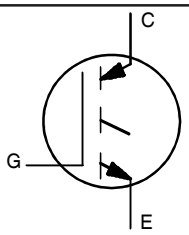
PD - 91683B

International
IOR Rectifier

IRG4PSC71K

INSULATED GATE BIPOLAR TRANSISTOR

Short Circuit Rated
UltraFast IGBT



n-channel

V_{CES} = 600V

$V_{CE(on)\ typ.}$ = 1.83V

@V_{GE} = 15V, I_C = 60A

Features

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

Benefits

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

Super-247™

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Breakdown Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current	85⑥	A
I_C @ T_C = 100°C	Continuous Collector Current	60	
I_{CM}	Pulsed Collector Current ①	200	
I_{LM}	Clamped Inductive Load Current ①	200	
t_{SC}	Short Circuit Withstand Time	10	µs
V_{GE}	Gate-to-Emitter Voltage	± 20	V
E_{ARV}	Reverse Voltage Avalanche Energy ①	180	mJ
P_D @ T_C = 25°C	Maximum Power Dissipation	350	W
P_D @ T_C = 100°C	Maximum Power Dissipation	140	
T_J	Operating Junction and	-55 to + 150	°C
T_{STG}	Storage Temperature Range		
	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)

3/18/05

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	600	—	—	V	V_{GE} = 0V, I_C = 250µA
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage ⑦	18	—	—	V	V_{GE} = 0V, I_C = 1.0A
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.5	—	V/°C	V_{GE} = 0V, I_C = 10mA
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	—	1.83	2.3	V	I_C = 60A V_{GE} = 15V
		—	2.20	—		I_C = 100A See Fig.2, 5
		—	1.81	—		I_C = 60A , 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	—	-8.0	—	mV/°C	V_{CE} = V_{GE}, I_C = 1.5mA
g_{fe}	Forward Transconductance ⑤	31	46	—	S	V_{CE} = 50V, I_C = 60A
I_{CES}	Zero Gate Voltage Collector Current	—	—	500	µA	V_{GE} = 0V, V_{CE} = 600V
		—	—	2.0		V_{GE} = 0V, V_{CE} = 10V, T_J = 25°C
		—	—	5.0	mA	V_{GE} = 0V, V_{CE} = 600V, 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)	—	340	510	nC	I_C = 60A
Q_{ge}	Gate - Emitter Charge (turn-on)	—	44	66		V_{CC} = 400V See Fig.8
Q_{gc}	Gate - Collector Charge (turn-on)	—	160	240		V_{GE} = 15V
$t_{d(on)}$	Turn-On Delay Time	—	34	—	ns	
t_r	Rise Time	—	54	—		T_J = 25°C
$t_{d(off)}$	Turn-Off Delay Time	—	251	377		I_C = 60A, V_{CC} = 480V
t_f	Fall Time	—	89	133		V_{GE} = 15V, R_G = 5.0Ω
E_{on}	Turn-On Switching Loss	—	0.79	—	mJ	Energy losses include "tail"
E_{off}	Turn-Off Switching Loss	—	1.98	—		and diode reverse recovery
E_{ts}	Total Switching Loss	—	2.77	3.1		See Fig. 9,10,18
t_{sc}	Short Circuit Withstand Time	10	—	—	µs	V_{CC} = 360V, T_J = 125°C
						V_{GE} = 15V, R_G = 5.0Ω
$t_{d(on)}$	Turn-On Delay Time	—	37	—	ns	T_J = 150°C, See Fig. 10,11,18
t_r	Rise Time	—	56	—		I_C = 60A, V_{CC} = 480V
$t_{d(off)}$	Turn-Off Delay Time	—	356	—		V_{GE} = 15V, R_G = 5.0Ω,
t_f	Fall Time	—	177	—		Energy losses include "tail"
E_{ts}	Total Switching Loss	—	5.5	—	mJ	and diode reverse recovery
L_E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package
C_{ies}	Input Capacitance	—	6900	—	pF	V_{GE} = 0V
C_{oes}	Output Capacitance	—	730	—		V_{CC} = 30V See Fig. 7
C_{res}	Reverse Transfer Capacitance	—	190	—		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.

