

# International IOR Rectifier

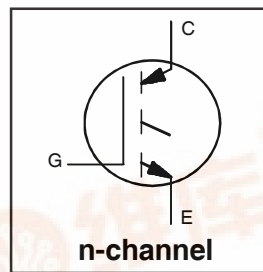
## PDP TRENCH IGBT

# IRGI4065PbF

### 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		
$V_{CE\ min}$	300	V
$V_{CE(ON)\ typ. @ I_C = 28A}$	1.25	V
$I_{RP\ max @ T_C = 25^\circ C}$	170	A
$T_J\ max$	150	$^\circ C$



G	C	E
Gate	Collector	Emitter

### Description

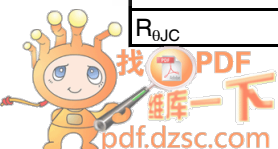
This IGBT is specifically designed for applications in Plasma Display Panels. This device utilizes advanced trench IGBT technology to achieve low  $V_{CE(on)}$  and low  $E_{PULSE}^{TM}$  rating per silicon area which improve panel efficiency. Additional features are  $150^\circ C$  operating junction 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	Parameter	Max.	Units
$V_{GE}$	Gate-to-Emitter Voltage	$\pm 30$	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current, $V_{GE} @ 15V$	28	A
$I_C @ T_C = 100^\circ C$	Continuous Collector, $V_{GE} @ 15V$	14	A
$I_{RP} @ T_C = 25^\circ C$	Repetitive Peak Current ①	170	A
$P_D @ T_C = 25^\circ C$	Power Dissipation	39	W
$P_D @ T_C = 100^\circ C$	Power Dissipation	16	W
	Linear Derating Factor	0.31	W/ $^\circ C$
$T_J$	Operating Junction and	-40 to + 150	$^\circ C$
$T_{STG}$	Storage Temperature Range		$^\circ C$
	Soldering Temperature for 10 seconds	300	$^\circ C$
	Mounting Torque, 6-32 or M3 Screw	10lb·in (1.1N·m)	N

### Thermal Resistance

Parameter	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ②	—	3.20	$^\circ C/W$



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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$BV_{CES}$	Collector-to-Emitter Breakdown Voltage	300	—	—	V	$V_{GE} = 0V, I_{CE} = 1\text{ mA}$
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage <sup>①</sup>	18	—	—	V	$V_{GE} = 0V, I_{CE} = 1\text{ A}$
$\Delta BV_{CES}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.23	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}$ , $I_{CE} = 1\text{ mA}$
$V_{CE(on)}$	Static Collector-to-Emitter Voltage	—	1.05	—	V	$V_{GE} = 15V, I_{CE} = 15A$ <sup>③</sup>
		—	1.25	1.45	V	$V_{GE} = 15V, I_{CE} = 28A$ <sup>③</sup>
		—	1.75	—	V	$V_{GE} = 15V, I_{CE} = 70A$ <sup>③</sup>
		—	2.25	—		$V_{GE} = 15V, I_{CE} = 110A$ <sup>③</sup>
		—	2.75	—	V	$V_{GE} = 15V, I_{CE} = 110A, T_J = 150^\circ\text{C}$ <sup>③</sup>
$V_{GE(th)}$	Gate Threshold Voltage	2.6	—	5.0	V	$V_{CE} = V_{GE}, I_{CE} = 0.5\text{ mA}$
$\Delta V_{GE(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	—	-12	—	mV/ $^\circ\text{C}$	
$I_{CES}$	Collector-to-Emitter Leakage Current	—	2.0	25	$\mu\text{A}$	$V_{CE} = 300V, V_{GE} = 0V$
		—	50	—		$V_{CE} = 300V, V_{GE} = 0V, T_J = 150^\circ\text{C}$
$I_{GES}$	Gate-to-Emitter Forward Leakage	—	—	100	nA	$V_{GE} = 30V$
	Gate-to-Emitter Reverse Leakage	—	—	-100		$V_{GE} = -30V$
$g_{fe}$	Forward Transconductance	—	26	—	S	$V_{CE} = 25V, I_{CE} = 25A$
$Q_g$	Total Gate Charge	—	62	—	nC	$V_{CE} = 200V, I_C = 25A, V_{GE} = 15V$ <sup>③</sup>
$Q_{gc}$	Gate-to-Collector Charge	—	20	—		
$t_{st}$	Shoot Through Blocking Time	100	—	—	ns	$V_{CC} = 240V, V_{GE} = 15V, R_G = 5.1\Omega$
$E_{PULSE}$	Energy per Pulse	—	875	—	$\mu\text{J}$	$L = 220\text{ nH}, C = 0.40\mu\text{F}, V_{GE} = 15V$ $V_{CC} = 240V, R_G = 5.1\Omega, T_J = 25^\circ\text{C}$
		—	975	—		$L = 220\text{ nH}, C = 0.40\mu\text{F}, V_{GE} = 15V$ $V_{CC} = 240V, R_G = 5.1\Omega, T_J = 100^\circ\text{C}$
$C_{iss}$	Input Capacitance	—	2200	—	pF	$V_{GE} = 0V$
$C_{oss}$	Output Capacitance	—	110	—		$V_{CE} = 30V$
$C_{rss}$	Reverse Transfer Capacitance	—	55	—		$f = 1.0\text{ MHz}$ , See Fig.13
$L_C$	Internal Collector Inductance	—	5.0	—	nH	Between lead, 6mm (0.25in.)
$L_E$	Internal Emitter Inductance	—	13	—		from package and center of die contact

