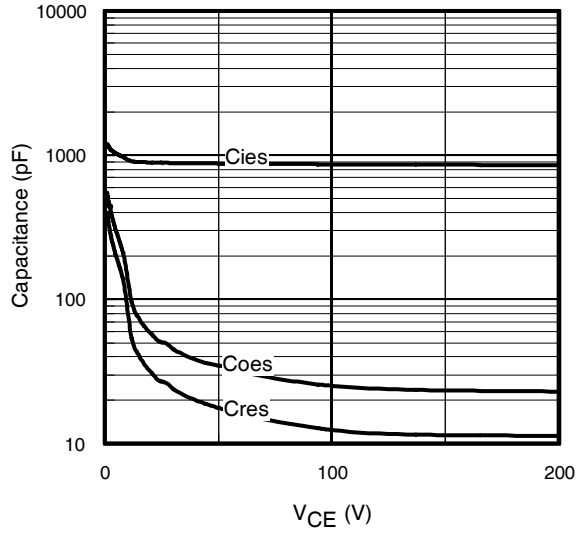


Fig 13. Typical Capacitance vs. Collector-to-Emitter Voltage

Fig 14. Typical Gate Charge vs. Gate-to-Source Voltage

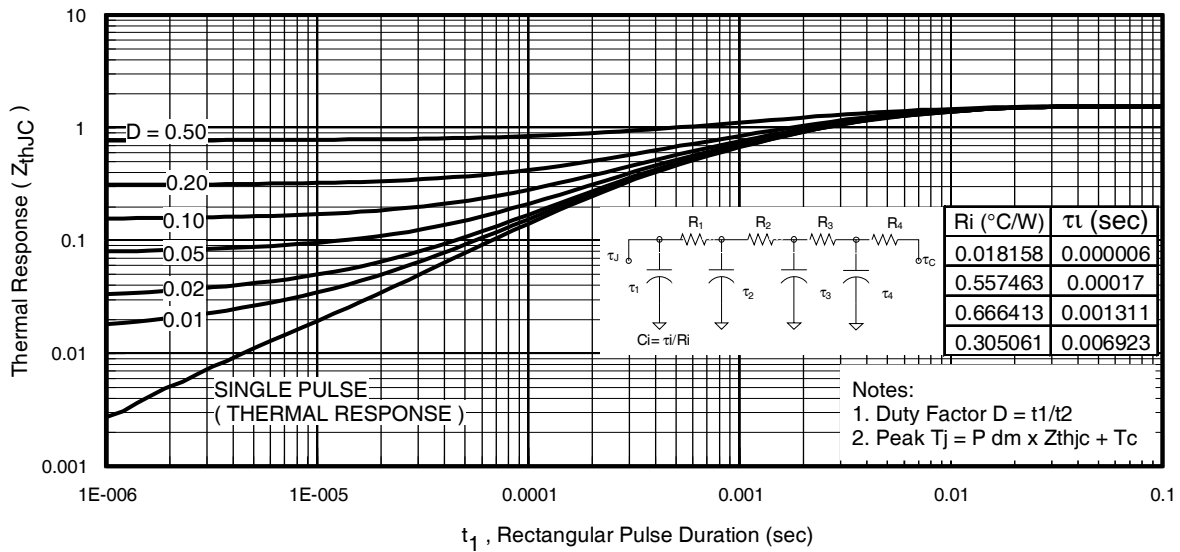


Fig 15. Maximum Effective Transient Thermal Impedance, Junction-to-Case

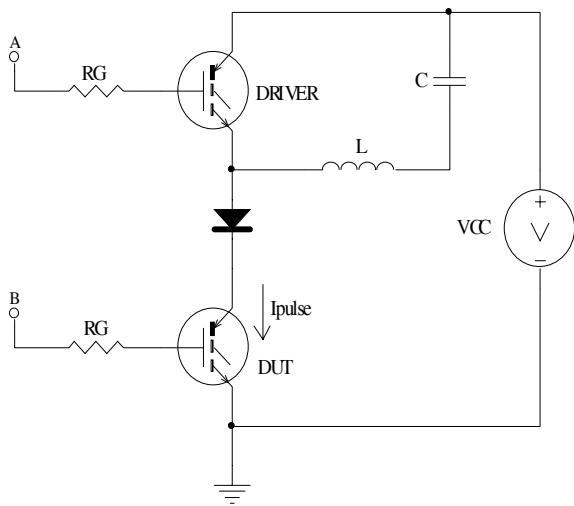


Fig 16a. t_{st} and E_{PULSE} Test Circuit

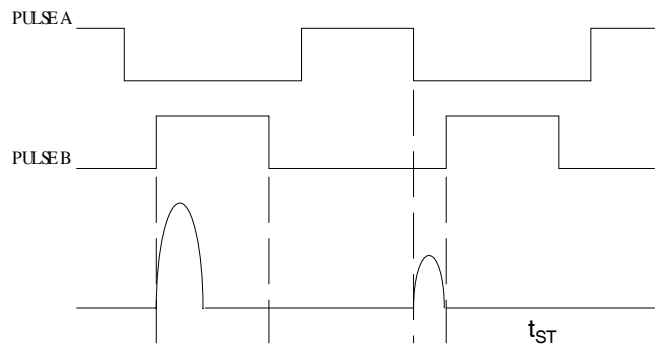


Fig 16b. t_{st} Test Waveforms

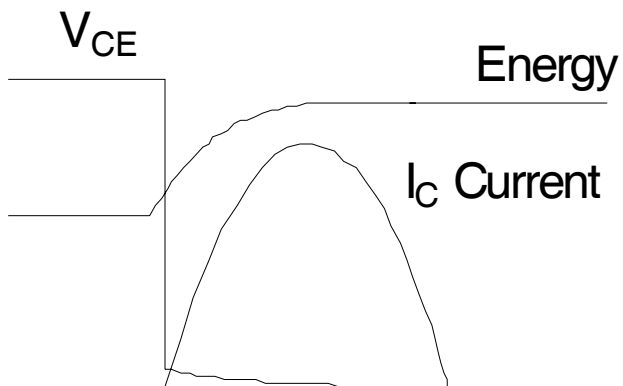


Fig 16c. E_{PULSE} Test Waveforms

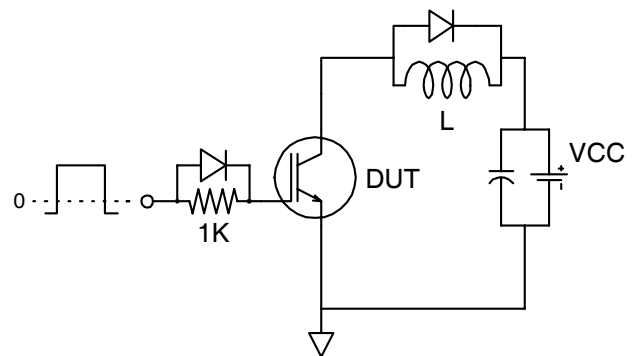
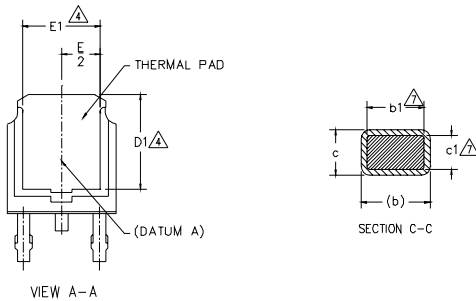
