International
IOR Rectifier

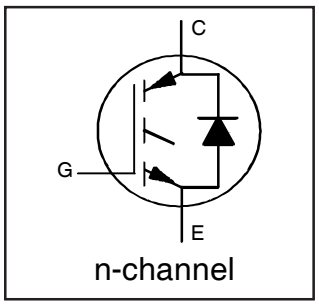
IRG6B330UDPbF

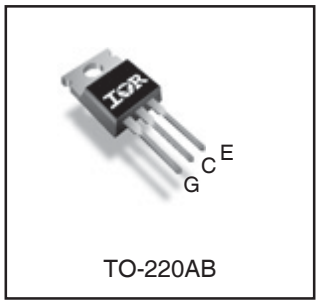
PDP TRENCH IGBT

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}™) 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 = 70A	1.69	V
I_{RP} max @ T_C= 25°C ①	250	A
T_J max	150	°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}™ rating per silicon area which improve panel efficiency. Additional features are 150°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°C	Continuous Collector Current, V_{GE} @ 15V	70	A
I_C @ T_C = 100°C	Continuous Collector, V_{GE} @ 15V	40	
I_{RP} @ T_C = 25°C	Repetitive Peak Current ①	250	
P_D @T_C = 25°C	Power Dissipation	160	W
P_D @T_C = 100°C	Power Dissipation	63	
	Linear Derating Factor	1.3	W/°C
T_J T_{STG}	Operating Junction and Storage Temperature Range	-40 to + 150	°C
	Soldering Temperature for 10 seconds	300	
	Mounting Torque, 6-32 or M3 Screw	10lb·in (1.1N·m)	N

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (IGBT)	Thermal Resistance Junction-to-Case-(each IGBT) ②	——	0.80	
$R_{\theta JC}$ (Diode)	Thermal Resistance Junction-to-Case-(each Diode) ②	1.6	2.4	
$R_{\theta CS}$	Case-to-Sink (flat, greased surface)	0.24	——	°C/W
$R_{\theta JA}$	Junction-to-Ambient (typical socket mount) ②	——	40	
	Weight	6.0 (0.21)	——	g (oz)

4/20/10

Electrical Characteristics @ T_J = 25°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
$\Delta BV_{CES}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.34	—	V/°C	Reference to 25°C, I_{CE} = 1mA
$V_{CE(on)}$	Static Collector-to-Emitter Voltage	—	1.18	1.48	V	V_{GE} = 15V, I_{CE} = 25A ③
		—	1.36	1.68		V_{GE} = 15V, I_{CE} = 40A ③
		—	1.69	2.09		V_{GE} = 15V, I_{CE} = 70A ③
		—	2.26	2.76		V_{GE} = 15V, I_{CE} = 120A ③
		—	1.93	—		V_{GE} = 15V, I_{CE} = 70A, T_J = 150°C
$V_{GE(th)}$	Gate Threshold Voltage	2.6	—	5.0	V	V_{CE} = V_{GE}, I_{CE} = 500µA
$\Delta V_{GE(th)}/\Delta T_J$	Gate Threshold Voltage Coefficient	—	-11	—	mV/°C	
I_{CES}	Collector-to-Emitter Leakage Current	—	2.0	25	µA	V_{CE} = 330V, V_{GE} = 0V
		—	5.0	—		V_{CE} = 330V, V_{GE} = 0V, T_J = 100°C
		—	100	—		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	—	50	—	S	V_{CE} = 25V, I_{CE} = 25A
Q_g	Total Gate Charge	—	85	—	nC	V_{CE} = 200V, I_C = 25A, V_{GE} = 15V ③
Q_{gc}	Gate-to-Collector Charge	—	31	—		
$t_{d(on)}$	Turn-On delay time	—	47	—	ns	I_C = 25A, V_{CC} = 196V
t_r	Rise time	—	37	—		R_G = 10Ω, L=200µH, L_S= 200nH
$t_{d(off)}$	Turn-Off delay time	—	176	—		T_J = 25°C
t_f	Fall time	—	99	—		
$t_{d(on)}$	Turn-On delay time	—	45	—	ns	I_C = 25A, V_{CC} = 196V
t_r	Rise time	—	38	—		R_G = 10Ω, L=200µH, L_S= 200nH
$t_{d(off)}$	Turn-Off delay time	—	228	—		T_J = 150°C
t_f	Fall time	—	183	—		
t_{st}	Shoot Through Blocking Time	100	—	—	ns	V_{CC} = 240V, V_{GE} = 15V, R_G= 5.1Ω
E_{PULSE}	Energy per Pulse	—	834	—	µJ	L = 220nH, C= 0.40µF, V_{GE} = 15V V_{CC} = 240V, R_G= 5.1Ω, T_J = 25°C
		—	985	—		L = 220nH, C= 0.40µF, V_{GE} = 15V V_{CC} = 240V, R_G= 5.1Ω, T_J = 100°C
C_{iss}	Input Capacitance	—	2297	—	pF	V_{GE} = 0V
C_{oss}	Output Capacitance	—	141	—		V_{CE} = 30V
C_{rss}	Reverse Transfer Capacitance	—	74	—		ƒ = 1.0MHz, See Fig.13
L_C	Internal Collector Inductance	—	5.0	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L_E	Internal Emitter Inductance	—	13	—		

