PD - 91685

International
IOR Rectifier

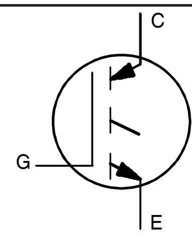
IRG4PSH71U

INSULATED GATE BIPOLAR TRANSISTOR

UltraFast Speed IGBT

Features

- UltraFast switching speed optimized for operating frequencies 8 to 40kHz in hard switching, 200kHz in resonant mode soft switching
- Generation 4 IGBT design provides tighter parameter distribution and higher efficiency (minimum switching and conduction losses) than prior generations
- Industry-benchmark Super-247 package with higher power handling capability compared to same footprint TO-247
- Creepage distance increased to 5.35mm



n-channel

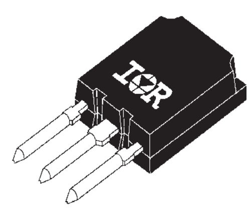
V_{CES} = 1200V

$V_{CE(on)}$ typ. = 2.50V

@V_{GE} = 15V, I_C = 50A

Benefits

- Generation 4 IGBT's offer highest efficiencies available
- Maximum power density, twice the power handling of the TO-247, less space than TO-264
- IGBTs optimized for specific application conditions
- Cost and space saving in designs that require multiple, paralleled IGBTs



SUPER - 247

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
I_C @ T_C = 25°C	Continuous Collector Current	99	A
I_C @ T_C = 100°C	Continuous Collector Current	50	
I_{CM}	Pulse Collector Current ①	200	
I_{LM}	Clamped Inductive Load current ②	200	
V_{GE}	Gate-to-Emitter Voltage	±20	V
E_{ARV}	Reverse Voltage Avalanche Energy ⑤	150	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
	Storage Temperature Range, for 10 sec.	300 (0.063 in. (1.6mm) from case)	

Thermal / Mechanical Characteristics

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case- IGBT	——	——	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 (2.0)			N (kgf)
Wt	Weight	——	6 (0.21)	——	g (oz.)

5/24/04

Electrical Characteristics @ T_J = 25°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 = 250µA	
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage	19	—	—	V	V_{GE} = 0V, I_C = 1.0A	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.78	—	V/°C	V_{GE} = 0V, I_C = 1mA	
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	2.52	2.70	V	I_C = 70A	V_{GE} = 15V
		—	3.17	—		I_C = 140A	See Fig.2, 5
		—	2.68	—		I_C = 70A, T_J = 150°C	
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0		$V_{CE} = V_{GE}$, I_C = 250µA	
$\Delta V_{GE(th)}/\Delta T_J$	Threshold Voltage temp. coefficient	—	-9.2	—	mV/°C	$V_{CE} = V_{GE}$, I_C = 1.0mA	
gfe	Forward Transconductance ④	48	72	—	S	V_{CE} = 100V, I_C = 70A	
I_{CES}	Zero Gate Voltage Collector Current	—	—	500	µA	V_{GE} = 0V, V_{CE} = 1200V	
		—	—	2.0		V_{GE} = 0V, V_{CE} = 10V	
		—	—	5000		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)	—	370	560	nC	I_C = 70A
Q_{ge}	Gate-to-Emitter Charge (turn-on)	—	61	24		V_{CC} = 400V See Fig.8
Q_{gc}	Gate-to-Collector Charge (turn-on)	—	120	50		V_{GE} = 15V
$t_{d(on)}$	Turn-On delay time	—	51	—	ns	I_C = 70A, V_{CC} = 960V
t_r	Rise time	—	70	—		V_{GE} = 15V, R_G = 5.0Ω
$t_{d(off)}$	Turn-Off delay time	—	280	390		Energy losses include "tail"
t_f	Fall time	—	170	260		See Fig. 9, 10, 11, 14
E_{on}	Turn-On Switching Loss	—	4.77	—	mJ	
E_{off}	Turn-Off Switching Loss	—	9.54	—		
E_{tot}	Total Switching Loss	—	14.3	15.8		
$t_{d(on)}$	Turn-On delay time	—	49	—	ns	T_J = 150°C, See Fig. 9, 10, 11, 14
t_r	Rise time	—	70	—		I_C = 70A, V_{CC} = 960V
$t_{d(off)}$	Turn-Off delay time	—	390	—		V_{GE} = 15V, R_G = 5.0Ω
t_f	Fall time	—	360	—		Energy losses include "tail"
E_{TS}	Total Switching Loss	—	25	—	mJ	
L_E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package
C_{ies}	Input Capacitance	—	7280	—	pF	V_{GE} = 0V
C_{oes}	Output Capacitance	—	290	—		V_{CC} = 30V, See Fig.7
C_{res}	Reverse Transfer Capacitance	—	50	—		f = 1.0MHz

