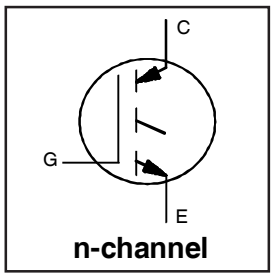
International
IOR Rectifier

IRG7S313UPbF

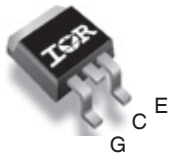
PDP TRENCH IGBT

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 = 20A	1.35	V
I_{RP} max @ T_C= 25°C	160	A
T_J max	150	°C



n-channel



D²Pak
IRG7S313UPbF

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	40	A
I_C @ T_C = 100°C	Continuous Collector, V_{GE} @ 15V	20	
I_{RP} @ T_C = 25°C	Repetitive Peak Current ①	160	
P_D @T_C = 25°C	Power Dissipation	78	W
P_D @T_C = 100°C	Power Dissipation	31	
	Linear Derating Factor	0.63	W/°C
T_J	Operating Junction and	-40 to + 150	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature for 10 seconds	300	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ②	—	1.6	°C/W

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} = 250µA
$\Delta BV_{CES}/\Delta T_J$	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
$\Delta V_{GE(th)}/\Delta T_J$	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	—	1.0	—	ns	I_C = 12A, V_{CC} = 196V
t_r	Rise time	—	13	—		R_G = 10Ω, L=210µH
$t_{d(off)}$	Turn-Off delay time	—	65	—		T_J = 25°C
t_f	Fall time	—	68	—		
$t_{d(on)}$	Turn-On delay time	—	11	—	ns	I_C = 12A, V_{CC} = 196V
t_r	Rise time	—	14	—		R_G = 10Ω, L=200µH, L_S= 150nH
$t_{d(off)}$	Turn-Off delay time	—	86	—		T_J = 150°C
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, ton=2µsec.