Diode Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions	
$I_{F(AV)}$	Average Forward Current at T_C=155°C	—	—	8.0	A		
I_{FSM}	Non Repetitive Peak Surge Current	—	—	100	A	T_J = 155°C, PW = 6.0ms half sine wave	
V_F	Forward Voltage	—	1.19	1.3	V	I_F = 8A	
		—	0.94	1.0		I_F = 8A, T_J = 150°C	
t_{rr}	Reverse Recovery Time	—	35	60	ns	I_F = 1A, di/dt = -50A/µs, V_R =30V	
		—	43	—		T_J = 25°C	I_F = 8A
		—	67	—		T_J = 125°C	di/dt = 200A/µs
Q_{rr}	Reverse Recovery Charge	—	60	—	nC	T_J = 25°C	V_R = 200V
		—	210	—		T_J = 125°C	
I_{rr}	Peak Recovery Current	—	2.8	—	A	T_J = 25°C	
		—	6.3	—		T_J = 125°C	

Notes:

① Half sine wave with duty cycle = 0.1, ton=2µsec.

② R_θ is measured at T_J of approximately 90°C.

③ Pulse width ≤ 400µs; duty cycle ≤ 2%.

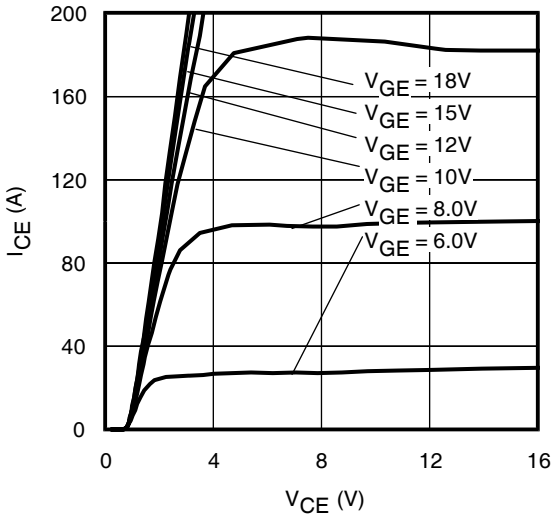


Fig 1. Typical Output Characteristics @ 25°C

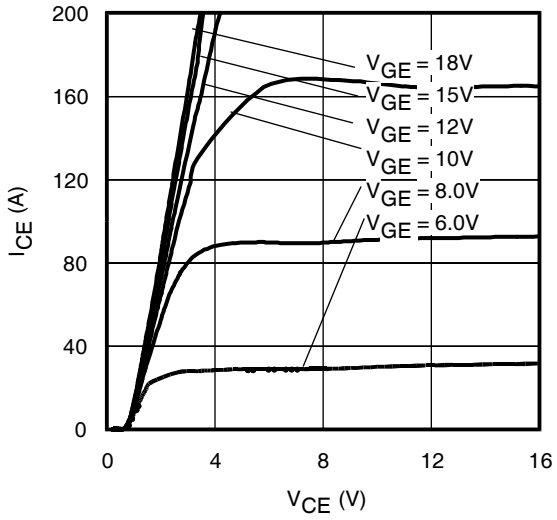


Fig 2. Typical Output Characteristics @ 75°C

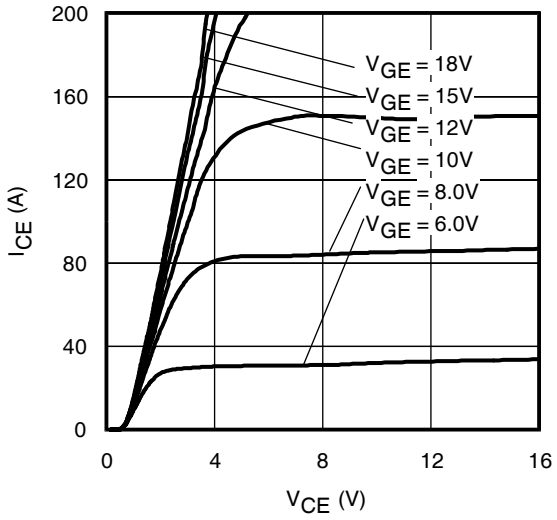