⑥ Current limited by the package, (Die current = 100A)

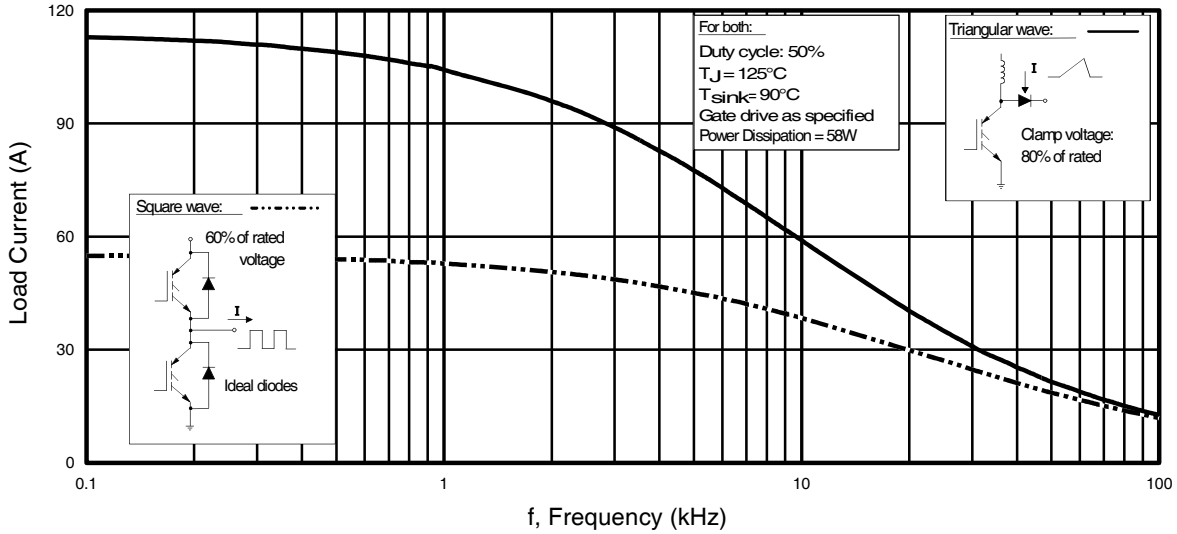


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I=I_{RMS}$ of fundamental; for triangular wave, $I=I_{PK}$)

