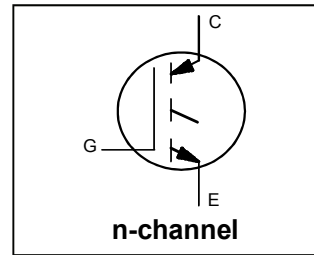


INSULATED GATE BIPOLAR TRANSISTOR

Fast Speed IGBT

Features

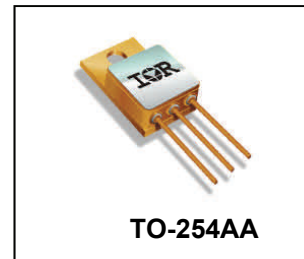
- Electrically Isolated and Hermetically Sealed
- Simple Drive Requirements
- Latch-proof
- Fast Speed Operation 3 kHz - 8 kHz
- High Operating Frequency
- Switching-loss Rating includes all "tail" Losses
- Ceramic Eyelets



$V_{CES} = 600V$
 $V_{CE(on) max} = 2.0V$
@ $V_{GE} = 15V, I_C = 30A$

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 HiRel Generation 3 IGBT's



Insulated Gate Bipolar Transistors (IGBTs) from IR HiRel have higher usable current densities than comparable polar 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		Units
V_{CES}	Collector-to-Emitter Breakdown Voltage	600	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	35*	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	30	
I_{CM}	Pulsed Collector Current ①	140	
I_{LM}	Clamped Inductive Load Current ②	140	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	150	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	60	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Lead Temperature	300 (0.063 in. /1.6 mm from case for 10s)	
	Weight	9.3 (Typical)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	—	0.83	°C/W

* Current is limited by package

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	$V_{GE} = 0V, I_C = 1.0mA$
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage ^③	17	—	—	V	$V_{GE} = 0V, I_C = 1.0A$
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.58	—	V/ $^\circ\text{C}$	$V_{GE} = 0V, I_C = 1.0mA$
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	—	2.0	V	$I_C = 30A, V_{GE} = 15V$, See Fig. 2,5
		—	—	2.2		$I_C = 35A, V_{GE} = 15V$, See Fig. 2,5
		—	—	1.9		$I_C = 30A, V_{GE} = 15V, T_J = 125^\circ\text{C}$
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0	V	$V_{CE} = V_{GE}, I_C = 1.0mA$
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-11.8	—	mV/ $^\circ\text{C}$	$V_{CE} = V_{GE}, I_C = 250\mu A$
gfe	Forward Transconductance ^④	21	—	—	S	$V_{CE} = 15V, I_C = 30A$
I_{CES}	Collector-to-Emitter Leakage Current	—	—	250	μA	$V_{GE} = 0V, V_{CE} = 480V$
		—	—	2000		$V_{GE} = 0V, V_{CE} = 480V, T_J = 125^\circ\text{C}$
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)	—	—	290	nC	$I_C = 30A$
Q_{ge}	Gate-to-Emitter Charge (turn-on)	—	—	42		$V_{GE} = 15V$ See Fig. 8
Q_{gc}	Gate-to-Collector Charge (turn-on)	—	—	97		$V_{CC} = 480V$
$t_{d(on)}$	Turn-On delay time	—	—	50	ns	$T_J = 25^\circ\text{C}$
t_r	Rise time	—	—	25		$I_C = 30A, V_{CC} = 480V$
$t_{d(off)}$	Turn-Off delay time	—	—	350		$V_{GE} = 15V, R_G = 2.35\Omega$,
t_f	Fall time	—	—	300		Energy losses include tail
E_{total}	Total Switching Loss	—	—	3.0	mJ	See Fig. 10, 11, 13, 14
$t_{d(on)}$	Turn-On delay time	—	—	50	ns	$T_J = 125^\circ\text{C}$
t_r	Rise time	—	—	25		$I_C = 30A, V_{CC} = 480V$
$t_{d(off)}$	Turn-Off delay time	—	—	475		$V_{GE} = 15V, R_G = 2.35\Omega$
t_f	Fall time	—	—	400		Energy losses include tail
E_{total}	Total Switching Loss	—	—	6.0	mJ	See Fig. 10, 11, 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	—	4100	—	pF	$V_{GE} = 0V$
C_{oes}	Output Capacitance	—	250	—		$V_{CC} = 30V$ See Fig. 7
C_{res}	Reverse Transfer Capacitance	—	49	—		$f = 1.0Mhz$

Notes:

- ① Repetitive rating; $V_{GE} = 20V$, pulse width limited by max. junction temperature. (See Fig. 13b).
- ② $V_{CC} = 80\%(V_{CES}), V_{GE} = 20V, L = 100\mu H, R_G = 2.35\Omega$, (See Fig. 13a).
- ③ Pulse width $\leq 80\mu s$; duty factor $\leq 0.1\%$.
- ④ Pulse width $5.0\mu s$, single shot.

