

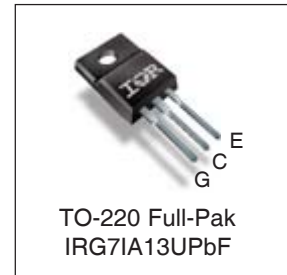
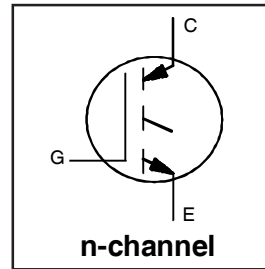
PDP TRENCH IGBT

IRG71A13UPbF

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		
$V_{CE\ min}$	360	V
$V_{CE(ON)}\ typ.\ @\ I_C = 20A$	1.42	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, $V_{GE} @ 15V$	20	A
$I_C @ T_C = 100^\circ C$	Continuous Collector, $V_{GE} @ 15V$	10	
$I_{RP} @ T_C = 25^\circ C$	Repetitive Peak Current ①	160	
$P_D @ T_C = 25^\circ C$	Power Dissipation	34	W
$P_D @ T_C = 100^\circ C$	Power Dissipation	14	
	Linear Derating Factor	0.27	W/ $^\circ C$
T_J	Operating Junction and	-40 to + 150	$^\circ C$
T_{STG}	Storage Temperature Range		
	Soldering Temperature for 10 seconds	300	
	Mounting Torque, 6-32 or M3 Screw	10 lbf·in (1.1 N·m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ②	—	3.7	$^\circ C/W$
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	—	65	
Wt	Weight	2.0	—	g

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV_{CES}	Collector-to-Emitter Breakdown Voltage	360	---	---	V	$V_{GE} = 0\text{V}, I_{CE} = 250\mu\text{A}$
$\Delta BV_{CES}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	---	0.4	---	$\text{V}/^\circ\text{C}$	Reference to $25^\circ\text{C}, I_{CE} = 1\text{mA}$
$V_{CE(on)}$	Static Collector-to-Emitter Voltage	---	1.26	1.52	V	$V_{GE} = 15\text{V}, I_{CE} = 12\text{A}$ ③
		---	1.42	---		$V_{GE} = 15\text{V}, I_{CE} = 20\text{A}$ ③
		---	1.84	---		$V_{GE} = 15\text{V}, I_{CE} = 40\text{A}$ ③
		---	2.25	---		$V_{GE} = 15\text{V}, I_{CE} = 60\text{A}$ ③
		---	1.48	---		$V_{GE} = 15\text{V}, I_{CE} = 20\text{A}, T_J = 150^\circ\text{C}$ 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	---	$\text{mV}/^\circ\text{C}$	
I_{CES}	Collector-to-Emitter Leakage Current	---	1.0	10	μA	$V_{CE} = 360\text{V}, V_{GE} = 0\text{V}$
		---	25	150		$V_{CE} = 360\text{V}, V_{GE} = 0\text{V}, T_J = 125^\circ\text{C}$
		---	75	---		$V_{CE} = 360\text{V}, V_{GE} = 0\text{V}, T_J = 150^\circ\text{C}$
I_{GES}	Gate-to-Emitter Forward Leakage	---	---	100	nA	$V_{GE} = 30\text{V}$
	Gate-to-Emitter Reverse Leakage	---	---	-100		$V_{GE} = -30\text{V}$
g_{fe}	Forward Transconductance	---	47	---	S	$V_{CE} = 25\text{V}, I_{CE} = 12\text{A}$
Q_g	Total Gate Charge	---	33	---	nC	$V_{CE} = 240\text{V}, I_C = 12\text{A}, V_{GE} = 15\text{V}$ ③
Q_{gc}	Gate-to-Collector Charge	---	12	---		
$t_{d(on)}$	Turn-On delay time	---	11	---	ns	$I_C = 12\text{A}, V_{CC} = 196\text{V}$ $R_G = 10\Omega, L = 210\mu\text{H}$ $T_J = 25^\circ\text{C}$
t_r	Rise time	---	13	---		
$t_{d(off)}$	Turn-Off delay time	---	75	---		
t_f	Fall time	---	120	---		
$t_{d(on)}$	Turn-On delay time	---	11	---	ns	$I_C = 12\text{A}, V_{CC} = 196\text{V}$ $R_G = 10\Omega, L = 200\mu\text{H}, L_S = 150\text{nH}$ $T_J = 150^\circ\text{C}$
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	$V_{CC} = 240\text{V}, V_{GE} = 15\text{V}, R_G = 5.1\Omega$
E_{PULSE}	Energy per Pulse	---	480	---	μJ	$L = 220\text{nH}, C = 0.20\mu\text{F}, V_{GE} = 15\text{V}$ $V_{CC} = 240\text{V}, R_G = 5.1\Omega, T_J = 25^\circ\text{C}$
		---	570	---		$L = 220\text{nH}, C = 0.20\mu\text{F}, V_{GE} = 15\text{V}$ $V_{CC} = 240\text{V}, R_G = 5.1\Omega, T_J = 100^\circ\text{C}$
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	$V_{GE} = 0\text{V}$
C_{oes}	Output Capacitance	---	47	---		$V_{CE} = 30\text{V}$
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 $\leq 2\%$.

