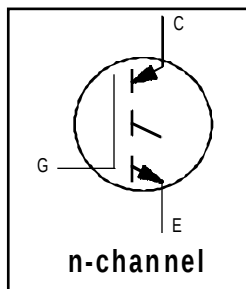


Features

- Standard: Optimized for minimum saturation voltage and low operating frequencies (< 1kHz)
- Generation 4 IGBT design provides tighter parameter distribution and higher efficiency than Generation 3
- Industry standard TO-247AC package



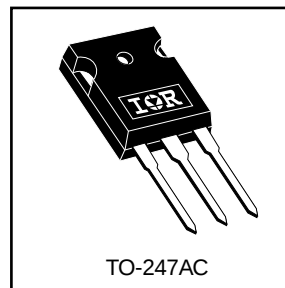
$$V_{CES} = 600V$$

$$V_{CE(on)} \text{ typ.} = 1.4V$$

$$@V_{GE} = 15V, I_C = 18A$$

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 industry-standard Generation 3 IR IGBT's



TO-247AC

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	34	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	18	
I_{CM}	Pulsed Collector Current ①	68	
I_{LM}	Clamped Inductive Load Current ②	68	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
E_{ARV}	Reverse Voltage Avalanche Energy ③	10	mJ
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	100	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	42	
T_J	Operating Junction and	-55 to + 150	$^\circ C$
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds		
	Mounting torque, 6-32 or M3 screw.	300 (0.063 in. (1.6mm) from case) 10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.2	$^\circ C/W$
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	—	40	
Wt	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 ④	18	—	—	V	$V_{GE} = 0V, I_C = 1.0A$
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.75	—	V/ $^\circ\text{C}$	$V_{GE} = 0V, I_C = 1.0mA$
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	—	1.40	1.6	V	$I_C = 18A$ $V_{GE} = 15V$
		—	1.84	—		$I_C = 34A$ See Fig.2, 5
		—	1.45	—		$I_C = 18A, T_J = 150^\circ\text{C}$
$V_{GE(th)}$	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	—	-11	—	mV/ $^\circ\text{C}$	$V_{CE} = V_{GE}, I_C = 250\mu A$
g_{fe}	Forward Transconductance ⑤	6.0	11	—	S	$V_{CE} = 100V, I_C = 18A$
I_{CES}	Zero Gate Voltage Collector Current	—	—	250	μA	$V_{GE} = 0V, V_{CE} = 600V$
		—	—	2.0		$V_{GE} = 0V, V_{CE} = 10V, T_J = 25^\circ\text{C}$
		—	—	1000		$V_{GE} = 0V, V_{CE} = 600V, T_J = 150^\circ\text{C}$
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)	—	50	75	nC	$I_C = 18A$
Q_{ge}	Gate - Emitter Charge (turn-on)	—	7.3	11		$V_{CC} = 400V$ See Fig. 8
Q_{gc}	Gate - Collector Charge (turn-on)	—	17	26		$V_{GE} = 15V$
$t_{d(on)}$	Turn-On Delay Time	—	22	—	ns	$T_J = 25^\circ\text{C}$ $I_C = 18A, V_{CC} = 480V$ $V_{GE} = 15V, R_G = 23\Omega$ Energy losses include "tail" See Fig. 9, 10, 14
t_r	Rise Time	—	18	—		
$t_{d(off)}$	Turn-Off Delay Time	—	540	810		
t_f	Fall Time	—	390	590		
E_{on}	Turn-On Switching Loss	—	0.26	—	mJ	See Fig. 11, 14
E_{off}	Turn-Off Switching Loss	—	3.45	—		
E_{ts}	Total Switching Loss	—	3.71	5.6		
$t_{d(on)}$	Turn-On Delay Time	—	21	—	ns	$T_J = 150^\circ\text{C},$ $I_C = 18A, V_{CC} = 480V$ $V_{GE} = 15V, R_G = 23\Omega$ Energy losses include "tail" See Fig. 11, 14
t_r	Rise Time	—	19	—		
$t_{d(off)}$	Turn-Off Delay Time	—	790	—		
t_f	Fall Time	—	760	—		
E_{ts}	Total Switching Loss	—	6.55	—	mJ	
L_E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package
C_{ies}	Input Capacitance	—	1100	—	pF	$V_{GE} = 0V$ $V_{CC} = 30V$ See Fig. 7 $f = 1.0MHz$
C_{oes}	Output Capacitance	—	72	—		
C_{res}	Reverse Transfer Capacitance	—	13	—		

Notes:

- ① Repetitive rating; $V_{GE} = 20V$, pulse width limited by max. junction temperature. (See fig. 13b)
- ② $V_{CC} = 80\%(V_{CES})$, $V_{GE} = 20V$, $L = 10\mu H$, $R_G = 23\Omega$, (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.

