

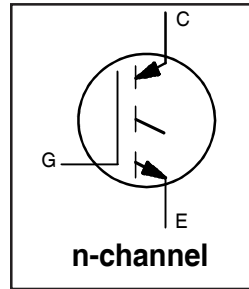
INSULATED GATE BIPOLAR TRANSISTOR

IRG4PSC71K

Short Circuit Rated
UltraFast IGBT

Features

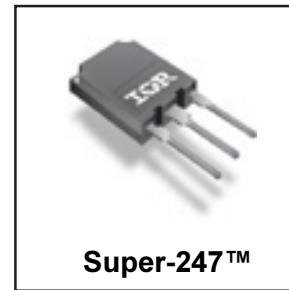
- Hole-less clip/pressure mount package compatible with TO-247 and TO-264, with reinforced pins
- High short circuit rating IGBTs, optimized for motorcontrol
- Minimum switching losses combined with low conduction losses
- Tightest parameter distribution
- Creepage distance increased to 5.35mm



$V_{CES} = 600V$
$V_{CE(on)} \text{ typ.} = 1.83V$
@ $V_{GE} = 15V, I_C = 60A$

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	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 ④	200	
I _{LM}	Clamped Inductive Load Current ⑤	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	$^\circ C/W$
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	—	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	—	—	38	
	Recommended Clip Force	20.0(2.0)	—	—	N (kgf)
	Weight	—	6 (0.21)	—	g (oz)

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	600	—	—	V	$V_{GE} = 0V, I_C = 250\mu A$
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage ∇	18	—	—	V	$V_{GE} = 0V, I_C = 1.0A$
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.5	—	V/ $^\circ\text{C}$	$V_{GE} = 0V, I_C = 10mA$
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	—	1.83	2.3	V	$I_C = 60A, V_{GE} = 15V$
		—	2.20	—		$I_C = 100A, V_{GE} = 15V$
		—	1.81	—		$I_C = 60A, T_J = 150^\circ\text{C}$
$V_{GE(th)}$	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	—	-8.0	—	mV/ $^\circ\text{C}$	$V_{CE} = V_{GE}, I_C = 1.5mA$
g_{fe}	Forward Transconductance ∇	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		$V_{GE} = 0V, V_{CE} = 10V, T_J = 25^\circ\text{C}$
		—	—	5.0	mA	$V_{GE} = 0V, V_{CE} = 600V, T_J = 150^\circ\text{C}$
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)	—	340	510	nC	$I_C = 60A$
Q_{ge}	Gate - Emitter Charge (turn-on)	—	44	66		$V_{CC} = 400V$
Q_{gc}	Gate - Collector Charge (turn-on)	—	160	240		$V_{GE} = 15V$
$t_{d(on)}$	Turn-On Delay Time	—	34	—	ns	$T_J = 25^\circ\text{C}$
t_r	Rise Time	—	54	—		$I_C = 60A, V_{CC} = 480V$
$t_{d(off)}$	Turn-Off Delay Time	—	251	377		$V_{GE} = 15V, R_G = 5.0\Omega$
t_f	Fall Time	—	89	133	mJ	Energy losses include "tail" and diode reverse recovery
E_{on}	Turn-On Switching Loss	—	0.79	—		See Fig. 9, 10, 18
E_{off}	Turn-Off Switching Loss	—	1.98	—		
E_{ts}	Total Switching Loss	—	2.77	3.1	μs	$V_{CC} = 360V, T_J = 125^\circ\text{C}$
t_{sc}	Short Circuit Withstand Time	10	—	—		$V_{GE} = 15V, R_G = 5.0\Omega$
$t_{d(on)}$	Turn-On Delay Time	—	37	—	ns	$T_J = 150^\circ\text{C},$ See Fig. 10, 11, 18
t_r	Rise Time	—	56	—		$I_C = 60A, V_{CC} = 480V$
$t_{d(off)}$	Turn-Off Delay Time	—	356	—		$V_{GE} = 15V, R_G = 5.0\Omega,$
t_f	Fall Time	—	177	—	mJ	Energy losses include "tail" and diode reverse recovery
E_{ts}	Total Switching Loss	—	5.5	—		
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	—		$V_{CC} = 30V$
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 $V_{CC} = 80\%(V_{CES})$, $V_{GE} = 20V$, $L = 10\mu H$, $R_G = 5.0\Omega$, (See fig. 13a)
- ③ Repetitive rating; pulse width limited by maximum junction temperature.
- ④ Pulse width $\leq 80\mu s$; duty factor $\leq 0.1\%$.
- ⑤ Pulse width $5.0\mu s$, single shot.
- ⑥ Current limited by the package, (Die current = 100A)

