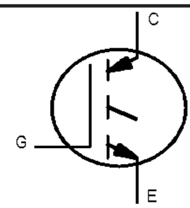
International
IOR Rectifier

PD- 95911

IRG4PSH71KPbF

INSULATED GATE BIPOLAR TRANSISTOR

Short Circuit Rated
UltraFast IGBT

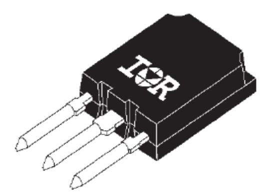


n-channel

V_{CES} = 1200V

$V_{CE(on)\ typ.}$ = 2.97V

@V_{GE} = 15V, I_C = 42A



SUPER - 247

Features

- Hole-less clip/pressure mount package compatible with TO-247 and TO-264, with reinforced pins
- High short circuit rating IGBTs, optimized for motorcontrol
- Minimum switching losses combined with low conduction losses
- Tightest parameter distribution
- Creepage distance increased to 5.35mm
- Lead-Free

Benefits

- Highest current rating IGBT
- Maximum power density, twice the power handling of the TO-247, less space than TO-264

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Breakdown Voltage	1200	V
I_C @ T_C = 25°C	Continuous Collector Current	78	A
I_C @ T_C = 100°C	Continuous Collector Current	42	
I_{CM}	Pulsed Collector Current ①	156	
I_{LM}	Clamped Inductive Load Current ②	156	
t_{SC}	Short Circuit Withstand Time	10	µs
V_{GE}	Gate-to-Emitter Voltage	± 20	V
E_{ARV}	Reverse Voltage Avalanche Energy ③	170	mJ
P_D @ T_C = 25°C	Maximum Power Dissipation	350	W
P_D @ T_C = 100°C	Maximum Power Dissipation	140	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Soldering Temperature, for 10 seconds	300 (0.063 in. (1.6mm from case)	

Thermal Resistance\ Mechanical

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	–––	–––	0.36	°C/W
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	–––	0.24	–––	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	–––	–––	38	
	Recommended Clip Force	20.0(2.0)	–––	–––	N (kgf)
	Weight	–––	6 (0.21)	–––	g (oz)

09/20/04

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

	Parameter	Min.	Typ.	Max.	Units	Conditions	
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	1200	—–	—–	V	V_{GE} = 0V, I_C = 250μA	
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage ④	18	—–	—–	V	V_{GE} = 0V, I_C = 1.0A	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—–	1.1	—–	V/°C	V_{GE} = 0V, I_C = 10mA	
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	—–	2.97	3.9	V	I_C = 42A	V_{GE} = 15V
		—–	3.44	—–		I_C = 78A	See Fig.2, 5
		—–	2.60	—–		I_C = 42A , T_J = 150°C	
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—–	6.0		V_{CE} = V_{GE}, I_C = 250μA	
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—–	-12	—–	mV/°C	V_{CE} = V_{GE}, I_C = 1.5mA	
g_{fe}	Forward Transconductance ⑤	25	38	—–	S	V_{CE} = 50V, I_C = 42A	
I_{CES}	Zero Gate Voltage Collector Current	—–	—–	500	μA	V_{GE} = 0V, V_{CE} = 1200V	
		—–	—–	2.0		V_{GE} = 0V, V_{CE} = 10V, T_J = 25°C	
		—–	—–	5.0	mA	V_{GE} = 0V, V_{CE} = 1200V, T_J = 150°C	
I_{GES}	Gate-to-Emitter Leakage Current	—–	—–	±100	nA	V_{GE} = ±20V	