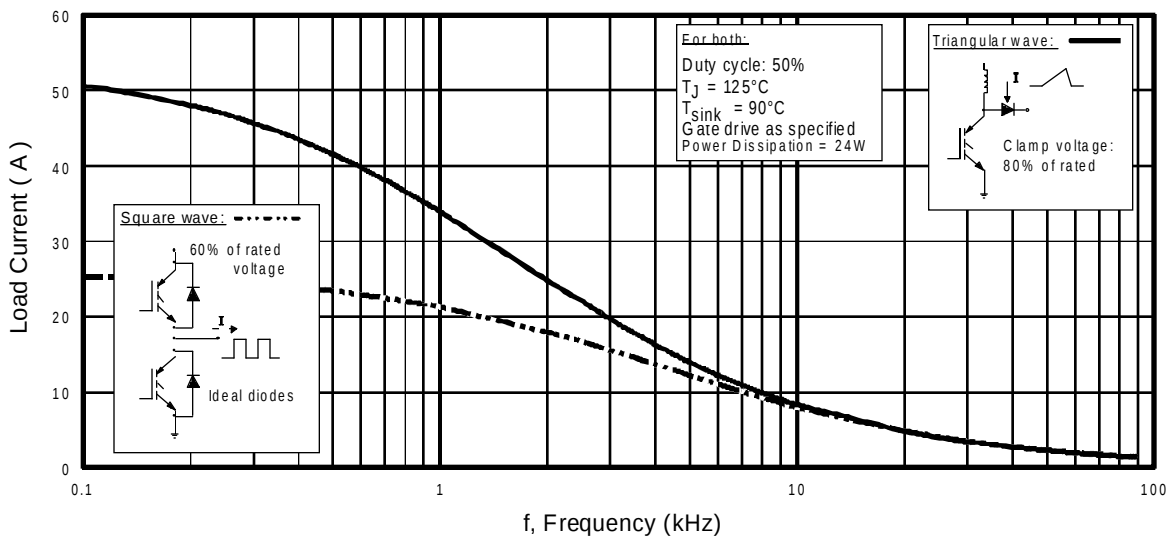


Fig. 1 - Typical Load Current vs. Frequency
(Load Current = I_{RMS} of fundamental)

