

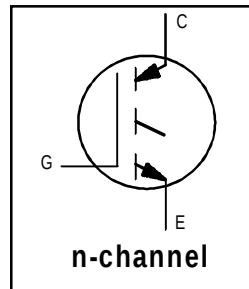
IRG4MC30F

INSULATED GATE BIPOLAR TRANSISTOR

Fast Speed IGBT

Features

- Electrically Isolated and Hermetically Sealed
- Simple Drive Requirements
- Latch-proof
- Fast Speed operation 3 kHz - 8 kHz
- High operating frequency
- Switching-loss rating includes all "tail" losses
- Ceramic eyelets



$$V_{CES} = 600V$$

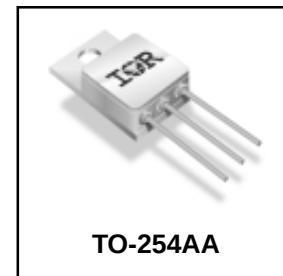
$$V_{CE(on) \max} = 1.7V$$

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

Benefits

- Generation 4 IGBT's offer highest efficiency available
- IGBT's optimized for specified application conditions
- Designed to be a "drop-in" replacement for equivalent IR Hi-Rel Generation 3 IGBT's

Insulated Gate Bipolar Transistors (IGBTs) from International Rectifier have higher usable current densities than comparable bipolar transistors, while at the same time having simpler gate-drive requirements of the familiar power MOSFET. They provide substantial benefits to a host of high-voltage, high-current applications.



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Breakdown Voltage	600	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	28	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	15	
I_{CM}	Pulsed Collector Current ①	112	
I_{LM}	Clamped Inductive Load Current ②	112	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	75	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	30	
T_J	Operating Junction and Storage Temperature Range	-55 to + 150	$^\circ C$
T_{STG}	Lead Temperature	300 (0.063in./1.6mm from case for 10s)	
	Weight	9.3 (typical)	

Thermal Resistance

	Parameter	Min	Typ	Max	Units	Test Conditions
R_{thJC}	Junction-to-Case	—	—	1.67	$^\circ C/W$	

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	$V_{GE} = 0V, I_C = 1.0\text{ mA}$
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage ③	18	—	—	V	$V_{GE} = 0V, I_C = 1.0\text{ A}$
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.63	—	V/°C	$V_{GE} = 0V, I_C = 1.0\text{ mA}$
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	—	—	1.7	V	$I_C = 15A, V_{GE} = 15V$
		—	—	2.2		$I_C = 28A, V_{GE} = 15V$
		—	—	2.7		$I_C = 15A, T_J = 125^\circ\text{C}$
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0		$V_{CE} = V_{GE}, I_C = 1.0\text{ mA}$
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-11	—	mV/°C	$V_{CE} = V_{GE}, I_C = 250\text{ }\mu\text{A}$
g_{fe}	Forward Transconductance ④	14	—	—	S	$V_{CE} \geq 15V, I_C = 15A$
I_{CES}	Zero Gate Voltage Collector Current	—	—	50	μA	$V_{GE} = 0V, V_{CE} = 480V$
		—	—	1000		$V_{GE} = 0V, V_{CE} = 480V, T_J = 125^\circ\text{C}$
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)	—	—	77	nC	$I_C = 15A$
Q_{ge}	Gate - Emitter Charge (turn-on)	—	—	12		$V_{CC} = 300V, V_{GE} = 15V$
Q_{gc}	Gate - Collector Charge (turn-on)	—	—	24		See Fig. 8
$t_{d(on)}$	Turn-On Delay Time	—	—	42	ns	$T_J = 25^\circ\text{C}$
t_r	Rise Time	—	—	30		$I_C = 15A, V_{CC} = 480V$
$t_{d(off)}$	Turn-Off Delay Time	—	—	300		$V_{GE} = 15V, R_G = 7.5\Omega$
t_f	Fall Time	—	—	300		Energy losses include "tail"
E_{ts}	Total Switching Loss	—	—	2.0	mJ	See Fig. 10, 11, 13, 14
$t_{d(on)}$	Turn-On Delay Time	—	—	25	ns	$T_J = 125^\circ\text{C},$
t_r	Rise Time	—	—	20		$I_C = 15A, V_{CC} = 480V$
$t_{d(off)}$	Turn-Off Delay Time	—	—	450		$V_{GE} = 15V, R_G = 7.5\Omega$
t_f	Fall Time	—	—	550		Energy losses include "tail"
E_{ts}	Total Switching Loss	—	—	3.0	mJ	See Fig. 13, 14
$L_C + L_E$	Total Inductance	—	6.8	—	nH	Measured from Collector lead (6mm/ 0.25in. from package) to Emitter lead (6mm / 0.25in. from package)
C_{ies}	Input Capacitance	—	1100	—	pF	$V_{GE} = 0V$
C_{oes}	Output Capacitance	—	74	—		$V_{CC} = 30V$
C_{res}	Reverse Transfer Capacitance	—	14	—		$f = 1.0\text{ MHz}$