Fig 3. Typical Output Characteristics @ 125°C

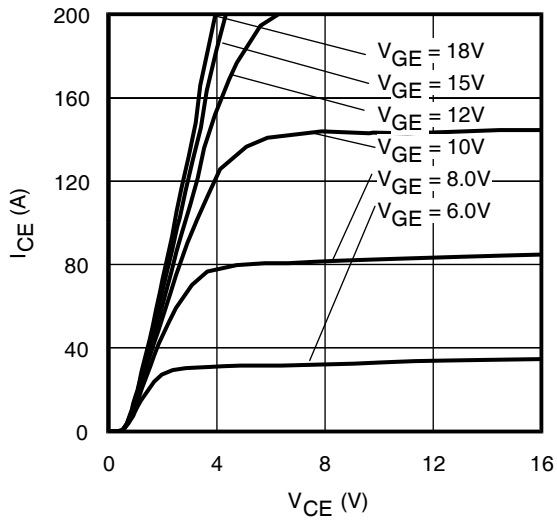


Fig 4. Typical Output Characteristics @ 150°C

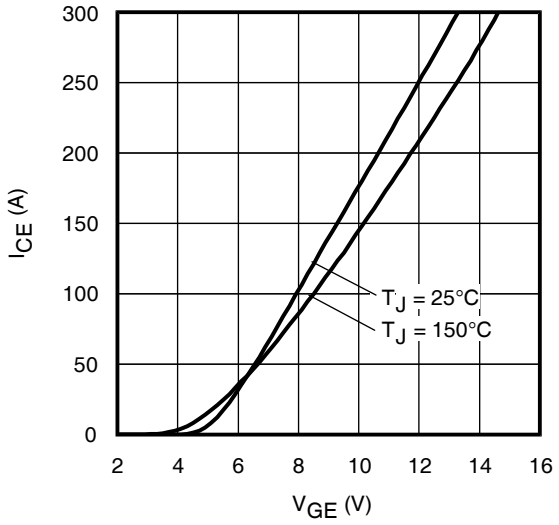


Fig 5. Typical Transfer Characteristics

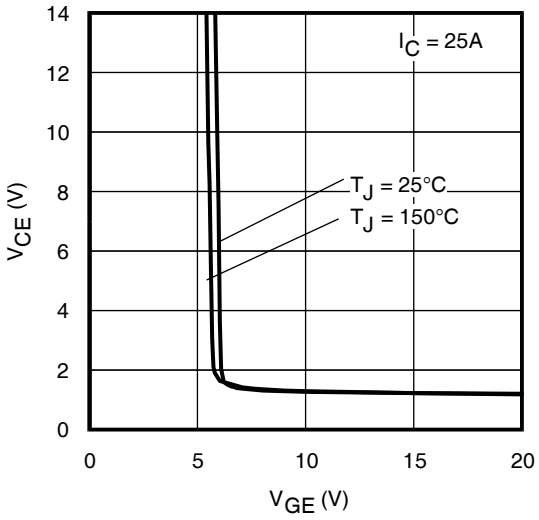


Fig 6. $V_{CE(ON)}$ vs. Gate Voltage

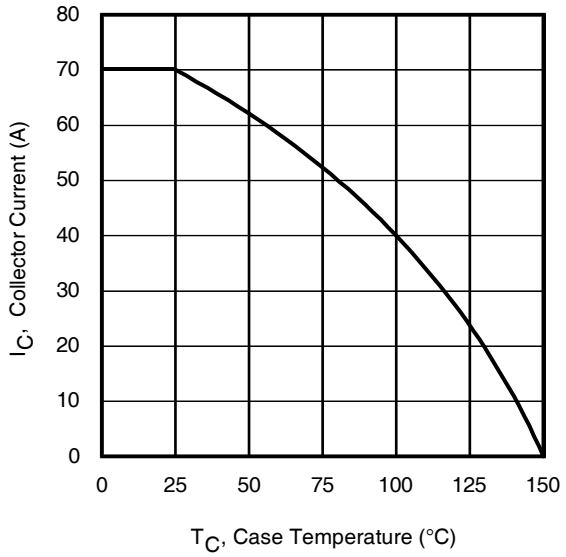


Fig 7. Maximum Collector Current vs. Case Temperature

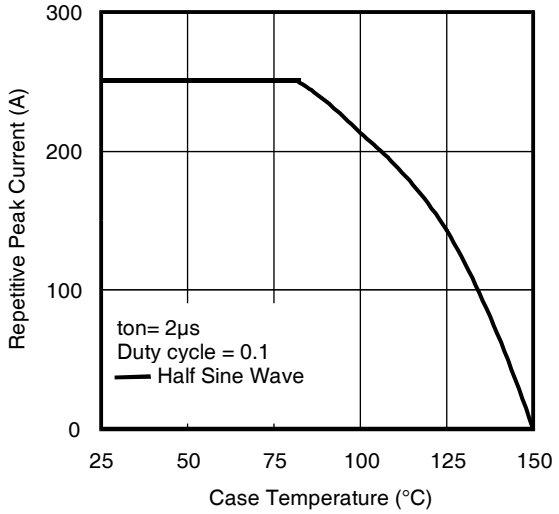


Fig 8. Typical Repetitive Peak Current vs. Case Temperature