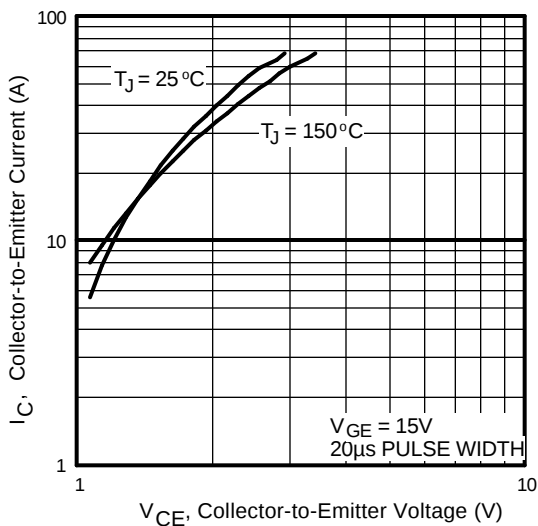


Fig. 2 - Typical Output Characteristics

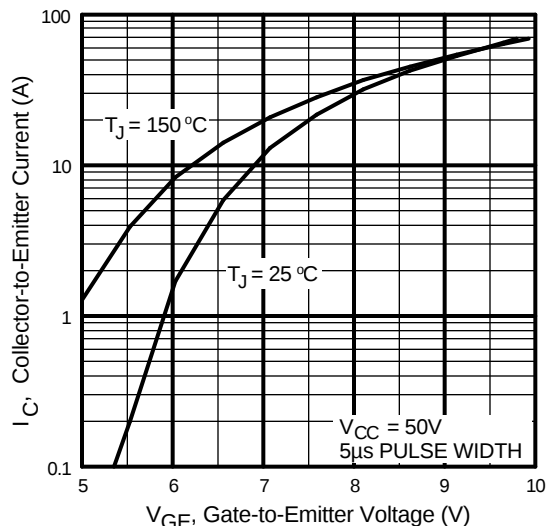


Fig. 3 - Typical Transfer Characteristics

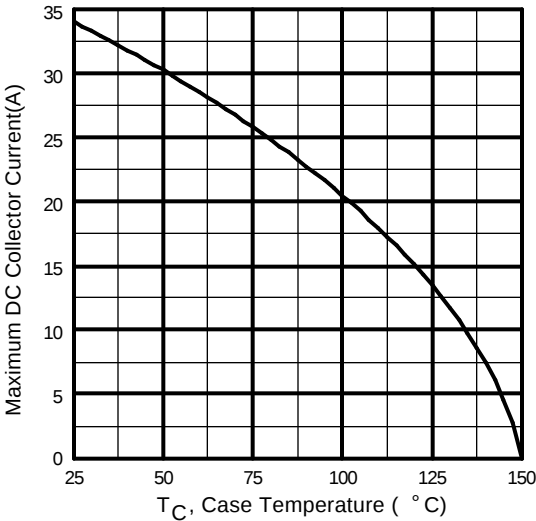


Fig. 4 - Maximum Collector Current vs. Case Temperature

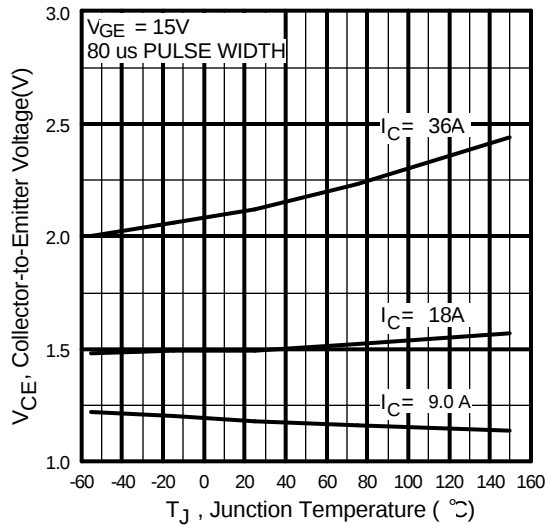


Fig. 5 - Typical Collector-to-Emitter Voltage vs. Junction Temperature

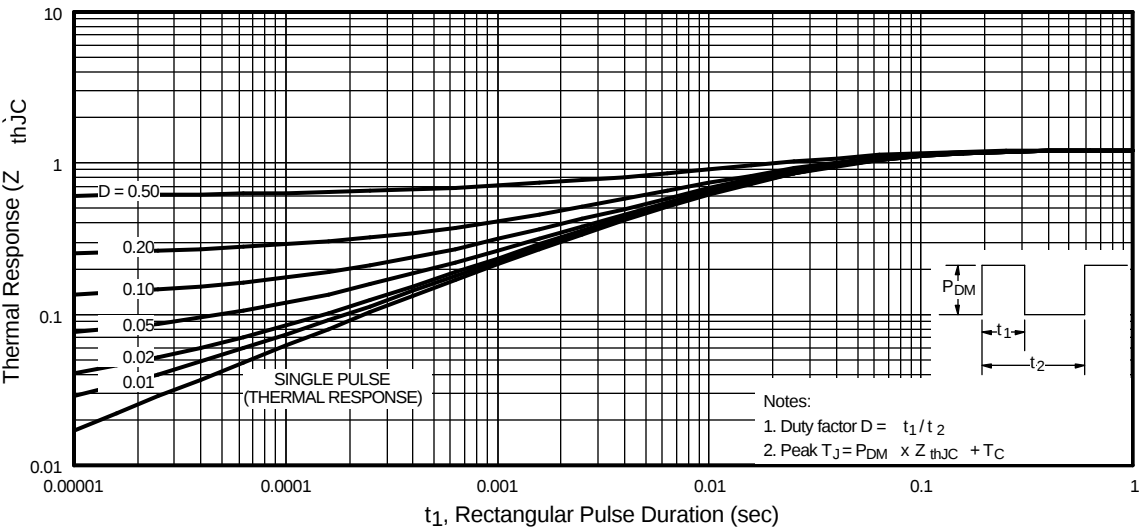


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

