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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.

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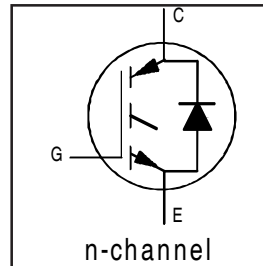
IRG4PH50KDPbF

INSULATED GATE BIPOLAR TRANSISTOR WITH
ULTRAFAST SOFT RECOVERY DIODE

Short Circuit Rated
UltraFast IGBT

Features

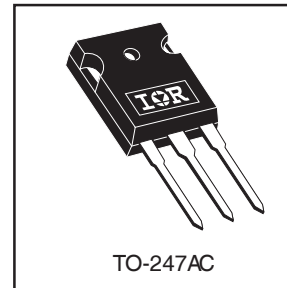
- High short circuit rating optimized for motor control, $t_{sc} = 10\mu s$, $V_{CC} = 720V$, $T_J = 125^\circ C$, $V_{GE} = 15V$
- Combines low conduction losses with high switching speed
- Tighter parameter distribution and higher efficiency than previous generations
- IGBT co-packaged with HEXFRED™ ultrafast, ultrasoft recovery antiparallel diodes
- Lead-Free



$V_{CES} = 1200V$
$V_{CE(on) typ.} = 2.77V$
@ $V_{GE} = 15V, I_C = 24A$

Benefits

- Latest generation 4 IGBT's offer highest power density motor controls possible
- HEXFRED™ diodes optimized for performance with IGBTs. Minimized recovery characteristics reduce noise, EMI and switching losses
- This part replaces the IRGPH50KD2 and IRGPH50MD2 products
- For hints see design tip 97003



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	45	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	24	
I_{CM}	Pulsed Collector Current ①	90	
I_{LM}	Clamped Inductive Load Current ②	90	
$I_F @ T_C = 100^\circ C$	Diode Continuous Forward Current	16	
I_{FM}	Diode Maximum Forward Current	90	
t_{sc}	Short Circuit Withstand Time	10	μs
V_{GE}	Gate-to-Emitter Voltage	± 20	V
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	200	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	78	
T_J	Operating Junction and	-55 to +150	$^\circ C$
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	
	Mounting Torque, 6-32 or M3 Screw.	10 lbf•in (1.1 N•m)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case - IGBT	—	—	0.64	$^\circ C/W$
$R_{\theta JC}$	Junction-to-Case - Diode	—	—	0.83	
$R_{\theta CS}$	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)

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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 ^③	1200	—	—	V	$V_{GE} = 0V, I_C = 250\mu A$
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.91	—	V/°C	$V_{GE} = 0V, I_C = 1.0mA$
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	2.77	3.5	V	$I_C = 24A$ $V_{GE} = 15V$ $I_C = 45A$ See Fig. 2, 5 $I_C = 24A, T_J = 150^\circ\text{C}$
		—	3.28	—		
		—	2.54	—		
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0		$V_{CE} = V_{GE}, I_C = 250\mu A$
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-10	—	mV/°C	$V_{CE} = V_{GE}, I_C = 250\mu A$
g_{fe}	Forward Transconductance ^④	13	19	—	S	$V_{CE} = 100V, I_C = 24A$
I_{CES}	Zero Gate Voltage Collector Current	—	—	250	μA	$V_{GE} = 0V, V_{CE} = 1200V$
		—	—	6500		$V_{GE} = 0V, V_{CE} = 1200V, T_J = 150^\circ\text{C}$
V_{FM}	Diode Forward Voltage Drop	—	2.5	3.5	V	$I_C = 16A$ See Fig. 13 $I_C = 16A, T_J = 150^\circ\text{C}$
		—	2.1	3.0		
I_{GES}	Gate-to-Emitter Leakage Current	—	—	± 100	nA	$V_{GE} = \pm 20V$

