

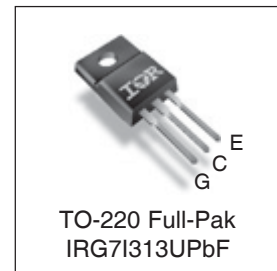
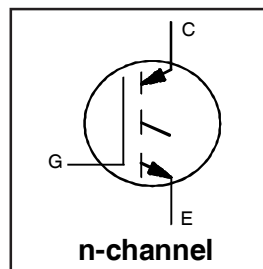
PDP TRENCH IGBT

IRG7I313UPbF

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, $V_{GE}\ @\ 15V$	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 T_{STG}	Operating Junction and Storage Temperature Range	-40 to + 150	$^\circ C$
	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	330	—	—	V	V _{GE} = 0V, I _{CE} = 250μA
ΔBV _{CES} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.4	—	V/°C	Reference to 25°C, I _{CE} = 1mA
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°C ③
V _{GE(th)}	Gate Threshold Voltage	2.2	—	4.7	V	V _{CE} = V _{GE} , I _{CE} = 1.0mA
ΔV _{GE(th)} /ΔT _J	Gate Threshold Voltage Coefficient	—	-10	—	mV/°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°C
		—	75	—		V _{CE} = 330V, V _{GE} = 0V, T _J = 150°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} = 15V③
Q _{gc}	Gate-to-Collector Charge	—	12	—		
t _{d(on)}	Turn-On delay time	—	11	—	ns	I _C = 12A, V _{CC} = 196V R _G = 10Ω, L=210μH T _J = 25°C
t _r	Rise time	—	13	—		
t _{d(off)}	Turn-Off delay time	—	75	—		
t _f	Fall time	—	68	—		
t _{d(on)}	Turn-On delay time	—	11	—	ns	I _C = 12A, V _{CC} = 196V R _G = 10Ω, L=200μH, L _S = 150nH T _J = 150°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 = 5.1Ω
E _{PULSE}	Energy per Pulse	—	480	—	μJ	L = 220nH, C= 0.20μF, V _{GE} = 15V V _{CC} = 240V, R _G = 5.1Ω, T _J = 25°C
		—	570	—		L = 220nH, C= 0.20μF, V _{GE} = 15V V _{CC} = 240V, R _G = 5.1Ω, T _J = 100°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 = 1.0MHz
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 $\leq 2\%$.

