



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



Contact us

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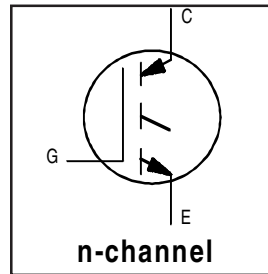
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Features

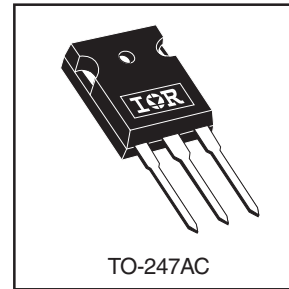
- High short circuit rating optimized for motor control, $t_{sc} = 10\mu s$, $V_{CC} = 720V$, $T_J = 125^\circ C$, $V_{GE} = 15V$
- Combines low conduction losses with high switching speed
- Latest generation design provides tighter parameter distribution and higher efficiency than previous generations



$V_{CES} = 1200V$
$V_{CE(on) typ.} = 2.74V$
@ $V_{GE} = 15V, I_C = 15A$

Benefits

- As a Freewheeling Diode we recommend our HEXFRED™ ultrafast, ultrasoft recovery diodes for minimum EMI / Noise and switching losses in the Diode and IGBT
- Latest generation 4 IGBT's offer highest power density motor controls possible
- This part replaces the IRGPH40K and IRGPH40M devices



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	30	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	15	
I_{CM}	Pulsed Collector Current ①	60	
I_{LM}	Clamped Inductive Load Current ②	60	
t_{sc}	Short Circuit Withstand Time	10	μs
V_{GE}	Gate-to-Emitter Voltage	± 20	V
E_{ARV}	Reverse Voltage Avalanche Energy ③	180	mJ
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	160	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	65	
T_J	Operating Junction and Storage Temperature Range	-55 to +150	$^\circ C$
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	
	Mounting torque, 6-32 or M3 screw.	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.77	$^\circ C/W$
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	—	40	
Wt	Weight	6 (0.21)	—	g (oz)

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

	Parameter	Min.	Typ.	Max.	Units	Conditions	
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	1200	—	—	V	$V_{GE} = 0\text{V}$, $I_C = 250\mu\text{A}$	
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage ④	18	—	—	V	$V_{GE} = 0\text{V}$, $I_C = 1.0\text{A}$	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.37	—	V/°C	$V_{GE} = 0\text{V}$, $I_C = 1.0\text{mA}$	
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	—	2.54	—	V	$V_{GE} = 15\text{V}$ See Fig.2, 5	
		—	2.74	3.4			$I_C = 10\text{A}$
		—	3.29	—			$I_C = 15\text{A}$
		—	2.53	—			$I_C = 30\text{A}$
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0		$V_{CE} = V_{GE}$, $I_C = 250\mu\text{A}$	
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-3.3	—	mV/°C	$V_{CE} = V_{GE}$, $I_C = 250\mu\text{A}$	
g_{fe}	Forward Transconductance ⑤	8.0	12	—	S	$V_{CE} = 100\text{V}$, $I_C = 15\text{A}$	
I_{CES}	Zero Gate Voltage Collector Current	—	—	250	μA	$V_{GE} = 0\text{V}$, $V_{CE} = 1200\text{V}$	
		—	—	2.0		$V_{GE} = 0\text{V}$, $V_{CE} = 10\text{V}$, $T_J = 25^\circ\text{C}$	
		—	—	3000		$V_{GE} = 0\text{V}$, $V_{CE} = 1200\text{V}$, $T_J = 150^\circ\text{C}$	
I_{GES}	Gate-to-Emitter Leakage Current	—	—	± 100	nA	$V_{GE} = \pm 20\text{V}$	

