

Features

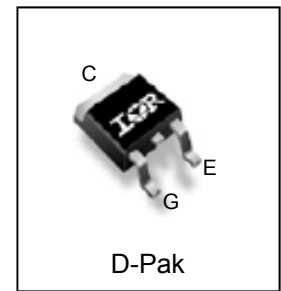
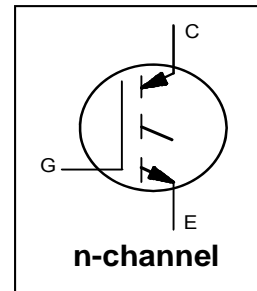
- Advanced Trench IGBT Technology
- Optimized for Sustain and Energy Recovery circuits in PDP applications
- Low $V_{CE(on)}$ and Energy per Pulse (E_{PULSE}^{TM}) for improved panel efficiency
- High repetitive peak current capability
- Lead Free package

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°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.

Key Parameters

$V_{CE\ min}$	360	V
$V_{CE(ON)\ typ. @ I_C = 20A}$	1.42	V
$I_{RP\ max @ T_C = 25^\circ C}$	276	A
$T_J\ max$	150	°C



G	C	E
Gate	Collector	Emitter

Ordering Information

Base part number	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
IRG7RA13UPbF	D-Pak	Tube	75	IRG7RA13UPbF
		Tape and Reel	2000	IRG7RA13UTRPbF
		Tape and Reel Left	3000	IRG7RA13UTRLPbF
		Tape and Reel Right	3000	IRG7RA13UTRRPbF

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{GE}	Gate-to-Emitter Voltage	±30	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current, $V_{GE} @ 15V$	40	A
$I_C @ T_C = 100^\circ C$	Continuous Collector, $V_{GE} @ 15V$	20	
$I_{RP} @ T_C = 25^\circ C$	Repetitive Peak Current ①	276	
$P_D @ T_C = 25^\circ C$	Power Dissipation	78	W
$P_D @ T_C = 100^\circ C$	Power Dissipation	31	
	Linear Derating Factor	0.63	W/°C
T_J T_{STG}	Operating Junction and Storage Temperature Range	-40 to + 150	°C
	Soldering Temperature for 10 seconds	300	

