

IRG4PSH71U

INSULATED GATE BIPOLAR TRANSISTOR

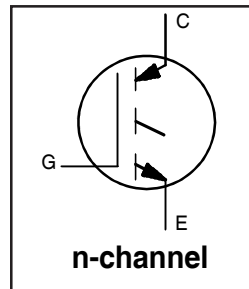
UltraFast Speed IGBT

Features

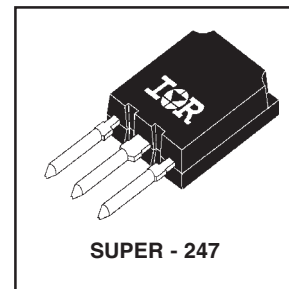
- UltraFast switching speed optimized for operating frequencies 8 to 40kHz in hard switching, 200kHz in resonant mode soft switching
- Generation 4 IGBT design provides tighter parameter distribution and higher efficiency (minimum switching and conduction losses) than prior generations
- Industry-benchmark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

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



$V_{CES} = 1200V$
$V_{CE(on)} \text{ typ.} = 2.50V$
@ $V_{GE} = 15V, I_C = 50A$



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	99	A
$I_C @ T_C = 100^\circ C$	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 ③	150	mJ
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	350	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	140	
T_J	Operating Junction and	-55 to +150	$^\circ C$
T_{STG}	Storage Temperature Range		
	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	$^\circ C/W$
$R_{\theta CS}$	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.)

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

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 13a)
- ③ Pulse width $\leq 80\mu s$; duty factor $\leq 0.1\%$.
- ④ Pulse width $5.0\mu s$, single shot.
- ⑤ Repetitive rating; pulse width limited by maximum junction temperature.

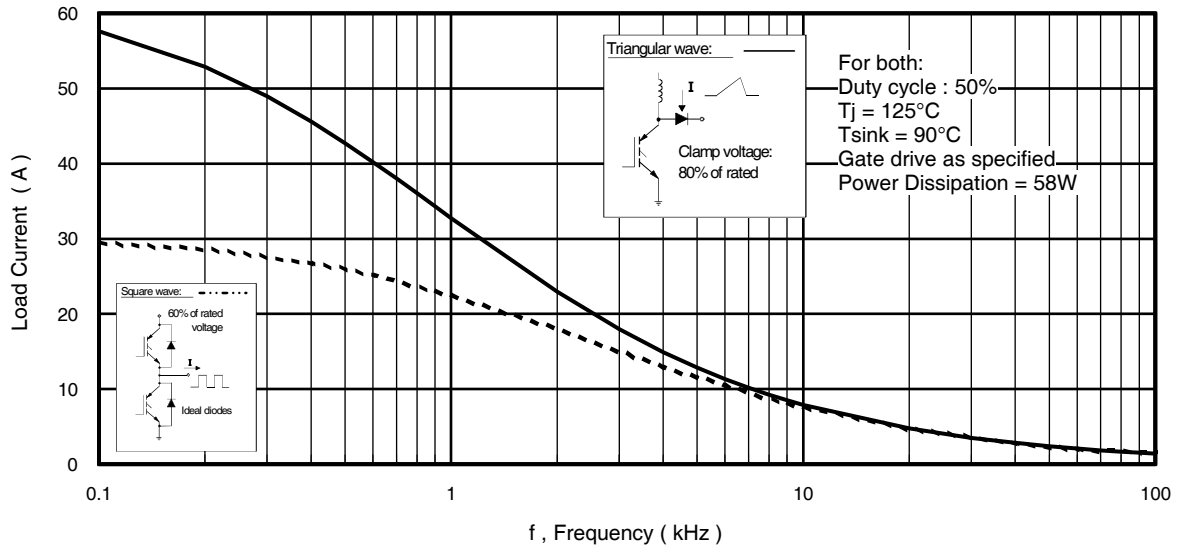


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I = I_{\text{RMS}}$ of fundamental; for triangular wave, $I = I_{\text{PK}}$)