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge (turn-on)	—	410	610	nC	I_C = 42A
Q_{ge}	Gate - Emitter Charge (turn-on)	—	47	70		V_{CC} = 400V See Fig.8
Q_{gc}	Gate - Collector Charge (turn-on)	—	145	220		V_{GE} = 15V
$t_{d(on)}$	Turn-On Delay Time	—	45	—	ns	
t_r	Rise Time	—	38	—		T_J = 25°C
$t_{d(off)}$	Turn-Off Delay Time	—	220	340		I_C = 42A, V_{CC} = 960V
t_f	Fall Time	—	160	250		V_{GE} = 15V, R_G = 5.0Ω
E_{on}	Turn-On Switching Loss	—	2.35	—	mJ	Energy losses include "tail"
E_{off}	Turn-Off Switching Loss	—	3.14	—		See Fig. 9,10,14
E_{ts}	Total Switching Loss	—	5.49	8.3		
t_{sc}	Short Circuit Withstand Time	10	—	—	μs	V_{CC} = 720V, T_J = 125°C V_{GE} = 20V, R_G = 5.0Ω
$t_{d(on)}$	Turn-On Delay Time	—	42	—	ns	T_J = 150°C
t_r	Rise Time	—	41	—		I_C = 42A, V_{CC} = 960V
$t_{d(off)}$	Turn-Off Delay Time	—	460	—		V_{GE} = 15V, R_G = 5.0Ω
t_f	Fall Time	—	250	—		Energy losses include "tail"
E_{ts}	Total Switching Loss	—	11.5	—	mJ	See Fig. 10,11,14
L_E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package
C_{ies}	Input Capacitance	—	5770	—	pF	V_{GE} = 0V
C_{oes}	Output Capacitance	—	400	—		V_{CC} = 30V See Fig. 7
C_{res}	Reverse Transfer Capacitance	—	100	—		f = 1.0MHz

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 = 10μH, R_G = 5.0Ω, (See fig. 13a)

③ Repetitive rating; pulse width limited by maximum junction temperature

④ Pulse width ≤ 80μs; duty factor ≤ 0.1%

⑤ Pulse width 5.0μs, single shot

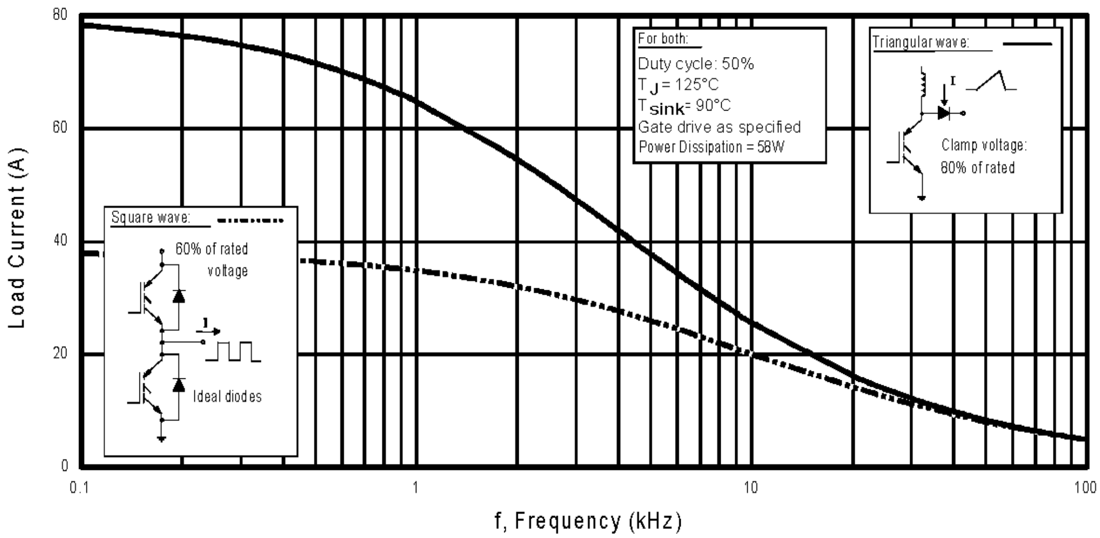


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I=I_{RMS}$ of fundamental; for triangular wave, $I=I_{PK}$)