Notes:

- ① Repetitive rating; $V_{GE} = 20V$, pulse width limited by max. junction temperature. (See fig. 13b)
- ② $V_{CC} = 80\%(V_{CES}), V_{GE} = 20V, L = 100\mu\text{H}, R_G = 7.5\Omega$, (See fig. 13a)
- ③ Pulse width $\leq 80\mu\text{s}$; duty factor $\leq 0.1\%$.
- ④ Pulse width $5.0\mu\text{s}$, single shot.

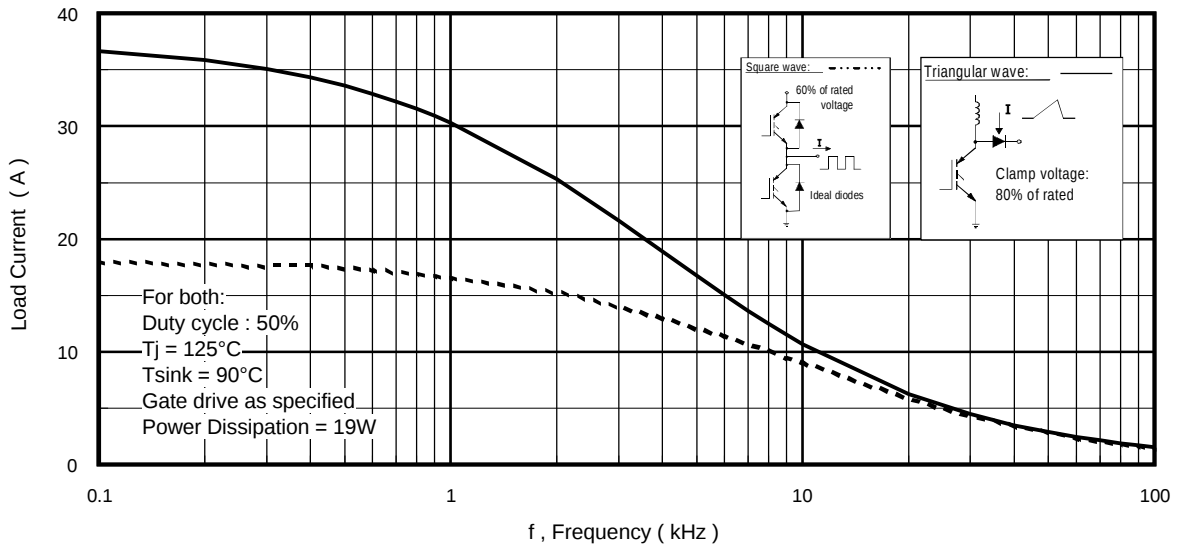


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I = I_{RMS}$ of fundamental; for triangular wave, $I = I_{PK}$)