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=10µH, R_G= 5.0 Ω (figure 13a)

③ Pulse width ≤ 80µs; duty factor ≤ 0.1%.

④ Pulse width 5.0µs, single shot.

⑤ Repetitive rating; pulse width limited by maximumjunction temperature.

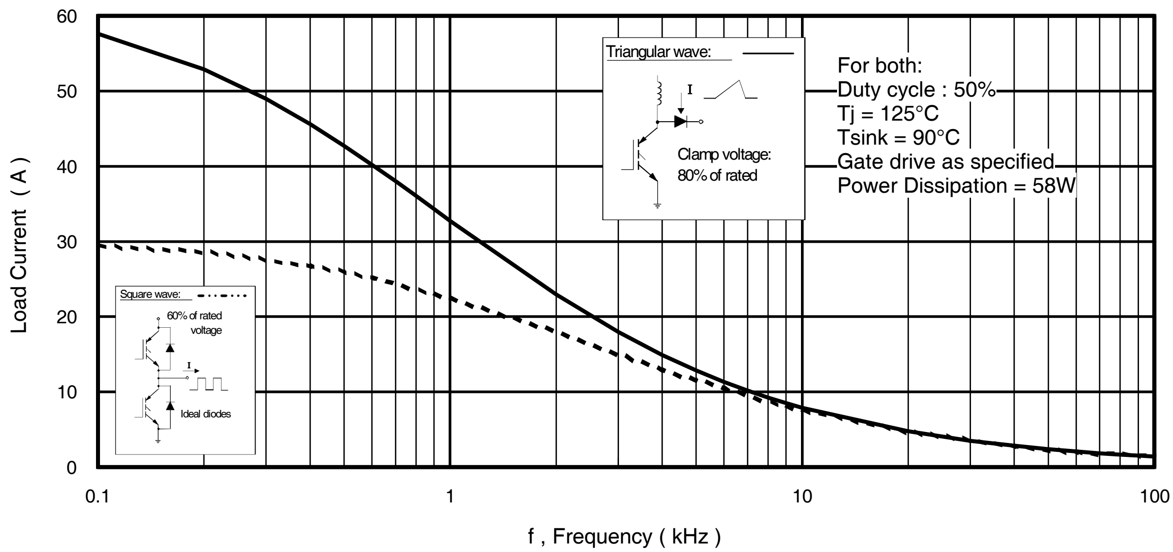


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I=I_{RMS}$ of fundamental; for triangular wave, $I=I_{PK}$)