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge (turn-on)	—	180	270	nC	$I_C = 24A$ $V_{CC} = 400V$ See Fig.8 $V_{GE} = 15V$
Q_{ge}	Gate - Emitter Charge (turn-on)	—	25	38		
Q_{gc}	Gate - Collector Charge (turn-on)	—	70	110		
$t_{d(on)}$	Turn-On Delay Time	—	87	—	ns	$T_J = 25^\circ\text{C}$ $I_C = 24A, V_{CC} = 800V$ $V_{GE} = 15V, R_G = 5.0\Omega$
t_r	Rise Time	—	100	—		
$t_{d(off)}$	Turn-Off Delay Time	—	140	300		
t_f	Fall Time	—	200	300		
E_{on}	Turn-On Switching Loss	—	3.83	—	mJ	Energy losses include "tail" and diode reverse recovery See Fig. 9,10,18
E_{off}	Turn-Off Switching Loss	—	1.90	—		
E_{ts}	Total Switching Loss	—	5.73	7.9		
t_{sc}	Short Circuit Withstand Time	10	—	—	μs	$V_{CC} = 720V, T_J = 125^\circ\text{C}$ $V_{GE} = 15V, R_G = 5.0\Omega$
$t_{d(on)}$	Turn-On Delay Time	—	67	—	ns	$T_J = 150^\circ\text{C}$, See Fig. 10,11,18 $I_C = 24A, V_{CC} = 800V$ $V_{GE} = 15V, R_G = 5.0\Omega$, Energy losses include "tail" and diode reverse recovery
t_r	Rise Time	—	72	—		
$t_{d(off)}$	Turn-Off Delay Time	—	310	—		
t_f	Fall Time	—	390	—		
E_{ts}	Total Switching Loss	—	8.36	—	mJ	
L_E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package
C_{ies}	Input Capacitance	—	2800	—	pF	$V_{GE} = 0V$ $V_{CC} = 30V$ See Fig. 7 $f = 1.0MHz$
C_{oes}	Output Capacitance	—	140	—		
C_{res}	Reverse Transfer Capacitance	—	53	—		
t_{rr}	Diode Reverse Recovery Time	—	90	135	ns	$T_J = 25^\circ\text{C}$ See Fig. 14 $T_J = 125^\circ\text{C}$ 14
		—	164	245		
I_{rr}	Diode Peak Reverse Recovery Current	—	5.8	10	A	$T_J = 25^\circ\text{C}$ See Fig. 15 $T_J = 125^\circ\text{C}$ 15
		—	8.3	15		
Q_{rr}	Diode Reverse Recovery Charge	—	260	675	nC	$T_J = 25^\circ\text{C}$ See Fig. 16 $T_J = 125^\circ\text{C}$ 16
		—	680	1838		
$di_{(rec)M}/dt$	Diode Peak Rate of Fall of Recovery During t_b	—	120	—	A/ μs	$T_J = 25^\circ\text{C}$ See Fig. 17 $T_J = 125^\circ\text{C}$ 17
		—	76	—		

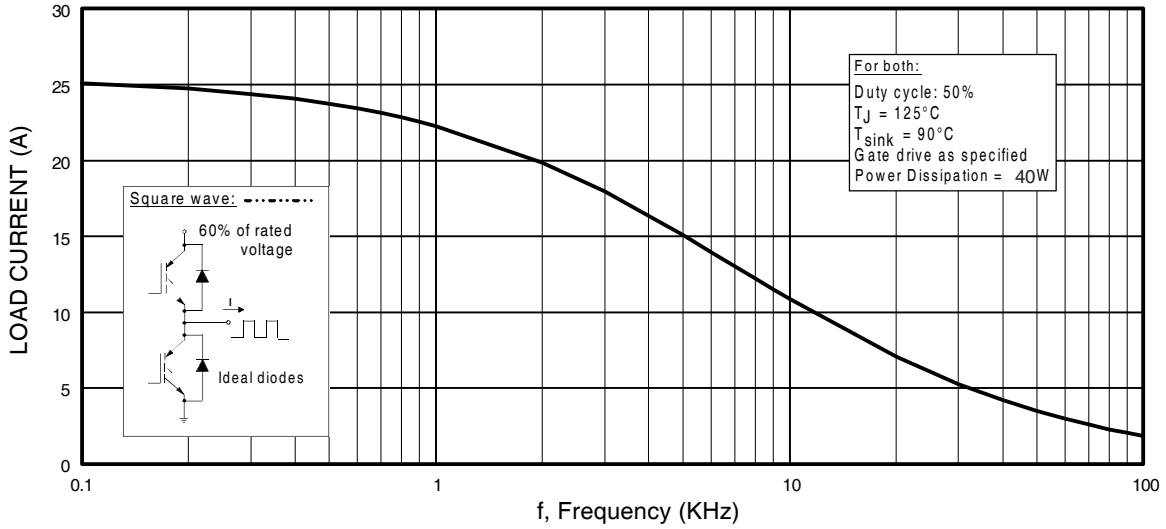


Fig. 1 - Typical Load Current vs. Frequency
 (Load Current = I_{RMS} of fundamental)