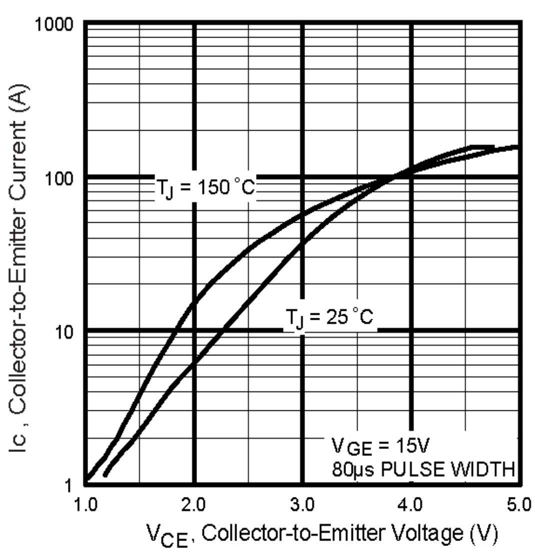


Fig. 2 - Typical Output Characteristics

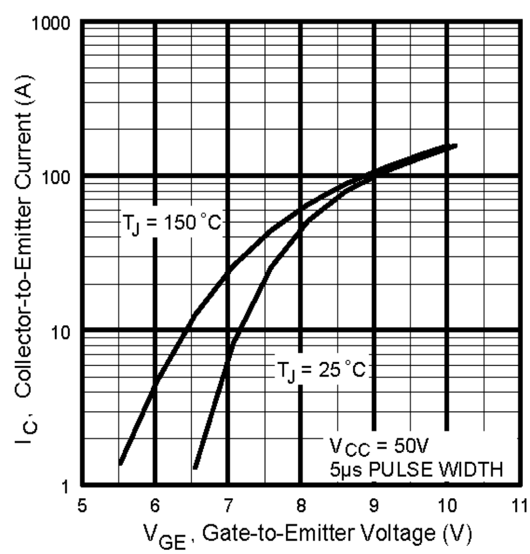


Fig. 3 - Typical Transfer Characteristics

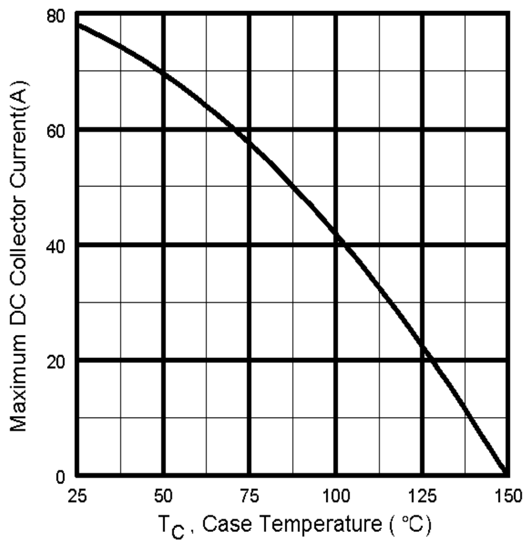


Fig. 4 - Maximum Collector Current vs. Case Temperature

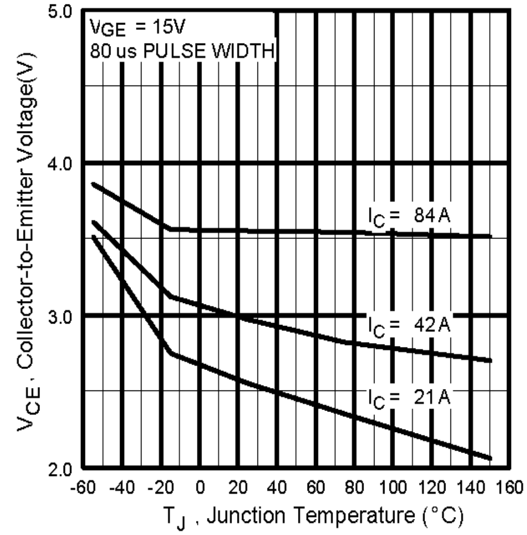


Fig. 5 - Collector-to-Emitter Voltage vs. Junction Temperature

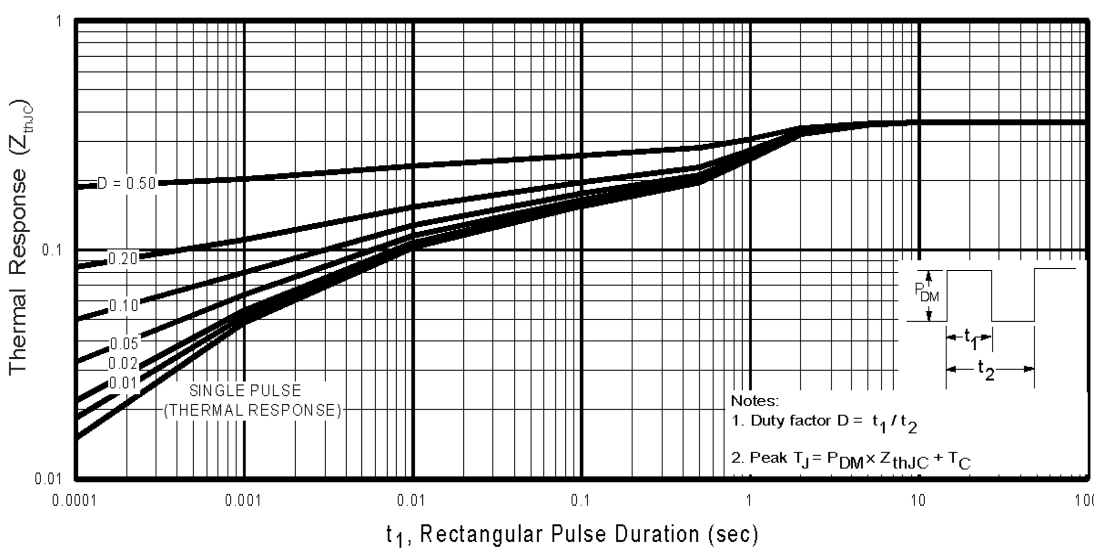


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

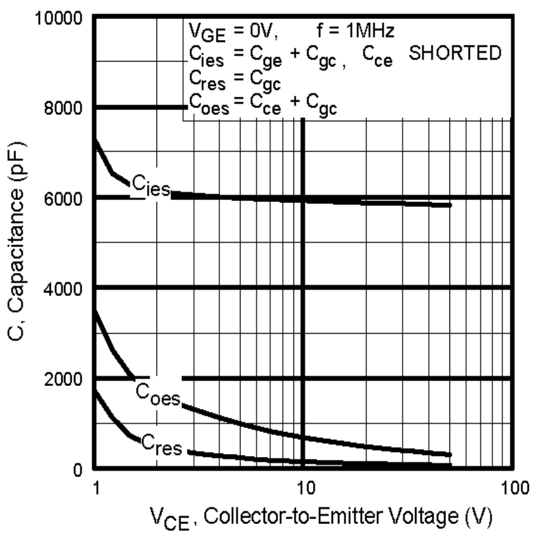