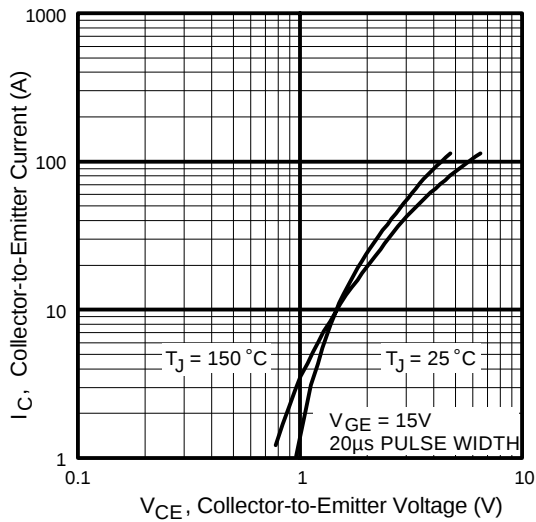


Fig. 2 - Typical Output Characteristics

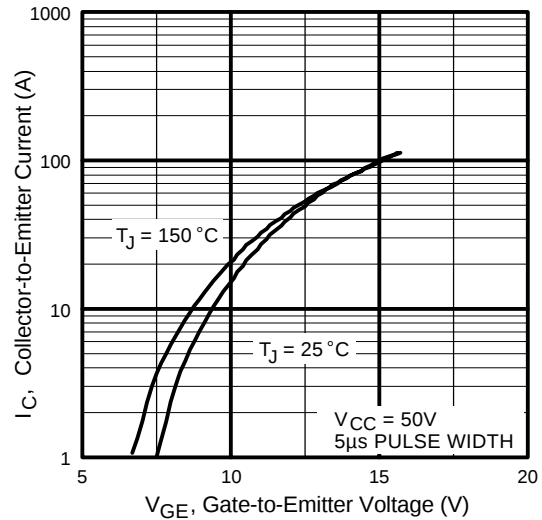


Fig. 3 - Typical Transfer Characteristics

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International
IRF Rectifier

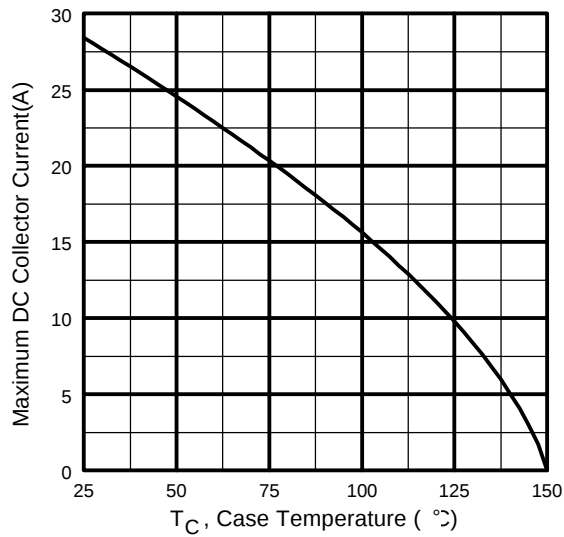


Fig. 4 - Maximum Collector Current vs. Case Temperature

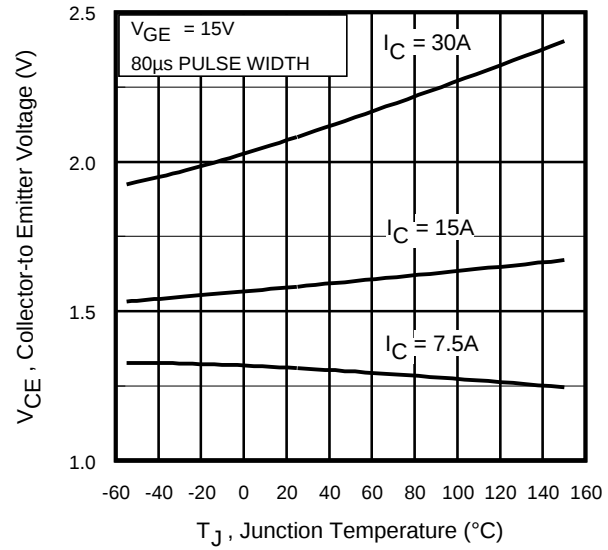