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge (turn-on)	—	94	140	nC	$I_C = 15\text{A}$ $V_{CC} = 400\text{V}$ $V_{GE} = 15\text{V}$ See Fig.8
Q_{ge}	Gate - Emitter Charge (turn-on)	—	14	22		
Q_{gc}	Gate - Collector Charge (turn-on)	—	37	55		
$t_{d(on)}$	Turn-On Delay Time	—	30	—	ns	$T_J = 25^\circ\text{C}$ $I_C = 15\text{A}$, $V_{CC} = 960\text{V}$ $V_{GE} = 15\text{V}$, $R_G = 10\Omega$ Energy losses include "tail" See Fig. 9,10,14
t_r	Rise Time	—	22	—		
$t_{d(off)}$	Turn-Off Delay Time	—	200	300		
t_f	Fall Time	—	150	230		
E_{on}	Turn-On Switching Loss	—	0.73	—	mJ	See Fig. 10,11,14
E_{off}	Turn-Off Switching Loss	—	1.66	—		
E_{ts}	Total Switching Loss	—	2.39	2.9		
t_{sc}	Short Circuit Withstand Time	10	—	—	μs	$V_{CC} = 720\text{V}$, $T_J = 125^\circ\text{C}$ $V_{GE} = 15\text{V}$, $R_G = 10\Omega$
$t_{d(on)}$	Turn-On Delay Time	—	29	—	ns	$T_J = 150^\circ\text{C}$, $I_C = 15\text{A}$, $V_{CC} = 960\text{V}$ $V_{GE} = 15\text{V}$, $R_G = 10\Omega$ Energy losses include "tail" See Fig. 10,11,14
t_r	Rise Time	—	24	—		
$t_{d(off)}$	Turn-Off Delay Time	—	870	—		
t_f	Fall Time	—	330	—		
E_{ts}	Total Switching Loss	—	4.93	—	mJ	$T_J = 25^\circ\text{C}$, $V_{GE} = 15\text{V}$, $R_G = 10\Omega$ $I_C = 10\text{A}$, $V_{CC} = 960\text{V}$ Energy losses include "tail"
E_{on}	Turn-On Switching Loss	—	0.37	—		
E_{off}	Turn-Off Switching Loss	—	0.89	—		
E_{ts}	Total Switching Loss	—	1.26	—		
L_E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package
C_{ies}	Input Capacitance	—	1600	—	pF	$V_{GE} = 0\text{V}$ $V_{CC} = 30\text{V}$ $f = 1.0\text{MHz}$ See Fig. 7
C_{oes}	Output Capacitance	—	77	—		
C_{res}	Reverse Transfer Capacitance	—	26	—		

Details of note ① through ⑤ are on the last page

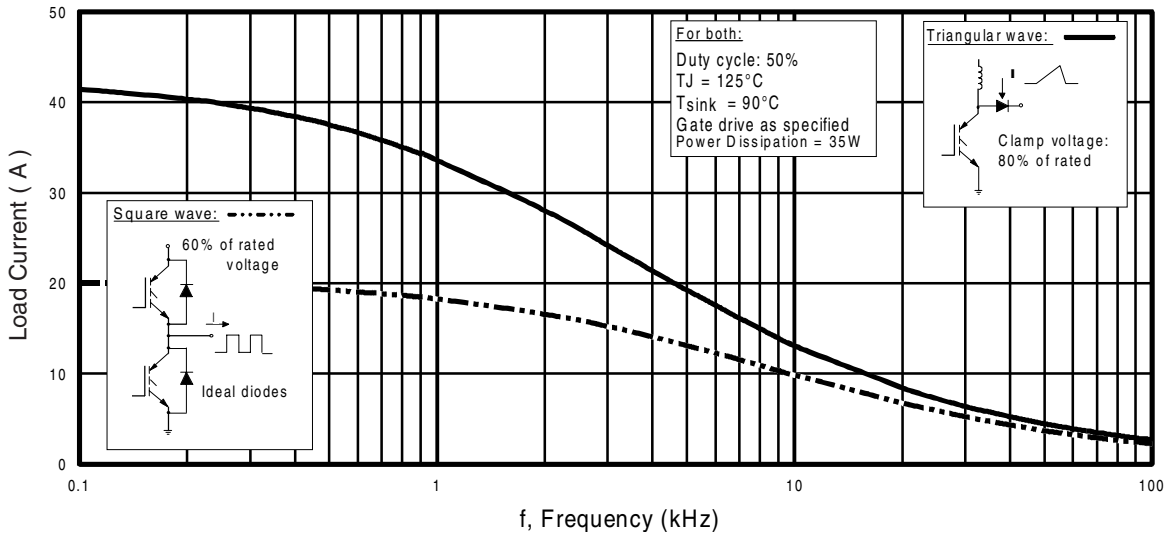


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = I_{RMS} of fundamental)