### Notes:

- ① Half sine wave with duty cycle = 0.10,  $t_{on} = 2\mu\text{sec}$ .
- ②  $R_\theta$  is measured at  $T_J$  of approximately  $90^\circ\text{C}$ .
- ③ Pulse width  $\leq 400\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

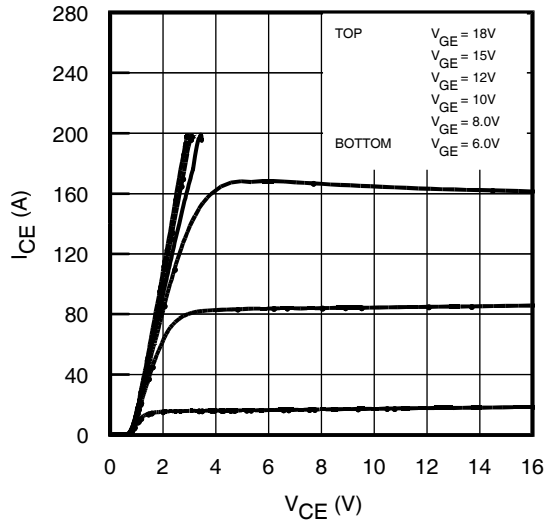


Fig 1. Typical Output Characteristics @  $25^{\circ}\text{C}$