Fig. 5 - Collector-to-Emitter Voltage vs. Junction Temperature

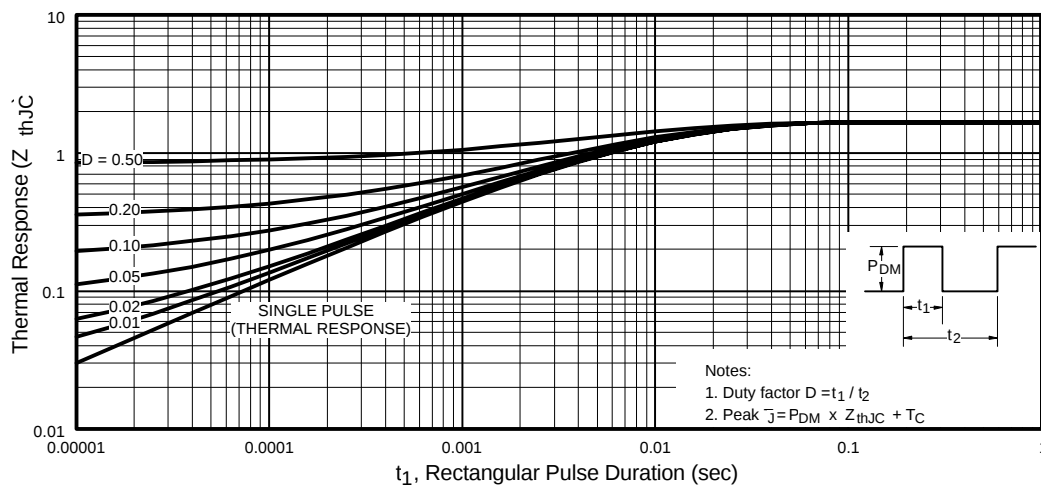


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

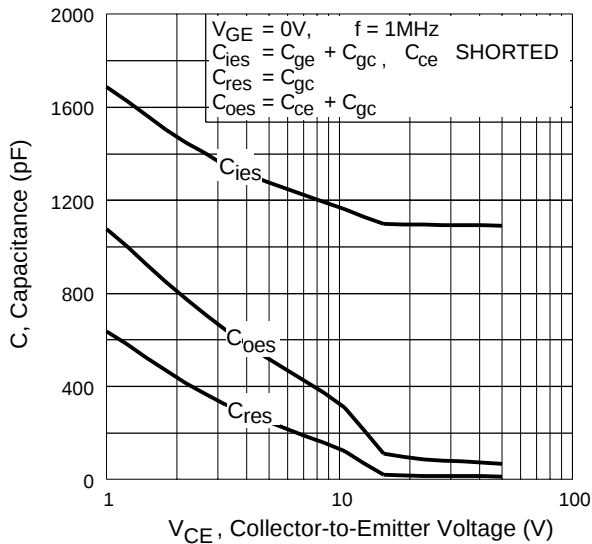


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

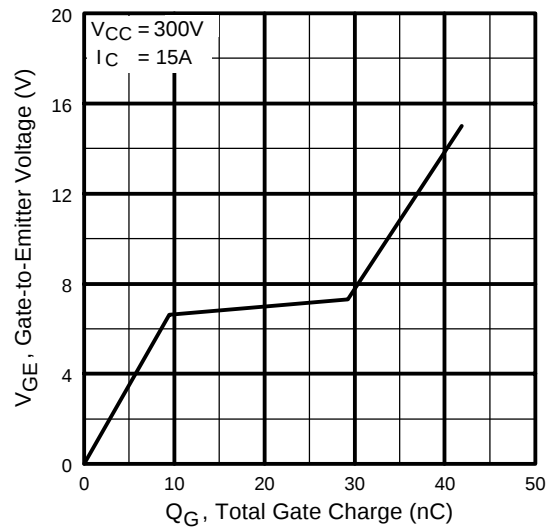


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

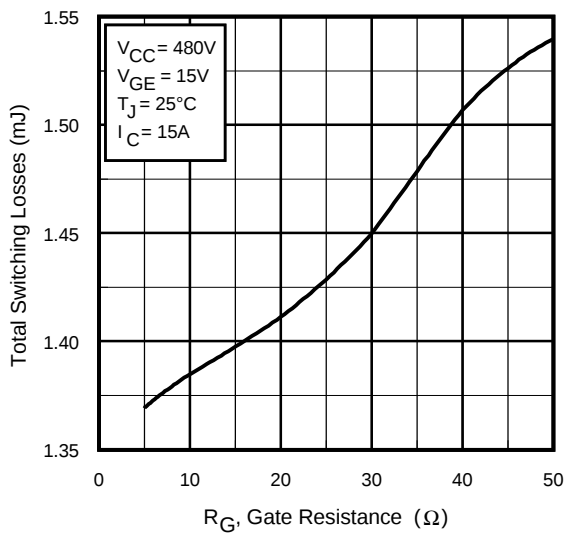