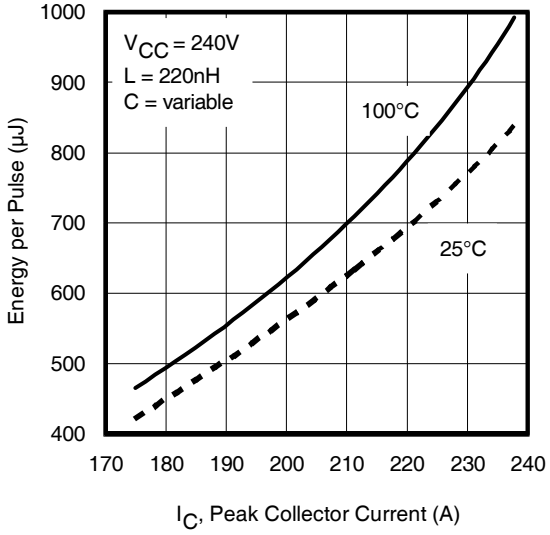


Fig 9. Typical E_{PULSE} vs. Collector Current

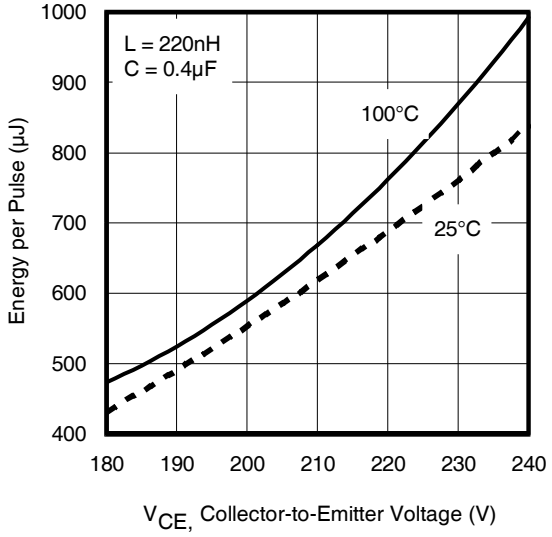


Fig 10. Typical E_{PULSE} vs. Collector-to-Emitter Voltage

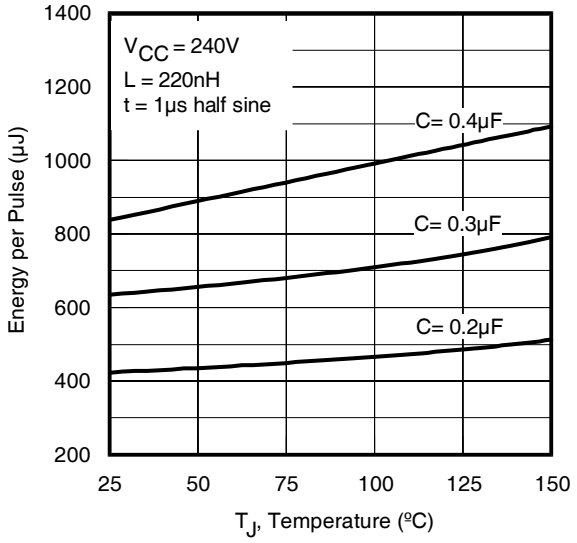


Fig 11. E_{PULSE} vs. Temperature

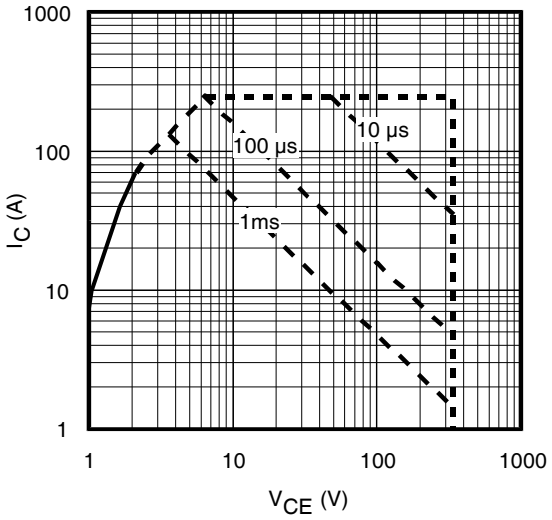


Fig 12. Forward Bias Safe Operating Area

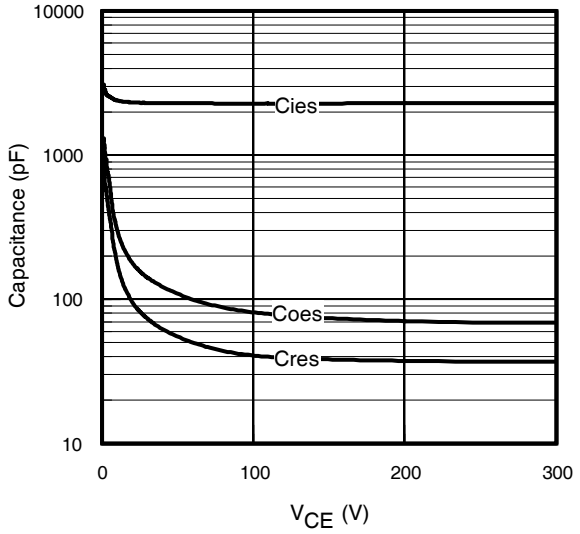


Fig 13. Typical Capacitance vs. Collector-to-Emitter Voltage