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

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

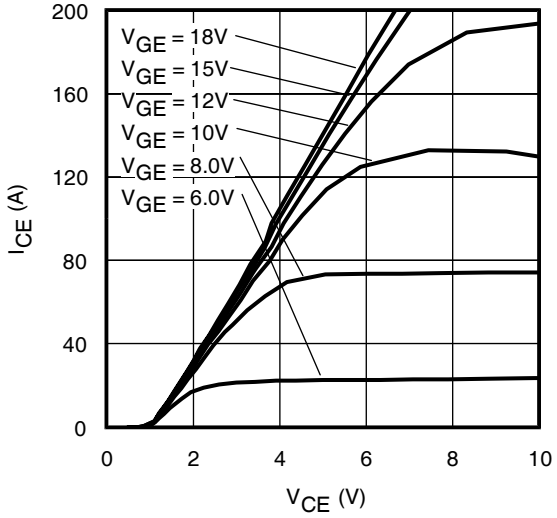


Fig 1. Typical Output Characteristics @ 25°C

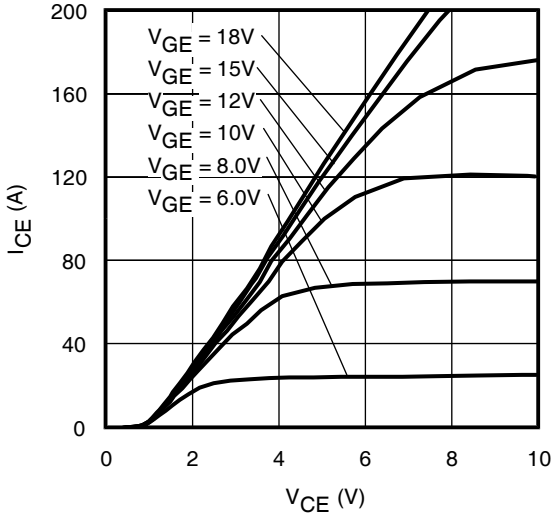


Fig 2. Typical Output Characteristics @ 75°C

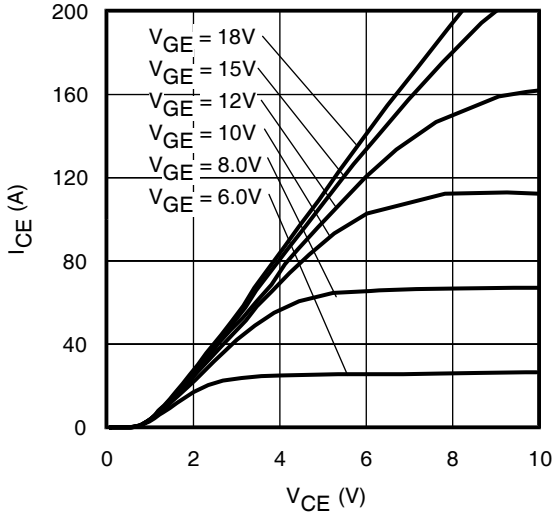


Fig 3. Typical Output Characteristics @ 125°C