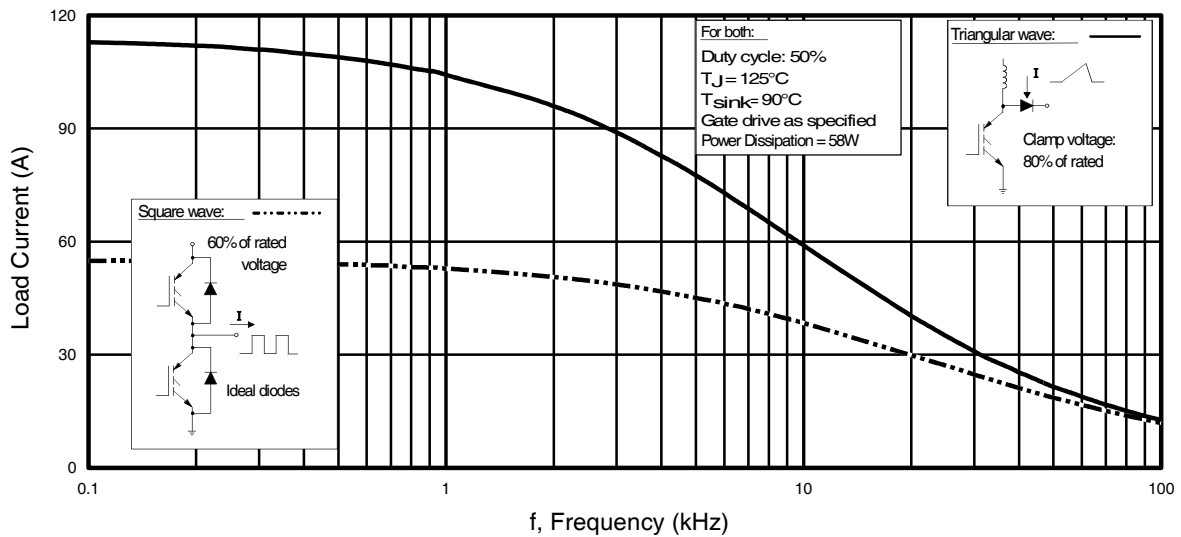


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I = I_{\text{RMS}}$ of fundamental; for triangular wave, $I = I_{\text{PK}}$)

