

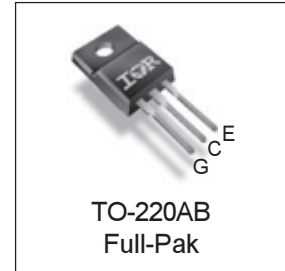
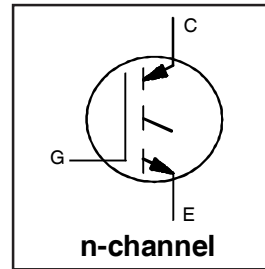
PDP TRENCH IGBT

IRG6I330UPbF

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
$V_{CE(on)}\ typ.\ @\ I_C = 28A$	1.30	V
$I_{RP}\ max\ @\ T_C = 25^\circ C$	250	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, $V_{GE}\ @\ 15V$	28	A
$I_C\ @\ T_C = 100^\circ C$	Continuous Collector, $V_{GE}\ @\ 15V$	15	
$I_{RP}\ @\ T_C = 25^\circ C$	Repetitive Peak Current ①	250	
$P_D\ @\ T_C = 25^\circ C$	Power Dissipation	43	W
$P_D\ @\ T_C = 100^\circ C$	Power Dissipation	17	
	Linear Derating Factor	0.34	W/ $^\circ C$
T_J	Operating Junction and	-40 to + 150	$^\circ C$
T_{STG}	Storage Temperature Range		
	Soldering Temperature for 10 seconds		
	Mounting Torque, 6-32 or M3 Screw	10lb·in (1.1N·m)	N

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ②	—	2.9	$^\circ C/W$

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} = 1 mA
V _{(BR)ECS}	Emitter-to-Collector Breakdown Voltage③	30	—	—	V	V _{GE} = 0V, I _{CE} = 1 A
ΔBV _{CES} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.29	—	V/°C	Reference to 25°C, I _{CE} = 1mA
V _{CE(on)}	Static Collector-to-Emitter Voltage	—	1.13	—	V	V _{GE} = 15V, I _{CE} = 15A ③
		—	1.30	1.55		V _{GE} = 15V, I _{CE} = 28A ③
		—	1.43	—		V _{GE} = 15V, I _{CE} = 40A ③
		—	1.80	—		V _{GE} = 15V, I _{CE} = 70A ③
		—	2.38	—		V _{GE} = 15V, I _{CE} = 120A ③
		—	2.10	—		V _{GE} = 15V, I _{CE} = 70A, T _J = 150°C ③
		V _{GE(th)}	Gate Threshold Voltage	2.6		—
ΔV _{GE(th)} /ΔT _J	Gate Threshold Voltage Coefficient	—	-12	—	mV/°C	
I _{CES}	Collector-to-Emitter Leakage Current	—	2.0	20	μA	V _{CE} = 330V, V _{GE} = 0V
		—	10	—		V _{CE} = 330V, V _{GE} = 0V, T _J = 100°C
		—	40	200		V _{CE} = 330V, V _{GE} = 0V, T _J = 125°C
		—	150	—		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	nA	V _{GE} = -30V
g _{fe}	Forward Transconductance	—	94	—	S	V _{CE} = 25V, I _{CE} = 25A
Q _g	Total Gate Charge	—	86	—	nC	V _{CE} = 200V, I _C = 25A, V _{GE} = 15V③
Q _{gc}	Gate-to-Collector Charge	—	36	—		
t _{d(on)}	Turn-On delay time	—	39	—	ns	I _C = 25A, V _{CC} = 196V R _G = 10Ω, L=200μH, L _S = 150nH T _J = 25°C
t _r	Rise time	—	32	—		
t _{d(off)}	Turn-Off delay time	—	120	—		
t _f	Fall time	—	55	—		
t _{d(on)}	Turn-On delay time	—	37	—	ns	I _C = 25A, V _{CC} = 196V R _G = 10Ω, L=200μH, L _S = 150nH T _J = 150°C
t _r	Rise time	—	33	—		
t _{d(off)}	Turn-Off delay time	—	159	—		
t _f	Fall time	—	95	—		
t _{st}	Shoot Through Blocking Time	100	—	—	ns	V _{CC} = 240V, V _{GE} = 15V, R _G = 5.1Ω
E _{PULSE}	Energy per Pulse	—	943	—	μJ	L = 220nH, C= 0.40μF, V _{GE} = 15V V _{CC} = 240V, R _G = 5.1Ω, T _J = 25°C
		—	1086	—		L = 220nH, C= 0.40μF, V _{GE} = 15V V _{CC} = 240V, R _G = 5.1Ω, T _J = 100°C
ESD	Human Body Model	Class 2 (Per JEDEC standard JESD22-A114)				
	Machine Model	Class B (Per EIA/JEDEC standard EIA/JESD22-A115)				
C _{ies}	Input Capacitance	—	2275	—	pF	V _{GE} = 0V
C _{oes}	Output Capacitance	—	108	—		V _{CE} = 30V
C _{res}	Reverse Transfer Capacitance	—	75	—		f = 1.0MHz, See Fig.13
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 $\leq 2\%$.