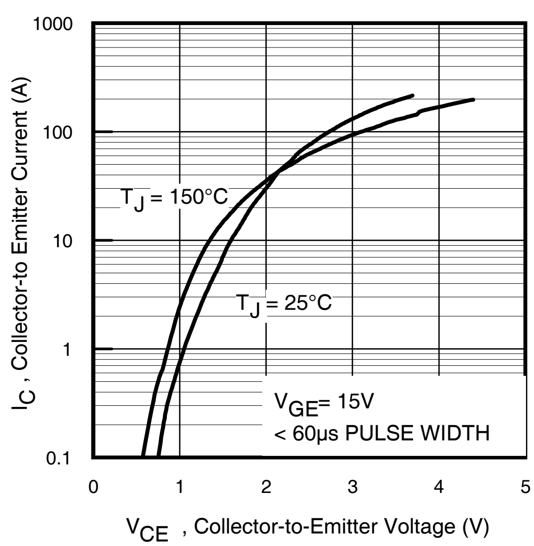


Fig. 2 - Typical Output Characteristics

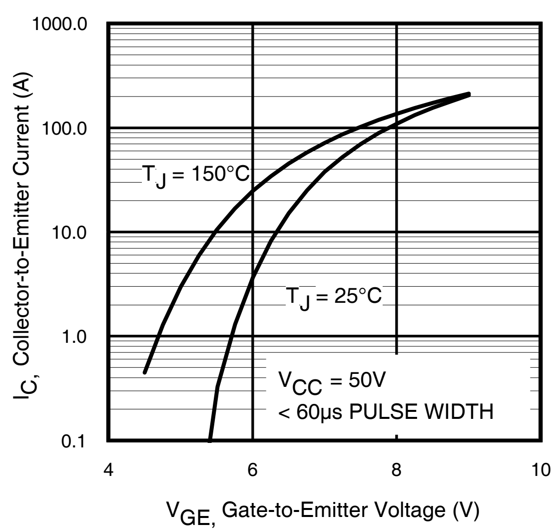


Fig. 3 - Typical Transfer Characteristics

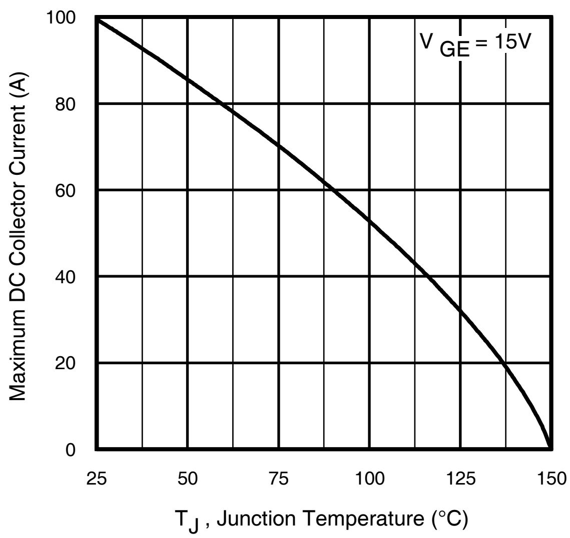


Fig. 4 - Maximum Collector Current vs. Case Temperature

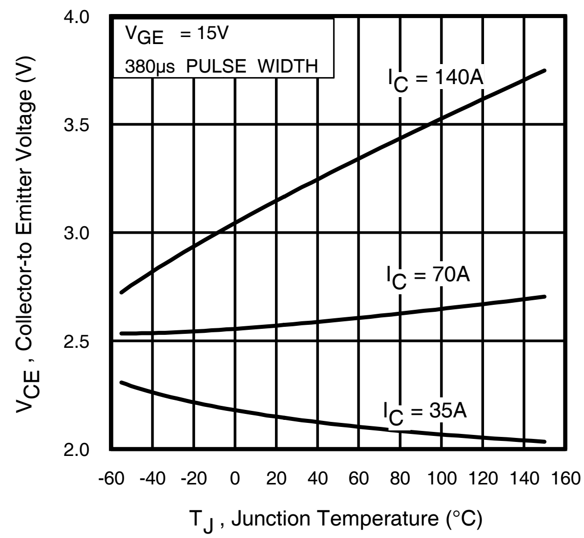


Fig. 5 - Collector-to-Emitter Voltage vs. Junction Temperature

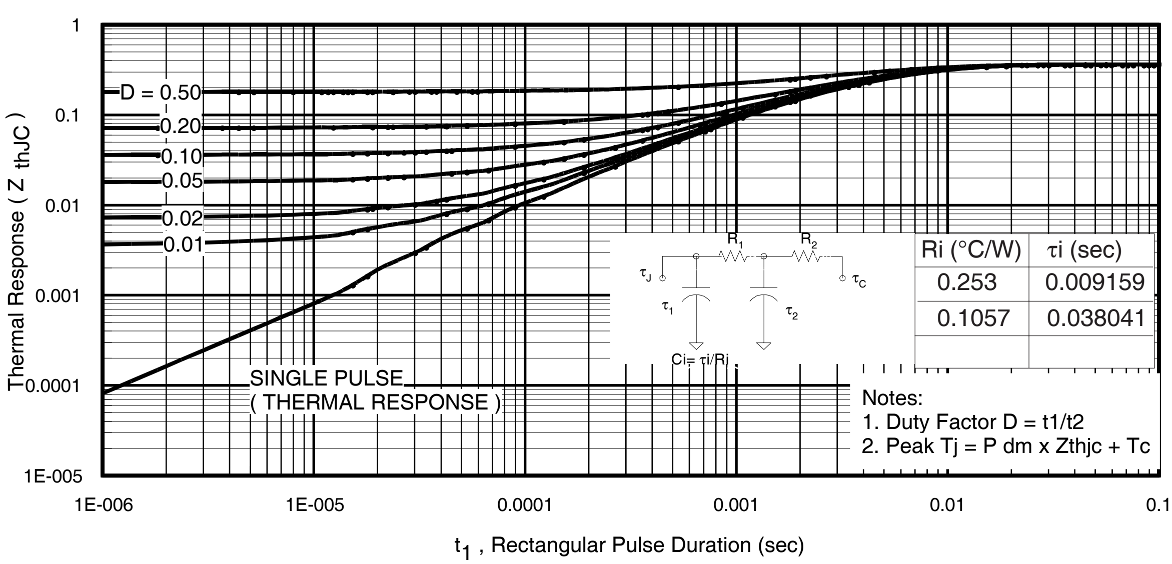