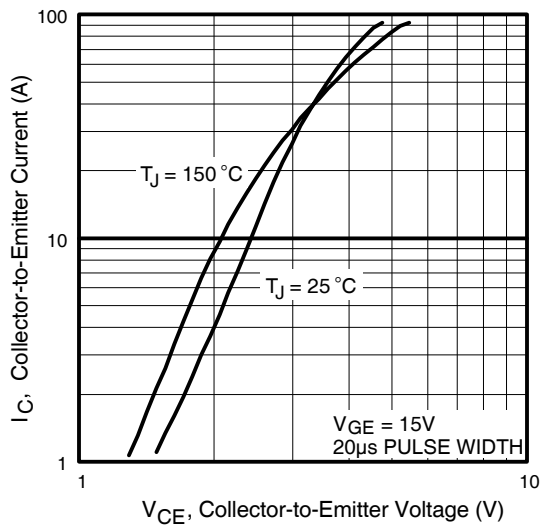


Fig. 2 - Typical Output Characteristics

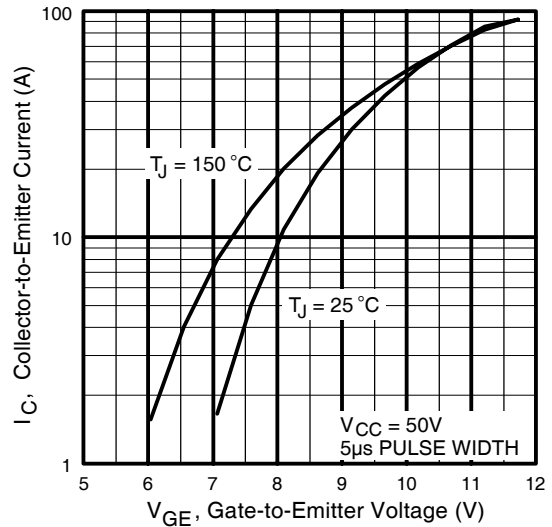


Fig. 3 - Typical Transfer Characteristics

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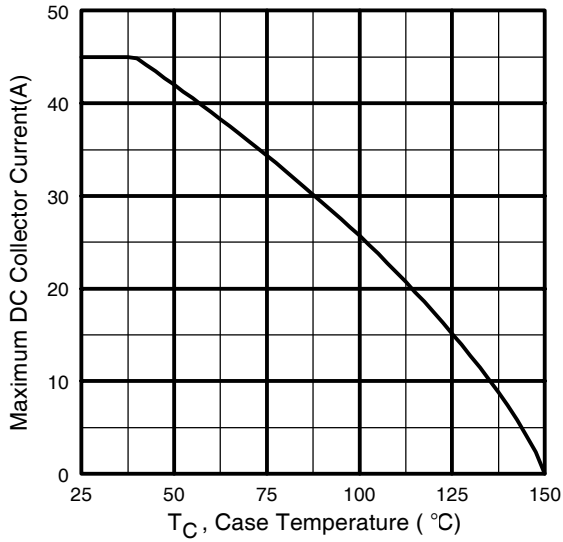