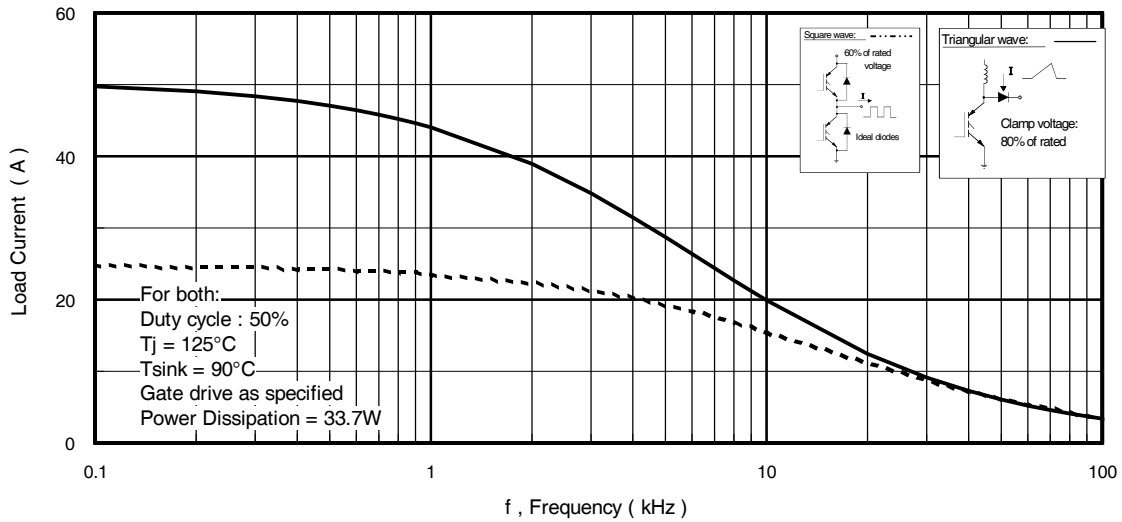


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I = I_{RMS}$ of fundamental; for triangular wave, $I = I_{PK}$)