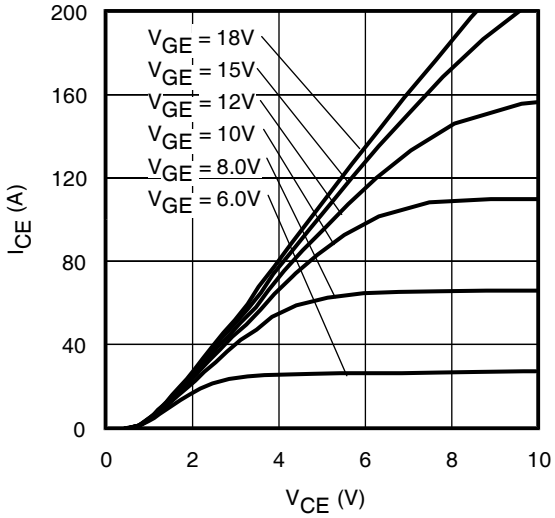


Fig 4. Typical Output Characteristics @ 150°C

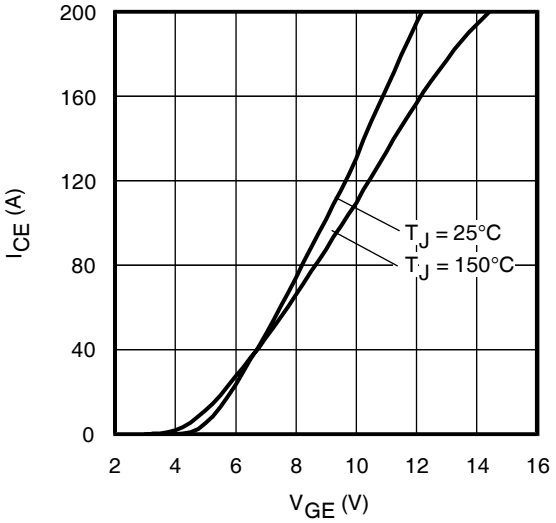


Fig 5. Typical Transfer Characteristics

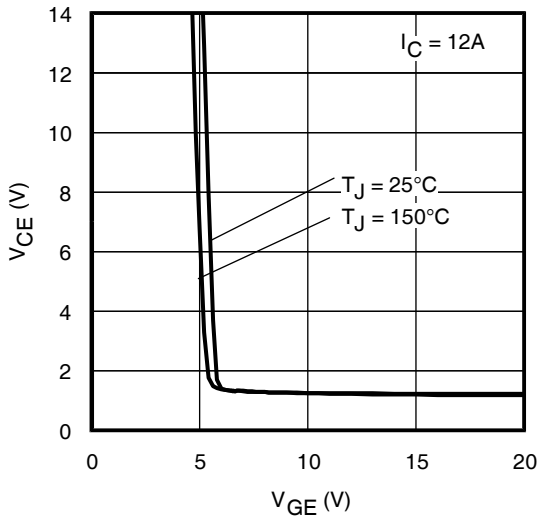


Fig 6. $V_{CE(ON)}$ vs. Gate Voltage

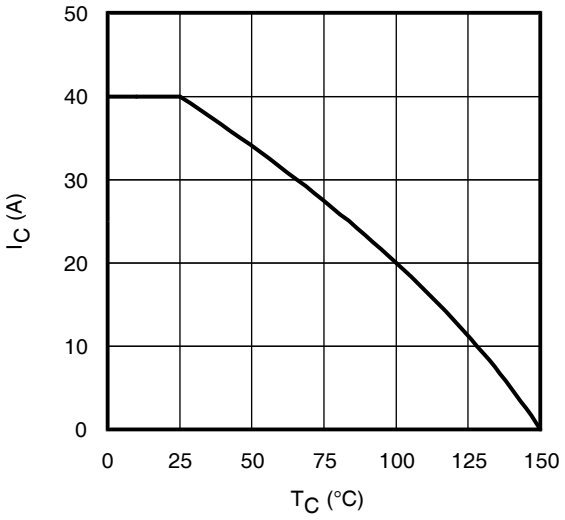


Fig 7. Maximum Collector Current vs. Case Temperature