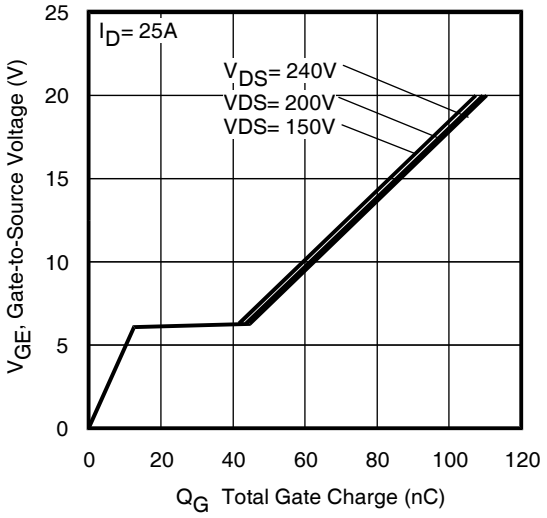
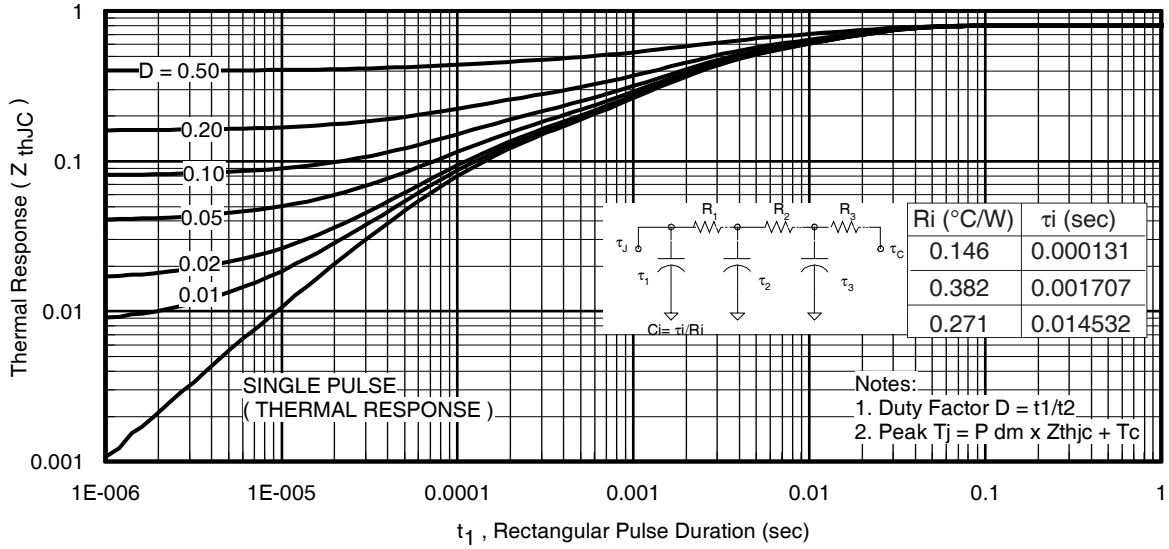
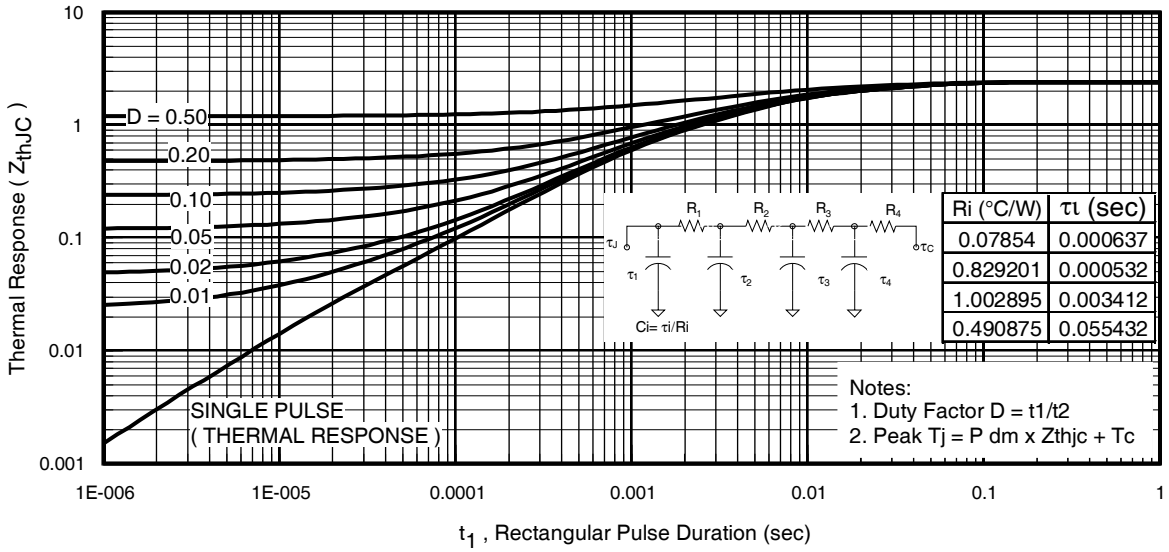


Fig 14. Typical Gate Charge vs. Gate-to-Emitter Voltage



Ri (°C/W)	τi (sec)
0.146	0.000131
0.382	0.001707
0.271	0.014532

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



Ri (°C/W)	τι (sec)
0.07854	0.000637
0.829201	0.000532
1.002895	0.003412
0.490875	0.055432

Fig 16. Maximum Effective Transient Thermal Impedance, Junction-to-Case (DIODE)