Thermal Resistance

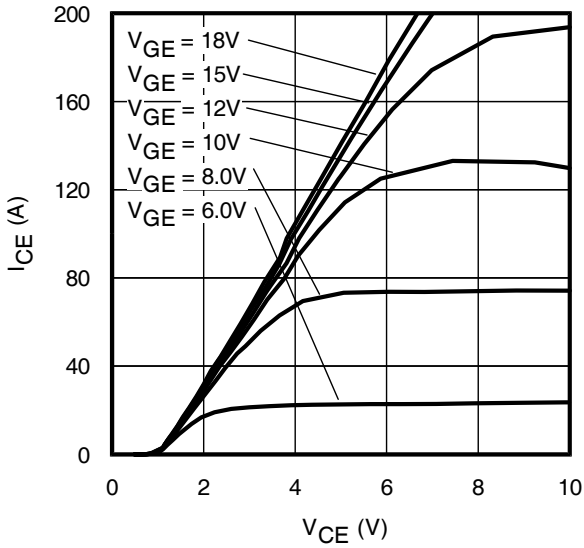
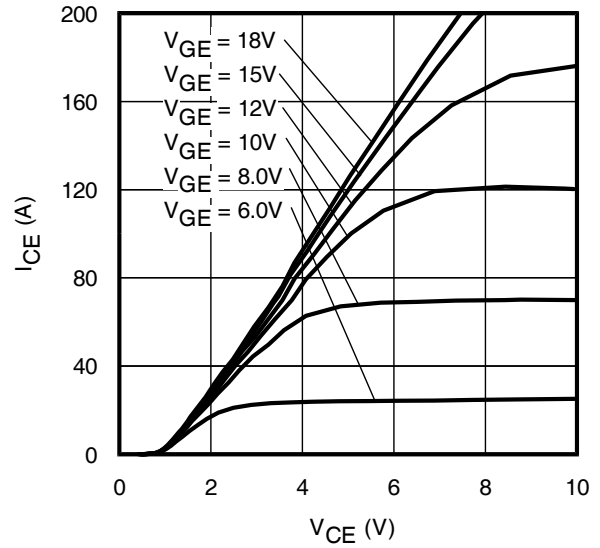
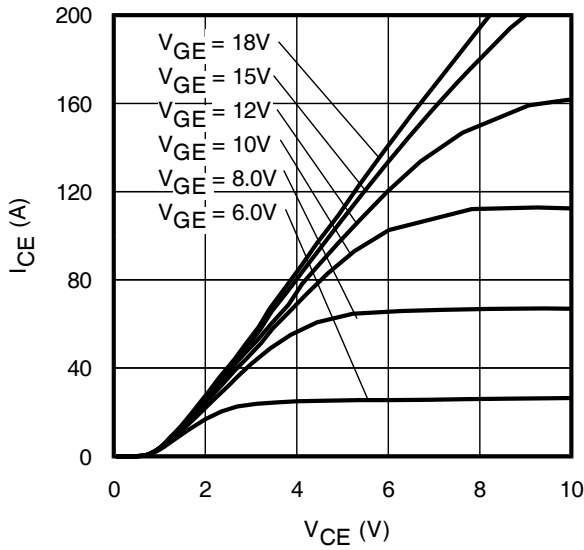
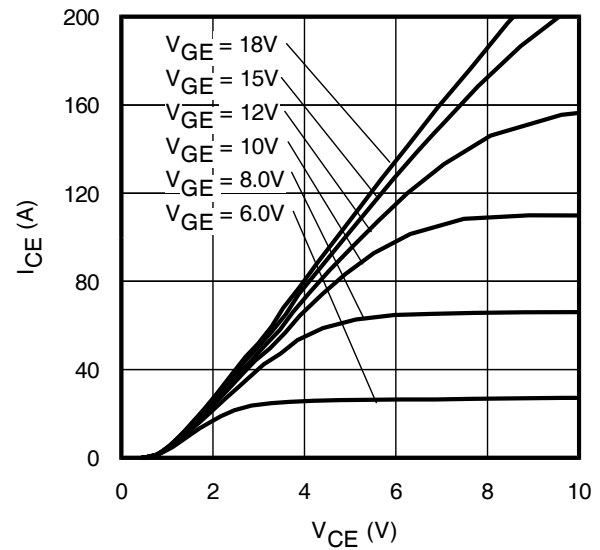
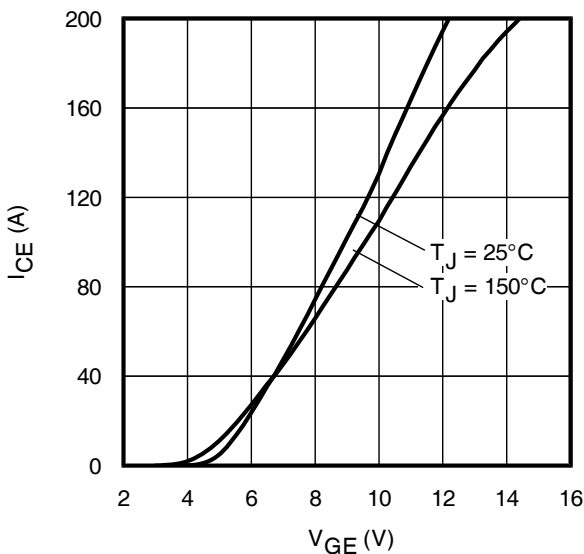
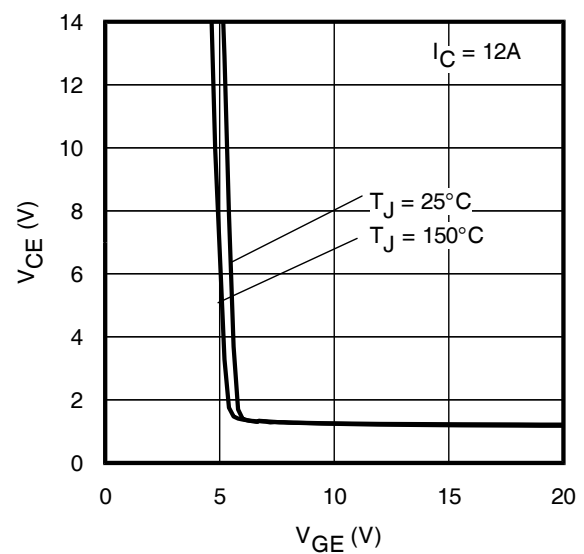
	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ②	—	1.6	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount) ④	—	50	