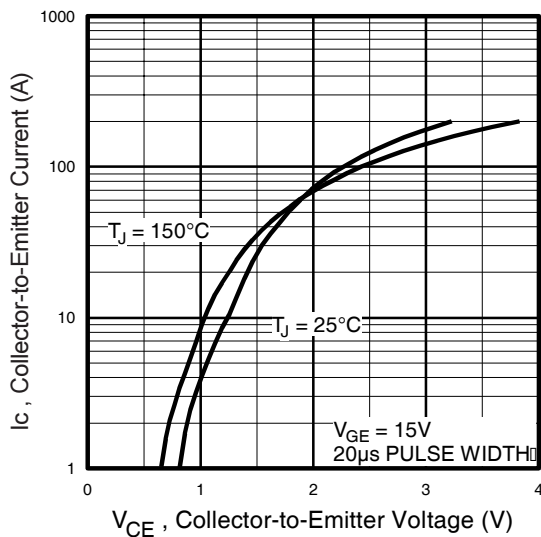


Fig. 2 - Typical Output Characteristics

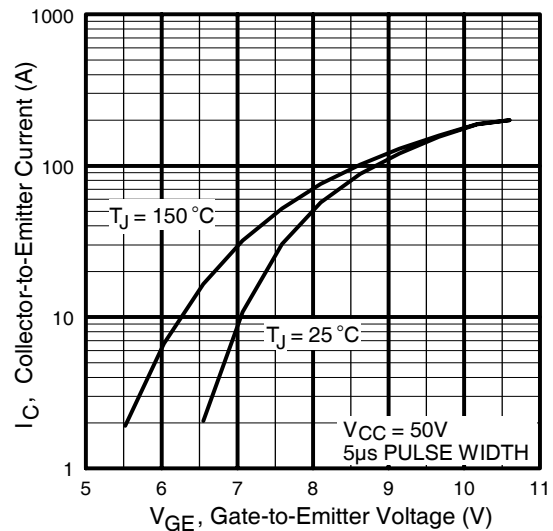


Fig. 3 - Typical Transfer Characteristics

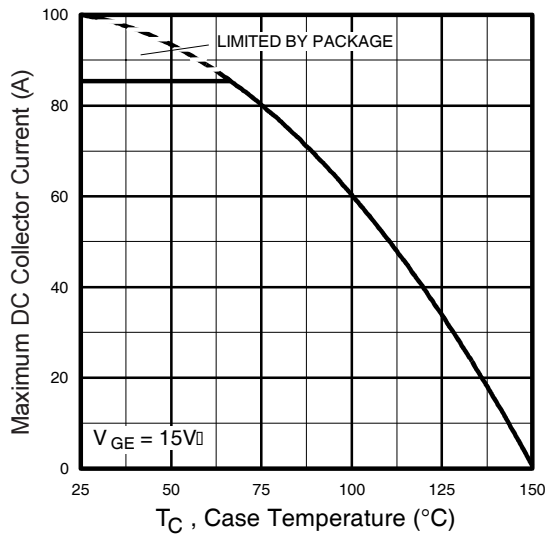


Fig. 4 - Maximum Collector Current vs. Case Temperature

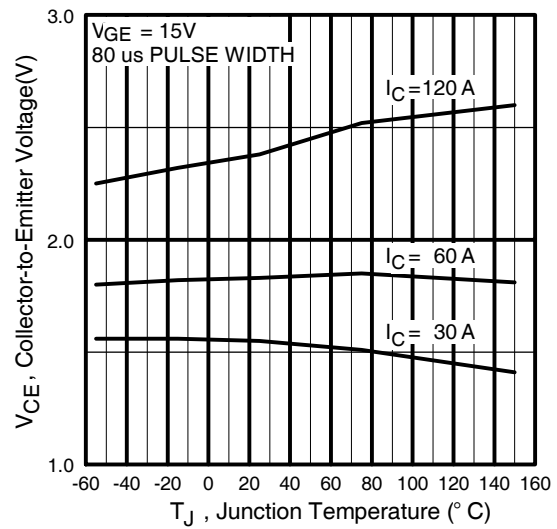


Fig. 5 - Collector-to-Emitter Voltage vs. Junction Temperature

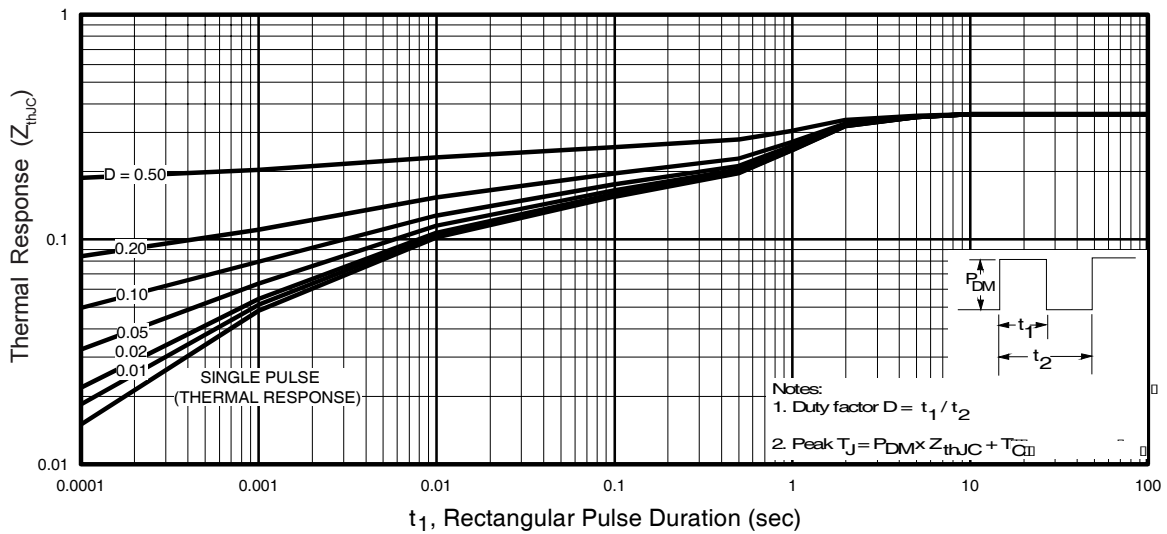