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

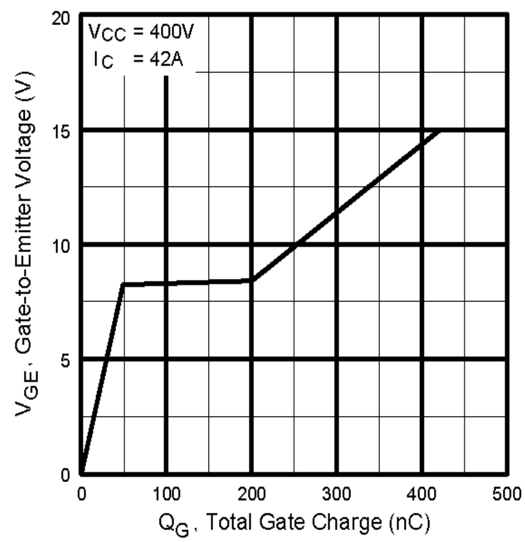


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

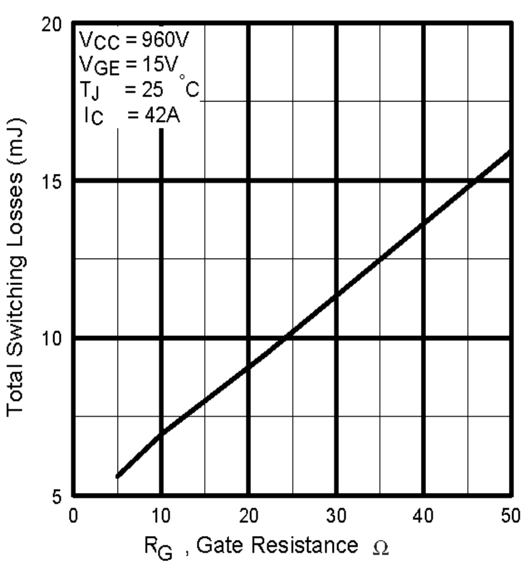


Fig. 9 - Typical Switching Losses vs. Gate Resistance

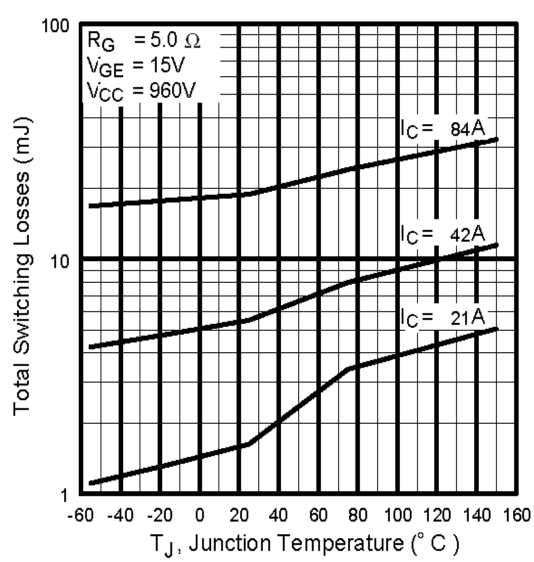


Fig. 10 - Typical Switching Losses vs. Junction Temperature

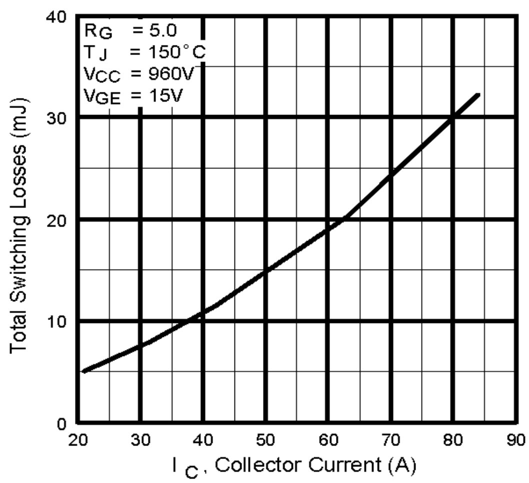


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

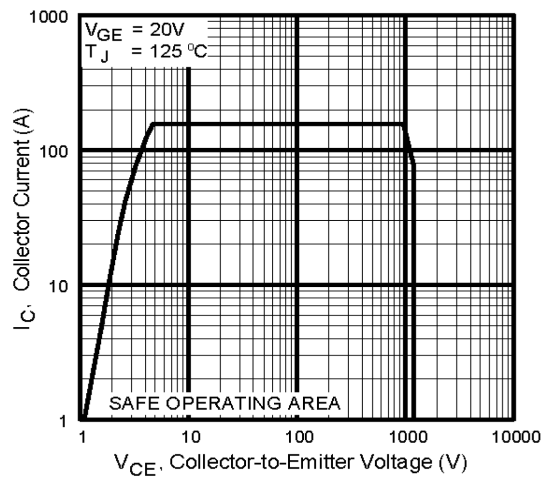


Fig. 12 - Turn-Off SOA

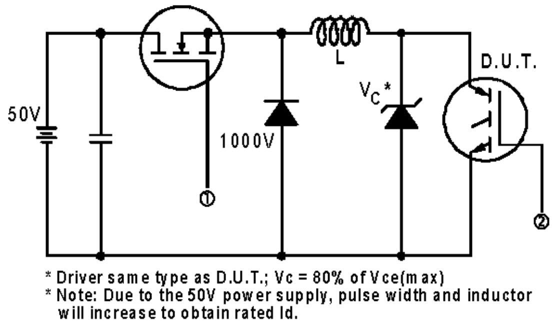