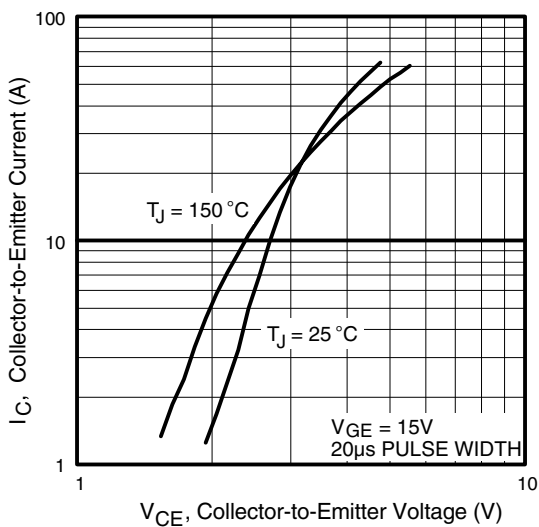


Fig. 2 - Typical Output Characteristics

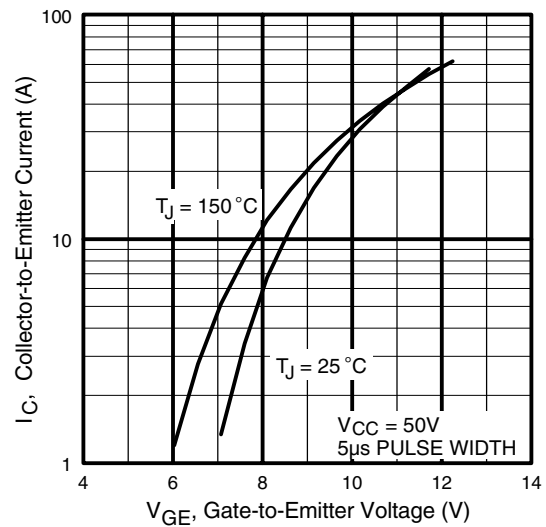


Fig. 3 - Typical Transfer Characteristics

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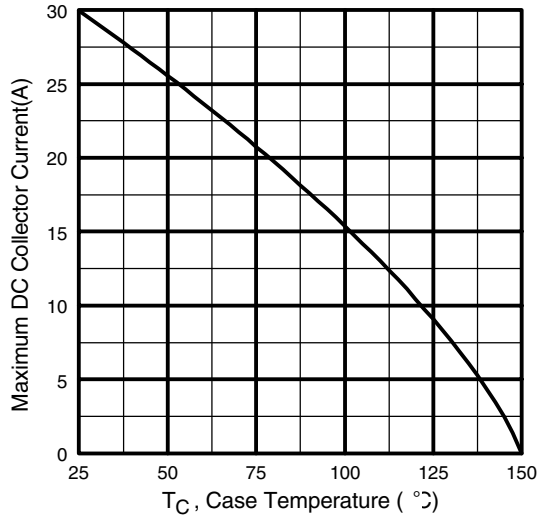