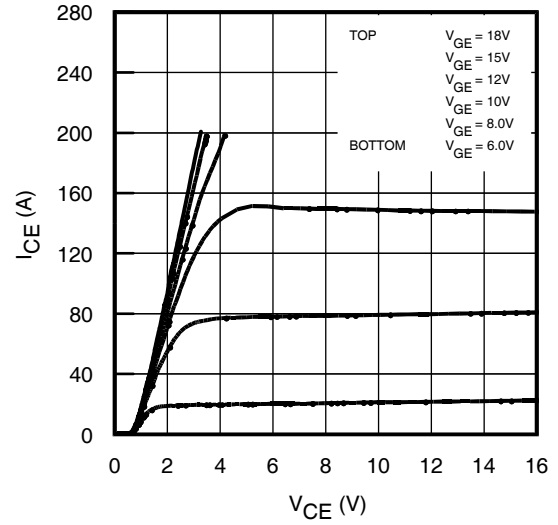


Fig 2. Typical Output Characteristics @  $75^{\circ}\text{C}$

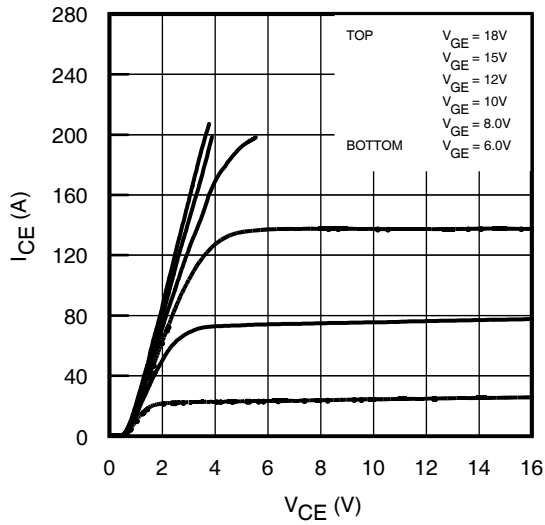


Fig 3. Typical Output Characteristics @  $125^{\circ}\text{C}$

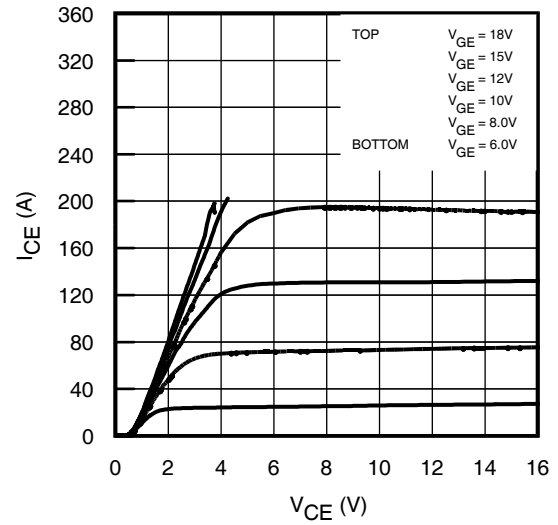


Fig 4. Typical Output Characteristics @  $150^{\circ}\text{C}$

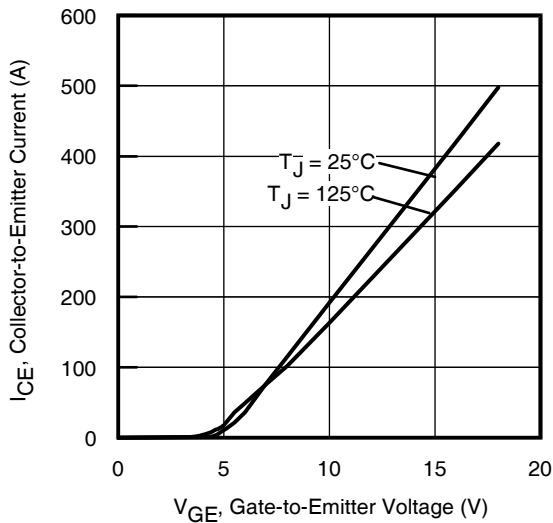