Fig. 4 - Maximum Collector Current vs. Case Temperature

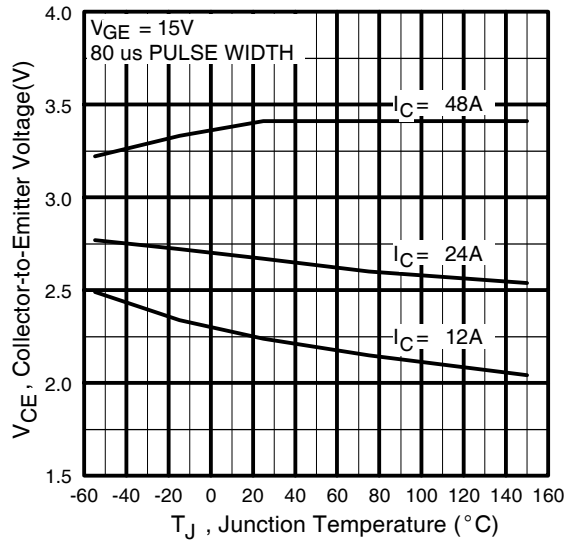


Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

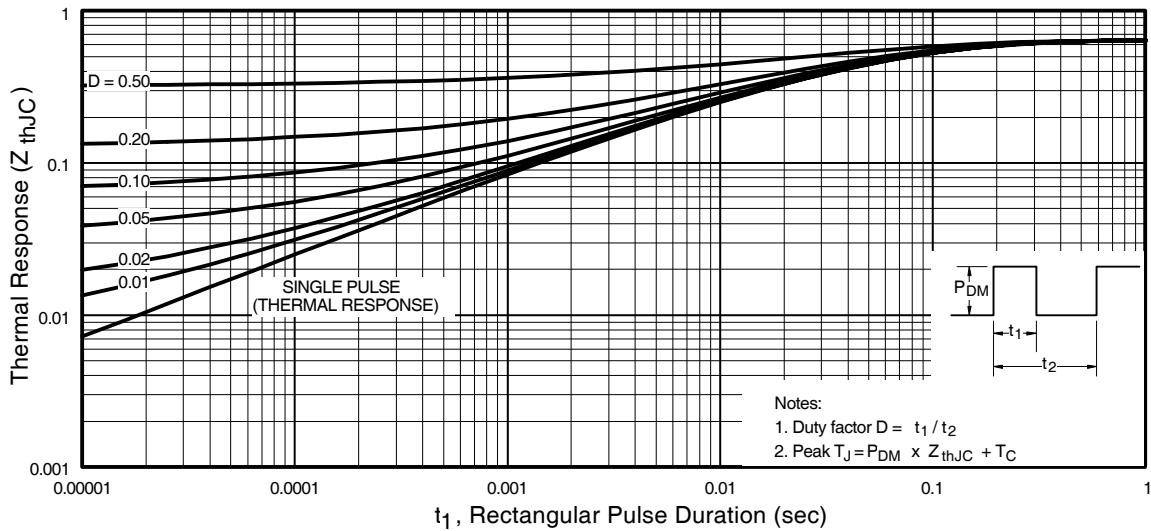


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

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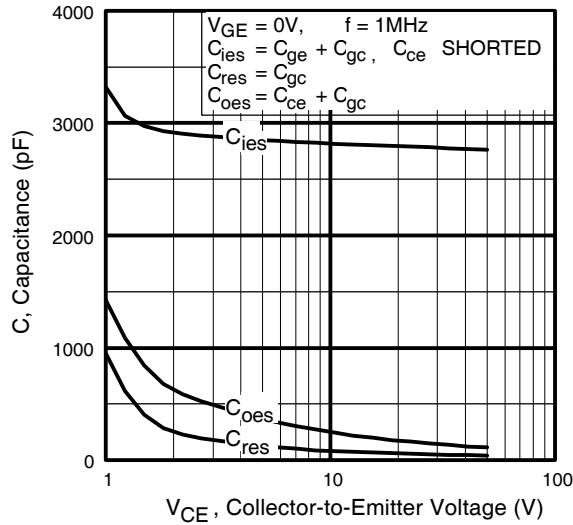