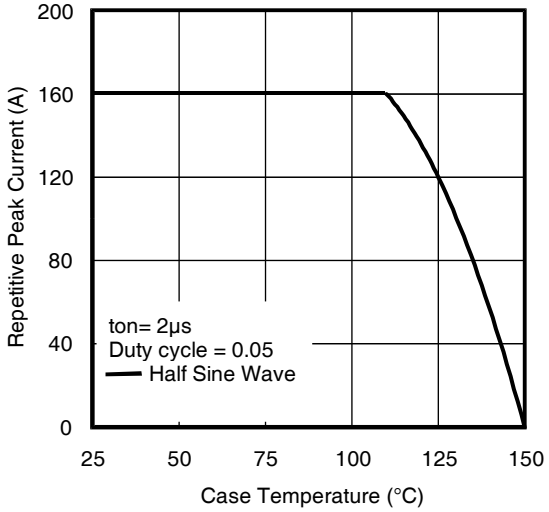


Fig 8. Typical Repetitive Peak Current vs. Case Temperature

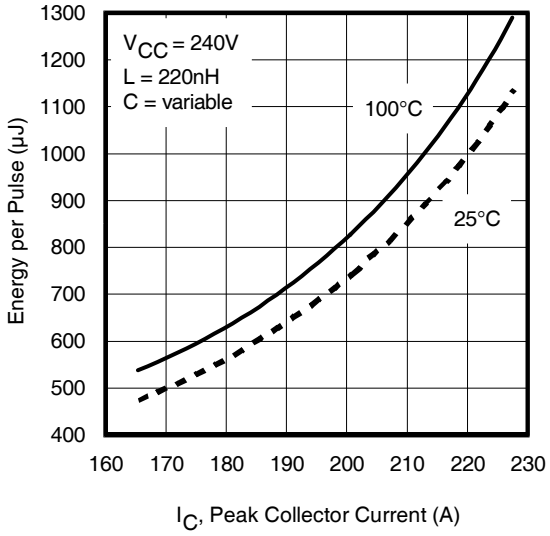


Fig 9. Typical E_{PULSE} vs. Collector Current

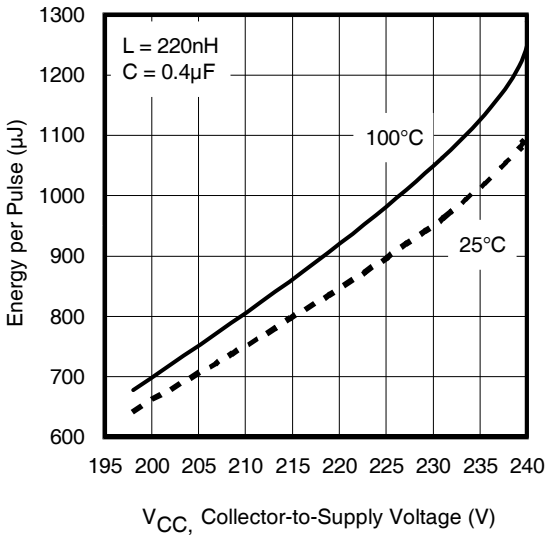


Fig 10. Typical E_{PULSE} vs. Collector-to-Supply Voltage

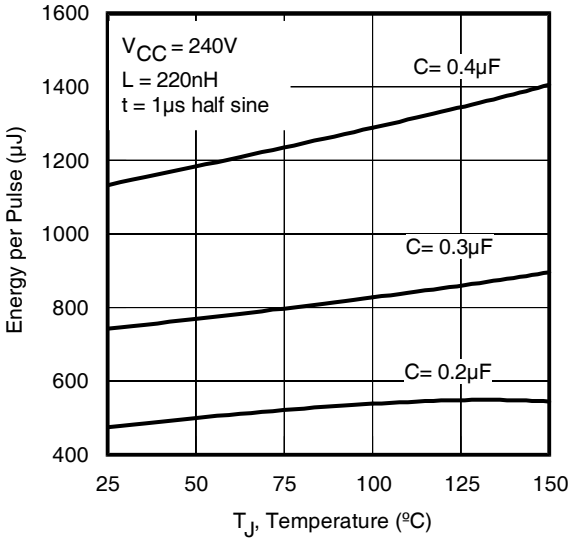


Fig 11. E_{PULSE} vs. Temperature