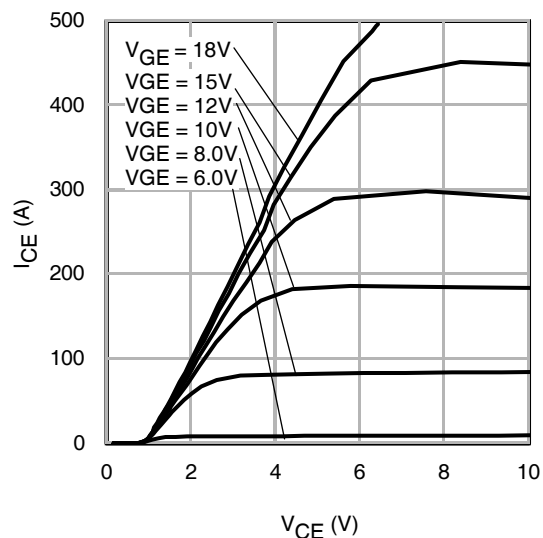


Fig 1. Typical Output Characteristics @ 25°C

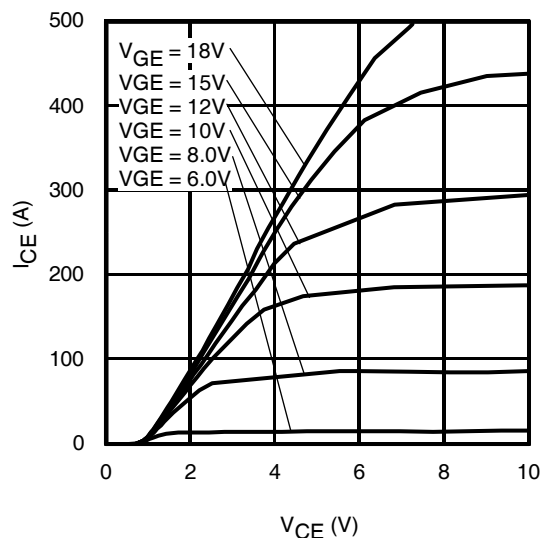


Fig 2. Typical Output Characteristics @ 75°C

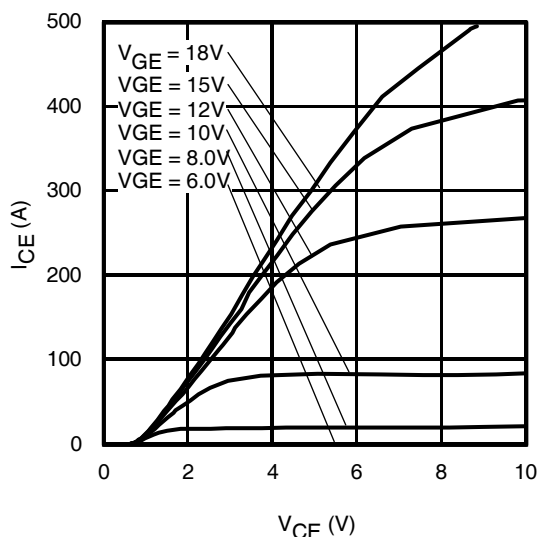


Fig 3. Typical Output Characteristics @ 125°C

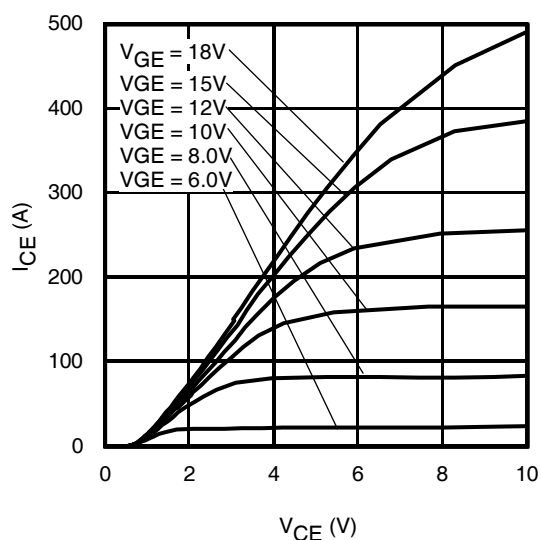


Fig 4. Typical Output Characteristics @ 150°C

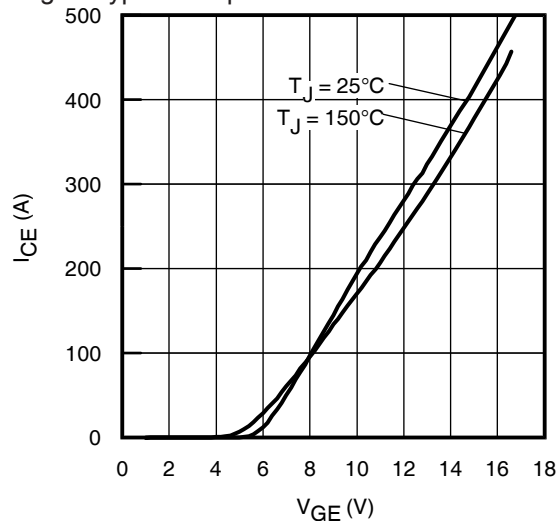


Fig 5. Typical Transfer Characteristics

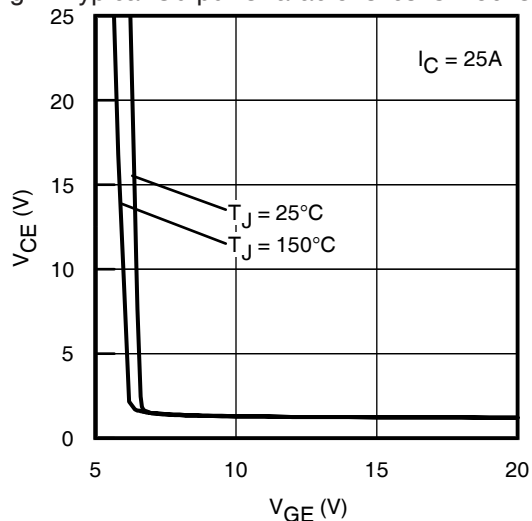


Fig 6. $V_{CE(ON)}$ vs. Gate Voltage

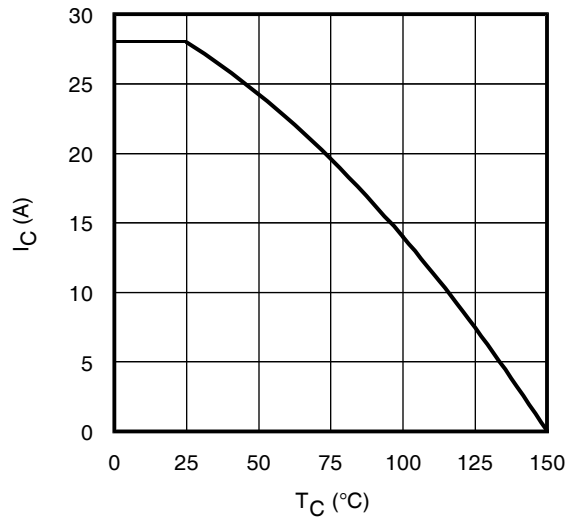