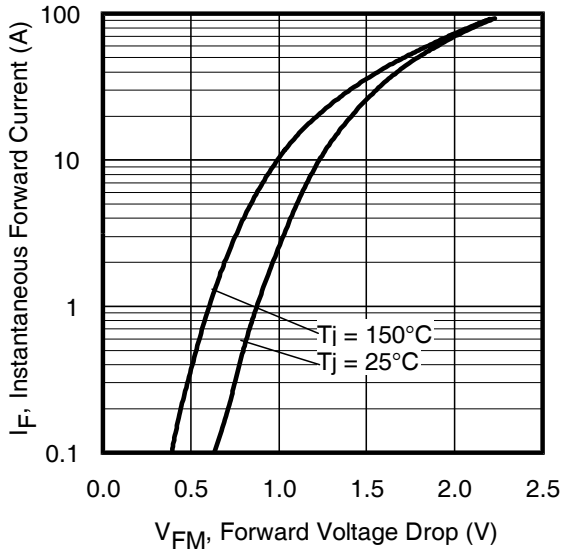


Fig. 17 - Typical Forward Voltage Drop Characteristics

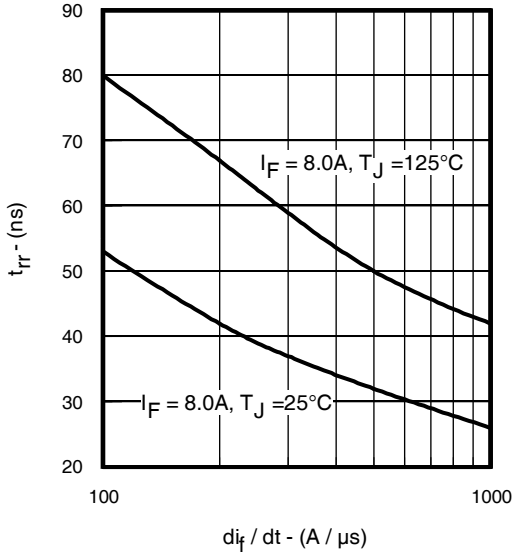


Fig. 18 - Typical Reverse Recovery vs. di_F/dt

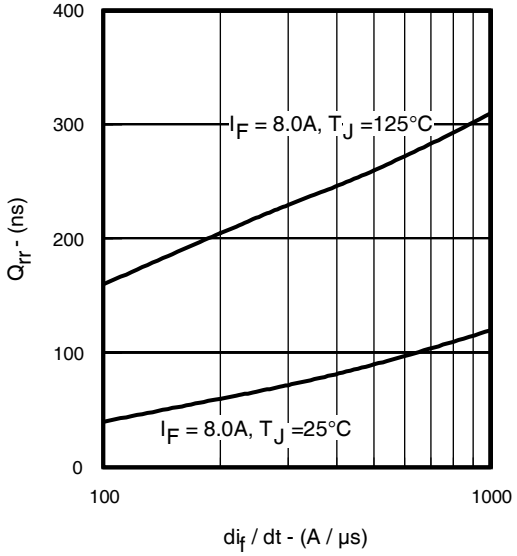


Fig. 19- Typical Stored Charge vs. di_F/dt

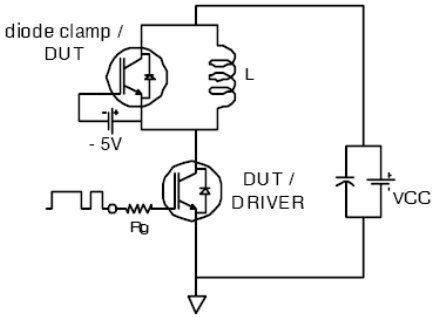


Fig.20 - Switching Loss Circuit

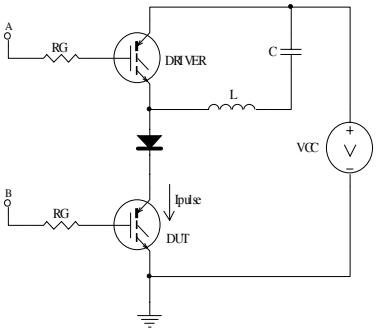


Fig 21a. t_{st} and E_{PULSE} Test Circuit

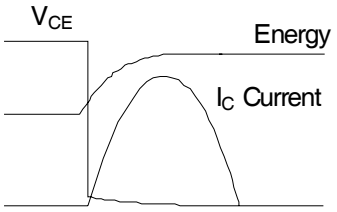


Fig 21b. t_{st} Test Waveforms

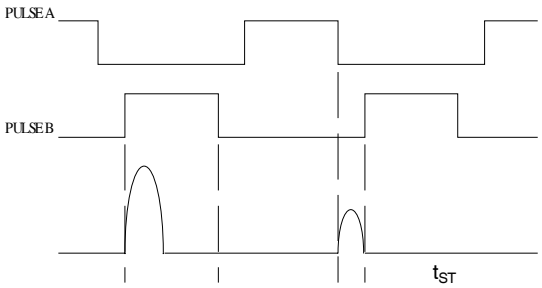


Fig 21c. E_{PULSE} Test Waveforms

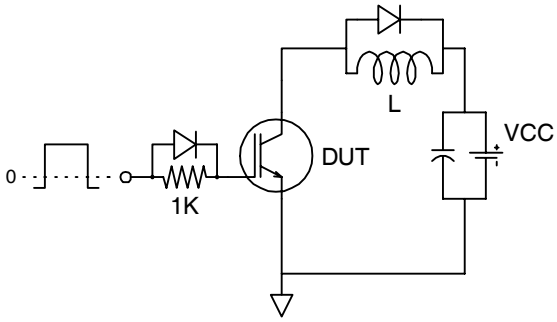
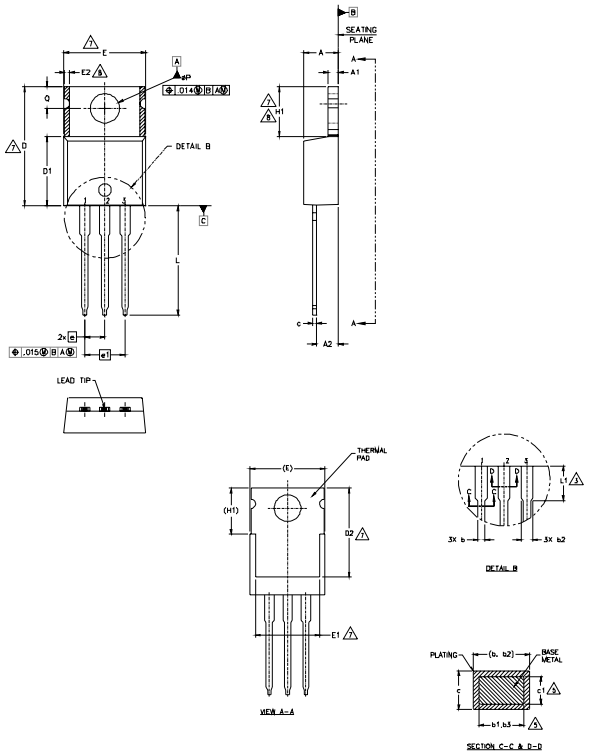


Fig. 22 - Gate Charge Circuit (turn-off)

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

1.– DIMENSIONING AND TOLERANCING AS PER ASME Y14.5 M– 1994.
2.– DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
3.– LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
4.– DIMENSION D, D1 & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5.– DIMENSION b1, b3 & c1 APPLY TO BASE METAL ONLY.
6.– CONTROLLING DIMENSION : INCHES.
7.– THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1
8.– DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRREGULARITIES ARE ALLOWED.