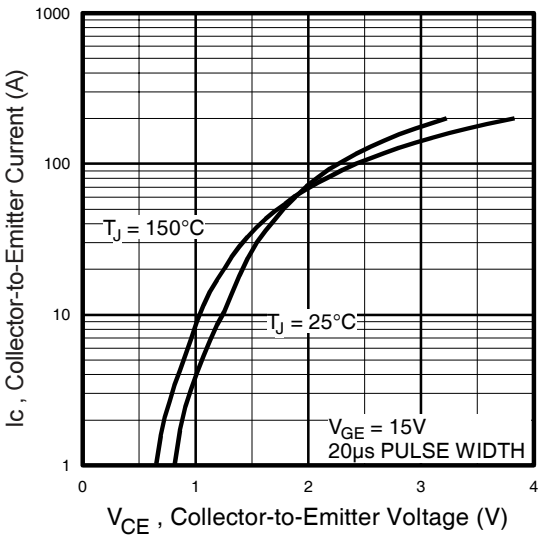


Fig. 2 - Typical Output Characteristics

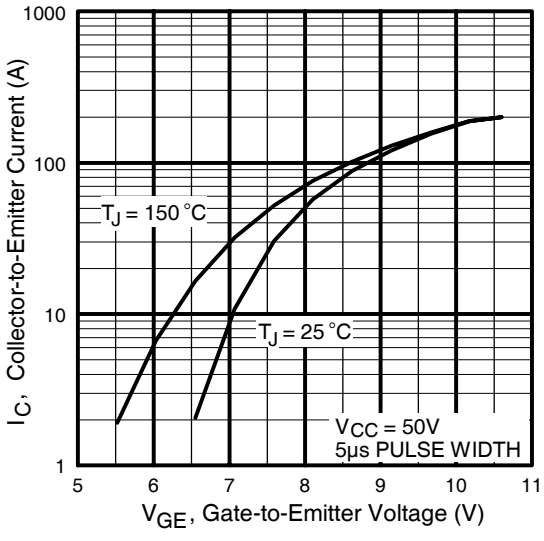


Fig. 3 - Typical Transfer Characteristics

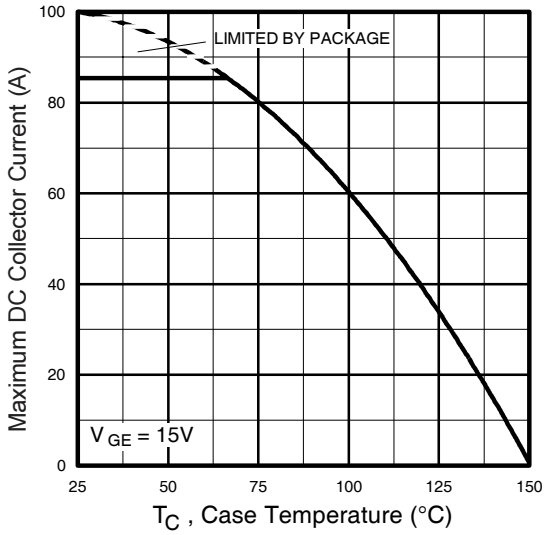


Fig. 4 - Maximum Collector Current vs. Case Temperature

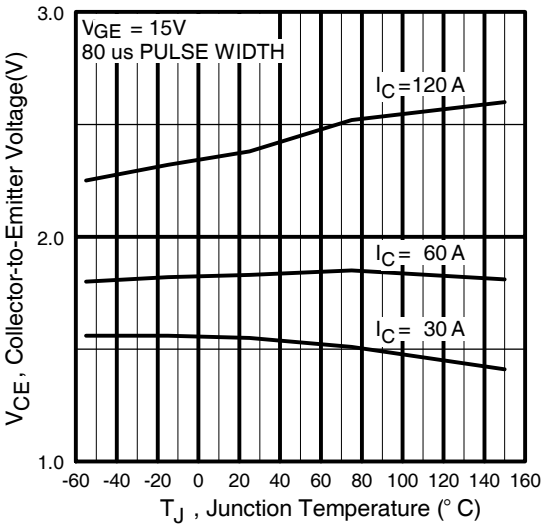


Fig. 5 - Collector-to-Emitter Voltage vs. Junction Temperature

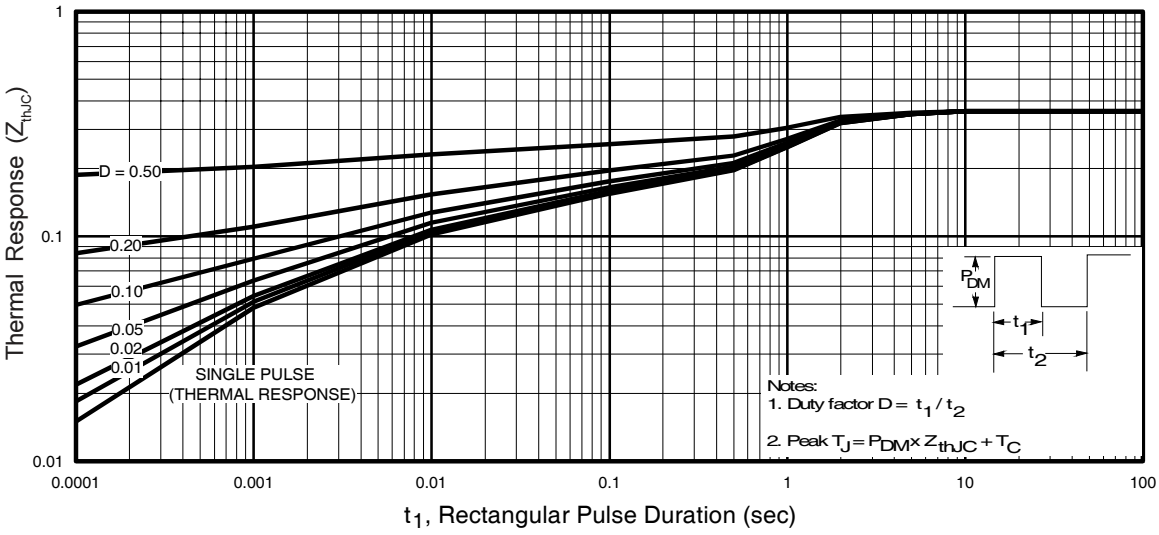


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