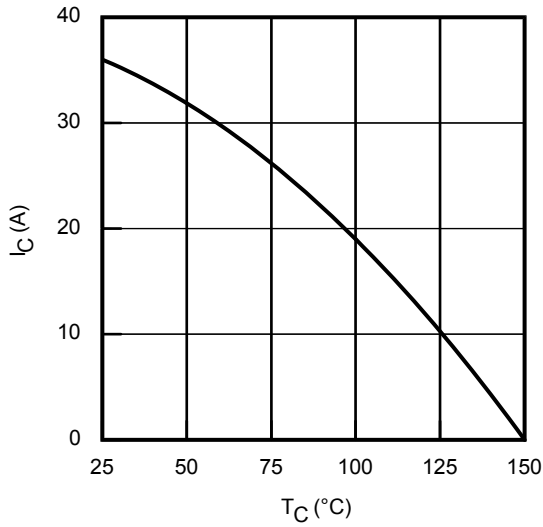
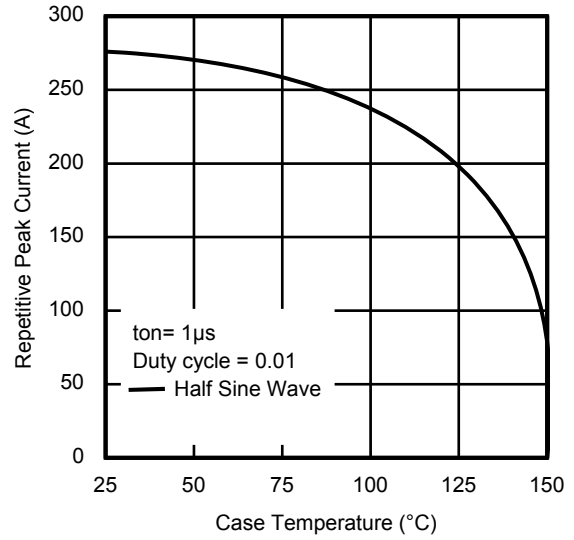
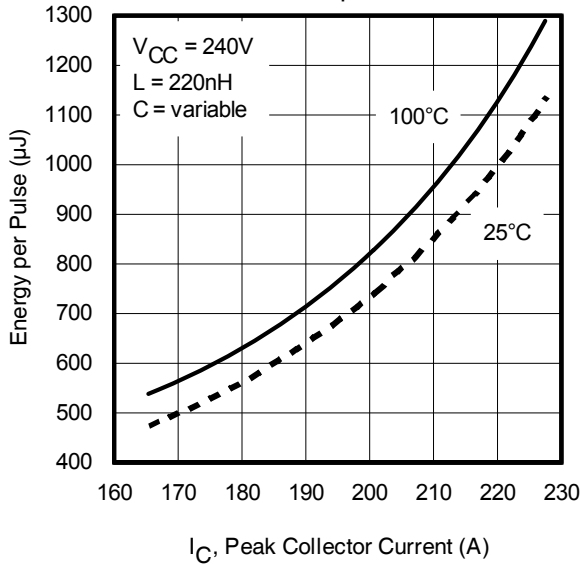
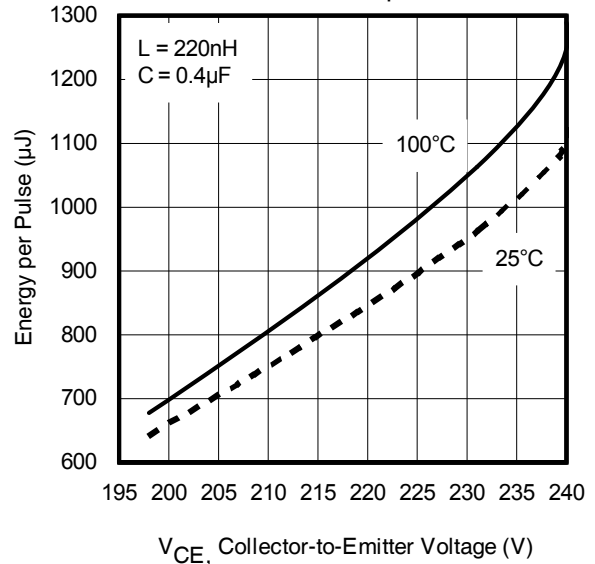
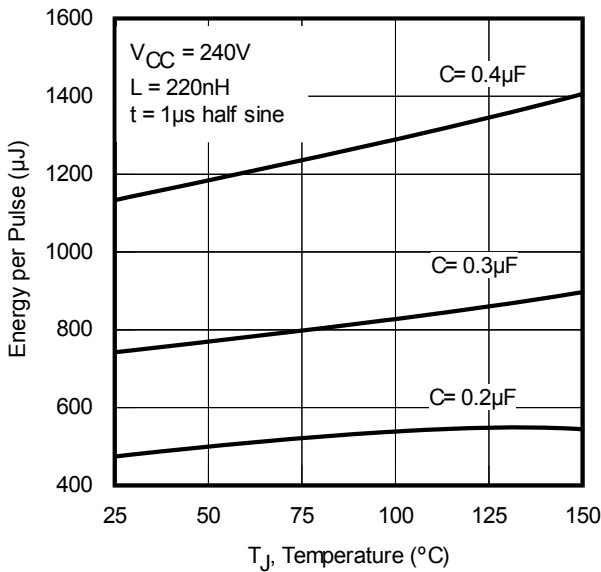
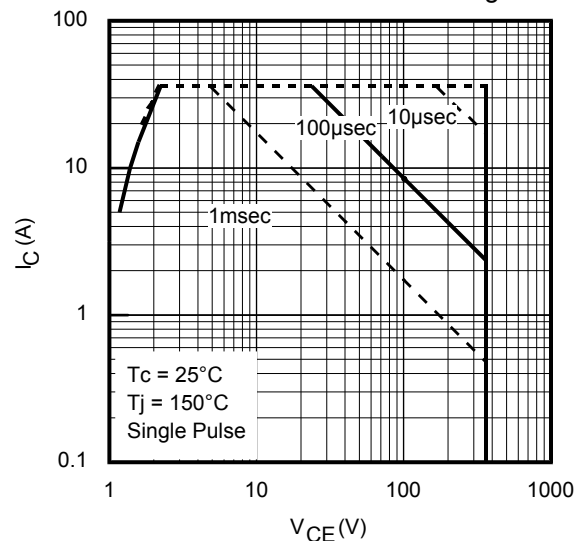
Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
BV _{CES}	Collector-to-Emitter Breakdown Voltage	360	—	—	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	—	1.26	1.52	V	V _{GE} = 15V, I _{CE} = 12A ③
		—	1.42	—		V _{GE} = 15V, I _{CE} = 20A ③
		—	1.84	—		V _{GE} = 15V, I _{CE} = 40A ③
		—	2.25	—		V _{GE} = 15V, I _{CE} = 60A ③
		—	1.48	—		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} = 360V, V _{GE} = 0V
		—	25	150		V _{CE} = 360V, V _{GE} = 0V, T _J = 125°C
		—	75	—		V _{CE} = 360V, 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} = 15V ③
Q _{gc}	Gate-to-Collector Charge	—	12	—		
t _{d(on)}	Turn-On delay time	—	11	—		
t _r	Rise time	—	13	—	ns	I _C = 12A, V _{CC} = 196V R _G = 10Ω, L = 210μH T _J = 25°C
t _{d(off)}	Turn-Off delay time	—	75	—		
t _f	Fall time	—	120	—		
t _{d(on)}	Turn-On delay time	—	11	—		
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 = 0.01, t_{on} = 1.0μsec.
- ② R_θ is measured at T_J approximately 90°C.
- ③ Pulse width ≤ 400μs; duty cycle ≤ 2%.
- ④ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.