Fig. 9 - Typical Switching Losses vs. Gate Resistance

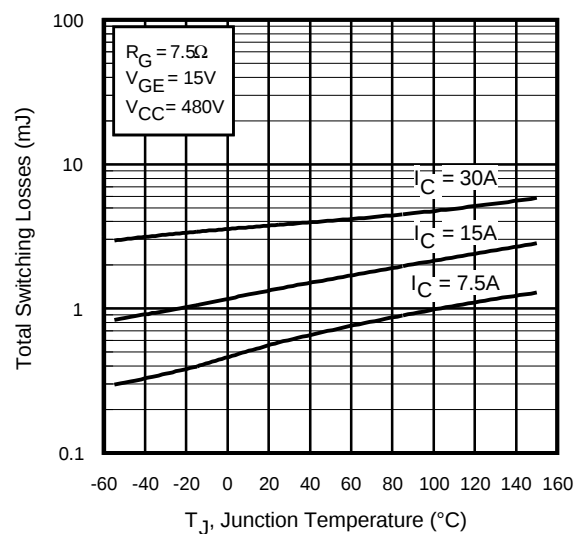


Fig. 10 - Typical Switching Losses vs. Junction Temperature

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IR Rectifier

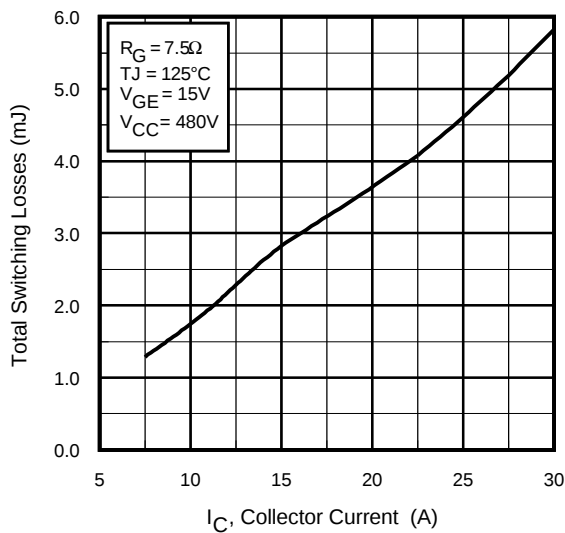


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

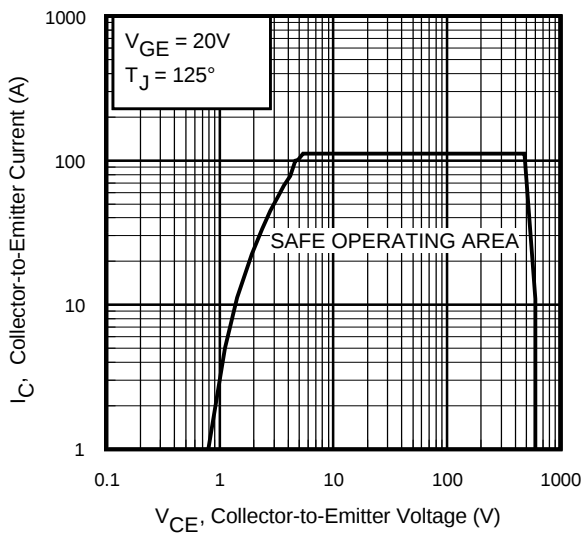
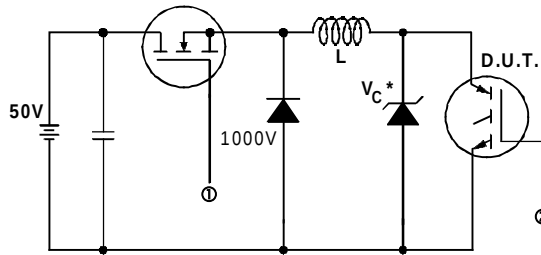