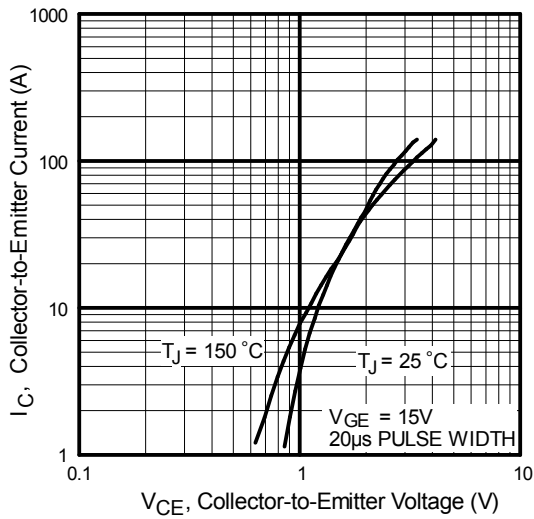


Fig 2. Typical Output Characteristics

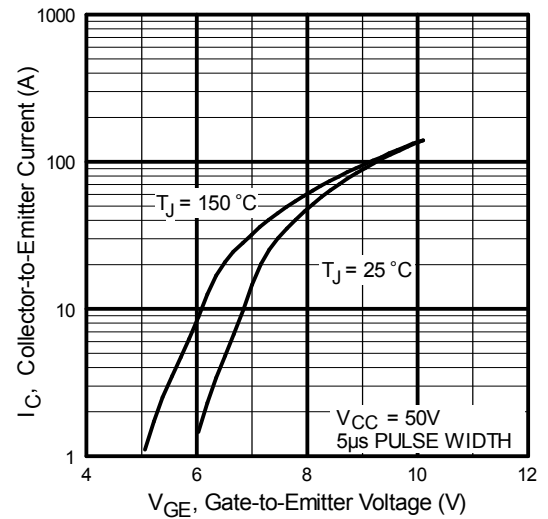


Fig 3. Typical Transfer Characteristics

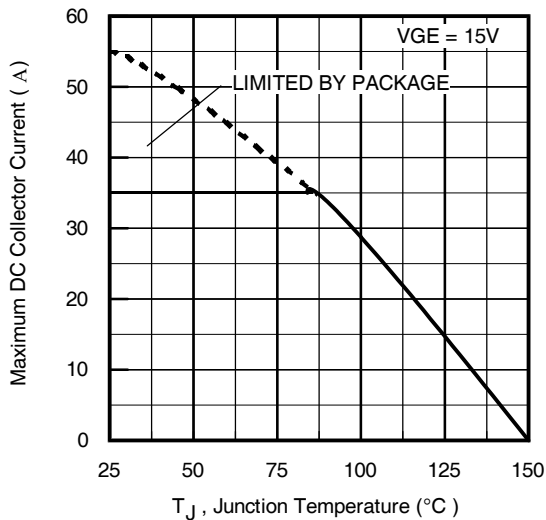


Fig 4. Maximum Collector Current Vs. Case Temperature

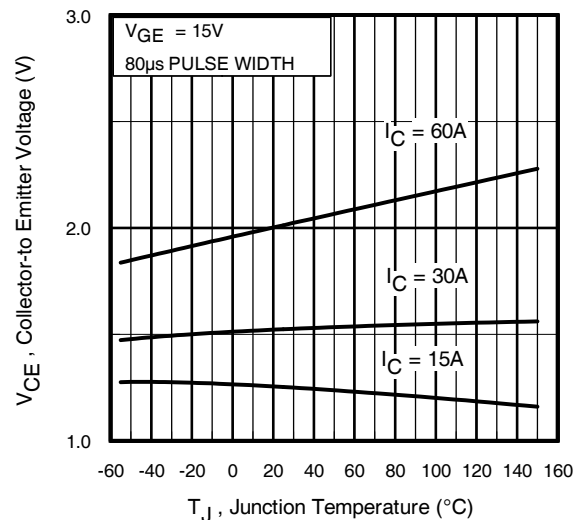


Fig 5. Collector-to-Emitter Voltage Vs. Junction Temperature

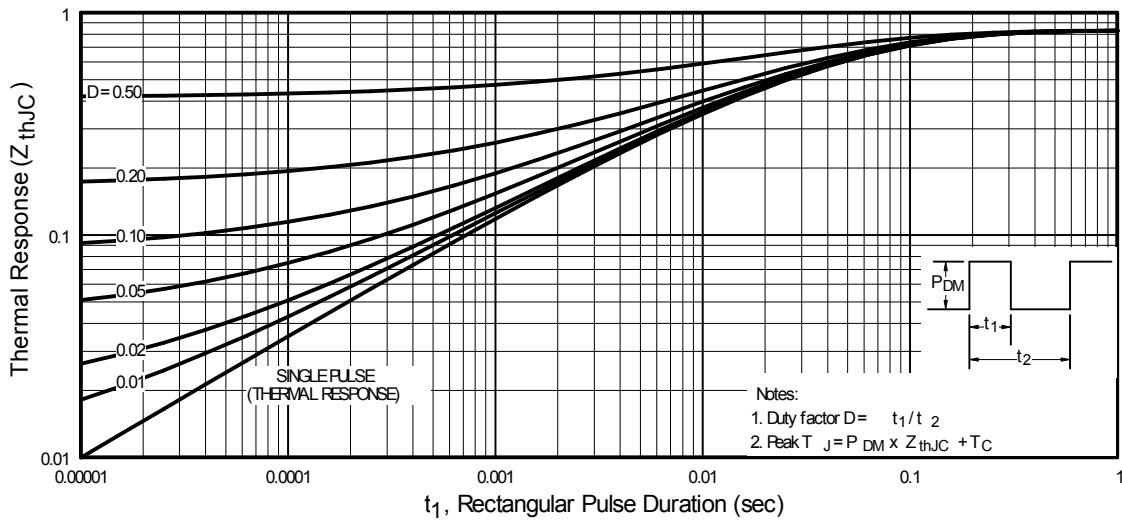