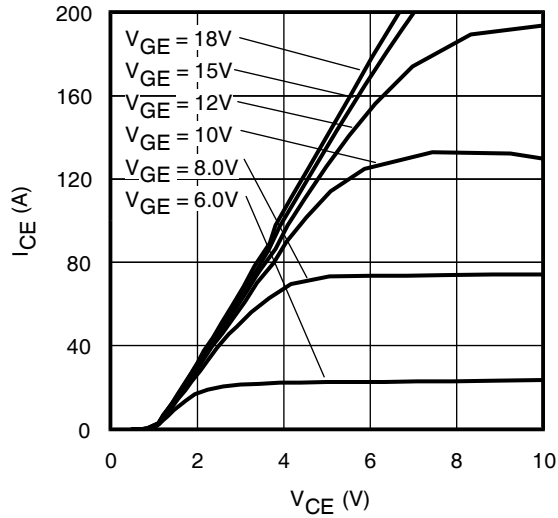


Fig 1. Typical Output Characteristics @ 25°C

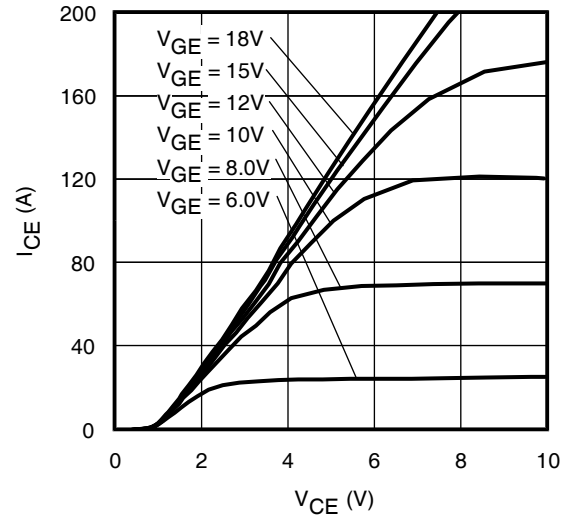


Fig 2. Typical Output Characteristics @ 75°C

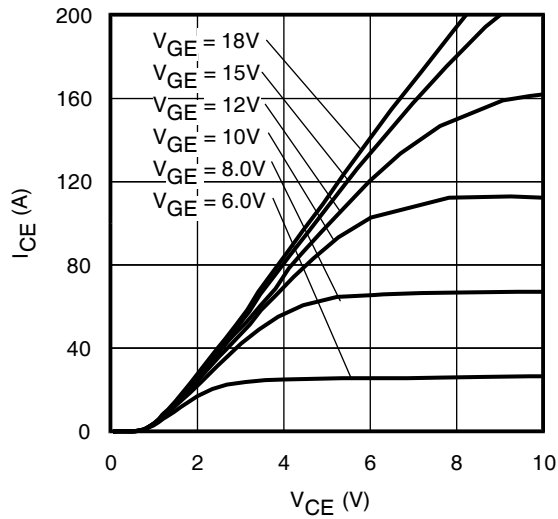


Fig 3. Typical Output Characteristics @ 125°C

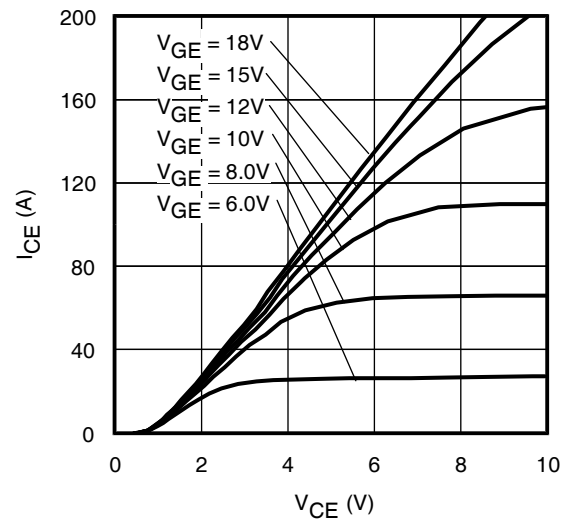


Fig 4. Typical Output Characteristics @ 150°C

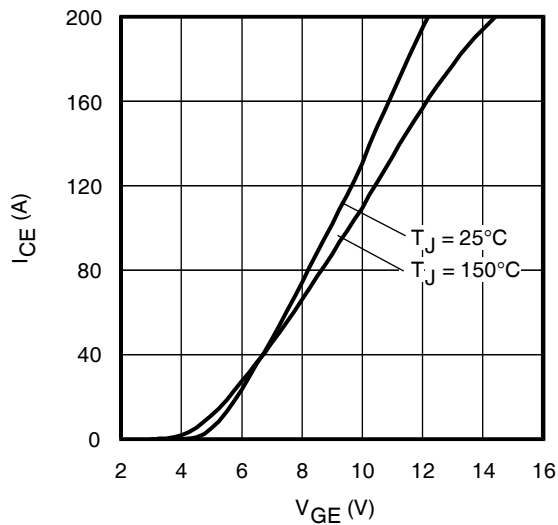