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

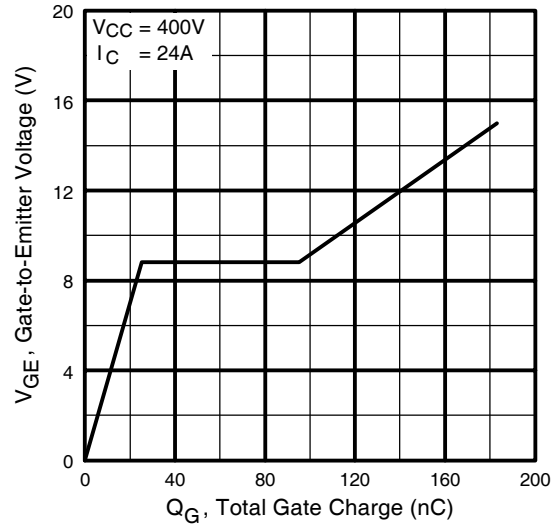


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

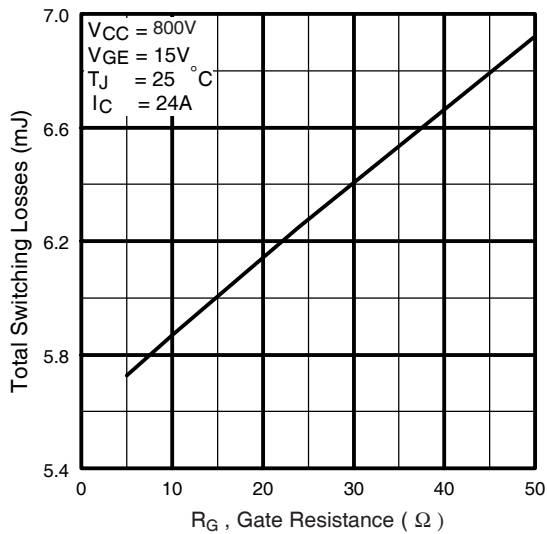


Fig. 9 - Typical Switching Losses vs. Gate Resistance

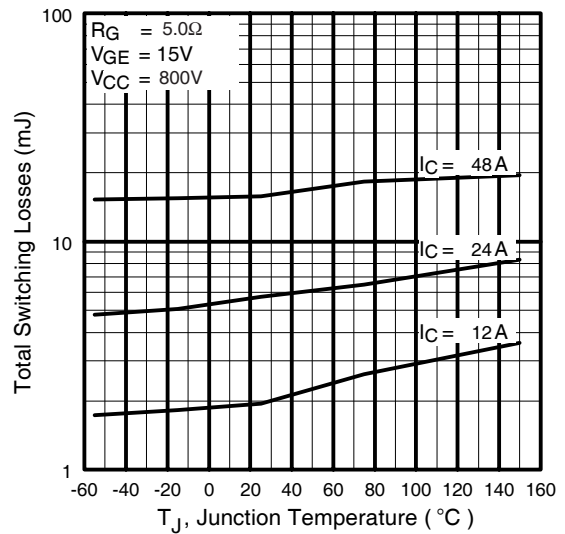


Fig. 10 - Typical Switching Losses vs. Junction Temperature

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International
IR Rectifier