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

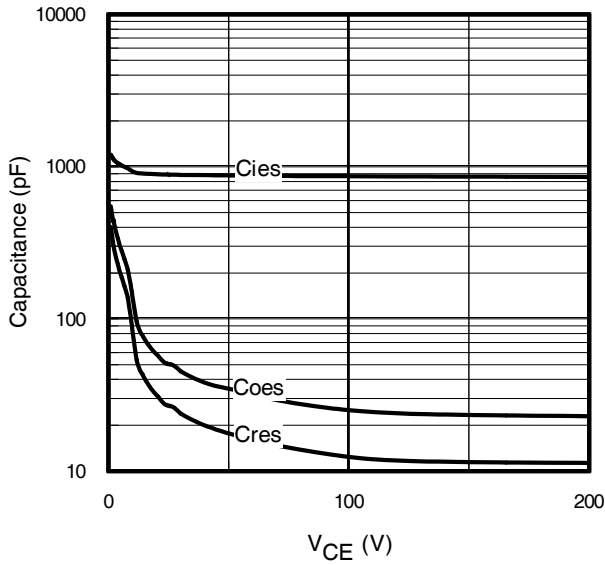


Fig 13. Typical Capacitance vs. Collector-to-Emitter Voltage

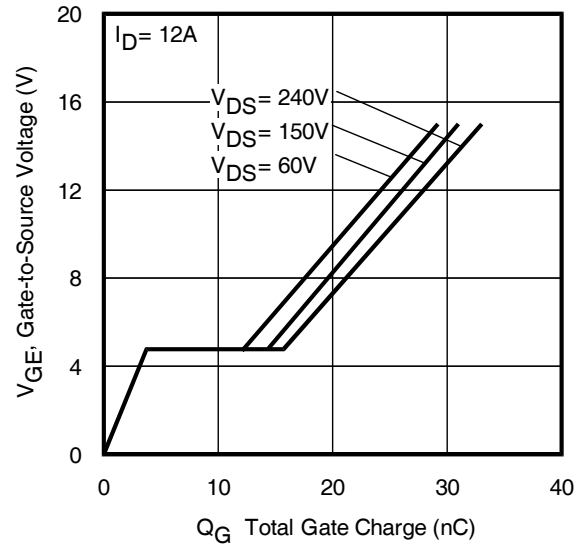


Fig 14. Typical Gate Charge vs. Gate-to-Source Voltage

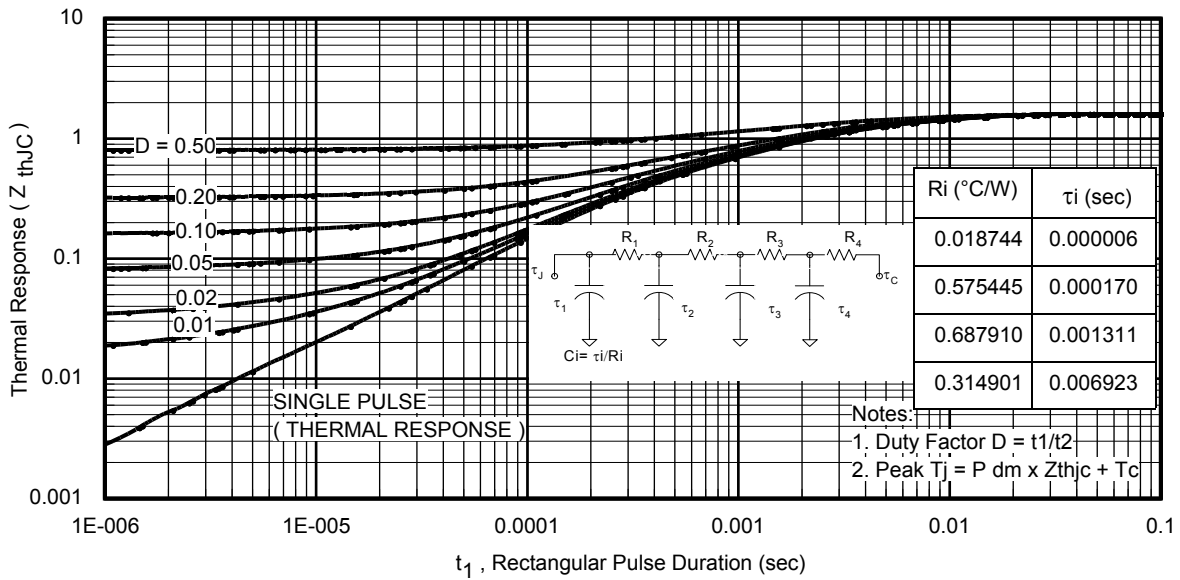


Fig 15. Maximum Effective Transient Thermal Impedance, Junction-to-Case

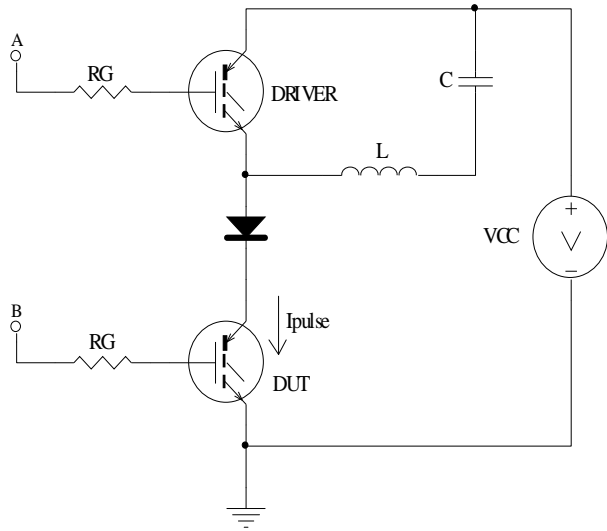


Fig 16a. t_{st} and E_{PULSE} Test Circuit

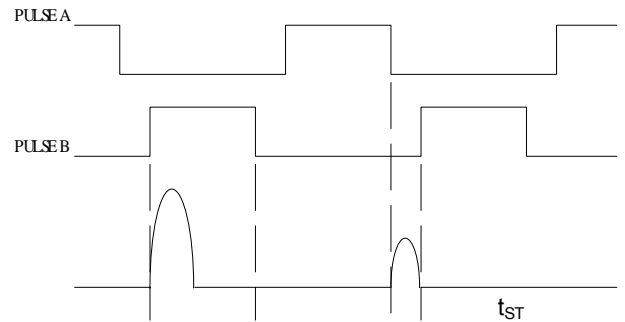


Fig 16b. t_{st} Test Waveforms

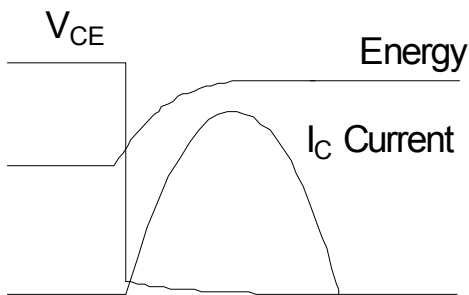


Fig 16c. E_{PULSE} Test Waveforms

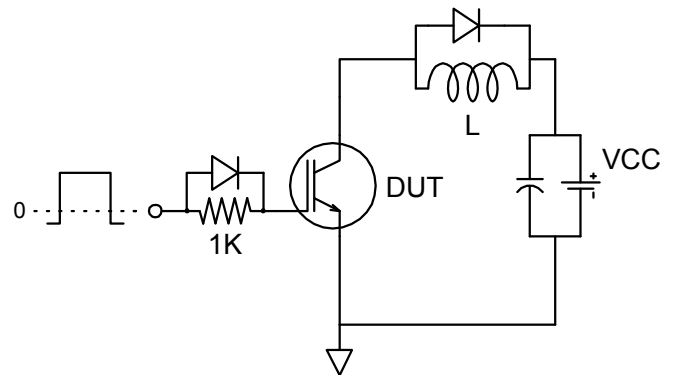
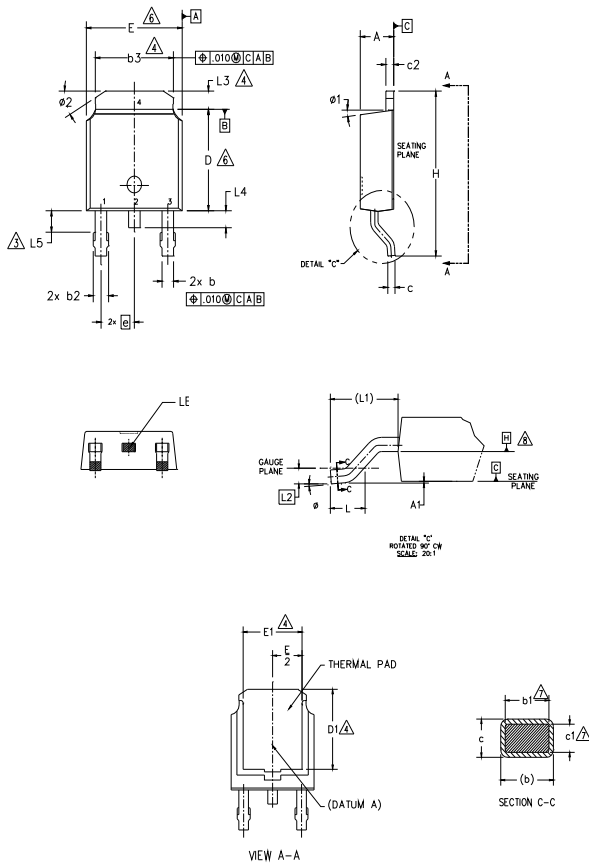


Fig 17. - Gate Charge Circuit (turn-off)