Fig 5. Typical Transfer Characteristics

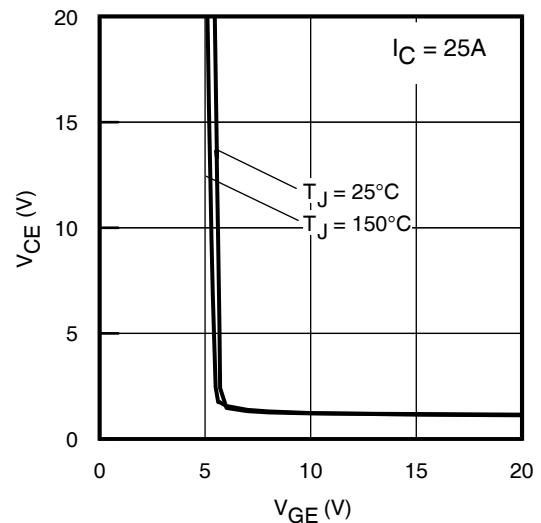


Fig 6.  $V_{CE(ON)}$  vs. Gate Voltage

# IRGI4065PbF

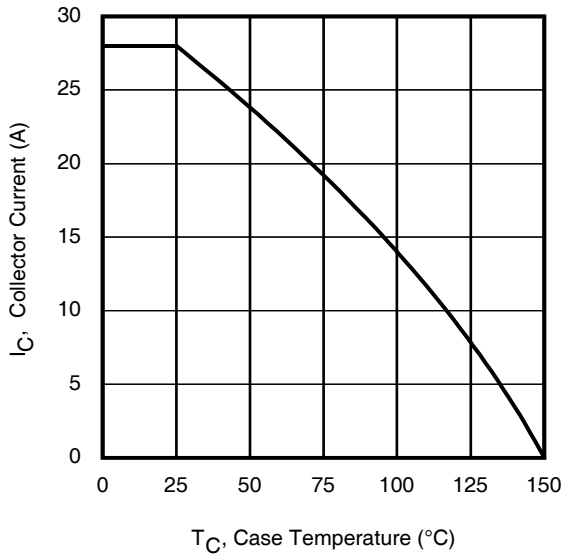


Fig 7. Maximum Collector Current vs. Case Temperature

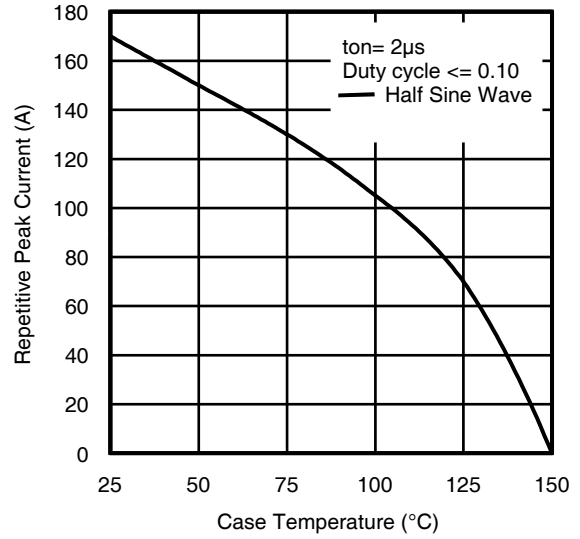


Fig 8. Typical Repetitive Peak Current vs. Case Temperature