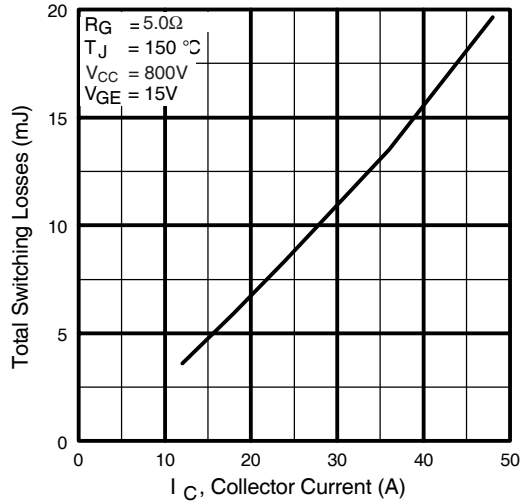


Fig. 11 - Typical Switching Losses vs. Collector Current

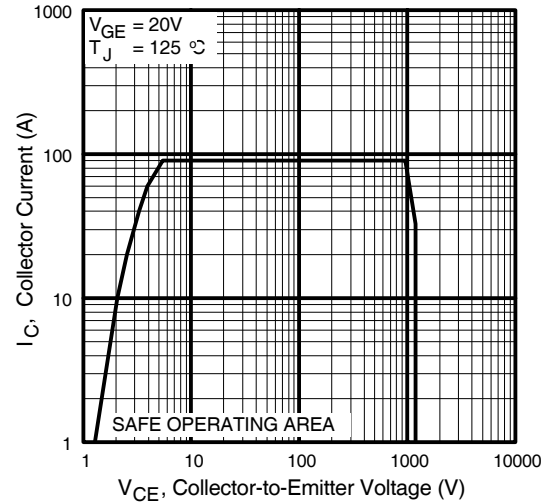


Fig. 12 - Turn-Off SOA

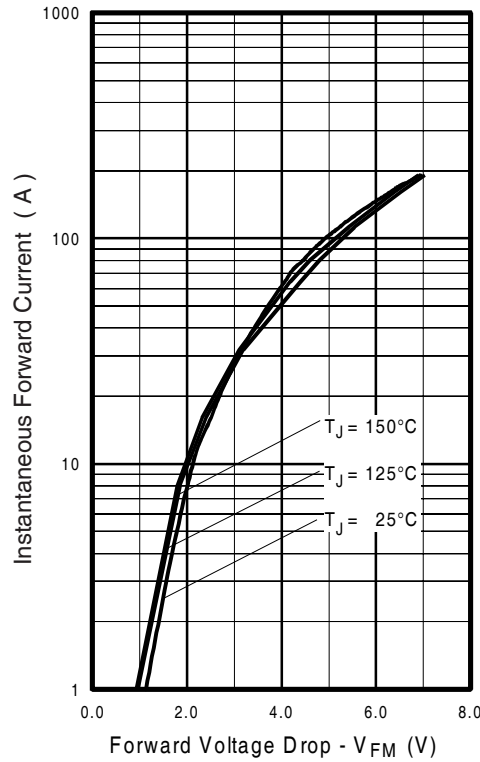


Fig. 13 - Typical Forward Voltage Drop vs. Instantaneous Forward Current

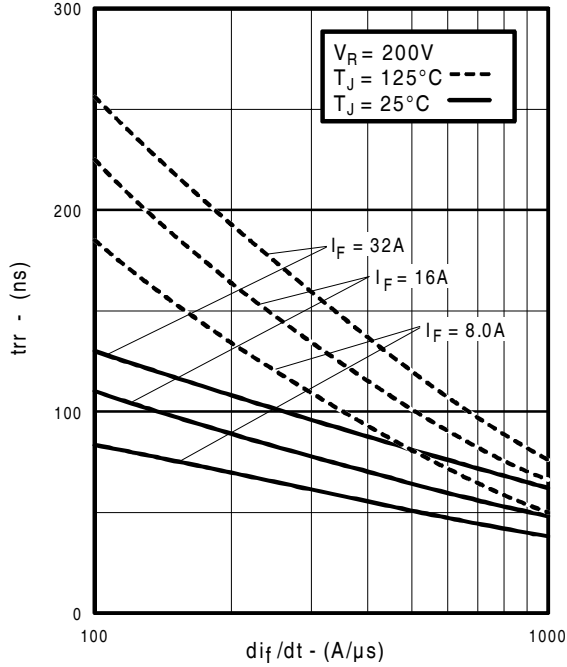


Fig. 14 - Typical Reverse Recovery vs. di/dt

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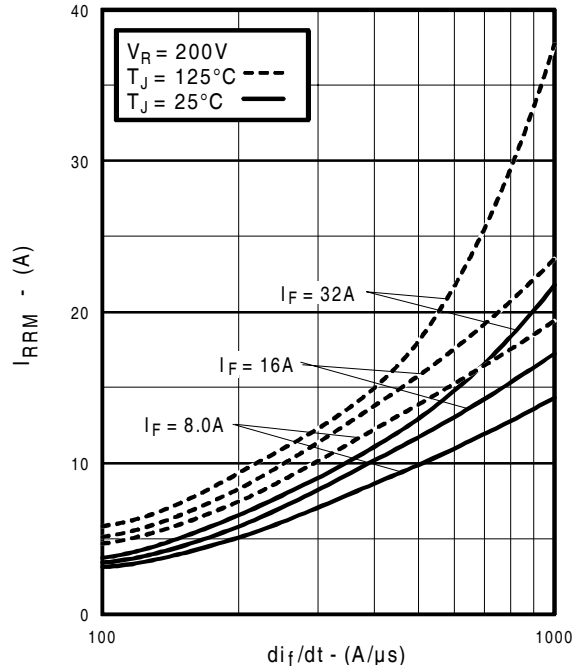