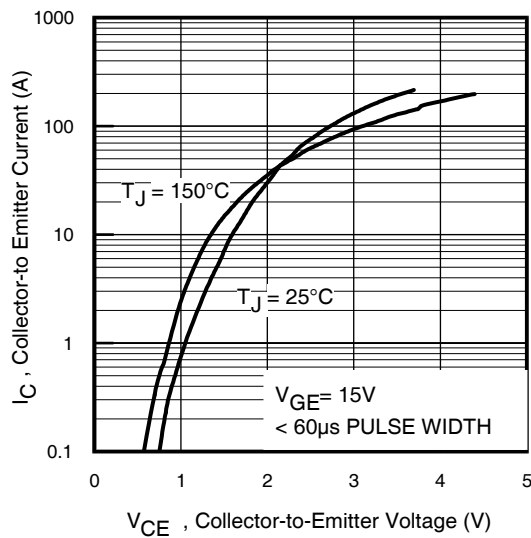


Fig. 2 - Typical Output Characteristics

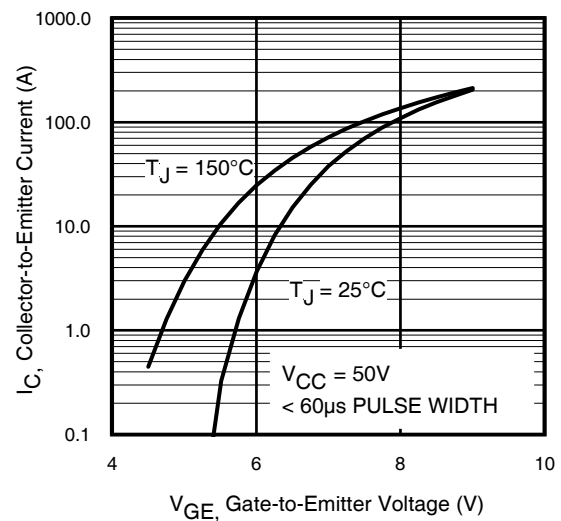


Fig. 3 - Typical Transfer Characteristics

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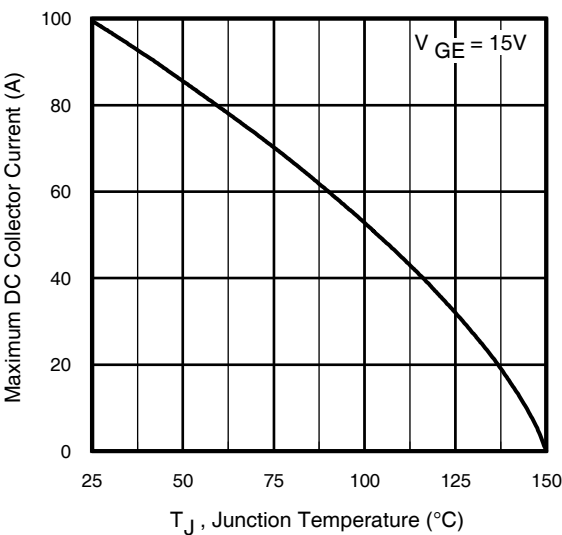