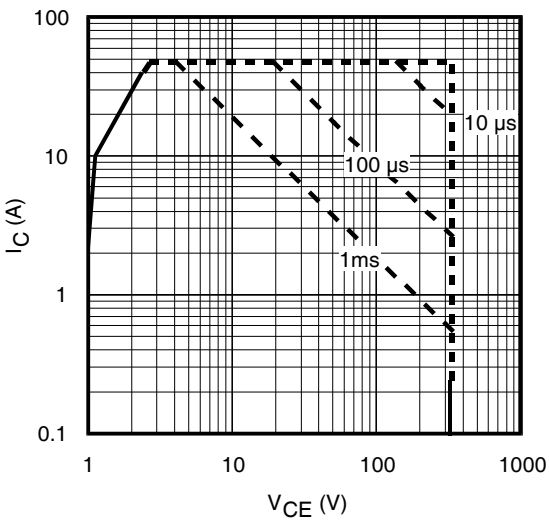


Fig 12. Forrward Bias Safe Operating Area

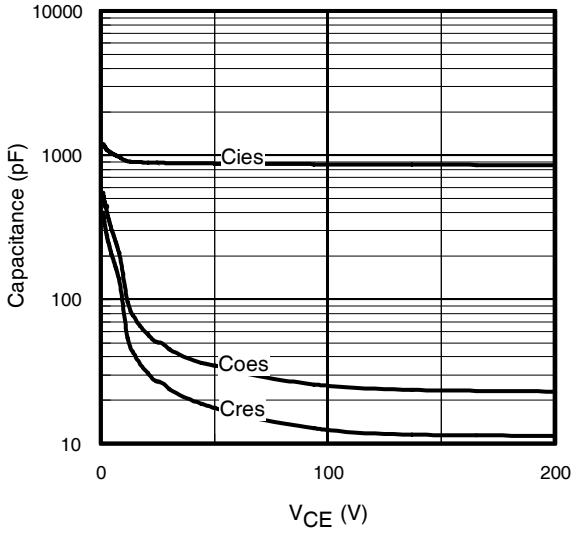


Fig 13. Typical Capacitance vs. Collector-to-Emitter Voltage

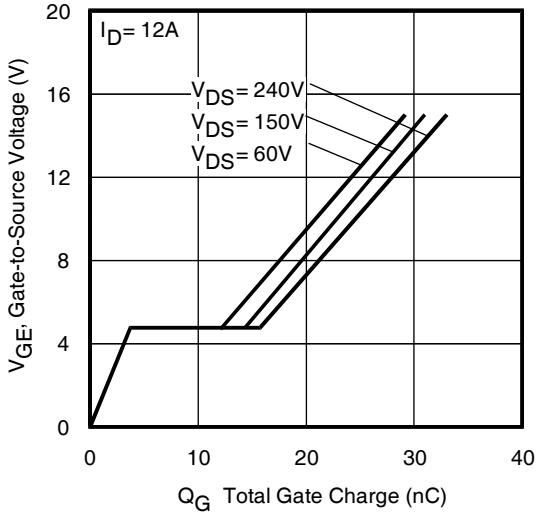


Fig 14. Typical Gate Charge vs. Gate-to-Emitter Voltage

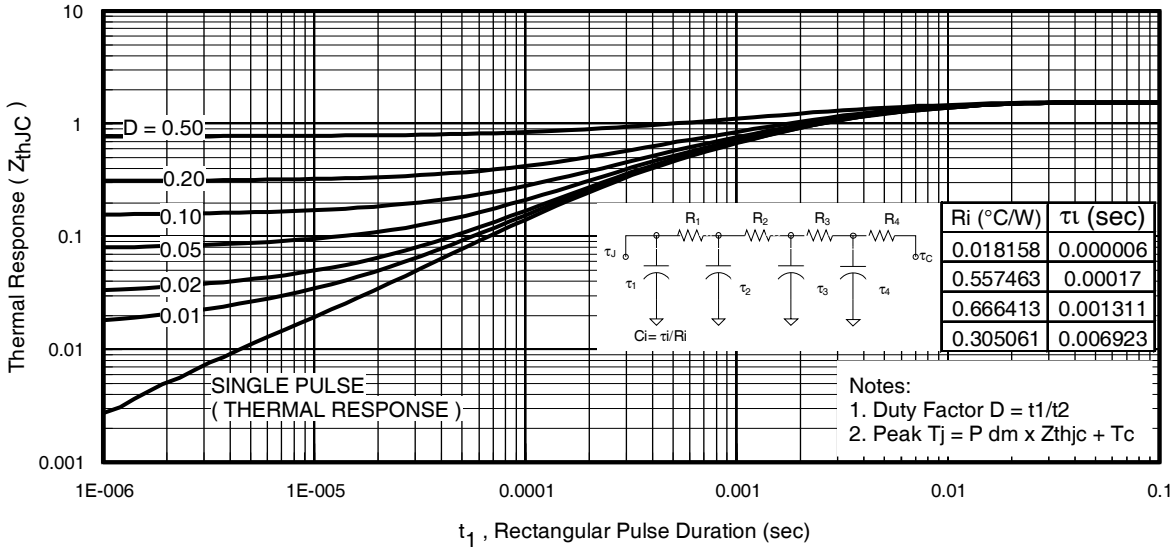