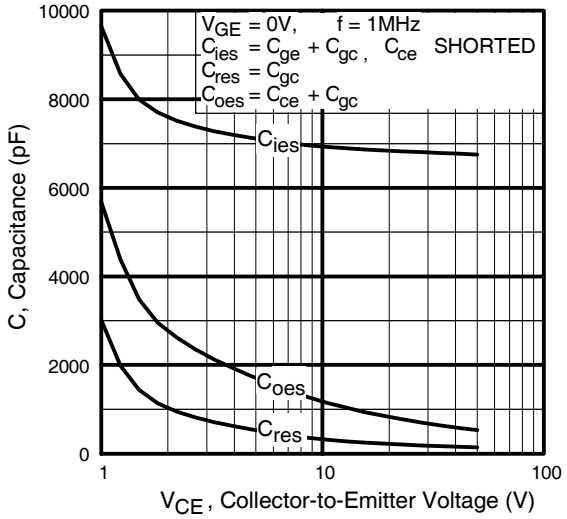


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

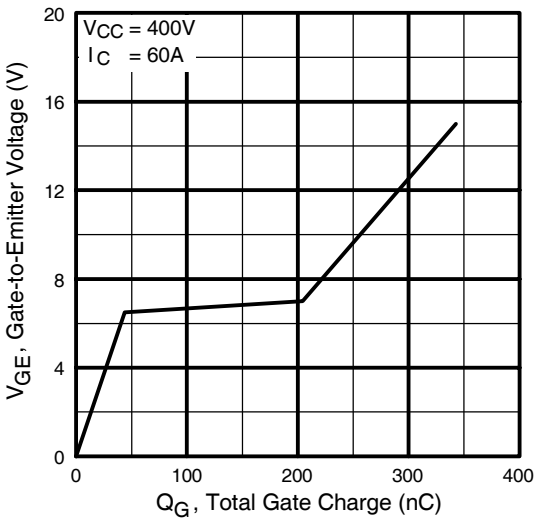


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

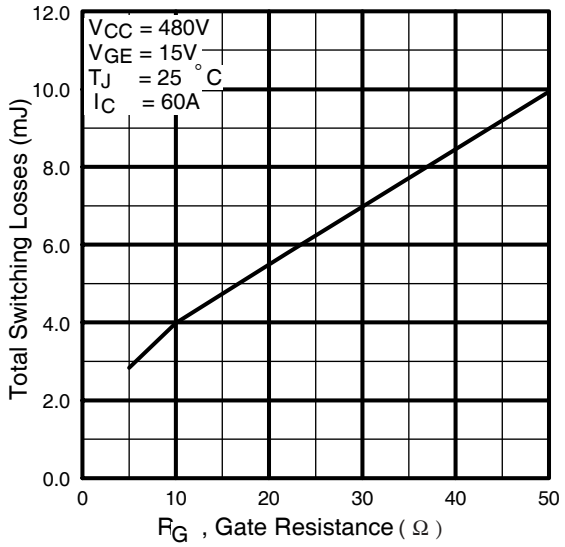


Fig. 9 - Typical Switching Losses vs. Gate Resistance

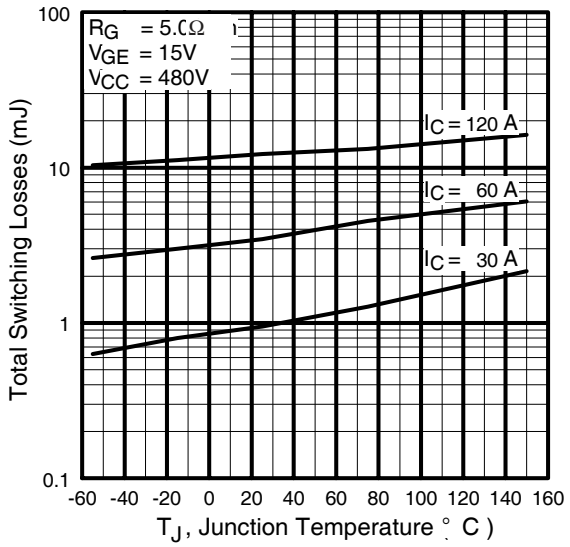


Fig. 10 - Typical Switching Losses vs. Junction Temperature

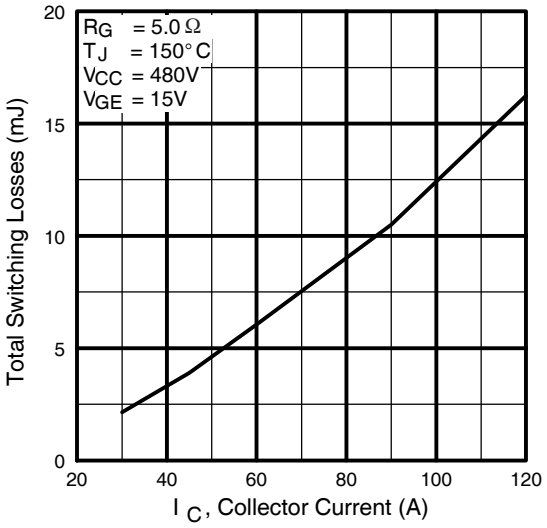


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