9.– OUTLINE CONFORMS TO JEDEC TO-220, EXCEPT A2 (max.) AND D2 (min.) WHERE DIMENSIONS ARE DERIVED FROM THE ACTUAL PACKAGE OUTLINE.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	3.56	4.83	.140	.190	
A1	0.51	1.40	.020	.055	
A2	2.03	2.92	.080	.115	
b	0.38	1.01	.015	.040	
b1	0.38	0.97	.015	.038	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.36	0.61	.014	.024	
c1	0.36	0.56	.014	.022	5
D	14.22	16.51	.560	.650	4
D1	8.38	9.02	.330	.355	
D2	11.68	12.88	.460	.507	7
E	9.65	10.67	.380	.420	4,7
E1	6.86	8.89	.270	.350	7
E2	–	0.76	–	.030	8
e	2.54 BSC		.100 BSC		
e1	5.08 BSC		.200 BSC		
H1	5.84	6.86	.230	.270	7,8
L	12.70	14.73	.500	.580	
L1	3.56	4.06	.140	.160	3
øP	3.54	4.08	.139	.161	
Q	2.54	3.42	.100	.135	

LEAD ASSIGNMENTS

HEXFET
1.– GATE
2.– DRAIN
3.– SOURCE

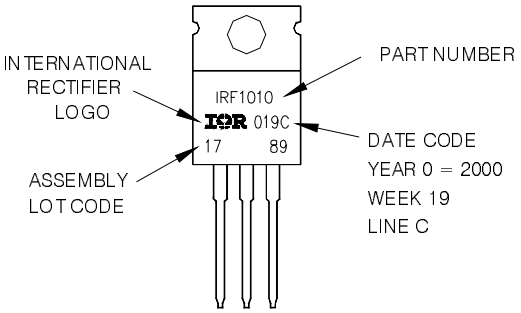
IGBTs, CoPACK
1.– GATE
2.– COLLECTOR
3.– EMITTER

DIODES
1.– ANODE
2.– CATHODE
3.– ANODE

TO-220AB Part Marking Information

EXAMPLE: THIS IS AN IRF1010
LOT CODE 1789
ASSEMBLED ON WW 19, 2000
IN THE ASSEMBLY LINE "C"

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



TO-220AB packages are not recommended for Surface Mount Application.

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

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
IOR Rectifier

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