Fig 5. Typical Transfer Characteristics

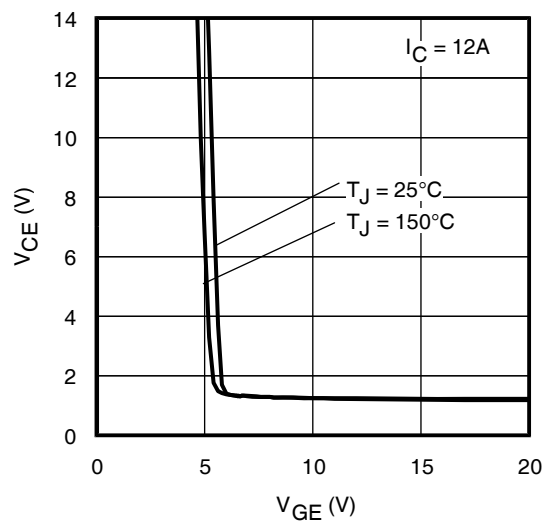


Fig 6. $V_{CE(ON)}$ vs. Gate Voltage

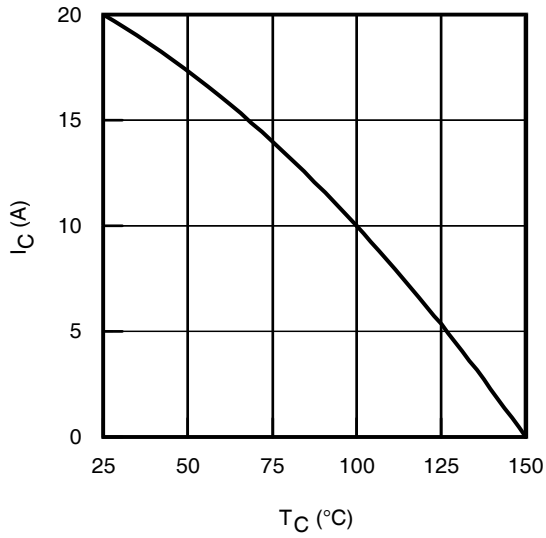


Fig 7. Maximum Collector Current vs. Case Temperature

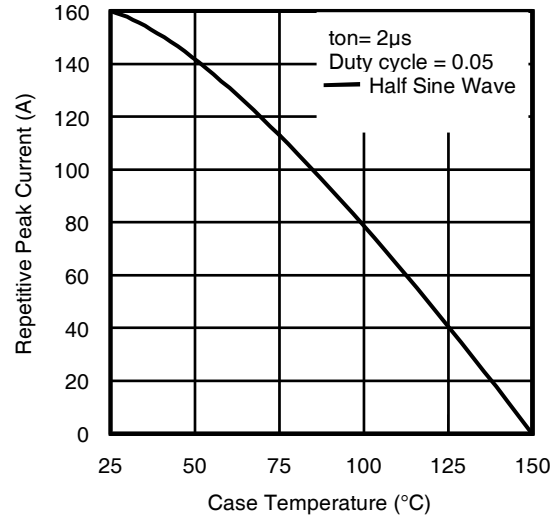


Fig 8. Typical Repetitive Peak Current vs. Case Temperature

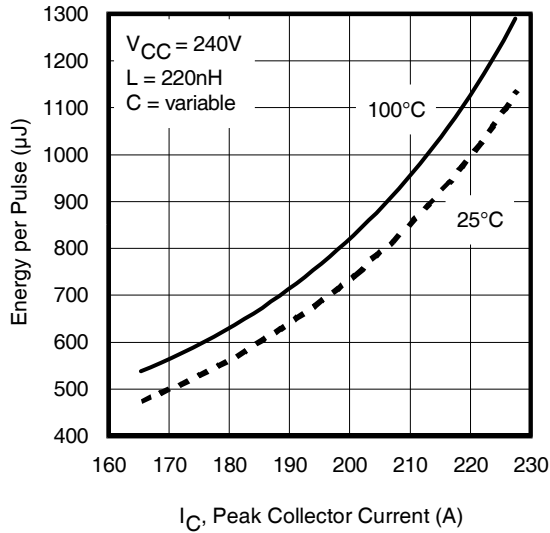