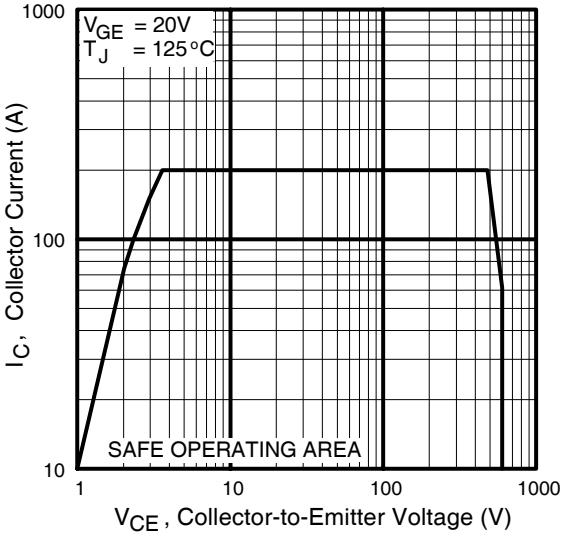


Fig. 12 - Turn-Off SOA

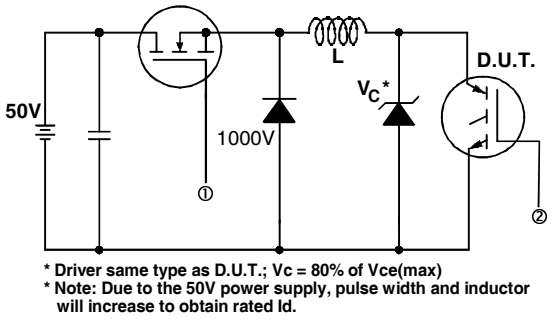


Fig. 13a - Clamped Inductive Load Test Circuit

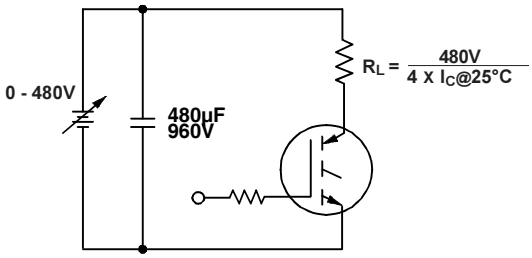


Fig. 13b - Pulsed Collector Current Test Circuit

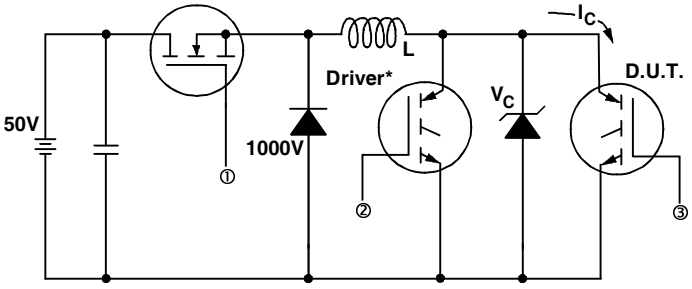


Fig. 14a - Switching Loss Test Circuit

*** Driver same type as D.U.T., VC = 480V**

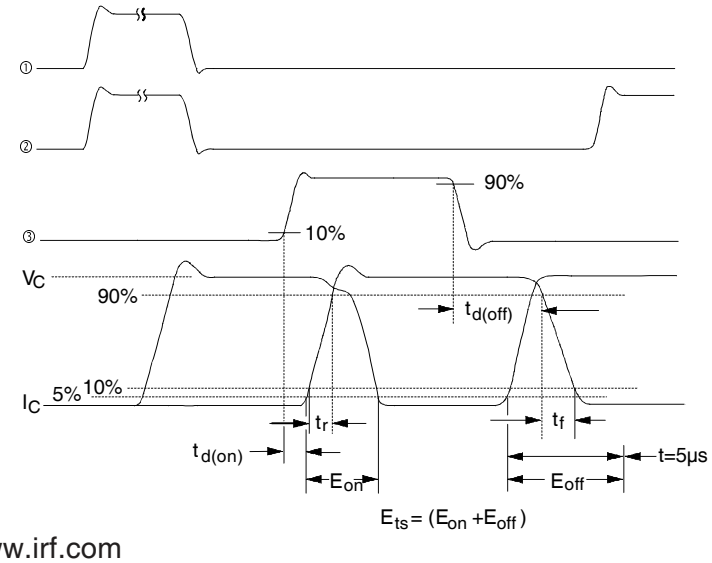
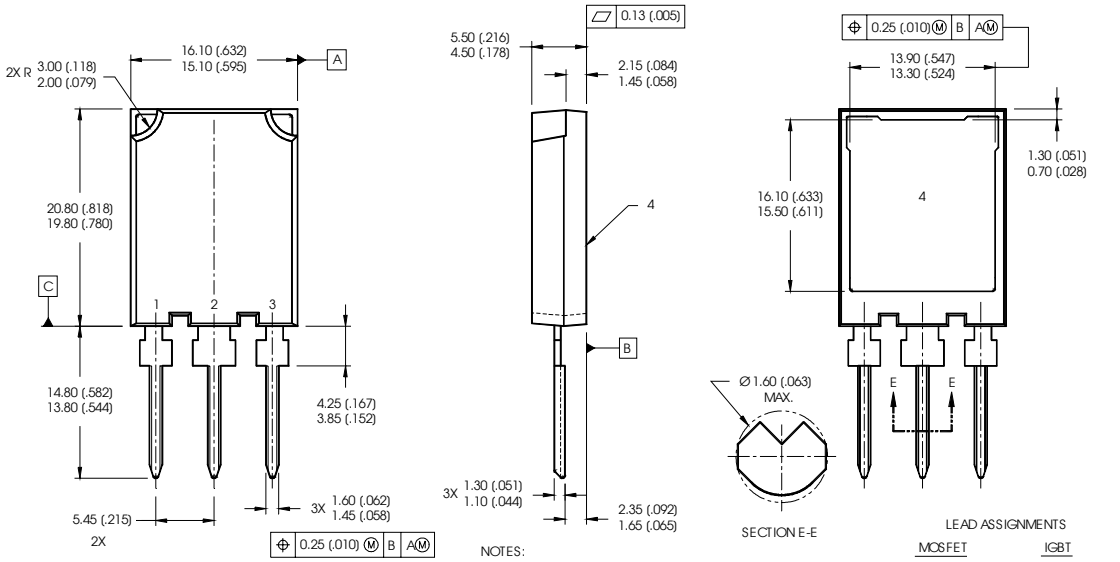


Fig. 14b - Switching Loss Waveforms

Super-247™ (TO-274AA) Package Outline

Dimensions are shown in millimeters



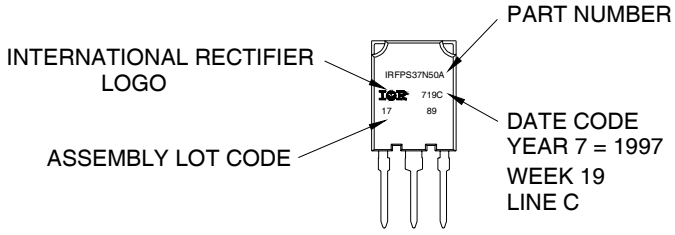
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
2. DIMENSIONS ARE SHOWN IN MILLIMETERS (INCHES)
3. CONTROLLING DIMENSION: MILLIMETER
4. OUTLINE CONFORMS TO JEDEC OUTLINE TO-274AA

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

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"

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