Fig. 12 - Turn-Off SOA



* Driver same type as D.U.T.; $V_c = 80\%$ of $V_{ce(max)}$
 * Note: Due to the 50V power supply, pulse width and inductor will increase to obtain rated I_d .

Fig. 13a - Clamped Inductive Load Test Circuit

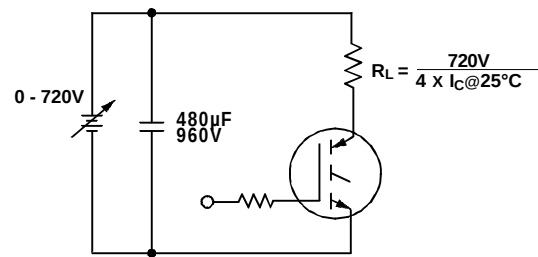


Fig. 13b - Pulsed Collector Current Test Circuit

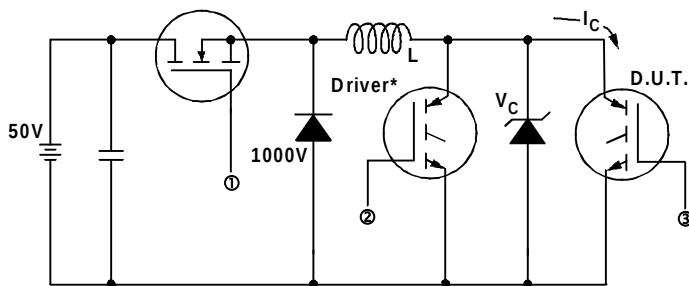


Fig. 14a - Switching Loss Test Circuit

* Driver same type as D.U.T., $V_C = 720V$

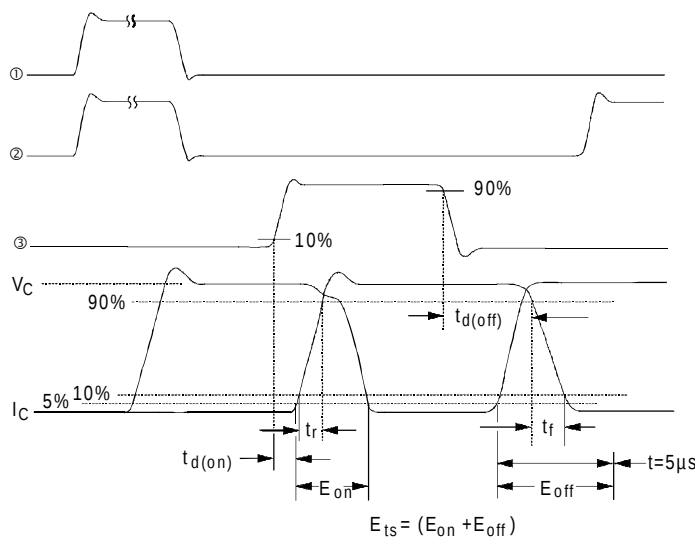


Fig. 14b - Switching Loss Waveforms

International
IOR Rectifier

[illegible]

1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
3. CONTROLLING DIMENSION: INCH.
4. CONFORMS TO JEDEC OUTLINE T O-254AA.

1=COLLECTOR
2=EMITTER
3=GATE

BERYLLIA WARNING PER MIL-PRF-19500

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