Fig. 4 - Maximum Collector Current vs. Case Temperature

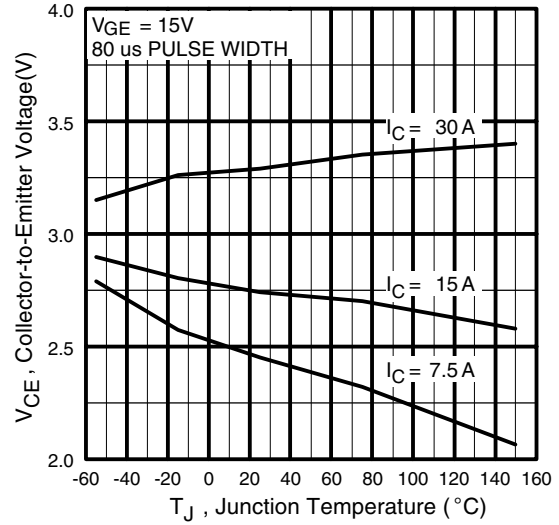


Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

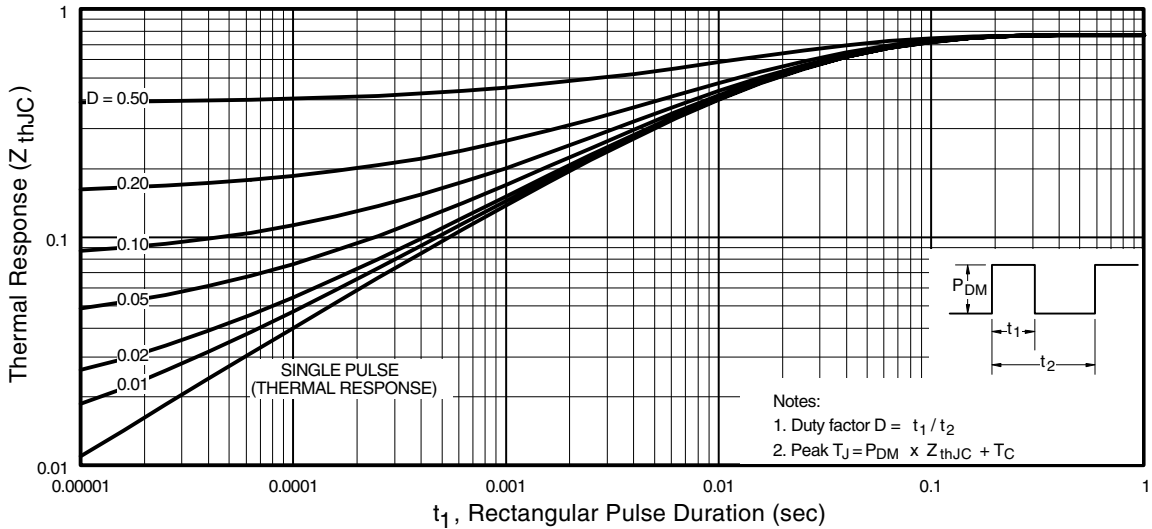


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

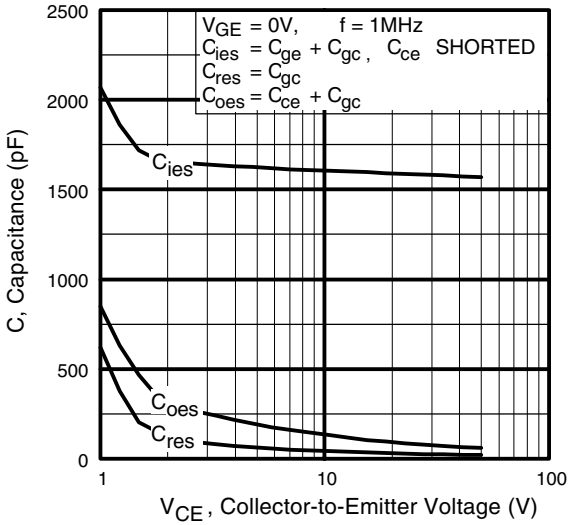


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

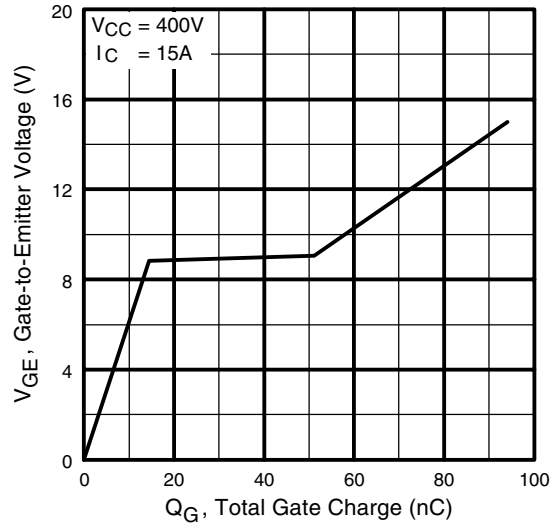