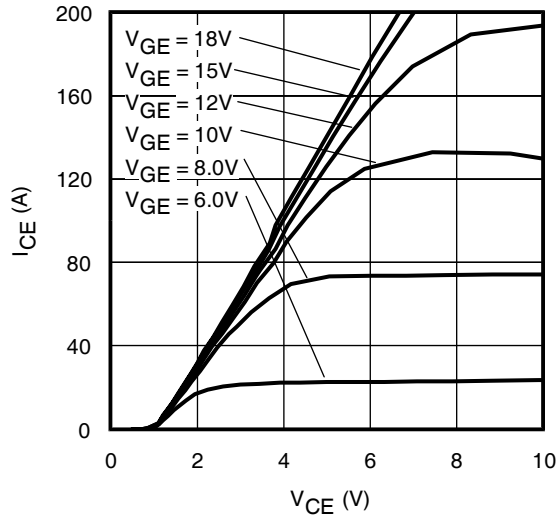


Fig 1. Typical Output Characteristics @ 25°C

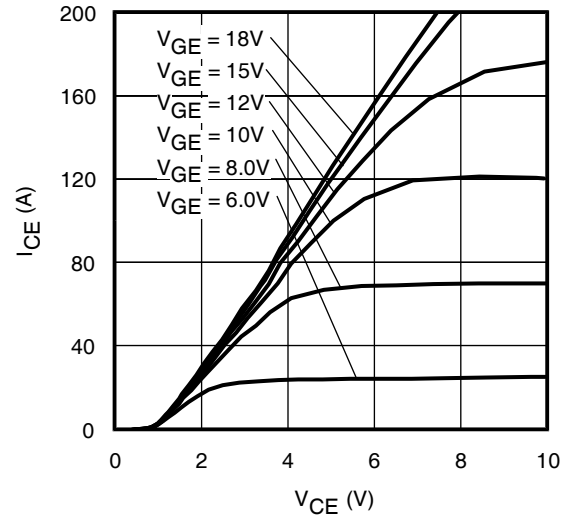


Fig 2. Typical Output Characteristics @ 75°C

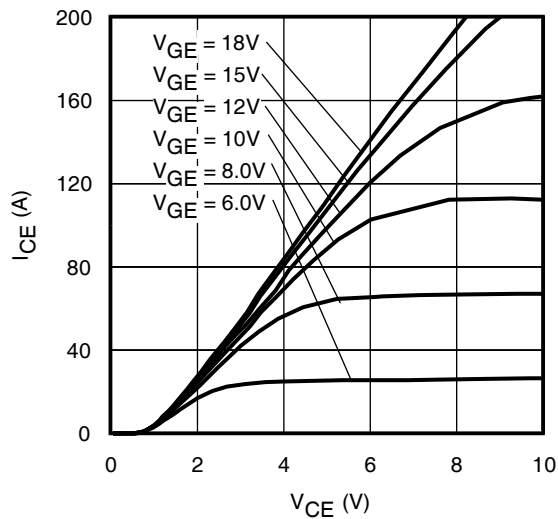


Fig 3. Typical Output Characteristics @ 125°C

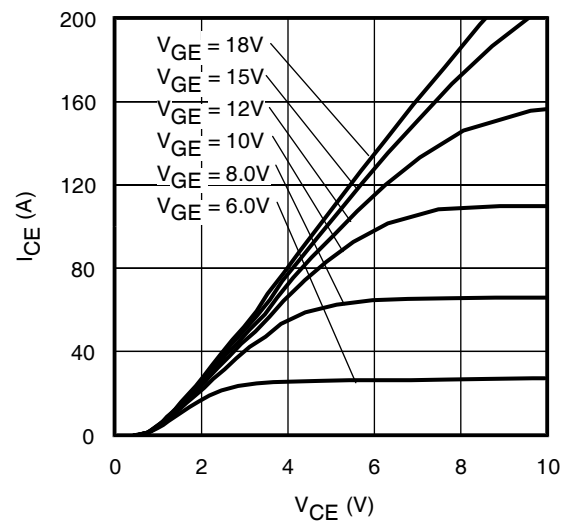


Fig 4. Typical Output Characteristics @ 150°C

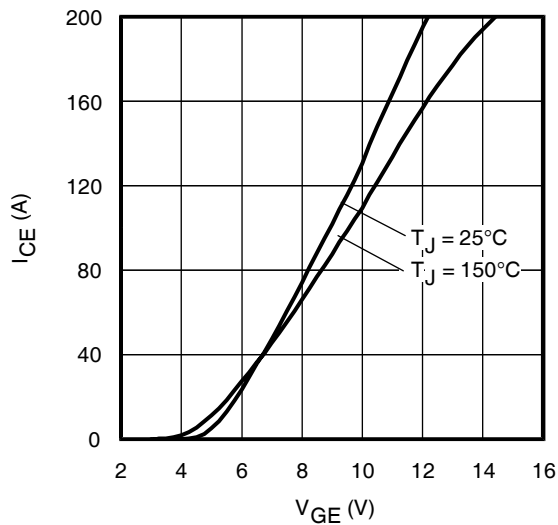


Fig 5. Typical Transfer Characteristics

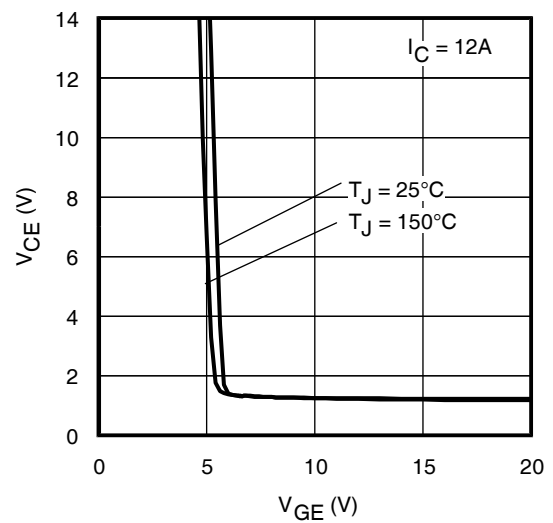