Fig 7. Maximum Collector Current vs. Case Temperature

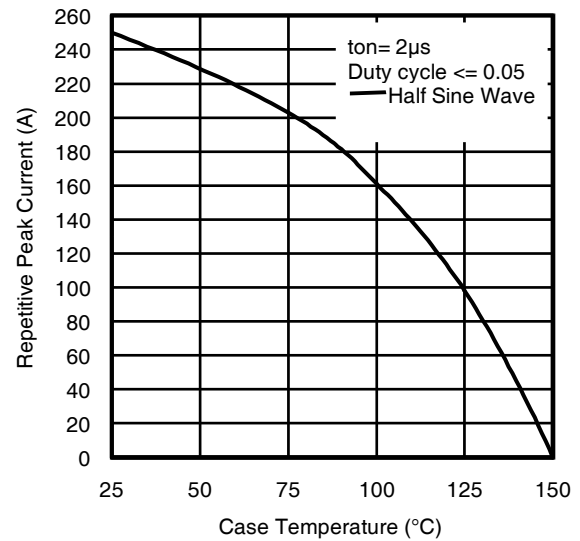


Fig 8. Typical Repetitive Peak Current vs. Case Temperature

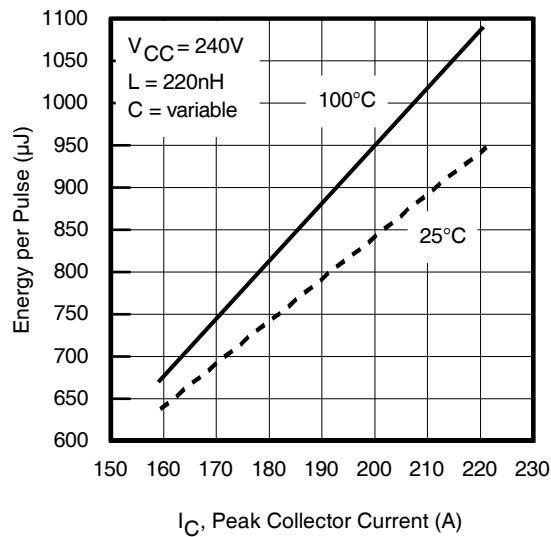


Fig 9. Typical E_{PULSE} vs. Collector Current

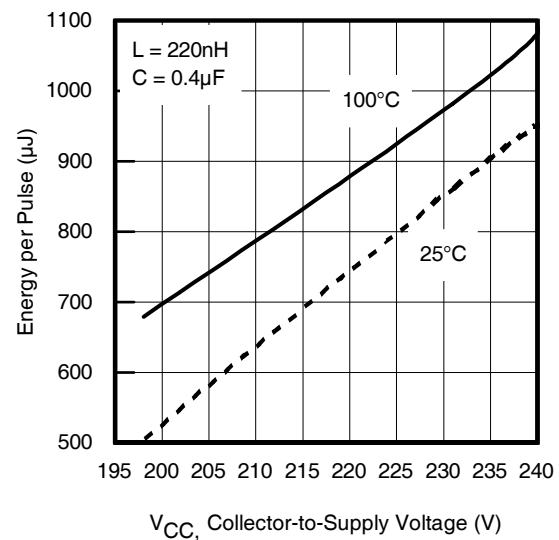


Fig 10. Typical E_{PULSE} vs. Collector-to-Supply Voltage

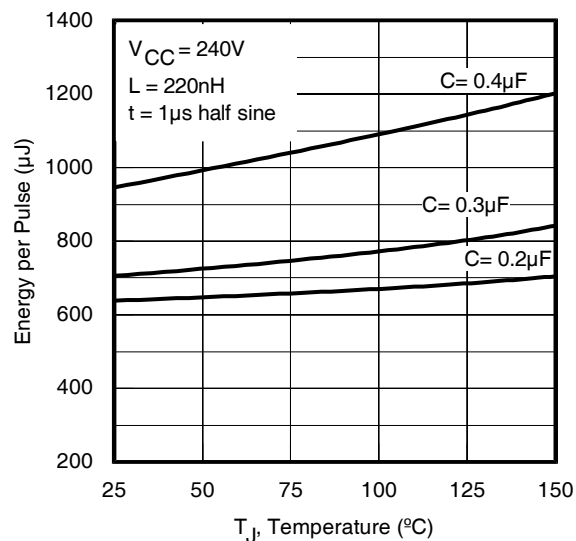


Fig 11. E_{PULSE} vs. Temperature

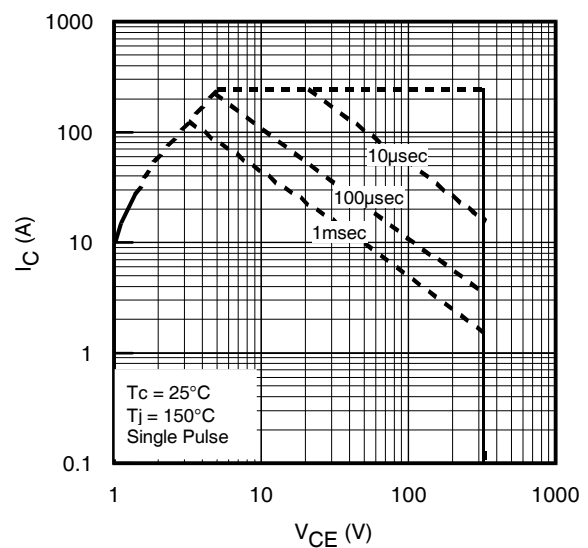


Fig 12. Forward Bias Safe Operating Area

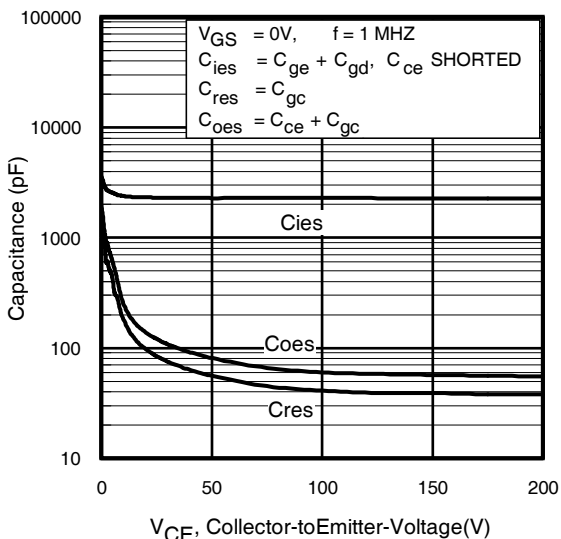