Fig 15. Maximum Effective Transient Thermal Impedance, Junction-to-Case

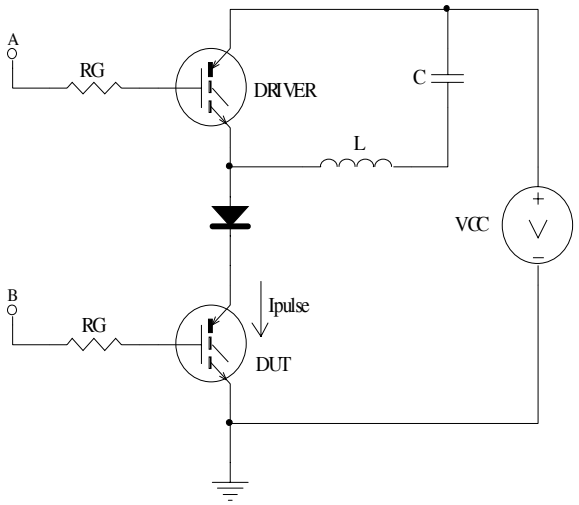


Fig 16a. t_{st} and E_{PULSE} Test Circuit

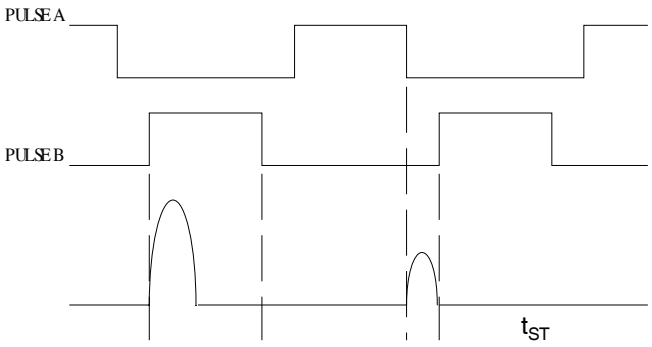


Fig 16b. t_{st} Test Waveforms

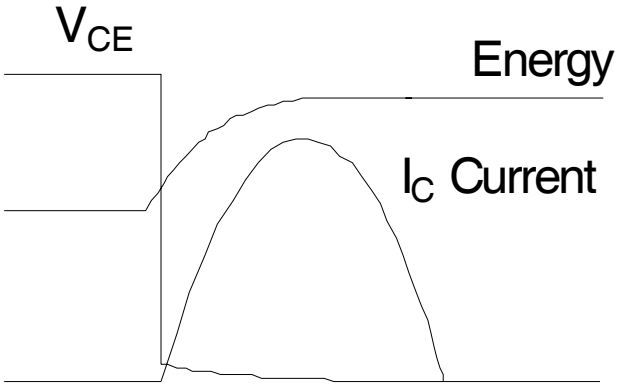


Fig 16c. E_{PULSE} Test Waveforms

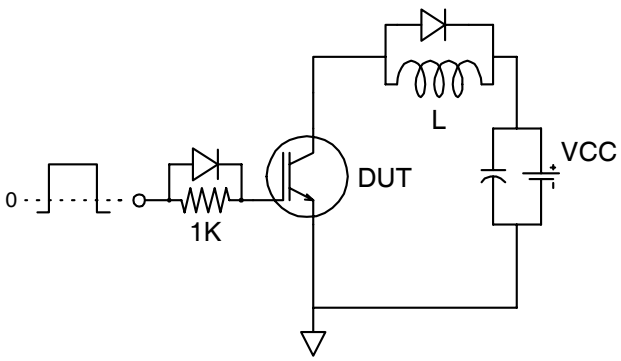
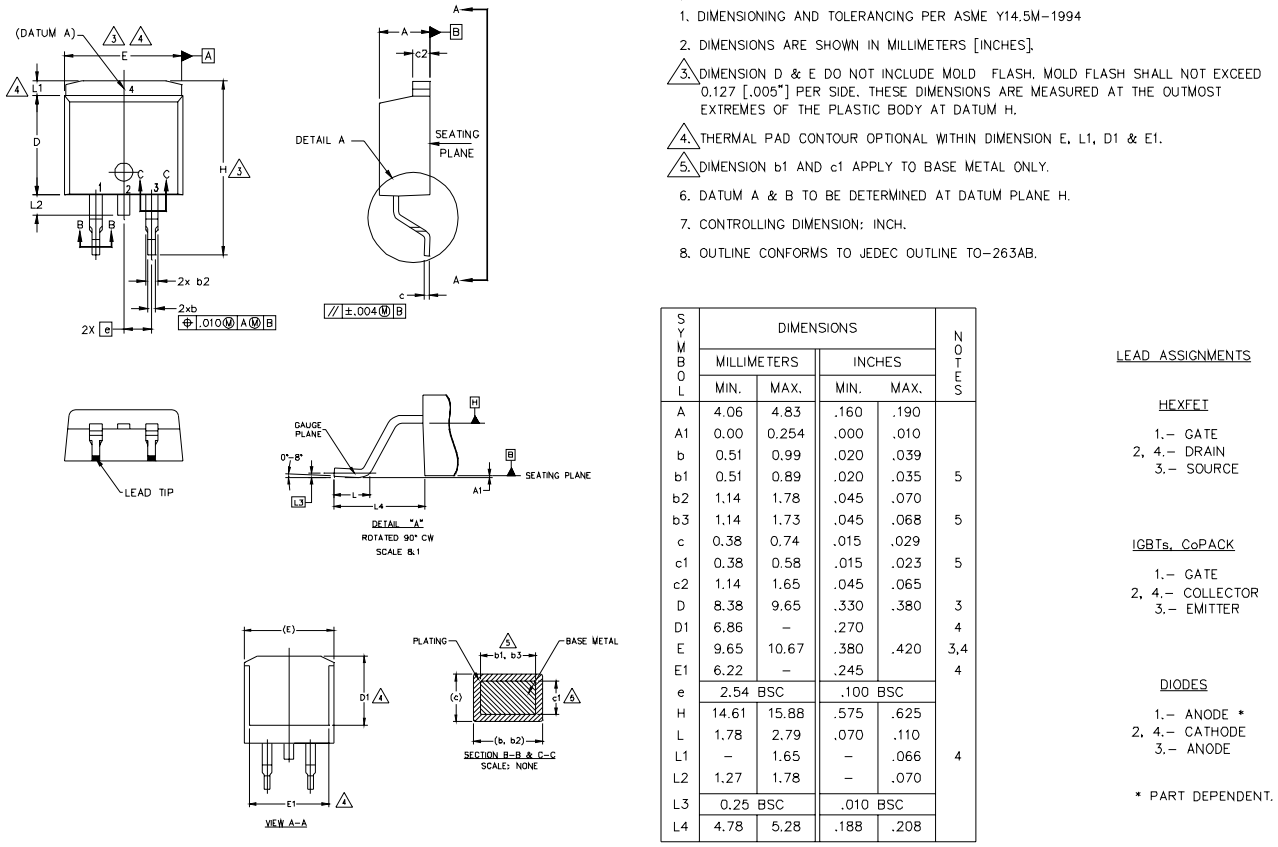