Fig 9. Typical E_{PULSE} vs. Collector Current

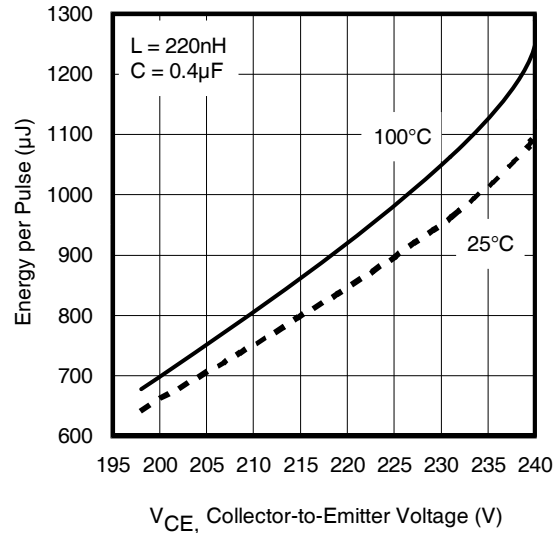


Fig 10. Typical E_{PULSE} vs. Collector-to-Emitter Voltage

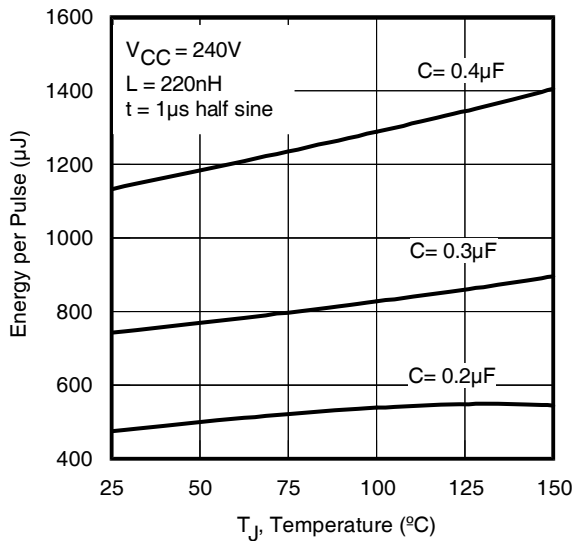


Fig 11. E_{PULSE} vs. Temperature

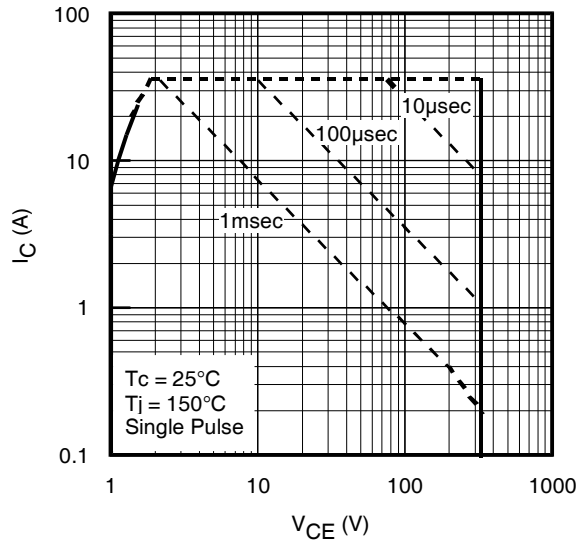


Fig 12. Forward Bias Safe Operating Area

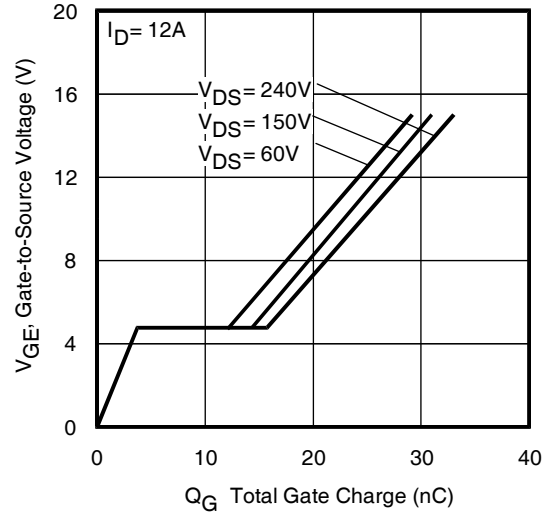
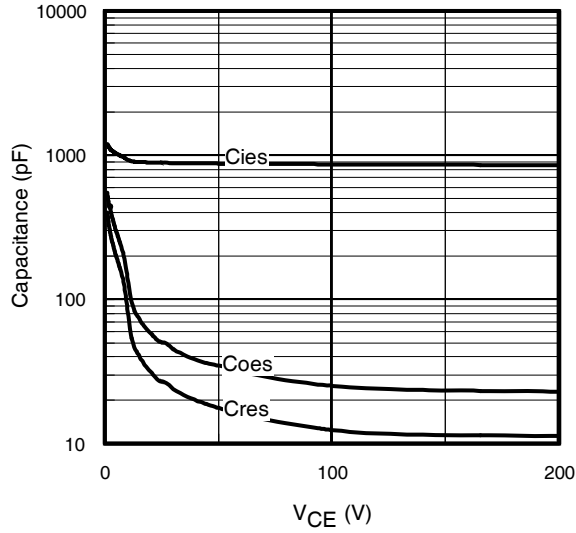