Fig 6. Maximum Effective Transient Thermal Impedance, Junction-to-Case

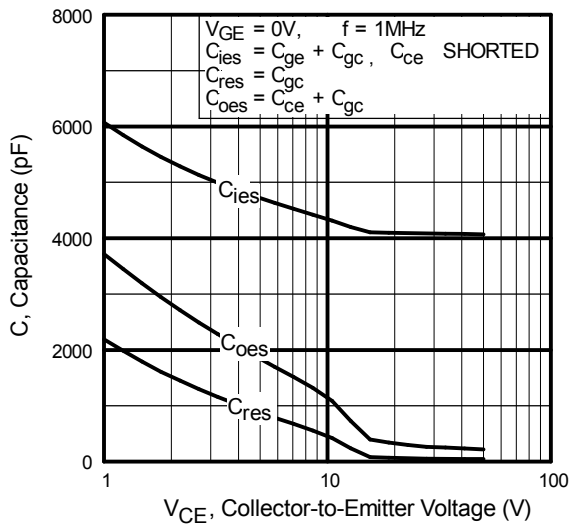


Fig 7. Typical Capacitance Vs. Collector-to-Emitter Voltage

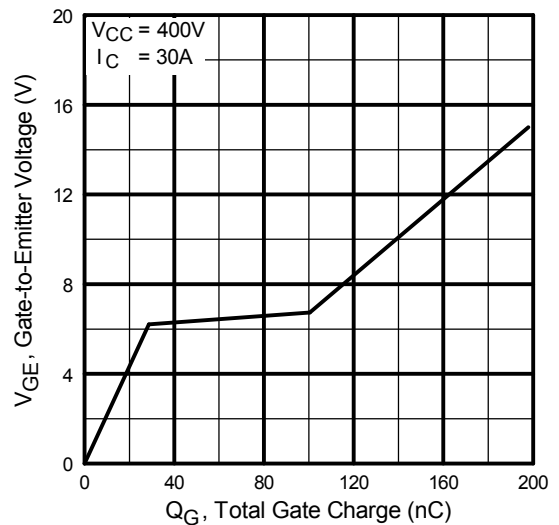


Fig 8. Typical Gate Charge Vs. Gate-to-Emitter Voltage

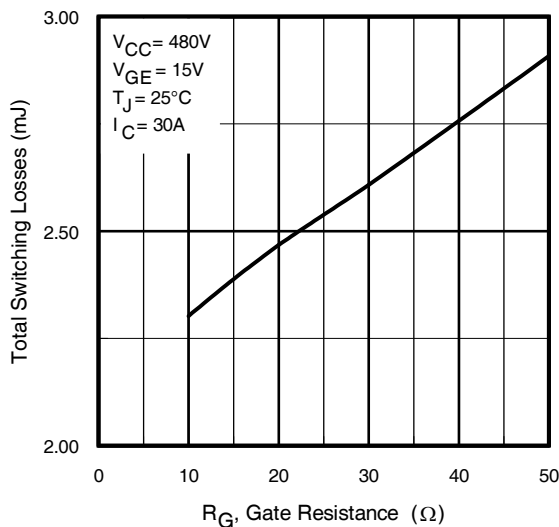


Fig 9. Typical Switching Losses Vs. Gate Resistance

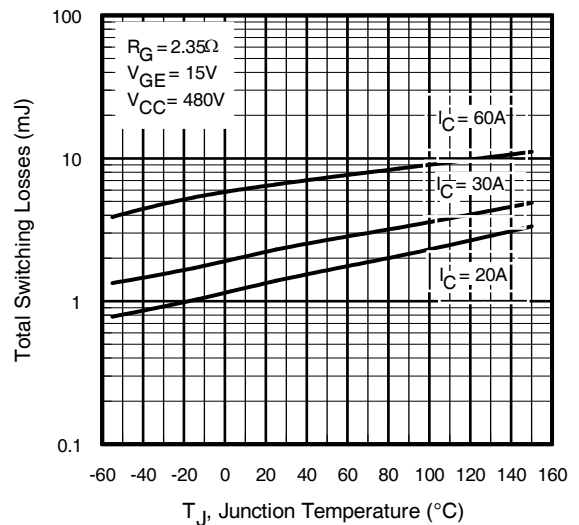