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

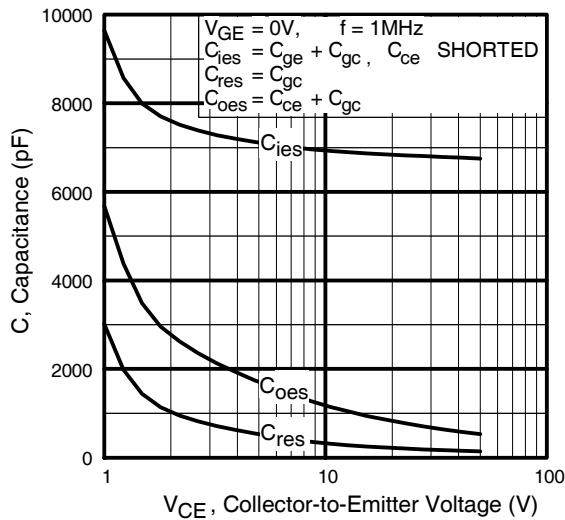


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

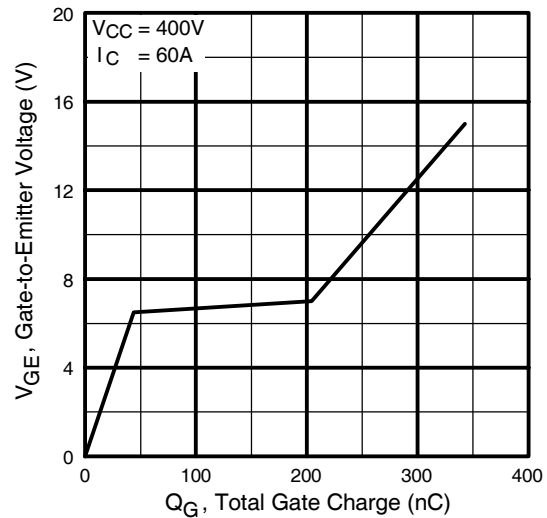


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

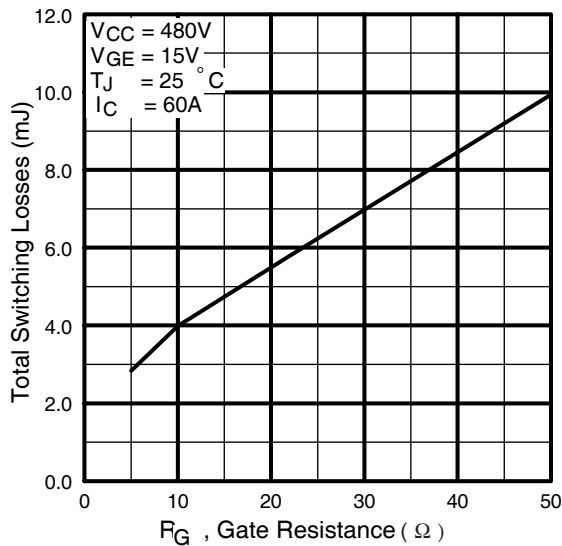


Fig. 9 - Typical Switching Losses vs. Gate Resistance

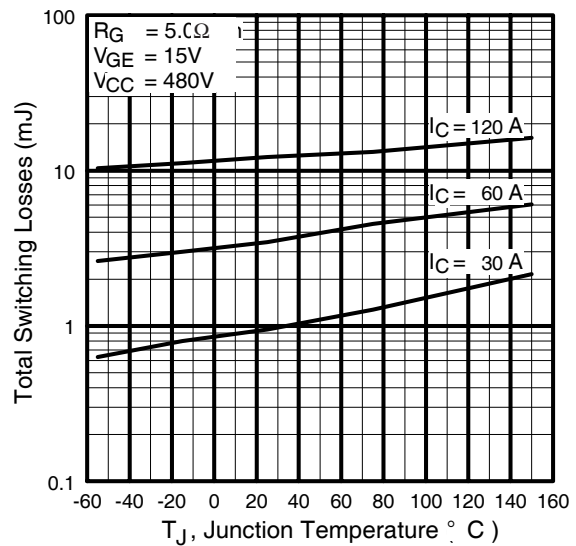


Fig. 10 - Typical Switching Losses vs. Junction Temperature