Fig 13. Typical Capacitance vs. Collector-to-Emitter Voltage

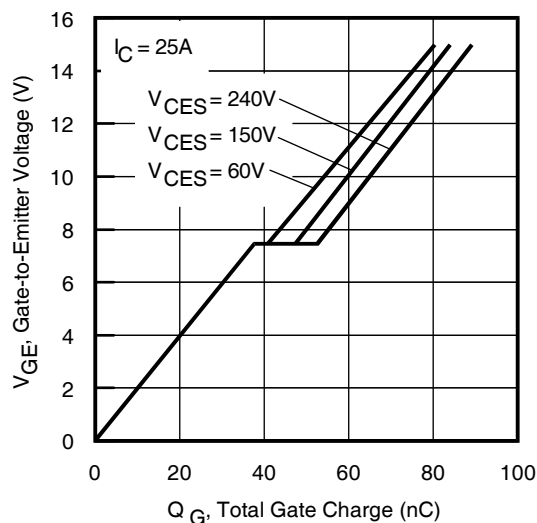


Fig 14. Typical Gate Charge vs. Gate-to-Emitter Voltage

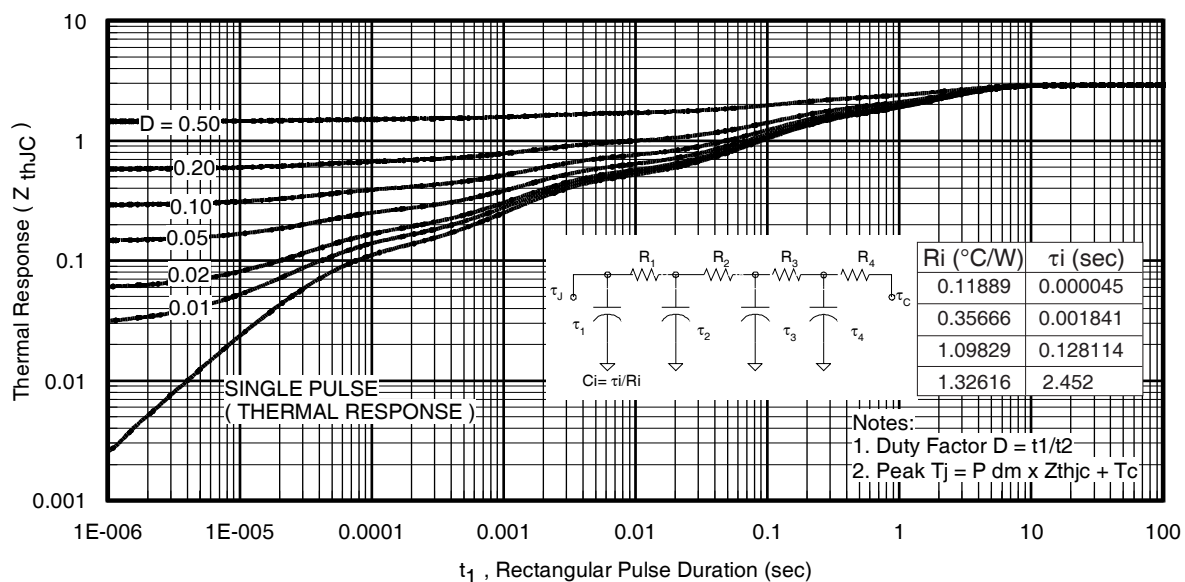


Fig 15. Maximum Effective Transient Thermal Impedance, Junction-to-Case

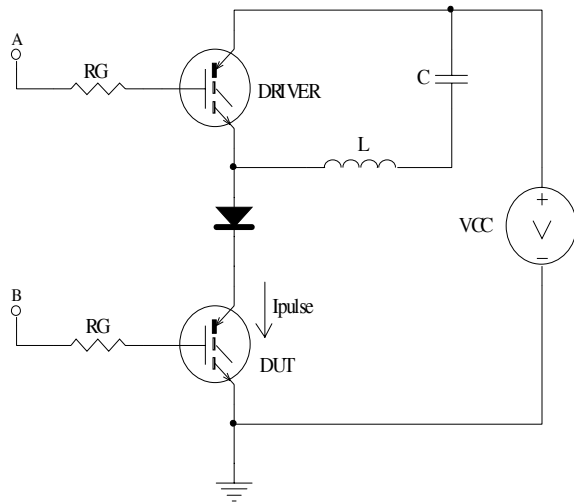


Fig 16a. t_{st} and E_{PULSE} Test Circuit

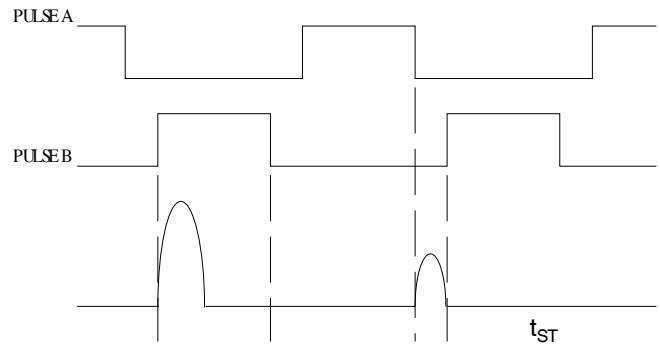


Fig 16b. t_{st} Test Waveforms

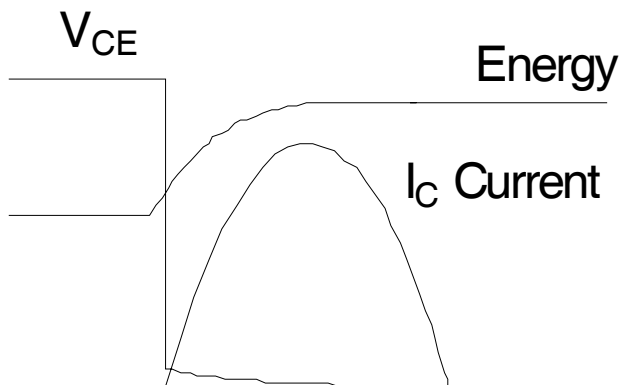


Fig 16c. E_{PULSE} Test Waveforms

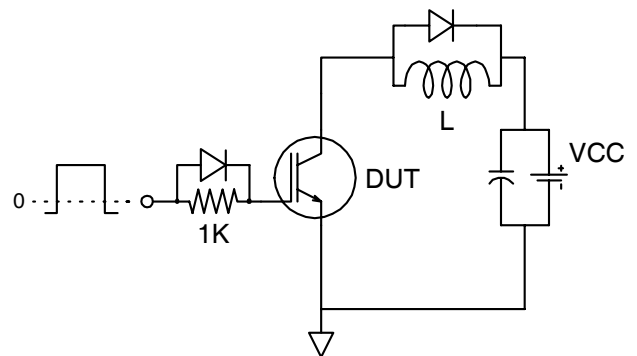