Fig 10. Typical Switching Losses Vs. Junction Temperature

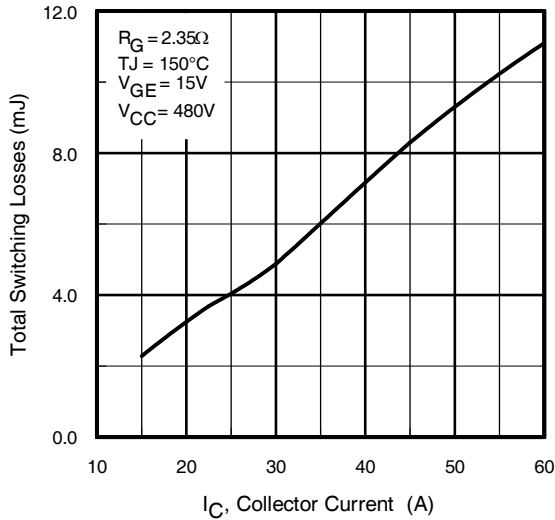


Fig 11. Typical Switching Losses Vs. Collector-to-Emitter Current

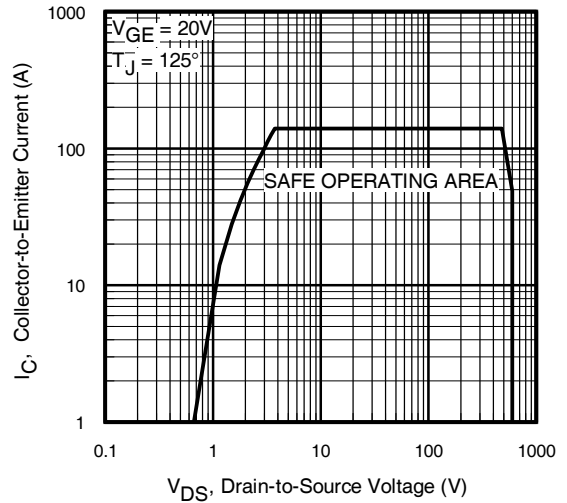
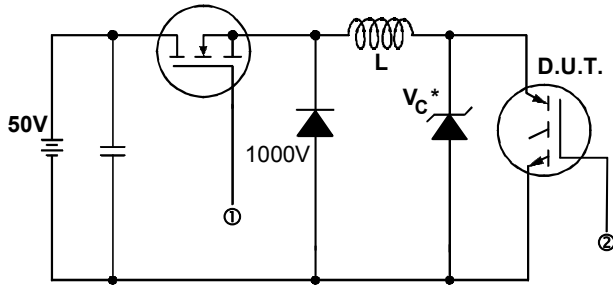


Fig 12. Turn-Off SOA



* 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

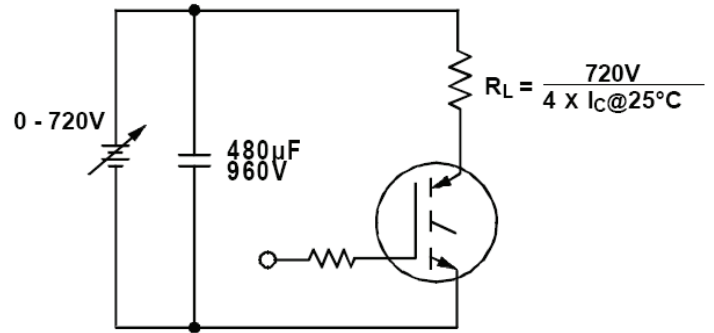
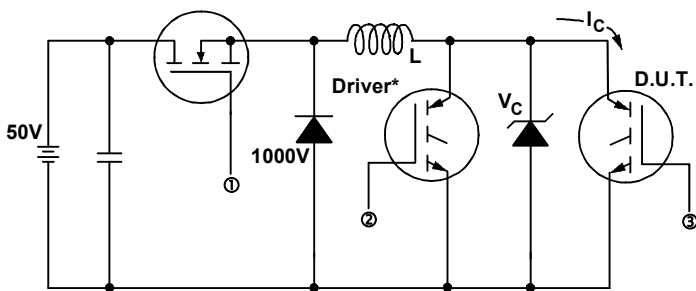