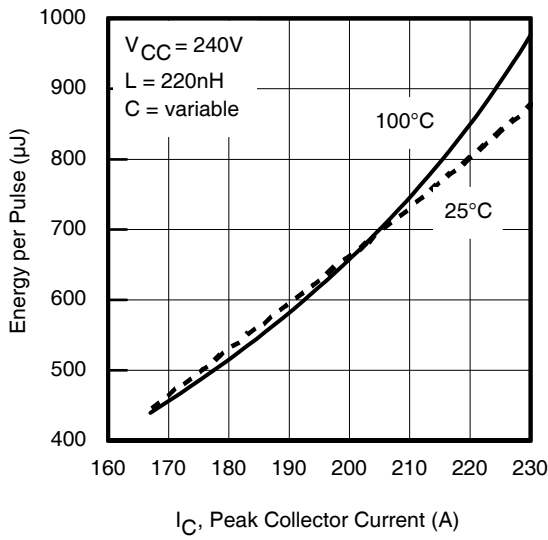


Fig 9. Typical  $E_{PULSE}$  vs. Collector Current

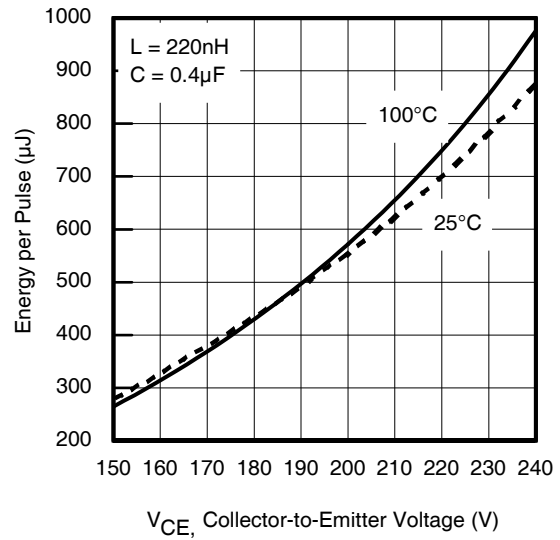


Fig 10. Typical  $E_{PULSE}$  vs. Collector-to-Emitter Voltage

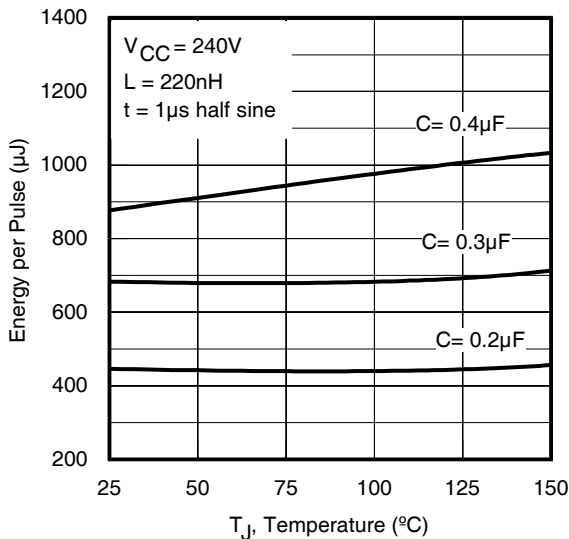


Fig 11.  $E_{PULSE}$  vs. Temperature

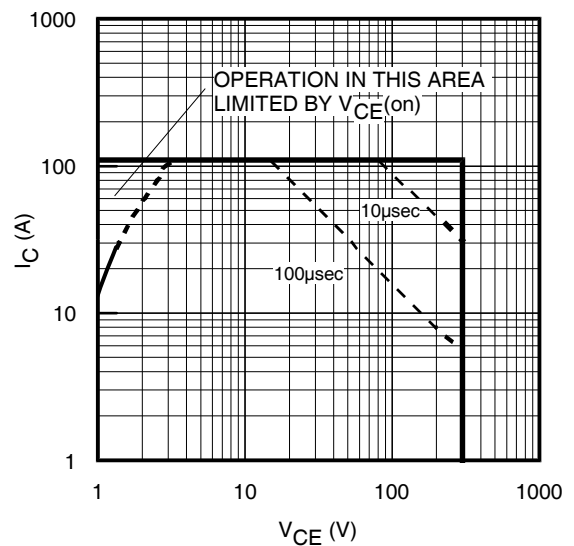


Fig 12. Forward Bias Safe Operating Area