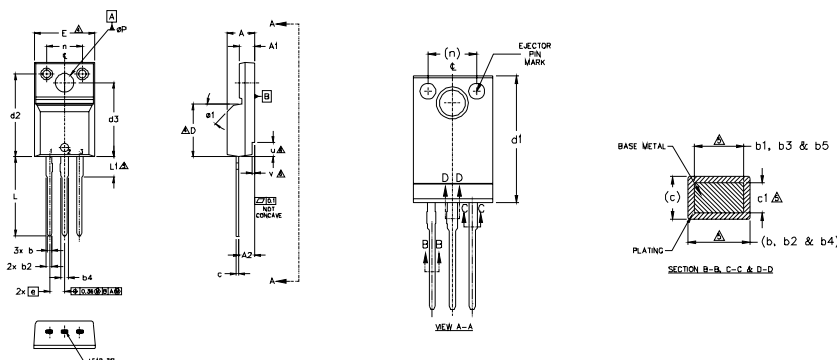


Fig. 17 - Gate Charge Circuit (turn-off)

TO-220 Full-Pak Package Outline

Dimensions are shown in millimeters (inches)

IRG6|330UPbF



SYMBOL	DIMENSIONS				UNIT
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.57	4.83	.180	.190	
A1	2.57	2.83	.101	.111	
a	2.51	2.93	.099	.115	
b	0.81	0.94	.032	.037	
b1	0.61	0.84	.024	.035	5
b2	0.76	1.27	.030	.050	
b3	0.76	1.22	.030	.048	5
b4	1.02	1.52	.040	.060	
b5	0.81	0.90	.030	.038	5
c	0.33	0.43	.013	.025	
c1	0.33	0.58	.013	.023	
d	0.61	0.90	.024	.036	4