Fig. 4 - Maximum Collector Current vs. Case Temperature

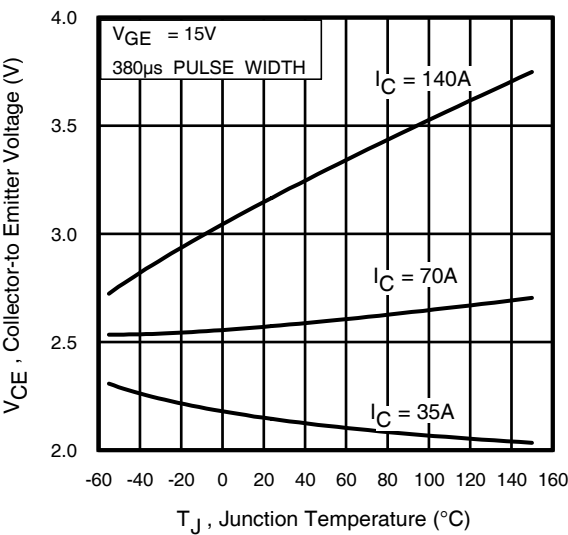


Fig. 5 - Collector-to-Emitter Voltage vs. Junction Temperature

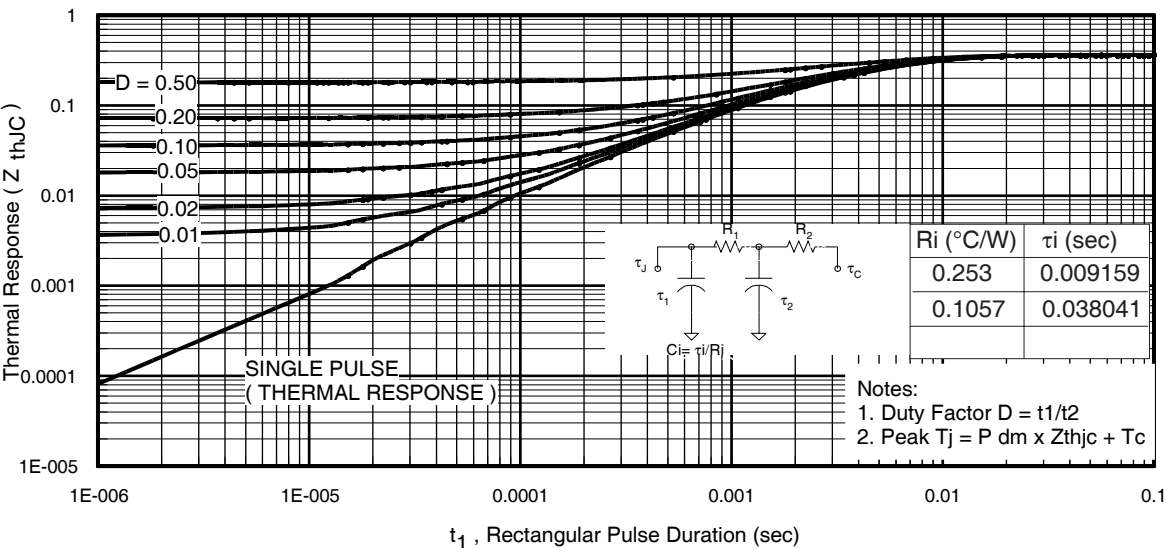


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

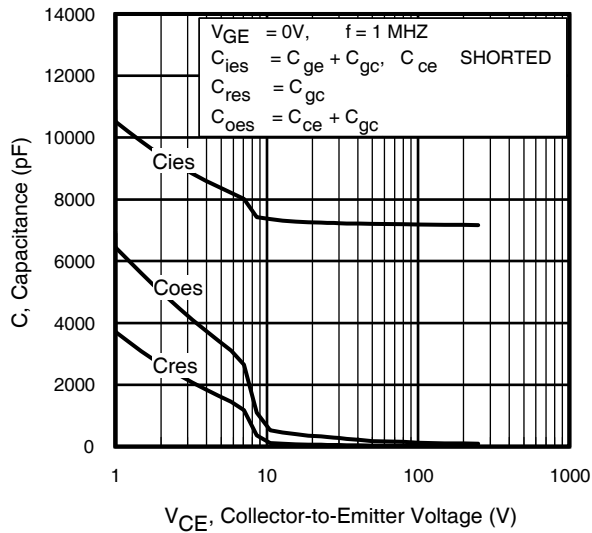


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

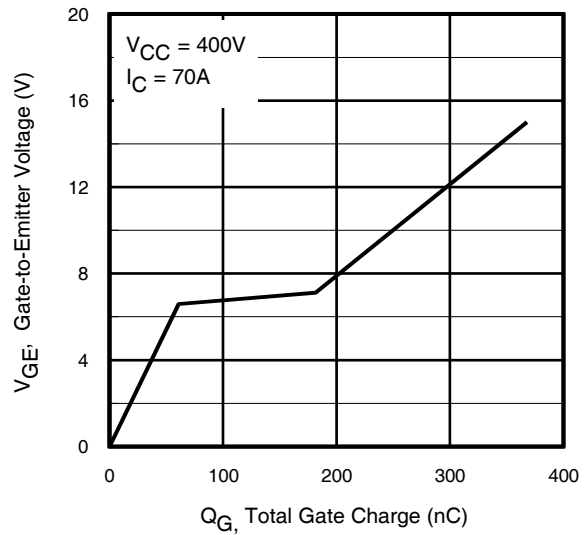


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