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

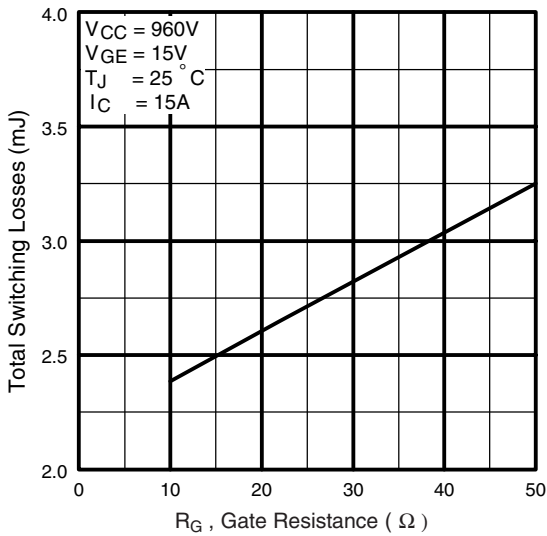


Fig. 9 - Typical Switching Losses vs. Gate Resistance

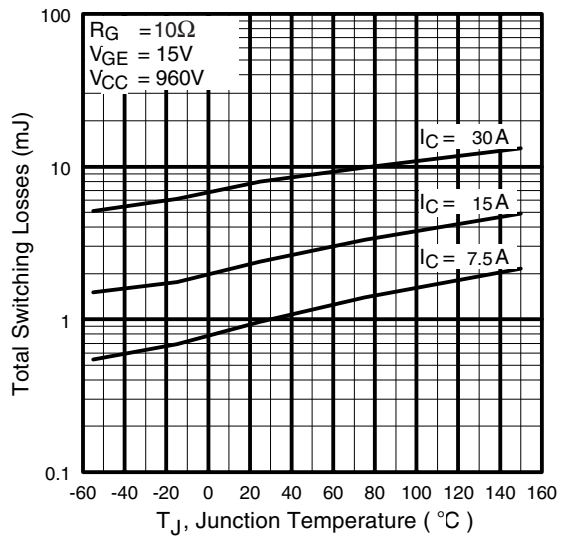


Fig. 10 - Typical Switching Losses vs. Junction Temperature

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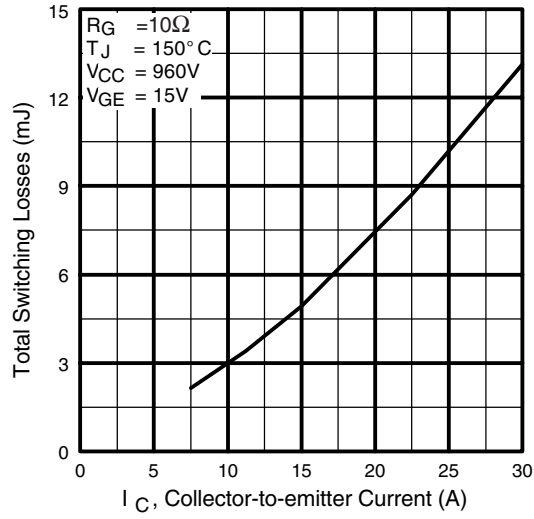