Fig. 15 - Typical Recovery Current vs. di/dt

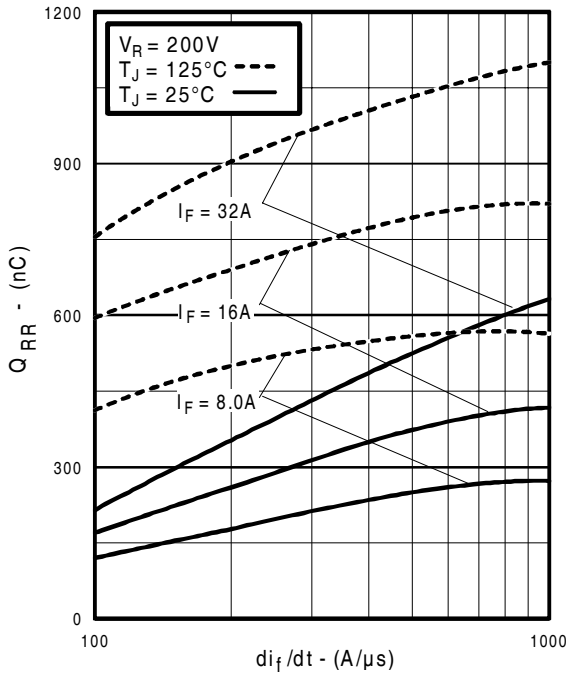


Fig. 16 - Typical Stored Charge vs. di/dt

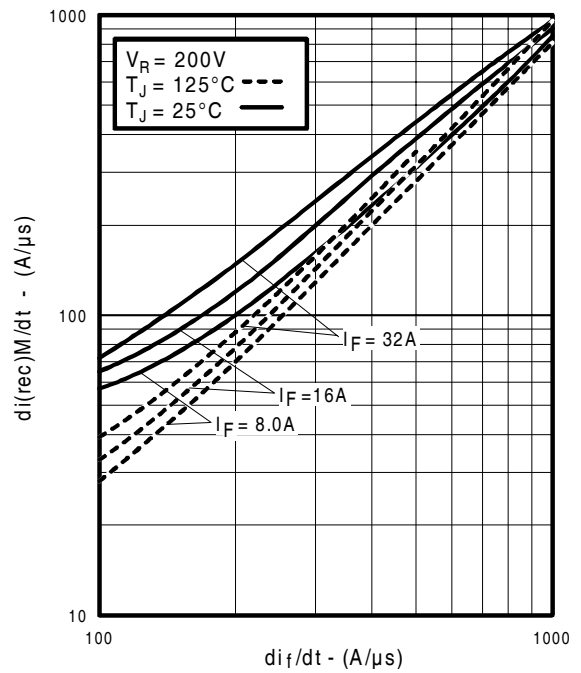


Fig. 17 - Typical $di_{(rec)M}/dt$ vs. di/dt

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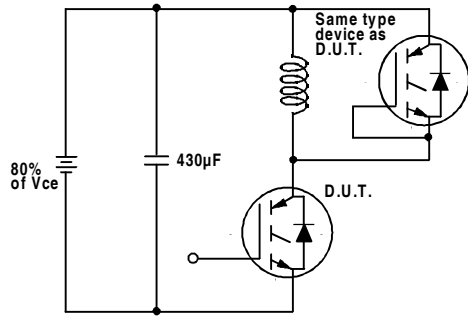


Fig. 18a - Test Circuit for Measurement of I_{LM} , E_{on} , $E_{off}(\text{diode})$, t_{rr} , Q_{rr} , I_{rr} , $t_{d(on)}$, t_r , $t_{d(off)}$, t_f

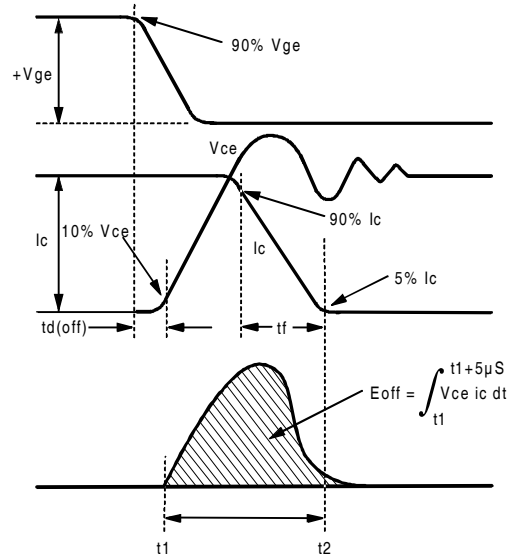


Fig. 18b - Test Waveforms for Circuit of Fig. 18a, Defining E_{off} , $t_{d(off)}$, t_f

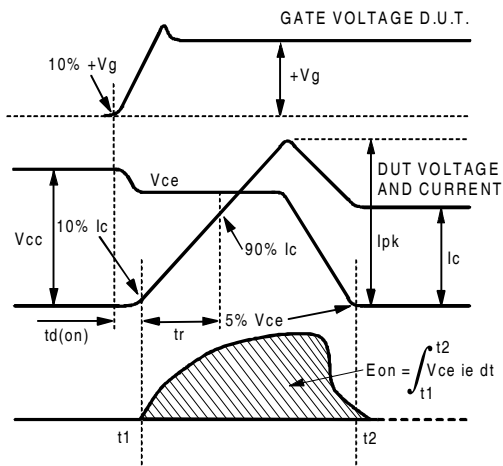


Fig. 18c - Test Waveforms for Circuit of Fig. 18a, Defining E_{on} , $t_{d(on)}$, t_r

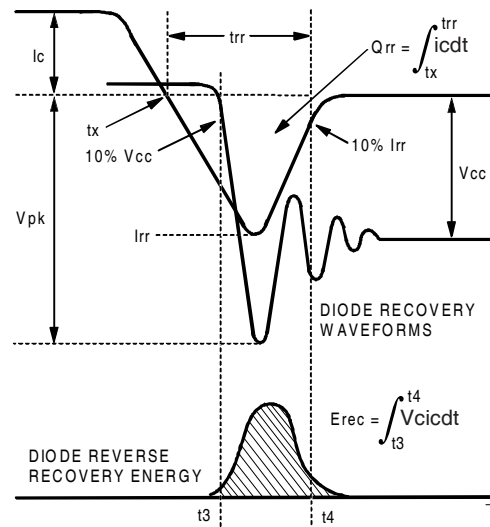


Fig. 18d - Test Waveforms for Circuit of Fig. 18a, Defining E_{rec} , t_{rr} , Q_{rr} , I_{rr}