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

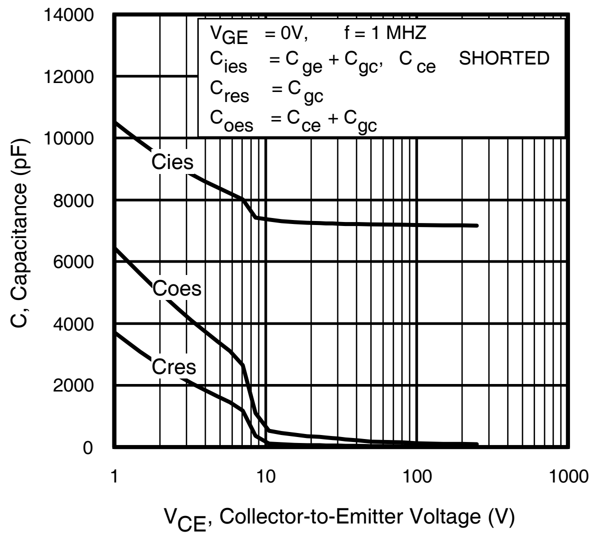


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

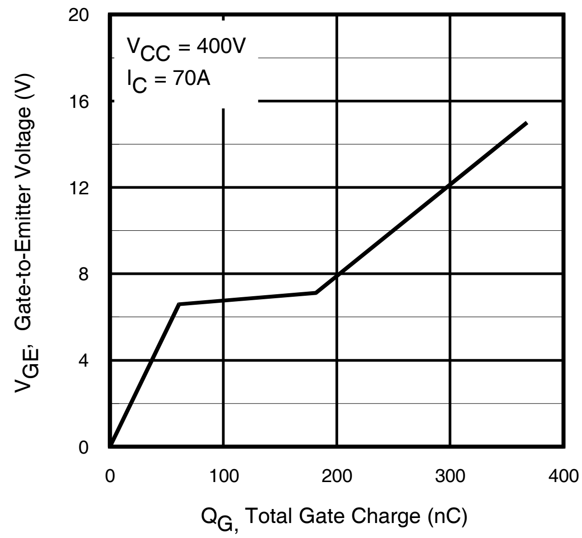


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

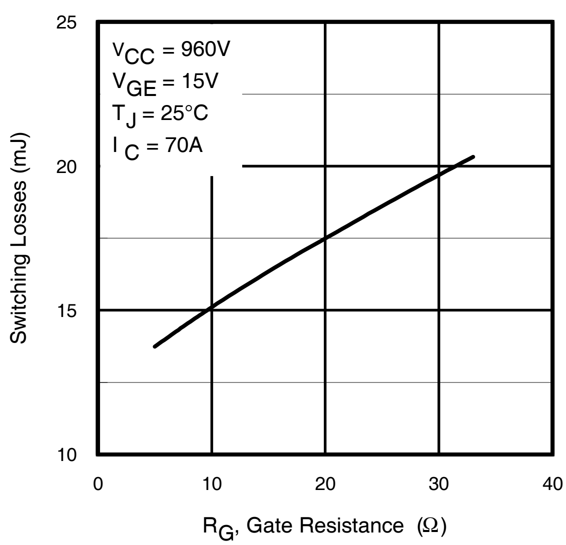


Fig. 9 - Typical Switching Losses vs. Gate Resistance

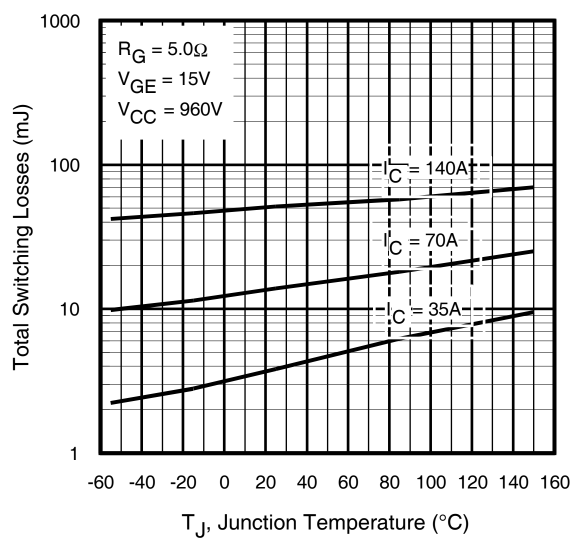


Fig. 10 - Typical Switching Losses vs. Junction Temperature