Fig 6. $V_{CE(ON)}$ vs. Gate Voltage

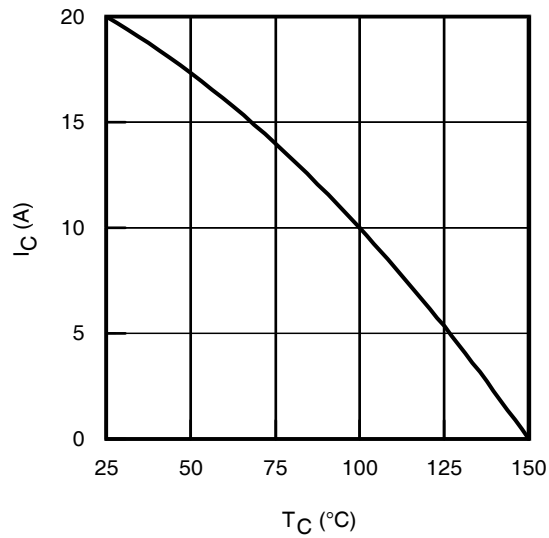


Fig 7. Maximum Collector Current vs. Case Temperature

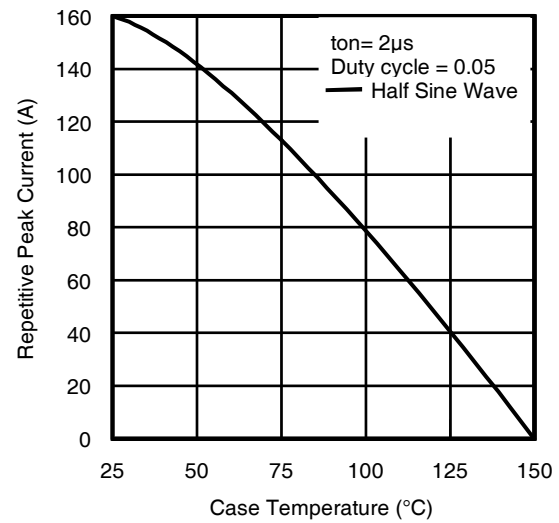


Fig 8. Typical Repetitive Peak Current vs. Case Temperature

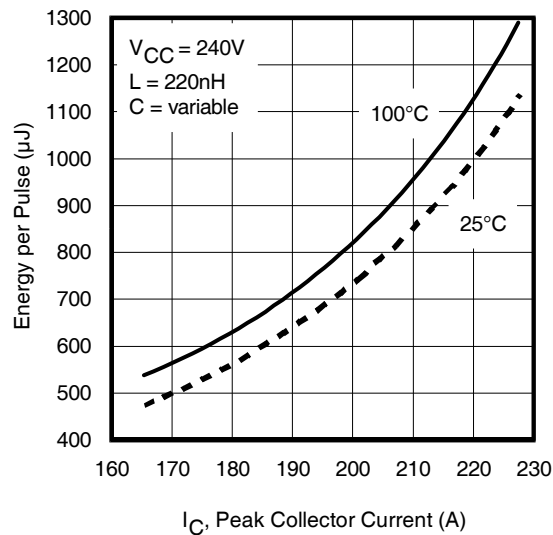


Fig 9. Typical E_{PULSE} vs. Collector Current

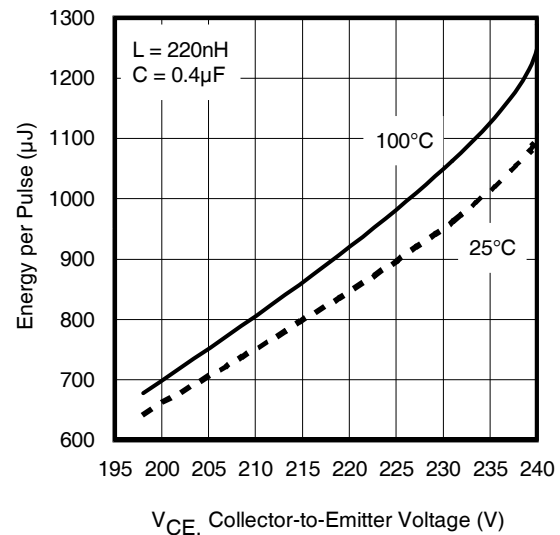


Fig 10. Typical E_{PULSE} vs. Collector-to-Emitter Voltage

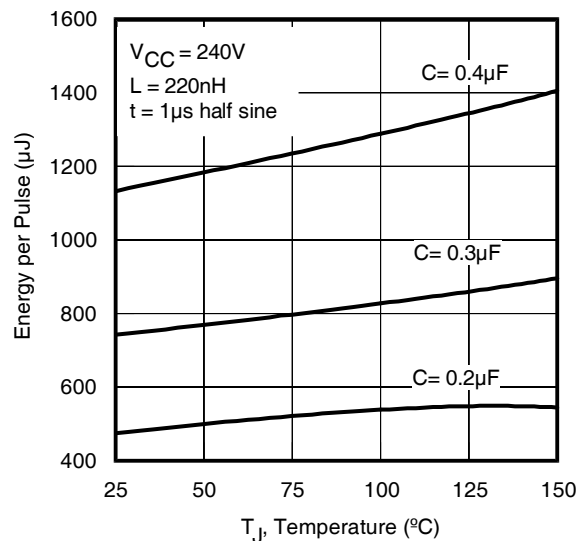


Fig 11. E_{PULSE} vs. Temperature