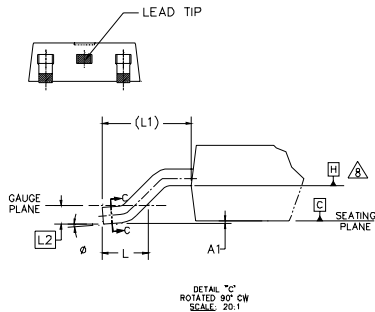
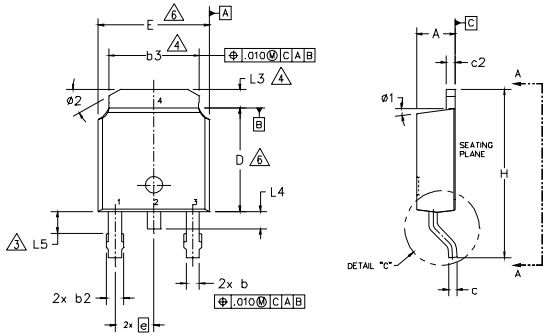


Fig. 17 - Gate Charge Circuit (turn-off)

D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

- 1.- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
- 2.- DIMENSION ARE SHOWN IN INCHES [MILLIMETERS]
- △ LEAD DIMENSION UNCONTROLLED IN L5.
- △ 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.
- △ 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.
- △ DIMENSION b1 & c1 APPLIED TO BASE METAL ONLY.
- △ DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
- 9.- OUTLINE CONFORMS TO JEDEC OUTLINE TO-252AA.