Fig. 17 - Gate Charge Circuit (turn-off)

D²Pak (TO-263AB) Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
5. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
6. DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
7. CONTROLLING DIMENSION: INCH.
8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-263AB.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	5
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86	–	.270		4
E	9.65	10.67	.380	.420	3,4
E1	6.22	–	.245		4
e	2.54 BSC		.100 BSC		
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1	–	1.65	–	.066	4
L2	1.27	1.78	–	.070	
L3	0.25 BSC		.010 BSC		
L4	4.78	5.28	.188	.208	

LEAD ASSIGNMENTS

HEXFET

1.- GATE
2, 4.- DRAIN
3.- SOURCE

IGBTs, CoPACK

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

DIODES

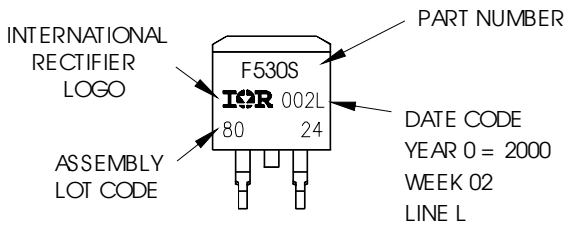
1.- ANODE *
2, 4.- CATHODE
3.- ANODE

* PART DEPENDENT.

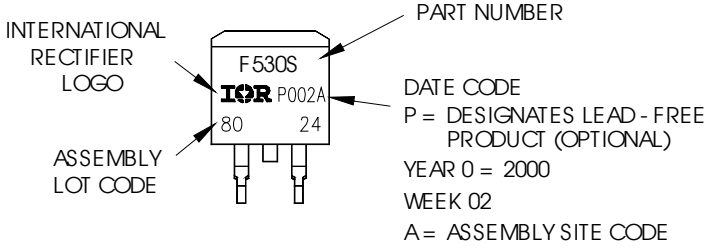
D²Pak (TO-263AB) Part Marking Information

EXAMPLE: THIS IS AN IRF530S WITH
LOT CODE 8024
ASSEMBLED ON WW 02, 2000
IN THE ASSEMBLY LINE "L"