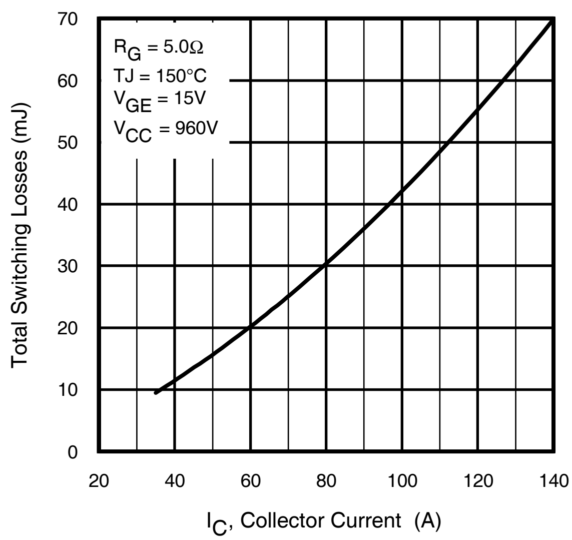


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

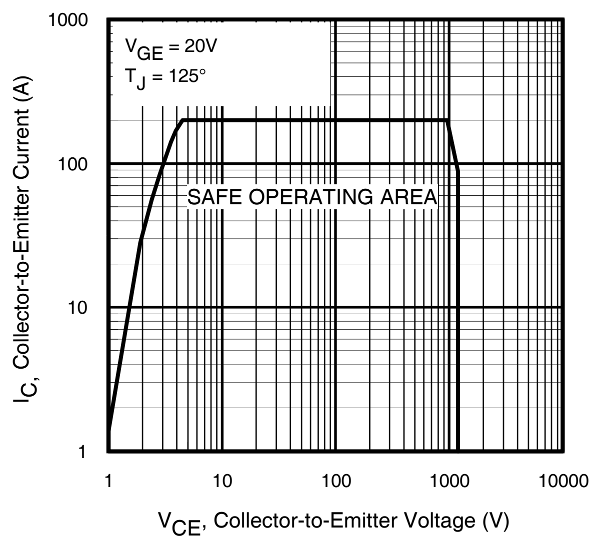


Fig. 12 - Turn-Off SOA

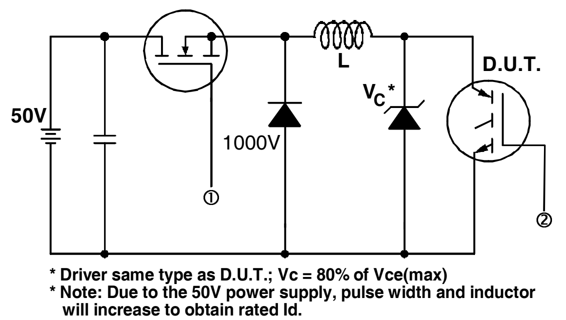


Fig. 13a - Clamped Inductive Load Test Circuit

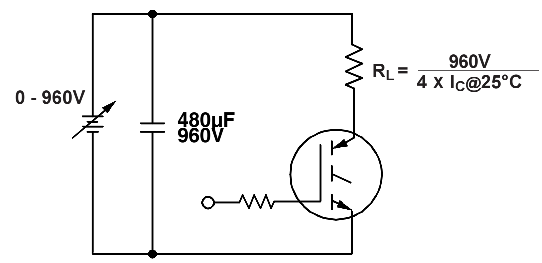


Fig. 13b - Pulsed Collector Current Test Circuit

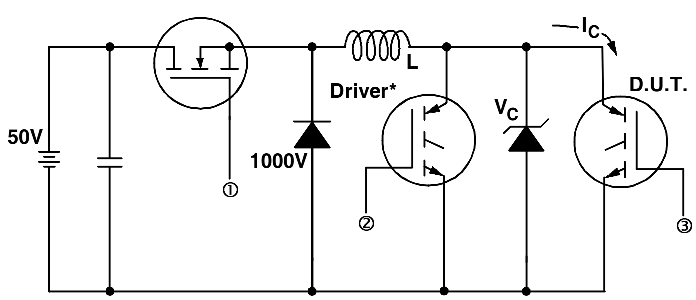