SYMBO L	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	2.18	2.39	.086	.094	
A1	-	0.13	-	.005	
b	0.64	0.89	.025	.035	
b1	0.65	0.79	.025	.031	7
b2	0.76	1.14	.030	.045	
b3	4.95	5.46	.195	.215	4
c	0.46	0.61	.018	.024	
c1	0.41	0.56	.016	.022	7
c2	0.46	0.89	.018	.035	
D	5.97	6.22	.235	.245	6
D1	5.21	-	.205	-	4
E	6.35	6.73	.250	.265	6
E1	4.32	-	.170	-	4
e	2.29 BSC		.090 BSC		
H	9.40	10.41	.370	.410	
L	1.40	1.78	.055	.070	
L1	2.74 BSC		.108 REF.		
L2	0.51 BSC		.020 BSC		
L3	0.89	1.27	.035	.050	4
L4	-	1.02	-	.040	
L5	1.14	1.52	.045	.060	3
∅	0"	10"	0"	10"	
∅1	0"	15"	0"	15"	
∅2	25"	35"	25"	35"	

LEAD ASSIGNMENTS

HEXFET

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

IGBT & CoPAK

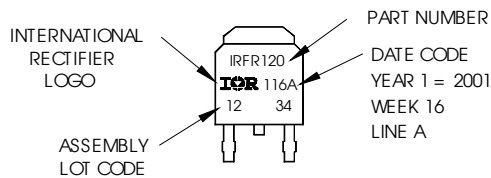
- 1.- GATE
- 2.- COLLECTOR
- 3.- EMITTER
- 4.- COLLECTOR

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

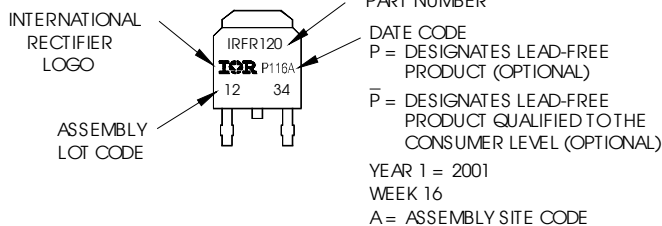
EXAMPLE: THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 1234
ASSEMBLED ON WW 16, 2001
IN THE ASSEMBLY LINE "A"

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

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



OR

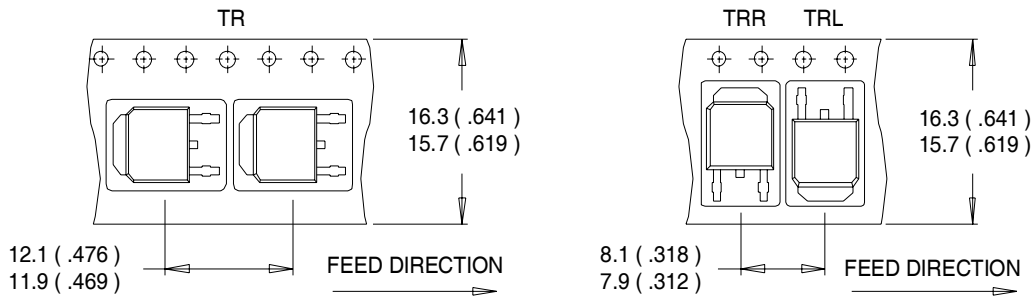


Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

IRG7R313UPbF

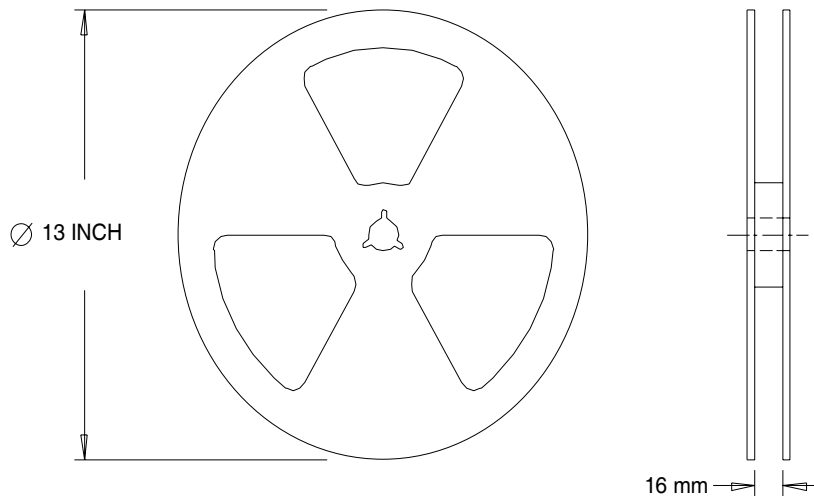
D-Pak (TO-252AA) Tape & Reel Information

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 for the 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.03/2010

www.irf.com