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



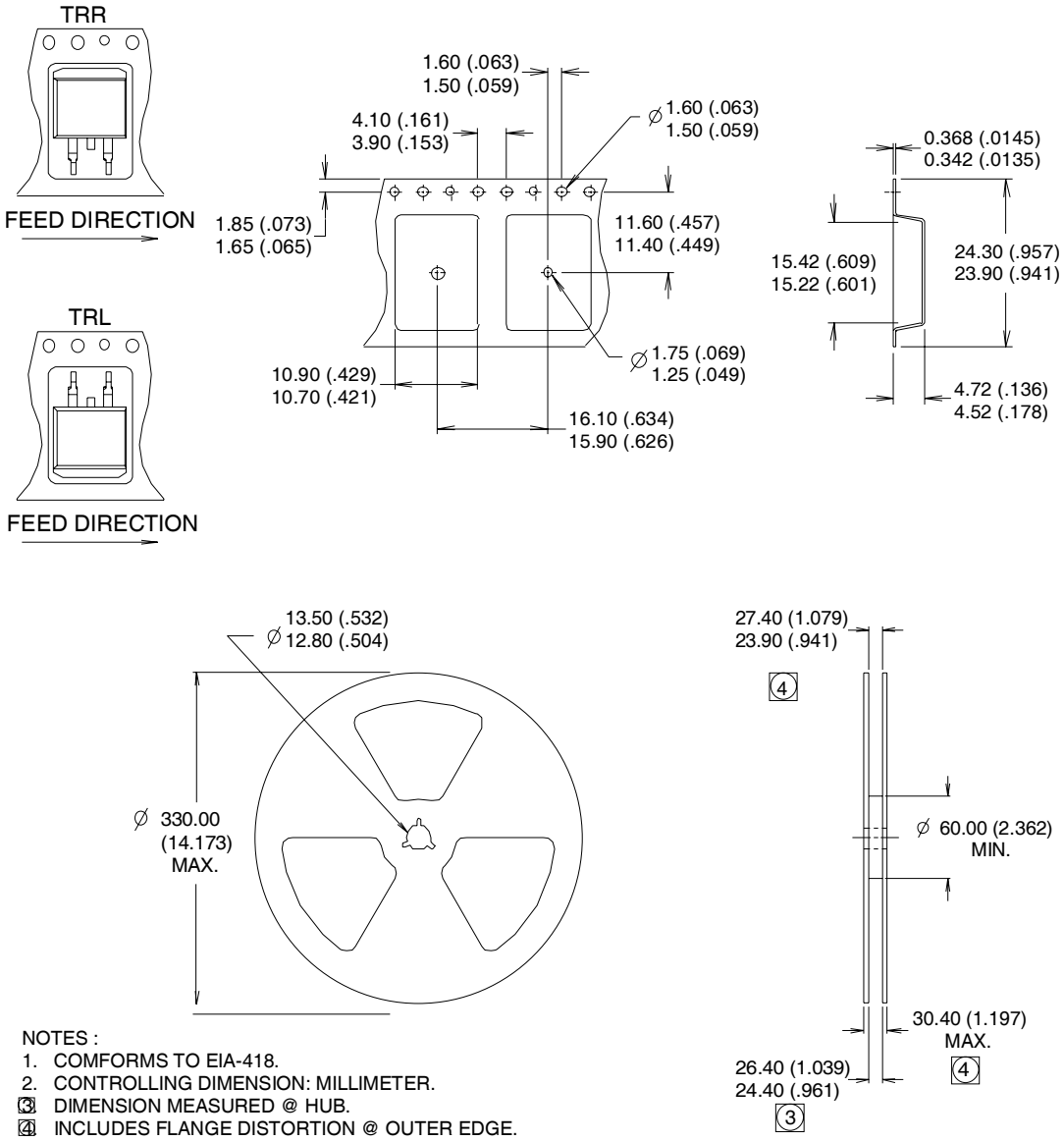
OR



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

D^{2}Pak (TO-263AB) Tape & Reel Information

Dimensions are shown in millimeters (inches)



NOTES :
1. COMFORMS TO EIA-418.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION MEASURED @ HUB.
4. INCLUDES FLANGE DISTORTION @ OUTER EDGE.

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.

International
IOR Rectifier

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