Fig. 14a - Switching Loss Test Circuit

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

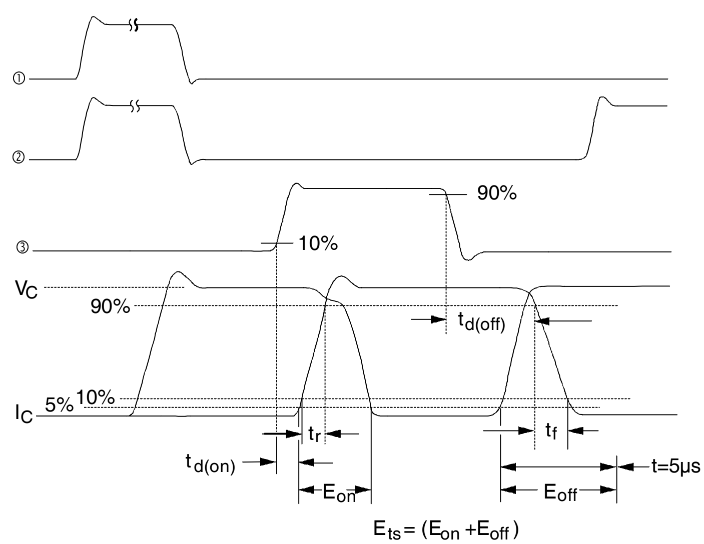
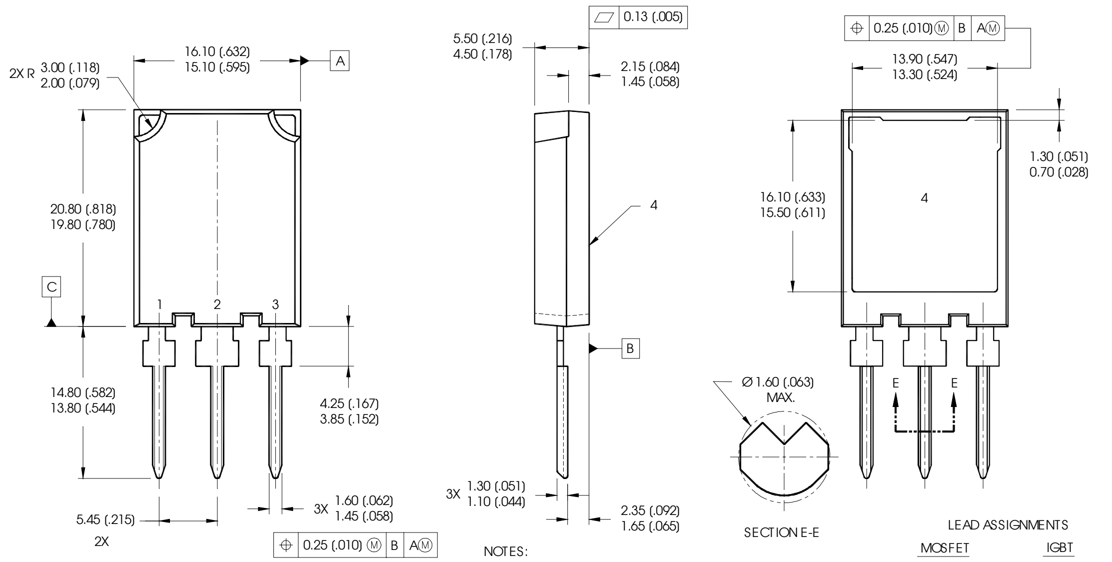


Fig. 14b - Switching Loss Waveforms

Super-247™ (TO-274AA) Package Outline

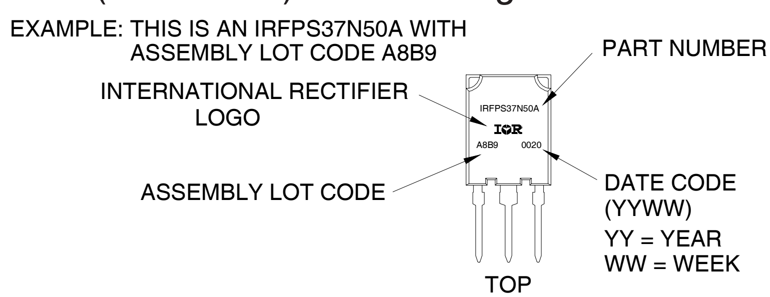


NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
2. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES)
3. CONTROLLING DIMENSION: MILLIMETER
4. OUTLINE CONFORMS TO JEDEC OUTLINE TO-274AA

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



Super TO-247™ package is not recommended for Surface Mount Application.

Data and specifications subject to change without notice.
This product has been designed and qualified for the Consumer market.
Qualification Standards can be found on IR's Web site.

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