D-Pak (TO-252AA) Package Outline

Dimensions are shown in millimeters (inches)



NOTES:

- 1.- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
- 2.- DIMENSION ARE SHOWN IN INCHES [MILLIMETERS]
- 3.- LEAD DIMENSION UNCONTROLLED IN L5.
- 4.- DIMENSION D1, E1, L3 & b3 ESTABLISH A MINIMUM MOUNTING SURFACE FOR THERMAL PAD.
- 5.- SECTION C-C DIMENSIONS APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN .005 AND 0.10 [0.13 AND 0.25] FROM THE LEAD TIP.
- 6.- DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005 [0.13] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
- 7.- DIMENSION b1 & c1 APPLIED TO BASE METAL ONLY.
- 8.- DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
- 9.- OUTLINE CONFORMS TO JEDEC OUTLINE TO-252AA.

SYMBOL	DIMENSIONS				NOTES	
	MILLIMETERS		INCHES			
	MIN.	MAX.	MIN.	MAX.		
A	2.18	2.39	.086	.094	7	
A1	-	0.13	-	.005		
b	0.64	0.89	.025	.035		
b1	0.65	0.79	.025	.031		
b2	0.76	1.14	.030	.045		
b3	4.95	5.46	.195	.215		4
c	0.46	0.61	.018	.024		7
c1	0.41	0.56	.016	.022		
c2	0.46	0.89	.018	.035		
D	5.97	6.22	.235	.245		6
D1	5.21	-	.205	-	4	
E	6.35	6.73	.250	.265	6	
E1	4.32	-	.170	-	4	
e	2.29 BSC		.090 BSC		4	
H	9.40	10.41	.370	.410		
L	1.40	1.78	.055	.070		
L1	2.74 BSC		.108 REF.			
L2	0.51 BSC		.020 BSC		3	
L3	0.89	1.27	.035	.050		
L4	-	1.02	-	.040		
L5	1.14	1.52	.045	.060		
ø	0"	10"	0"	10"	1.- GATE 2.- DRAIN 3.- SOURCE 4.- DRAIN	
ø1	0"	15"	0"	15"		
ø2	25"	35"	25"	35"		