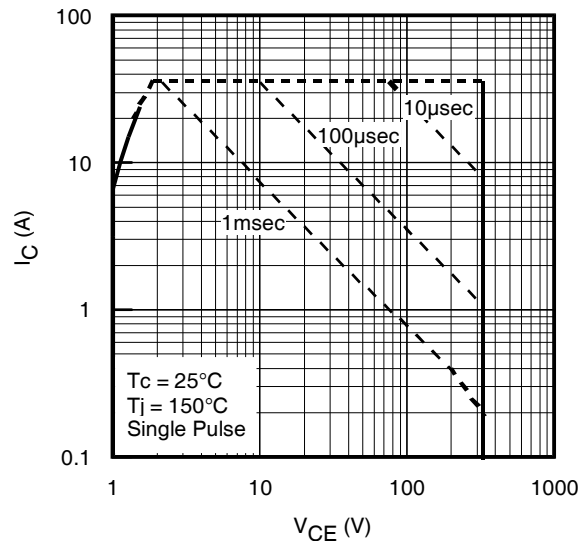


Fig 12. Forward Bias Safe Operating Area

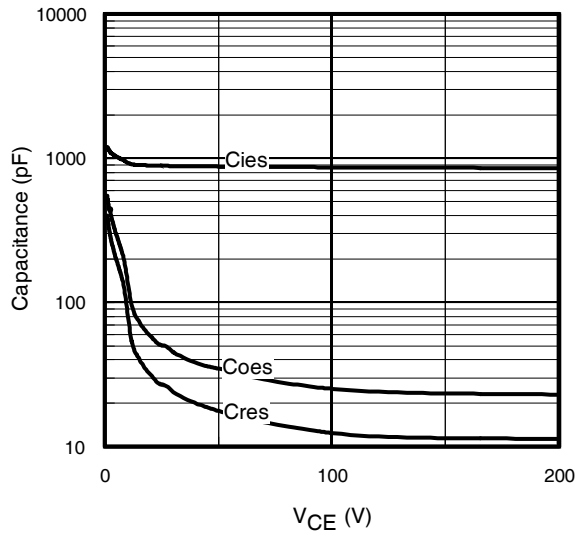


Fig 13. Typical Capacitance vs. Collector-to-Emitter Voltage

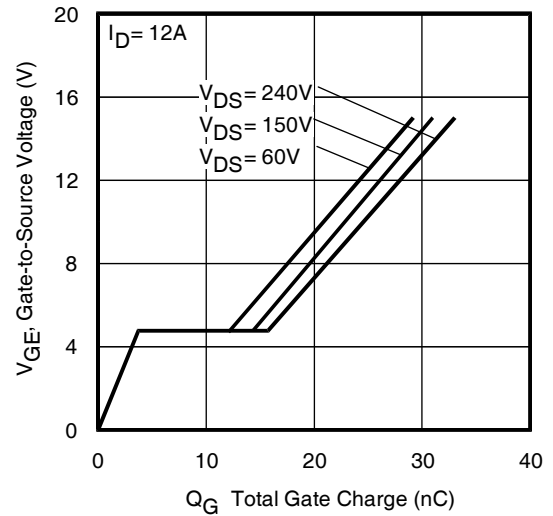


Fig 14. Typical Gate Charge vs. Gate-to-Emmitter Voltage

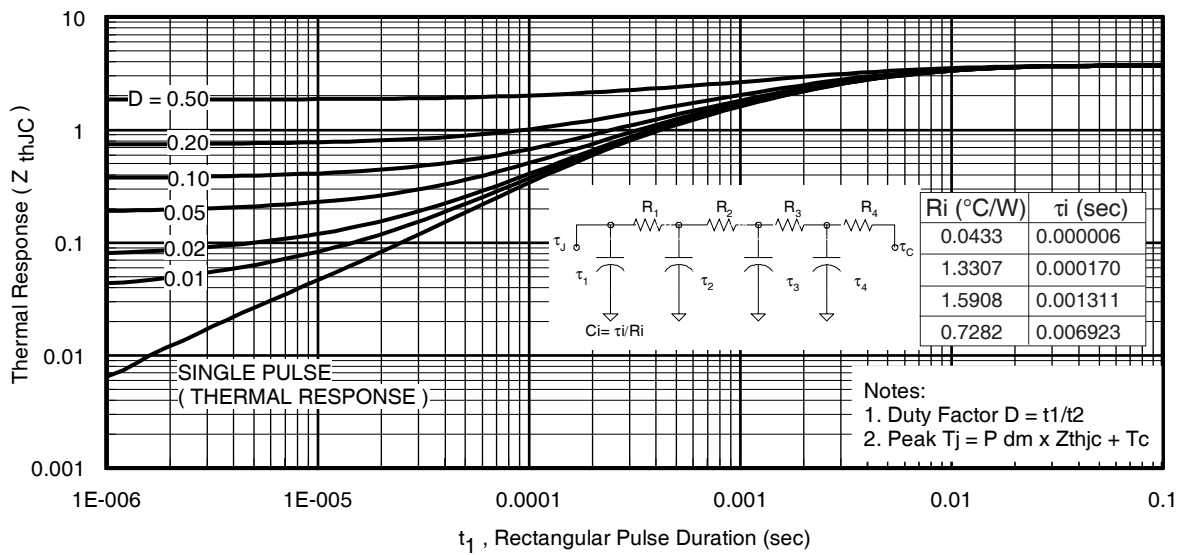


Fig 15. Maximum Effective Transient Thermal Impedance, Junction-to-Case

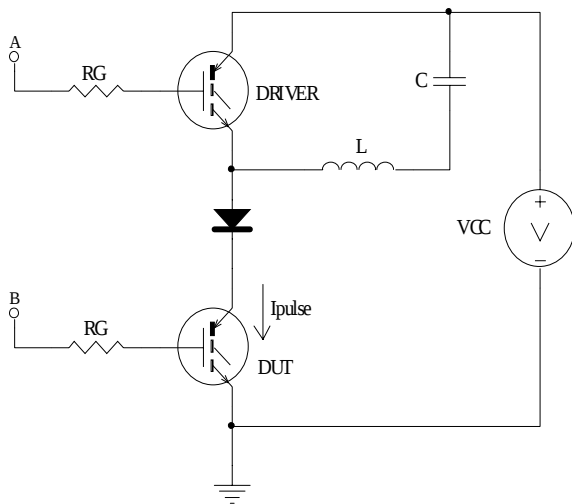


Fig 16a. t_{st} and E_{PULSE} Test Circuit