Fig 13. Typical Capacitance vs. Collector-to-Emitter Voltage

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

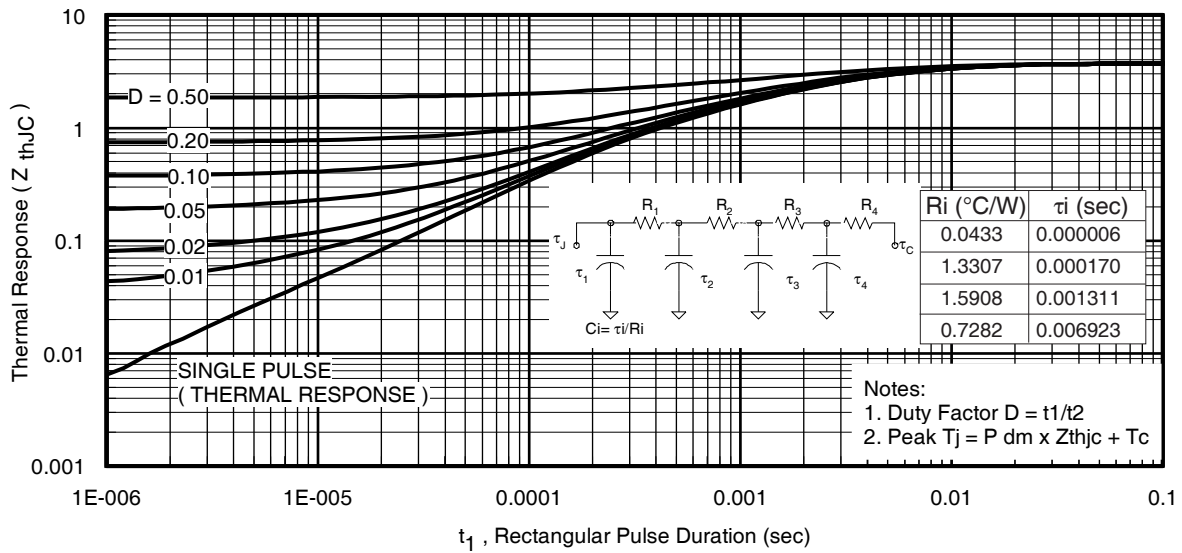


Fig 15. Maximum Effective Transient Thermal Impedance, Junction-to-Case

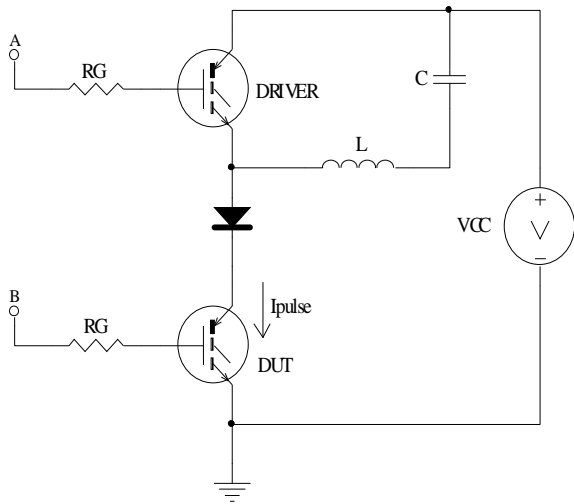


Fig 16a. t_{st} and E_{PULSE} Test Circuit

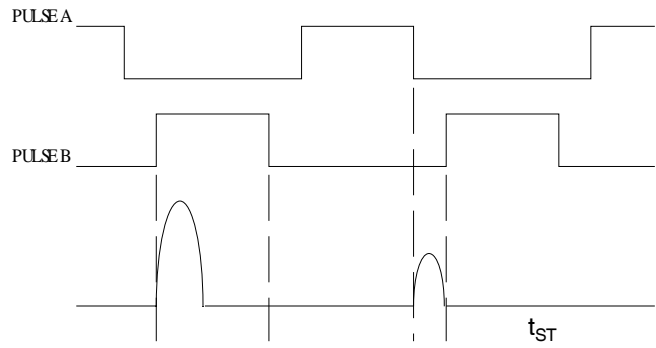


Fig 16b. t_{st} Test Waveforms

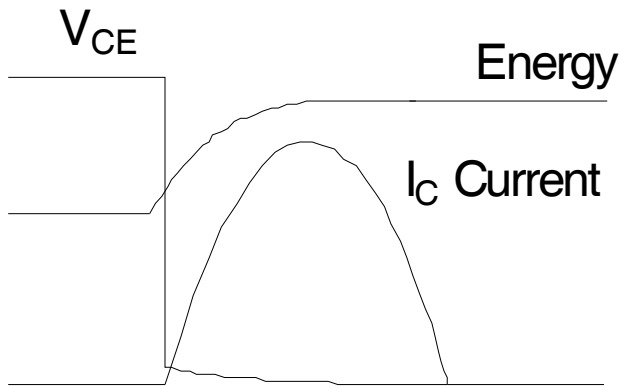


Fig 16c. E_{PULSE} Test Waveforms

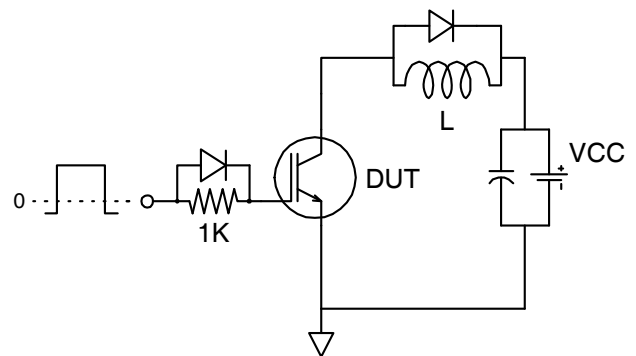
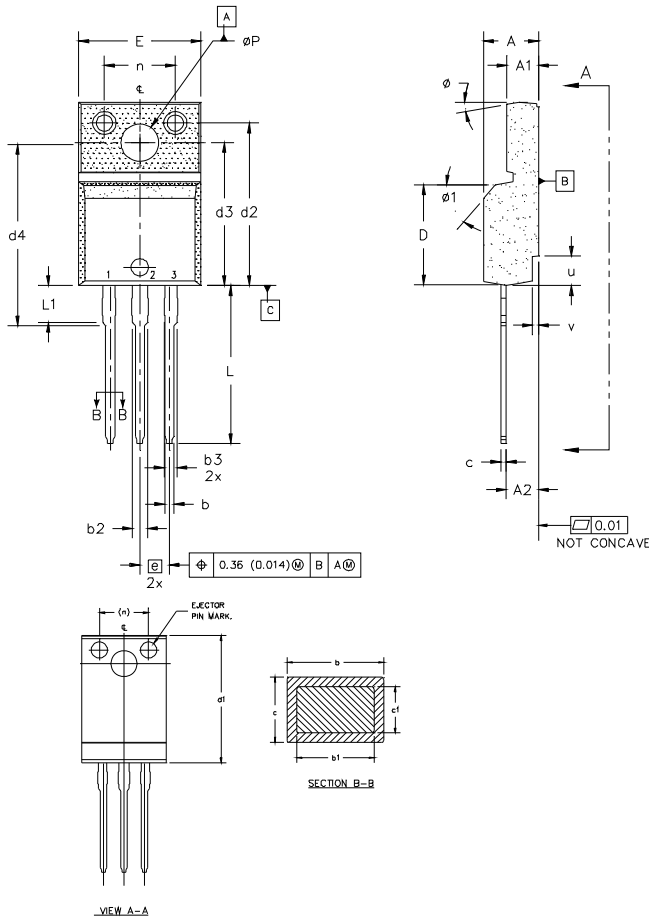


Fig. 17 - Gate Charge Circuit (turn-off)

TO-220 Full-Pak Package Outline

Dimensions are shown in millimeters (inches)



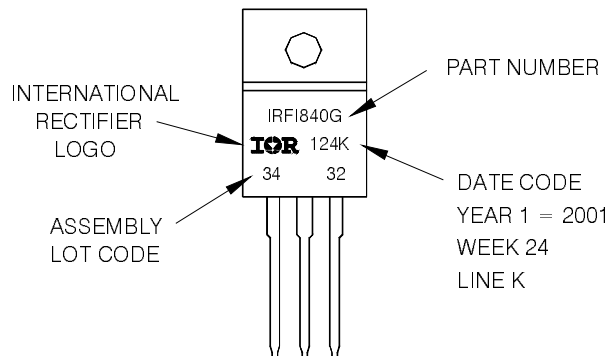
- NOTES:
- 1.0 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
 - 2.0 DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
 - 3.0 LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
 - 4.0 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
 - 5.0 DIMENSION b1 APPLY TO BASE METAL ONLY.
 - 6.0 STEP OPTIONAL ON PLASTIC BODY DEFINED BY DIMENSIONS u & v.
 - 7.0 CONTROLLING DIMENSION : INCHES.

SYMBOL	DIMENSIONS				NOTES	LEAD ASSIGNMENTS
	MILLIMETERS		INCHES			
A	4.57	4.83	0.180	0.190	5	HEXFEEET 1.- GATE 2.- DRAIN 3.- SOURCE
A1	2.57	2.83	0.101	0.114		
A2	2.51	2.85	0.099	0.112		
b	0.622	0.89	0.024	0.035		
b1	0.622	0.838	0.024	0.033		
b2	1.229	1.400	0.048	0.055		
b3	1.229	1.400	0.048	0.055		
c	0.440	0.629	0.017	0.025		
c1	0.440	0.584	0.017	0.023		
D	8.65	9.80	0.341	0.386		
d1	15.80	16.12	0.622	0.635		
d2	13.97	14.22	0.550	0.560		
d3	12.30	12.92	0.484	0.509		
d4	8.64	9.91	0.340	0.390	4	
E	10.36	10.63	0.408	0.419		
e	2.54 BSC		0.100 BSC			
L	13.20	13.73	0.520	0.541	3	
L1	3.10	3.50	0.122	0.138		
n	6.05	6.15	0.238	0.242		
phiP	3.05	3.45	0.120	0.136		
u	2.40	2.50	0.094	0.098	6	
v	0.40	0.50	0.016	0.020		
phi	3"	7"	3"	7"		
phi1		45"		45"		

TO-220 Full-Pak Part Marking Information

EXAMPLE: THIS IS AN IRF1840G
WITH ASSEMBLY
LOT CODE 3432
ASSEMBLED ON WW 24, 2001
IN THE ASSEMBLY LINE "K"

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



TO-220 Full-Pak package is not recommended for Surface Mount Application.

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.