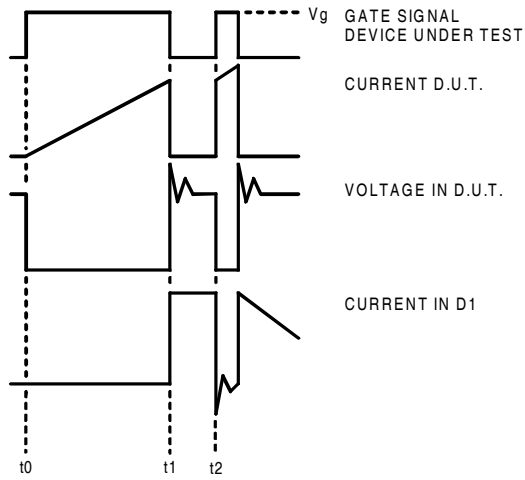


Figure 18e. Macro Waveforms for Figure 18a's Test Circuit

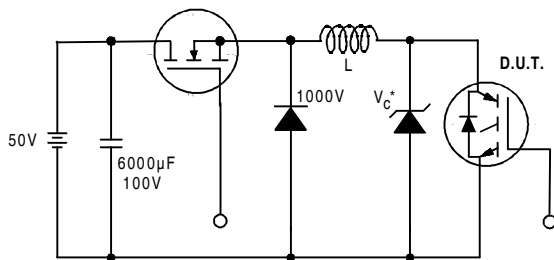


Figure 19. Clamped Inductive Load Test Circuit

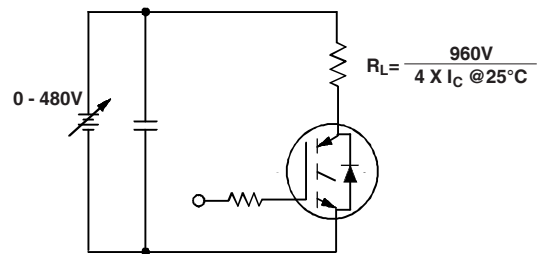


Figure 20. Pulsed Collector Current Test Circuit

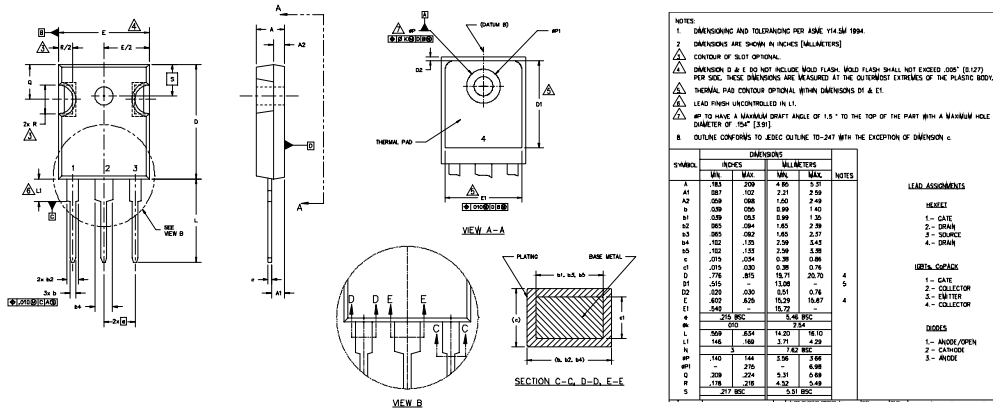
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Notes:

- ① Repetitive rating: $V_{GE}=20V$; pulse width limited by maximum junction temperature (figure 20)
- ② $V_{CC}=80\%(V_{CES})$, $V_{GE}=20V$, $L=10\mu H$, $R_G=5.0\Omega$ (figure 19)
- ③ Pulse width $\leq 80\mu s$; duty factor $\leq 0.1\%$.
- ④ Pulse width $5.0\mu s$, single shot.

TO-247AC Package Outline

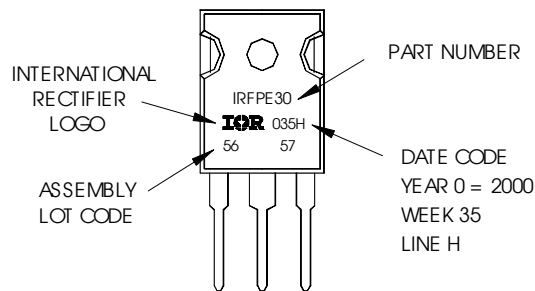
Dimensions are shown in millimeters (inches)



TO-247AC Part Marking Information

EXAMPLE: THIS IS AN IRFPE30
 WITH ASSEMBLY
 LOT CODE 5657
 ASSEMBLED ON WW 35, 2000
 IN THE ASSEMBLY LINE "H"

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



Data and specifications subject to change without notice.

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