d1	19.80	16.13	.622	.635	
d2	13.97	14.22	.550	.560	
d3	12.50	12.93	.484	.509	
e	8.61	8.61	.375	.375	4
e	2.54 BSC		.100 BSC		
L	13.20	13.72	.520	.540	
L1	3.57	3.67	.122	.145	3
n	6.05	6.60	.238	.260	
nP	3.05	3.45	.120	.136	
u	2.40	2.50	.094	.098	6
u	0.40	0.50	.016	.020	
ø1	.45"		.45"		

NOTES:

- 1.0 DIMENSIONING AND TOLERANCING AS 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 0.127 (0.005) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTER MOST EXTREMES OF THE PLASTIC BODY.
- 5.0 DIMENSION b1, b3, b5 & c1 APPLY TO BASE METAL ONLY.
- 6.0 STEP OPTIONAL ON PLASTIC BODY DEFINED BY DIMENSIONS u & v.
- 7.0 CONTROLLING DIMENSION: INCHES.

LEAD ASSIGNMENTS

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

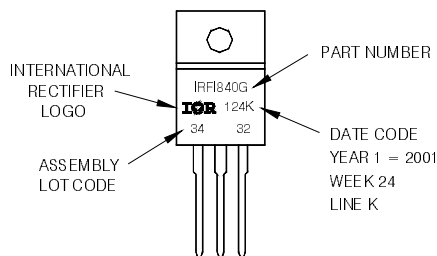
IGBTs, CoPACK

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

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.

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

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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
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