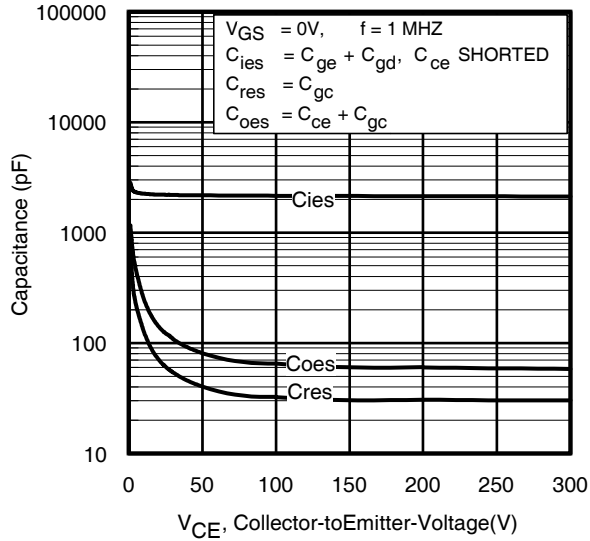


Fig 13. Typical Capacitance vs. Collector-to-Emitter Voltage

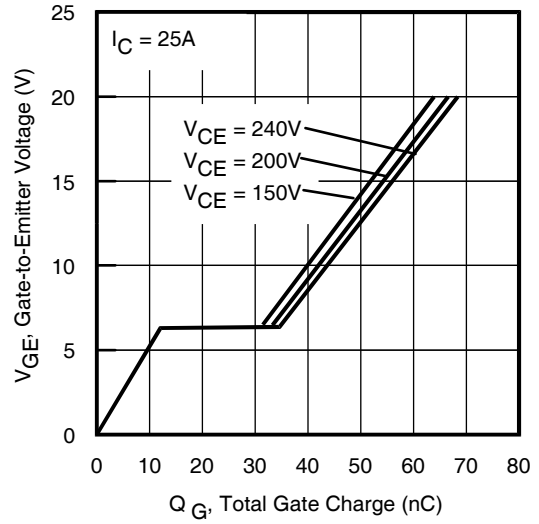


Fig 14. Typical Gate Charge vs. Gate-to-Emitter Voltage

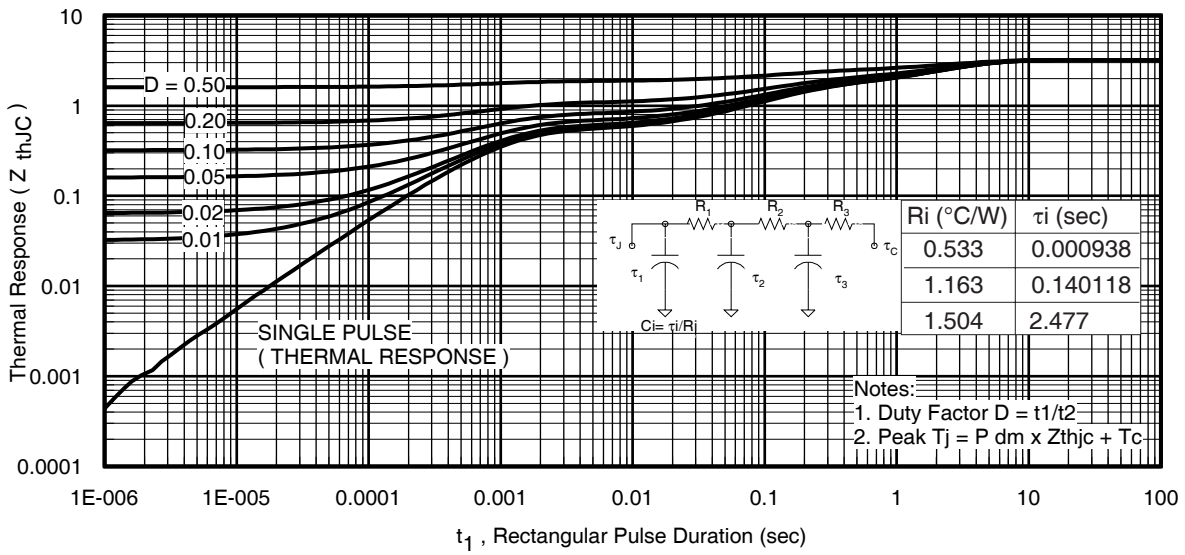
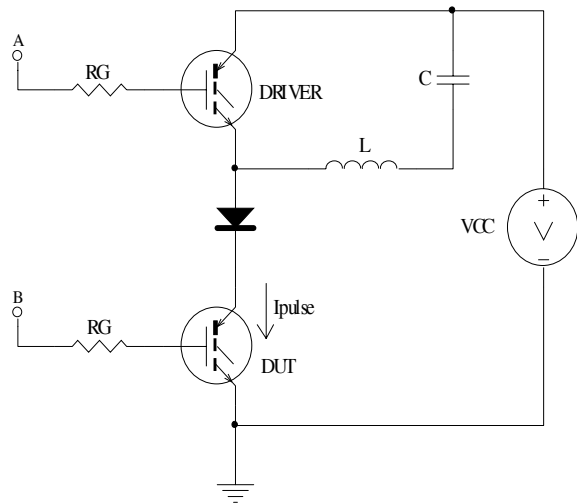
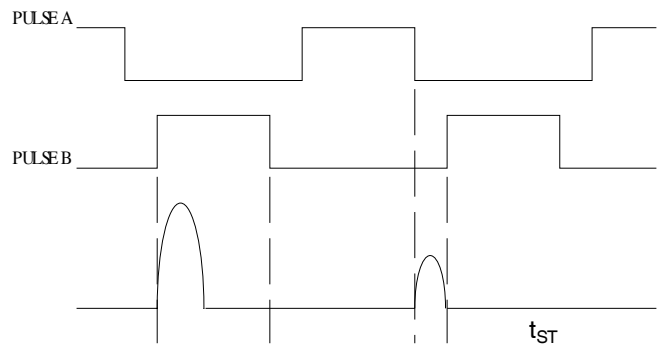