Fig. 13a - Clamped Inductive Load Test Circuit

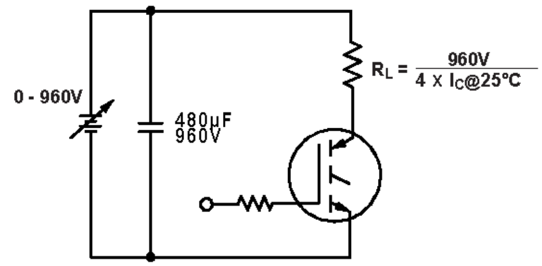


Fig. 13b - Pulsed Collector Current Test Circuit

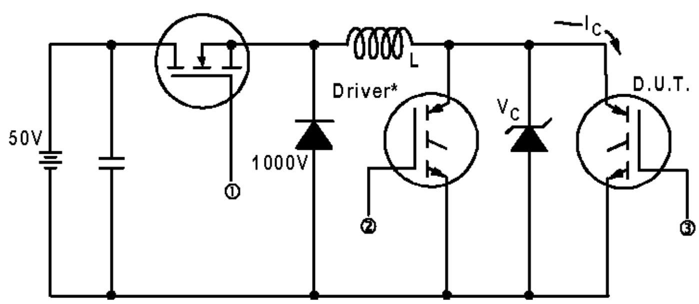


Fig. 14a - Switching Loss Test Circuit

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

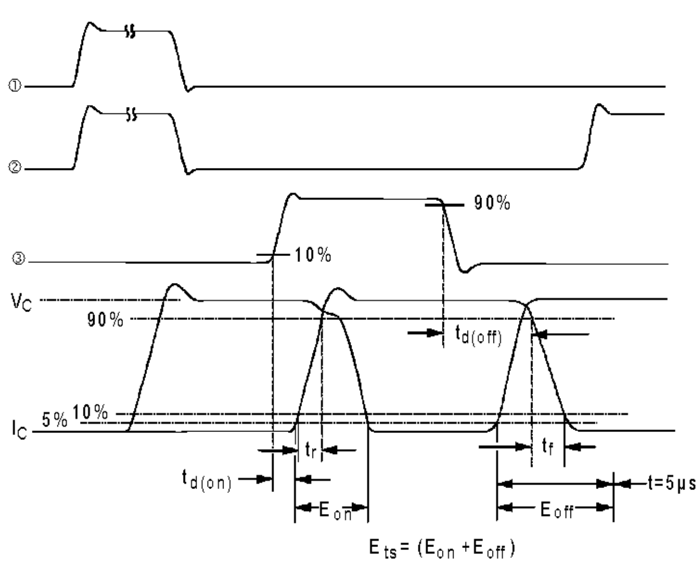
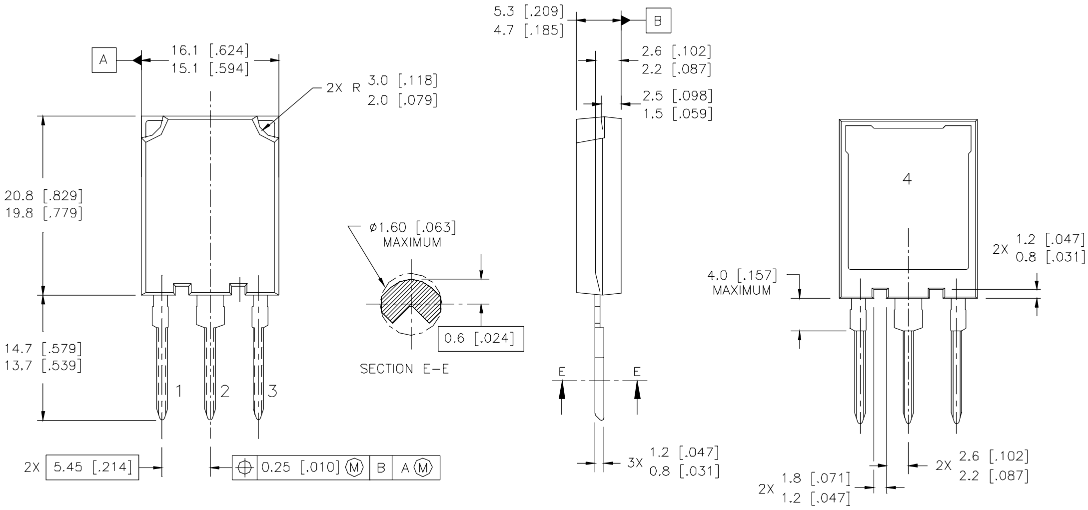


Fig. 14b - Switching Loss Waveforms

Case Outline and Dimensions — Super-247



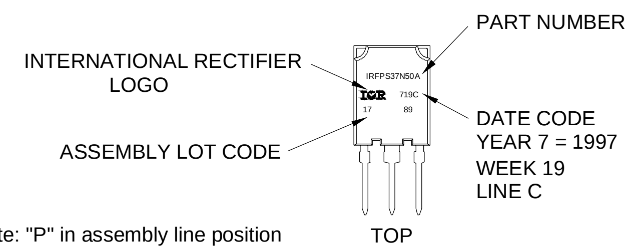
NOTES:
1. DIMENSIONS & TOLERANCING PER ASME Y14.5M-1994
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETRES [INCHES]

LEAD ASSIGNMENTS

MOSFET	IGBT
1 - GATE	1 - GATE
2 - DRAIN	2 - COLLECTOR
3 - SOURCE	3 - EMITTER
4 - DRAIN	4 - COLLECTOR

Super-247 (TO-274AA) Part Marking Information

EXAMPLE: THIS IS AN IRFPS37N50A WITH
ASSEMBLY LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"



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

Data and specifications subject to change without notice.

International
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