Fig 13b. Pulsed Collector Current Test Circuit



* Driver same type as D.U.T., $V_C = 720\text{V}$

Fig 14a. Switching Loss Test Circuit

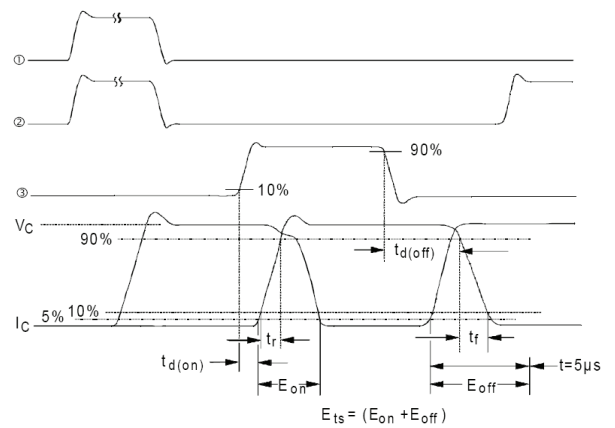
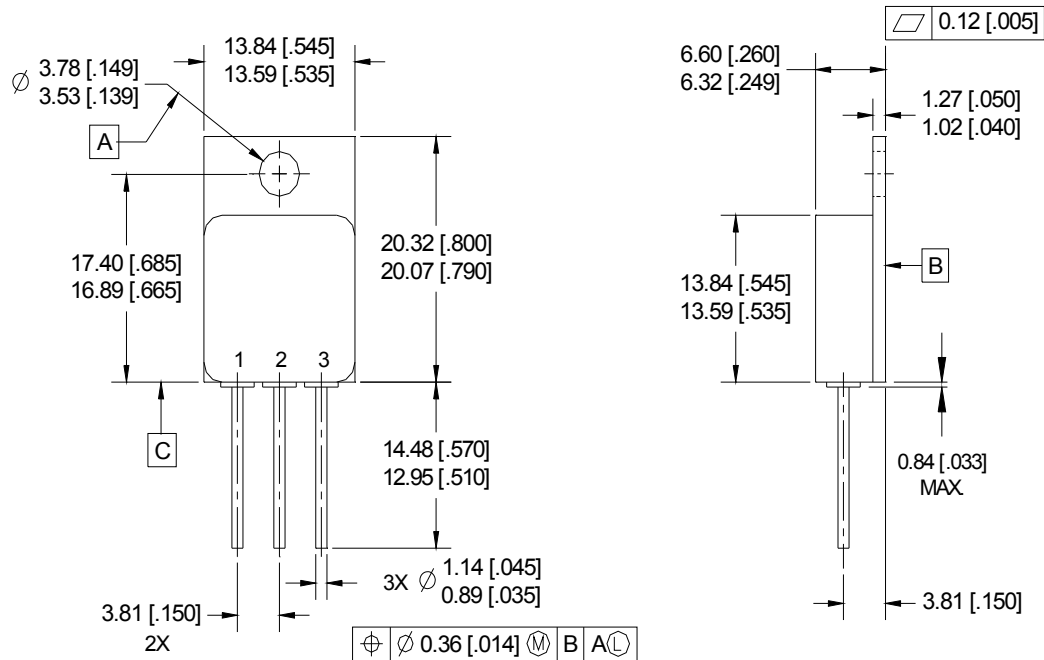


Fig 14b. Switching Loss Waveforms

Case Outline and Dimensions — TO-254AA



NOTES:

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 TO-254AA.

PIN ASSIGNMENTS

- 1 = COLLECTOR
- 2 = EMITTER
- 3 = GATE

BERYLLIA WARNING PER MIL-PRF-19500

Package containing beryllia shall not be ground, sandblasted, machined, or have other operations performed on them which will produce beryllia or beryllium dust. Furthermore, beryllium oxide packages shall not be placed in acids that will produce fumes containing beryllium.

IMPORTANT NOTICE

The information given in this document shall be in no event regarded as guarantee of conditions or characteristic. The data contained herein is a characterization of the component based on internal standards and is intended to demonstrate and provide guidance for typical part performance. It will require further evaluation, qualification and analysis to determine suitability in the application environment to confirm compliance to your system requirements.

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