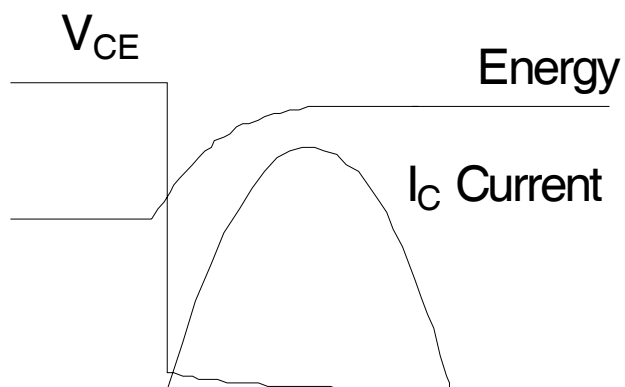
Fig 15. Maximum Effective Transient Thermal Impedance, Junction-to-Case



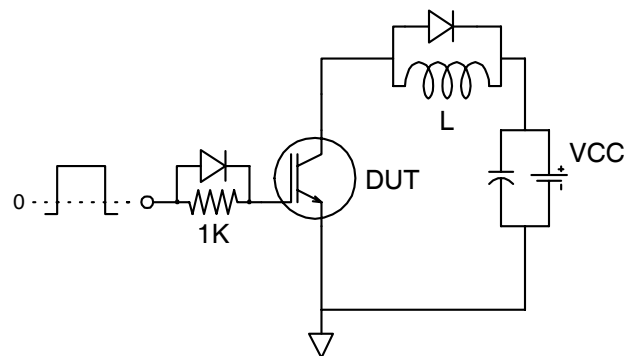
**Fig 16a.**  $t_{st}$  and  $E_{PULSE}$  Test Circuit



**Fig 16b.**  $t_{st}$  Test Waveforms



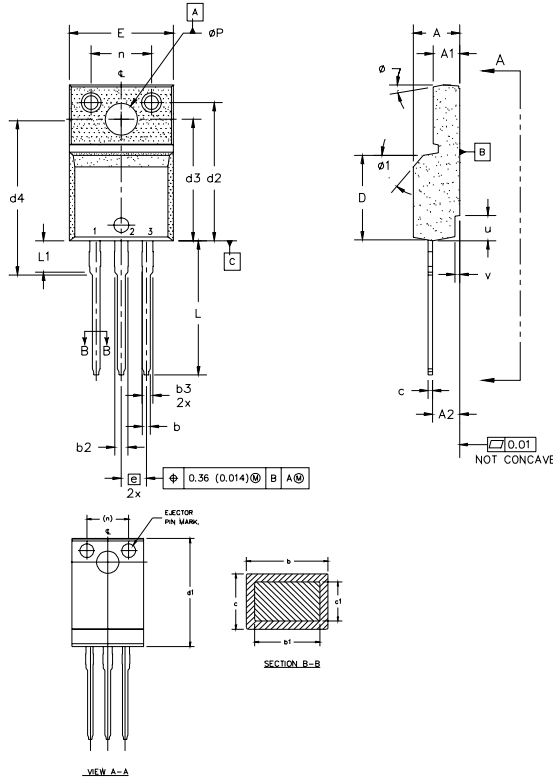
**Fig 16c.**  $E_{PULSE}$  Test Waveforms



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

## TO-220 Full-Pak Package Outline

Dimensions are shown in millimeters (inches)



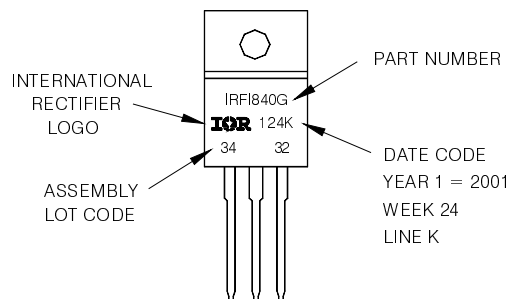
- NOTES:
- 1.0 DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
  - 2.0 DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES]
  - 3.0 LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
  - 4.0 DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
  - 5.0 DIMENSION d1 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		
A1	2.57	2.85	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	5	
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	4	
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		
u	2.40	2.50	0.094	0.098	6	
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 IRFI840G  
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-220AB Full-Pak package is not recommended for Surface Mount Application.**

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