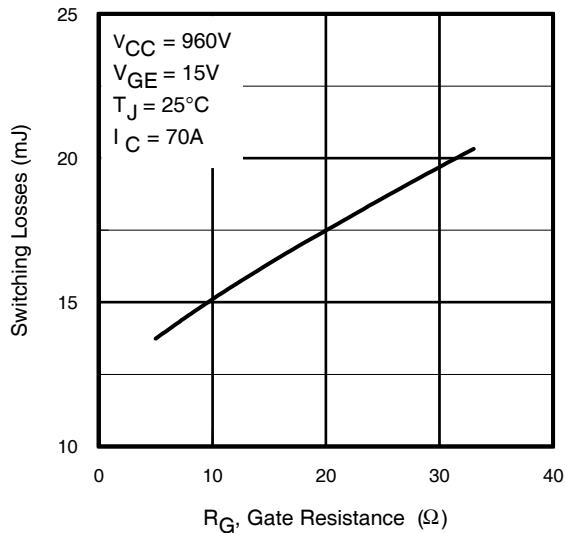


Fig. 9 - Typical Switching Losses vs. Gate Resistance

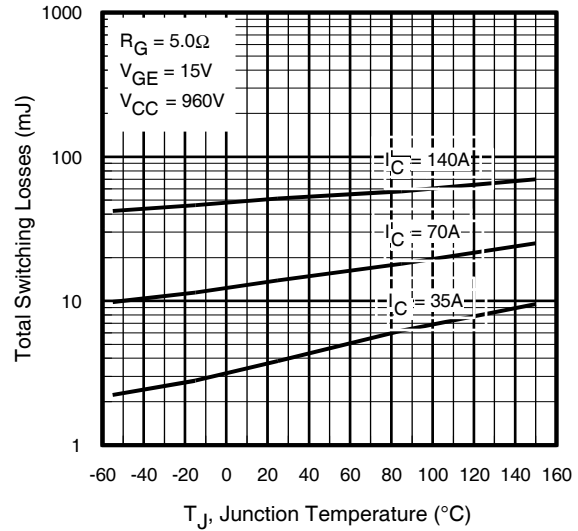


Fig. 10 - Typical Switching Losses vs. Junction Temperature

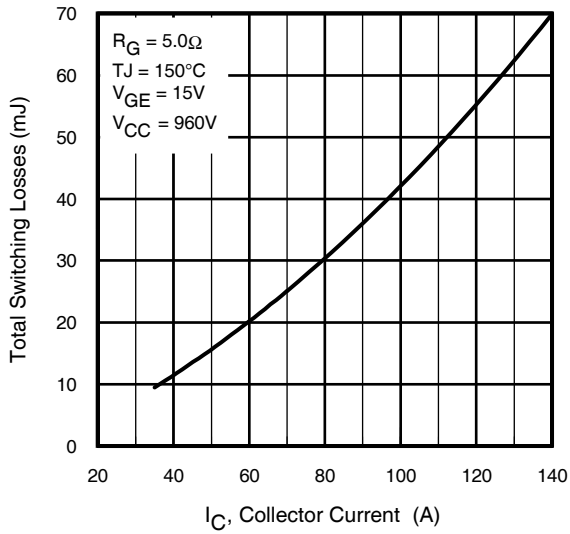


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

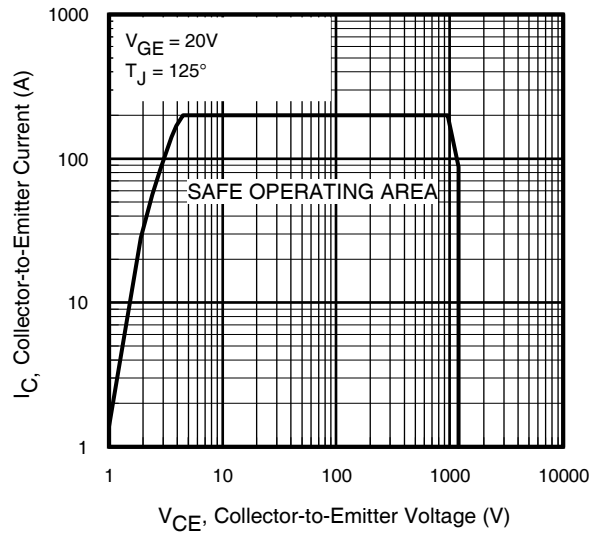


Fig. 12 - Turn-Off SOA

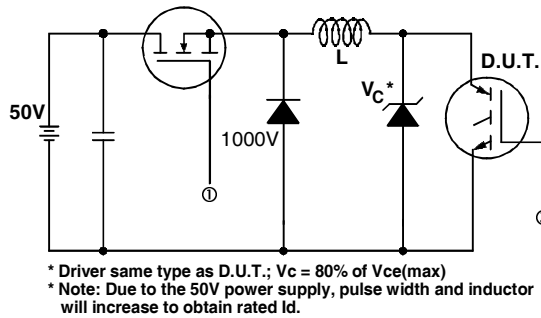