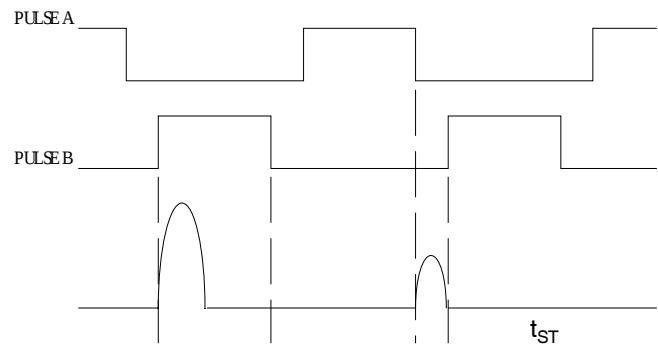


Fig 16b. t_{st} Test Waveforms

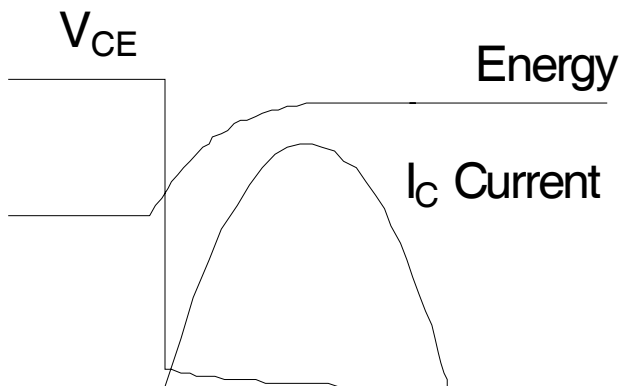


Fig 16c. E_{PULSE} Test Waveforms

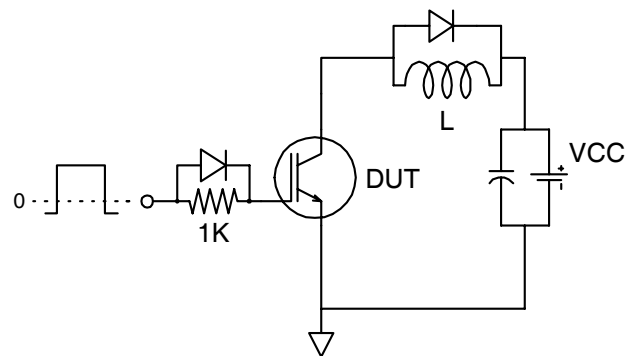
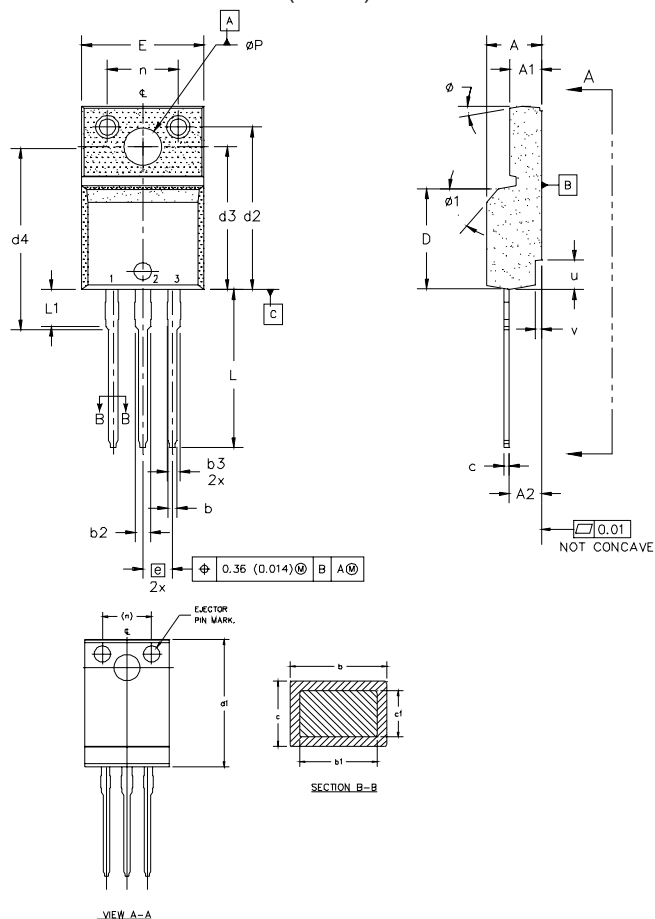


Fig. 17 - Gate Charge Circuit (turn-off)

TO-220 Full-Pak Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

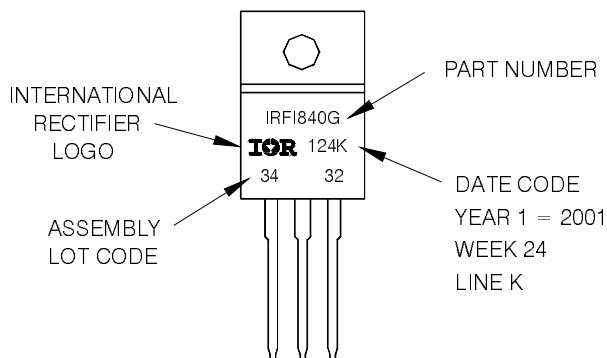
- 1.0 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
- 2.0 DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
- 3.0 LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
- 4.0 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE 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			
	MIN.	MAX.	MIN.	MAX.		
A	4.57	4.83	0.180	0.190	5	<u>HEXFET</u> 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		
L1	3.10	3.50	0.122	0.138	3	
n	6.05	6.15	0.238	0.242		
øP	3.05	3.45	0.120	0.136	6	
u	2.40	2.50	0.094	0.098		
v	0.40	0.50	0.016	0.020	6	
ø	3"	7"	3"	7"		
ø1		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.