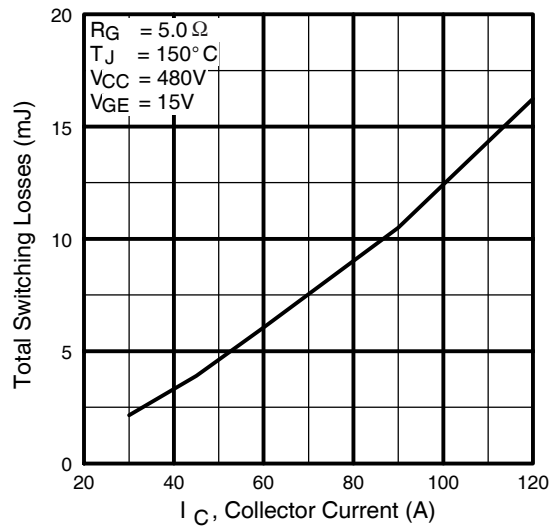


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

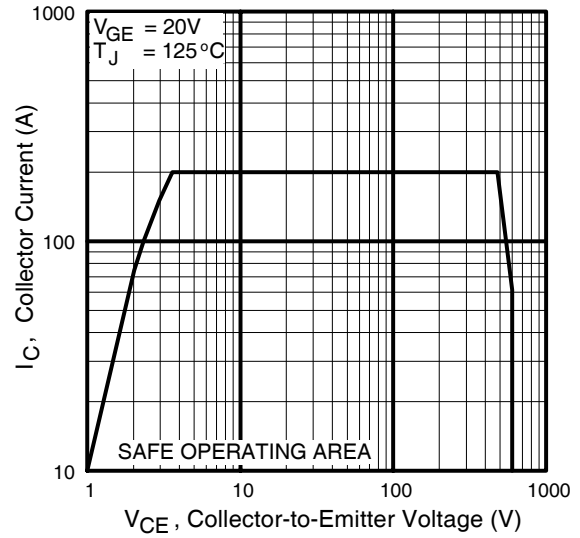


Fig. 12 - Turn-Off SOA

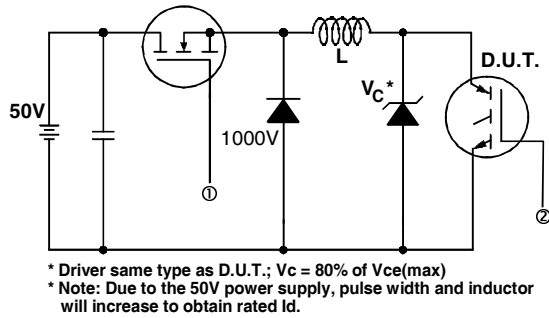


Fig. 13a - Clamped Inductive Load Test Circuit

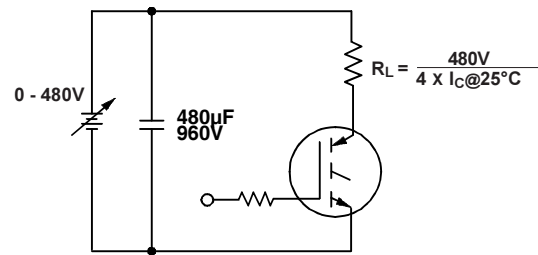


Fig. 13b - Pulsed Collector Current Test Circuit

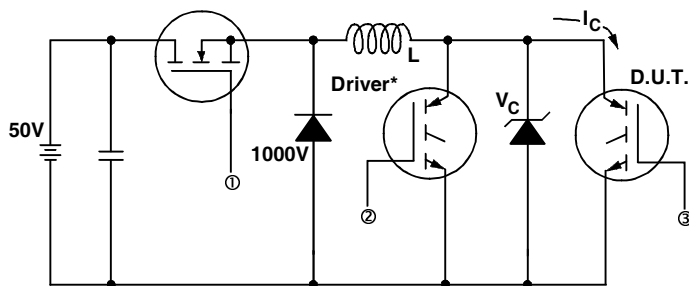


Fig. 14a - Switching Loss Test Circuit

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