LEAD ASSIGNMENTS

HEXFET

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

IGBT & CoPAK

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

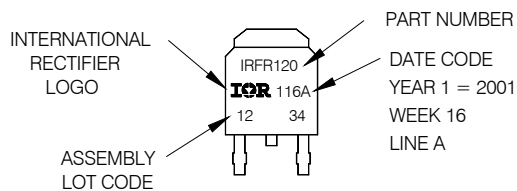
D-Pak (TO-252AA) Part Marking Information

Notes: This part marking information applies to devices produced after 02/26/2001

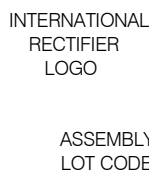
EXAMPLE: THIS IS AN IRFR120
WITH ASSEMBLY
LOT CODE 1234
ASSEMBLED ON WW 16, 2001
IN THE ASSEMBLY LINE "A"

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

"P̄" in assembly line position indicates "Lead-Free" qualification to the consumer-level



OR



PART NUMBER

DATE CODE
P = DESIGNATES LEAD-FREE PRODUCT (OPTIONAL)

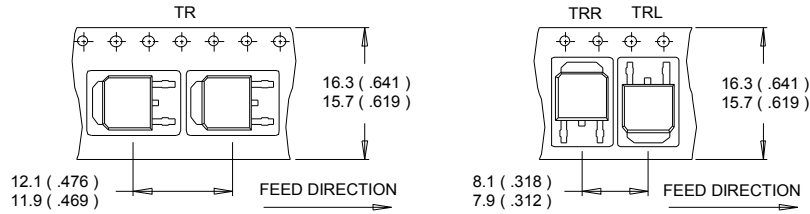
P̄ = DESIGNATES LEAD-FREE PRODUCT QUALIFIED TO THE CONSUMER LEVEL (OPTIONAL)

YEAR 1 = 2001
WEEK 16
A = ASSEMBLY SITE CODE

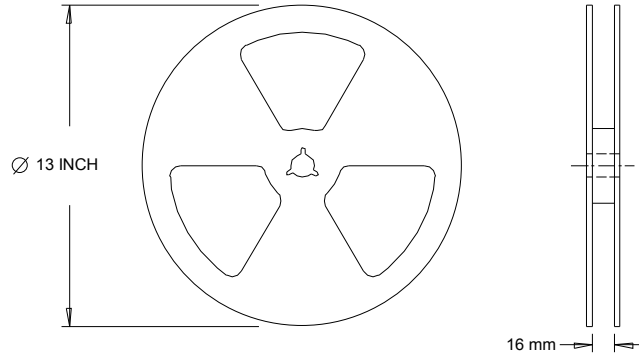
Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

D-Pak (TO-252AA) Tape & Reel Information

Dimensions are shown in millimeters (inches)



- NOTES :
1. CONTROLLING DIMENSION : MILLIMETER.
 2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES).
 3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



- NOTES :
1. OUTLINE CONFORMS TO EIA-481.

Qualification information[†]

Qualification level	Industrial ^{††} (per JEDEC JESD47F ^{†††} guidelines)	
Moisture Sensitivity Level	D-Pak	MSL1 (per JEDEC J-STD-020D ^{†††})
RoHS compliant	Yes	

† Qualification standards can be found at International Rectifier's web site: <http://www.irf.com/product-info/reliability/>

†† Higher qualification ratings may be available should the user have such requirements. Please contact your International Rectifier sales representative for further information: <http://www.irf.com/whoto-call/salesrep/>

††† Applicable version of JEDEC standard at the time of product release.