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

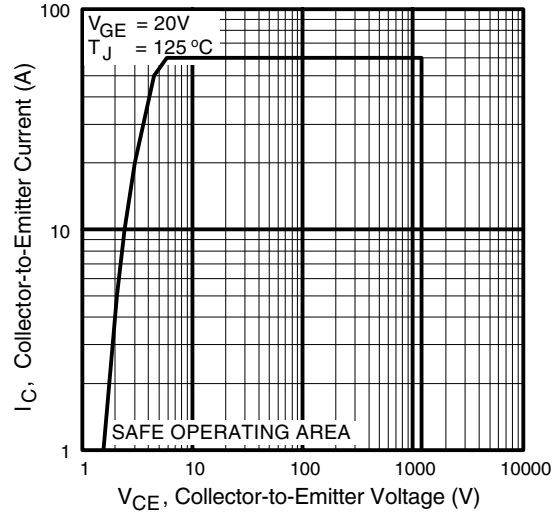


Fig. 12 - Turn-Off SOA

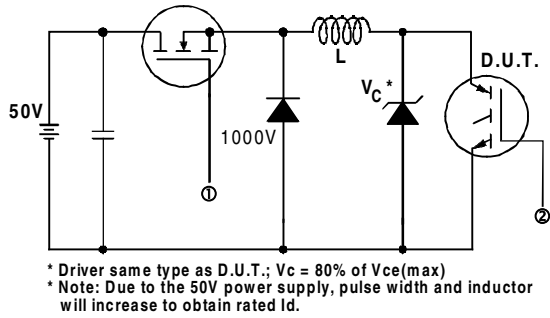


Fig. 13a - Clamped Inductive Load Test Circuit

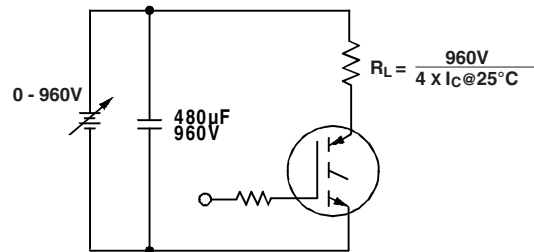


Fig. 13b - Pulsed Collector Current Test Circuit

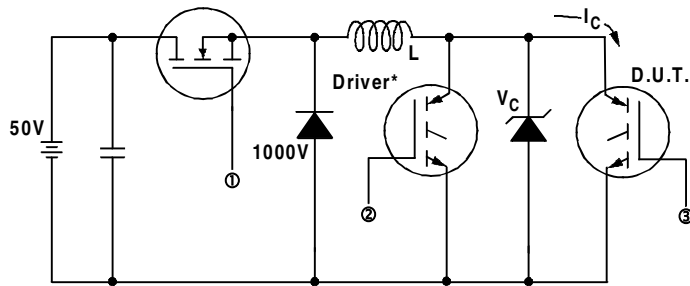


Fig. 14a - Switching Loss Test Circuit

* Driver same type as D.U.T., VC = 960V

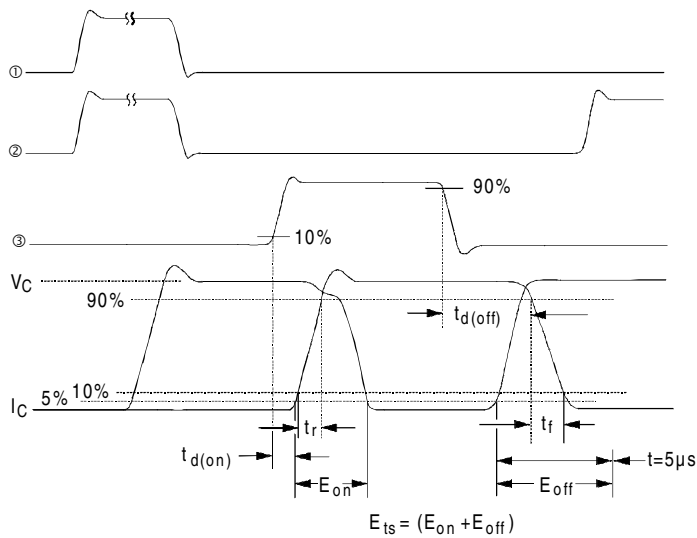


Fig. 14b - Switching Loss Waveforms

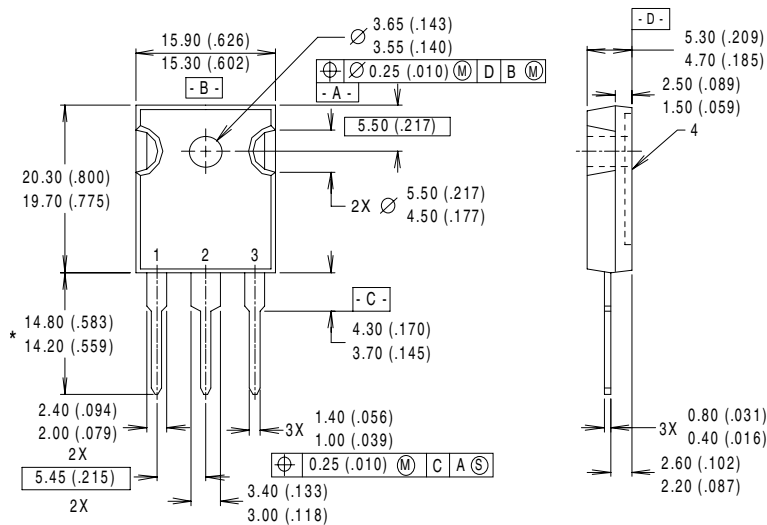
IRG4PH40K

International
IR Rectifier

Notes:

- ① Repetitive rating; $V_{GE} = 20V$, pulse width limited by max. junction temperature. (See fig. 13b)
- ② $V_{CC} = 80\%(V_{CES})$, $V_{GE} = 20V$, $L = 10\mu H$, $R_G = 10\Omega$, (See fig. 13a)
- ③ Repetitive rating; pulse width limited by maximum junction temperature.
- ④ Pulse width $\leq 80\mu s$; duty factor $\leq 0.1\%$.
- ⑤ Pulse width $5.0\mu s$, single shot.

Case Outline and Dimensions — TO-247AC



NOTES:

- 1 DIMENSIONS & TOLERANCING PER ANSI Y14.5M, 1982.
- 2 CONTROLLING DIMENSION : INCH.
- 3 DIMENSIONS ARE SHOWN MILLIMETERS (INCHES).
- 4 CONFORMS TO JEDEC OUTLINE TO-247AC.

LEAD ASSIGNMENTS

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

* LONGER LEADED (20mm)
VERSION AVAILABLE (TO-247AD)
TO ORDER ADD "E" SUFFIX
TO PART NUMBER

CONFORMS TO JEDEC OUTLINE TO-247AC (TO-3P)

Dimensions in Millimeters and (Inches)

International
IR Rectifier

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IR JAPAN: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo 171 Tel: 81 (0)3 3983 0086
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Data and specifications subject to change without notice. 6/00

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