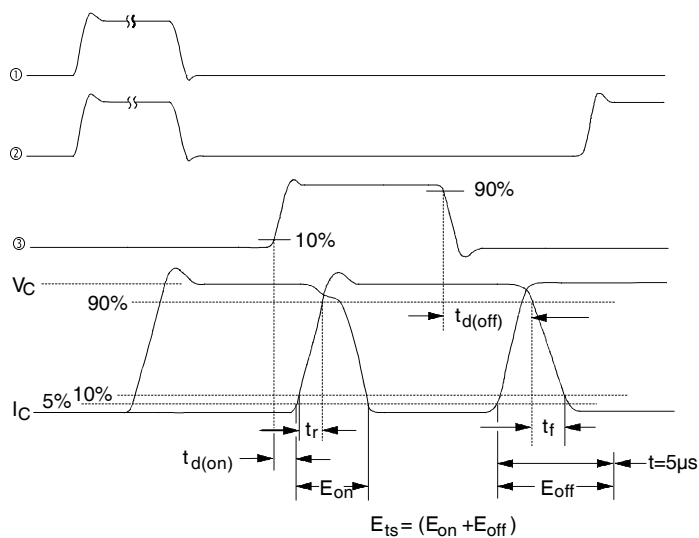


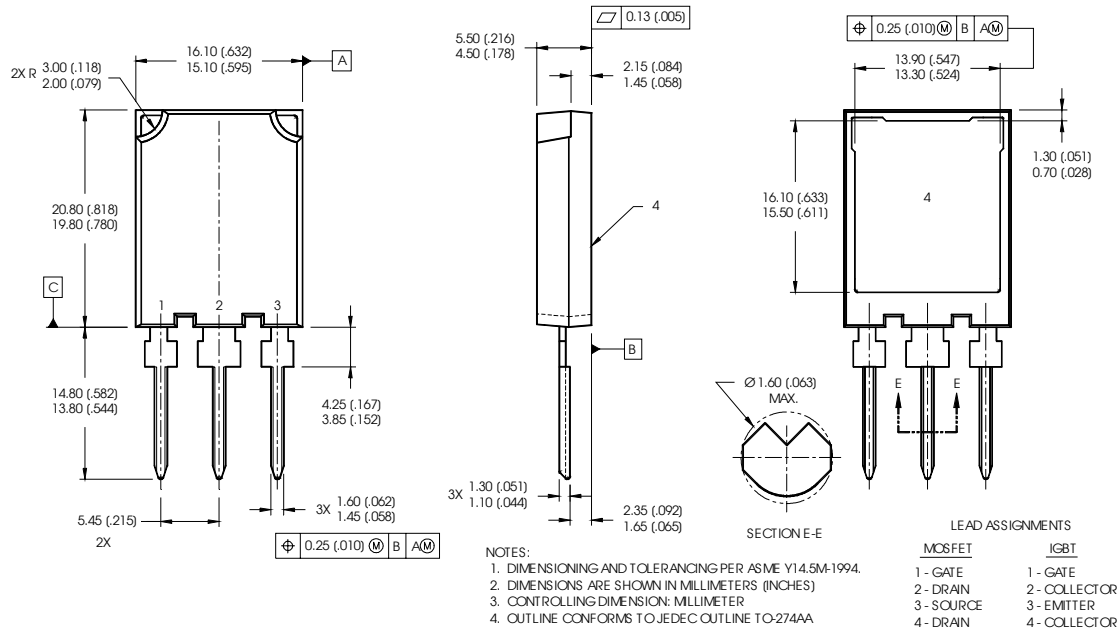
Fig. 14b - Switching Loss Waveforms

IRG4PSC71K

International
IR Rectifier

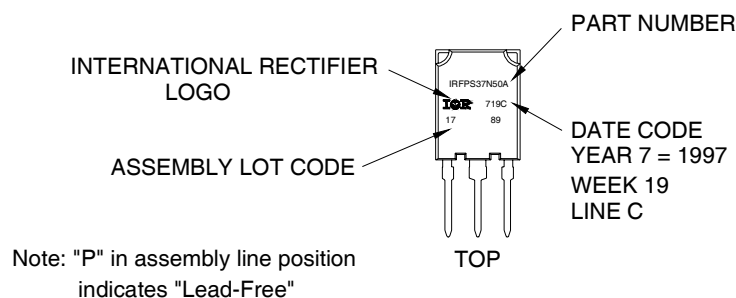
Super-247™ (TO-274AA) Package Outline

Dimensions are shown in millimeters



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"



International
IR Rectifier

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