Fig. 13a - Clamped Inductive Load Test Circuit

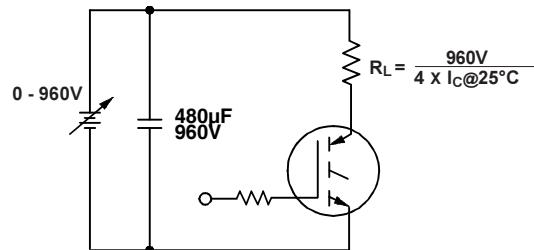


Fig. 13b - Pulsed Collector Current Test Circuit

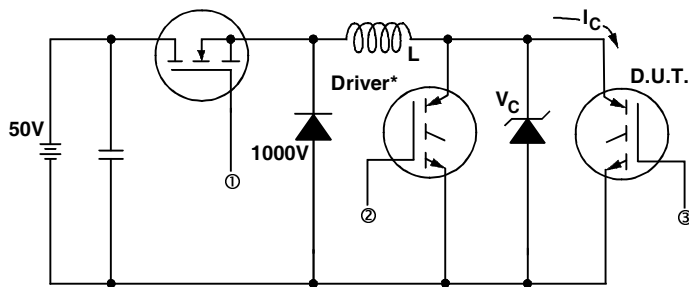


Fig. 14a - Switching Loss Test Circuit

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

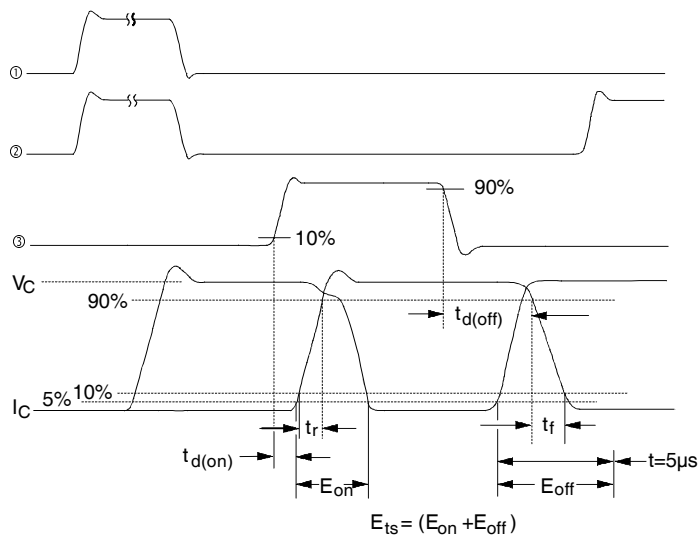
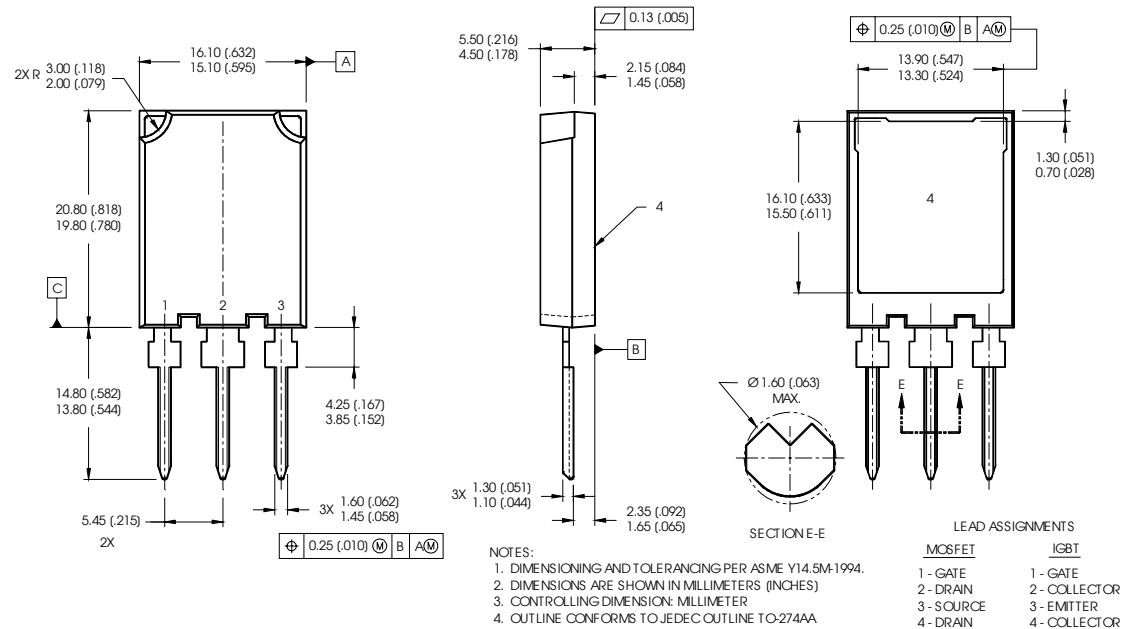


Fig. 14b - Switching Loss Waveforms

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Super-247™ (TO-274AA) Package Outline



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

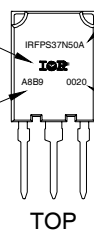
EXAMPLE: THIS IS AN IRFPS37N50A WITH
ASSEMBLY LOT CODE A8B9

INTERNATIONAL RECTIFIER
LOGO

ASSEMBLY LOT CODE

PART NUMBER

DATE CODE
(YYWW)
YY = YEAR
WW = WEEK



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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