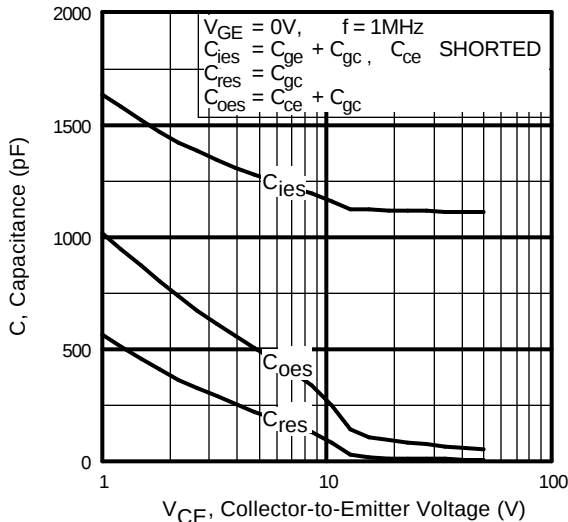


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

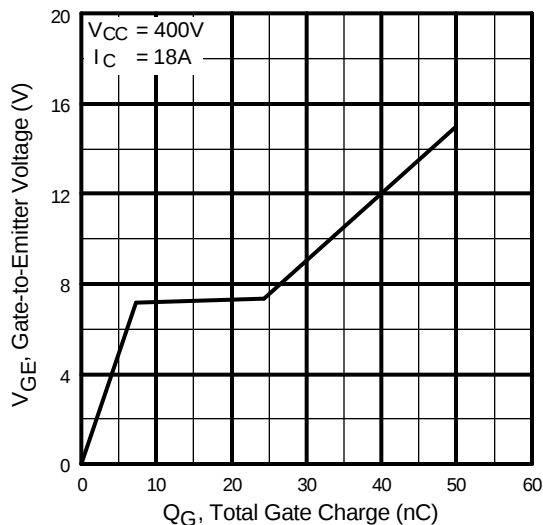


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

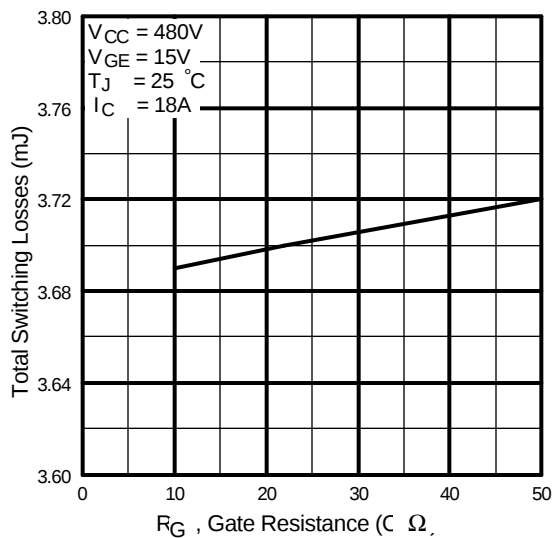


Fig. 9 - Typical Switching Losses vs. Gate Resistance

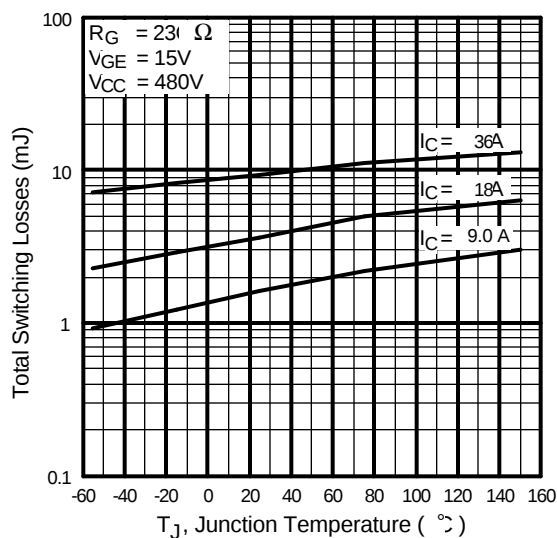


Fig. 10 - Typical Switching Losses vs. Junction Temperature

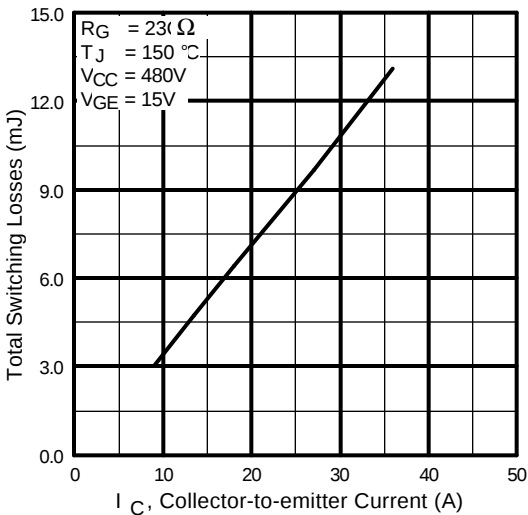


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

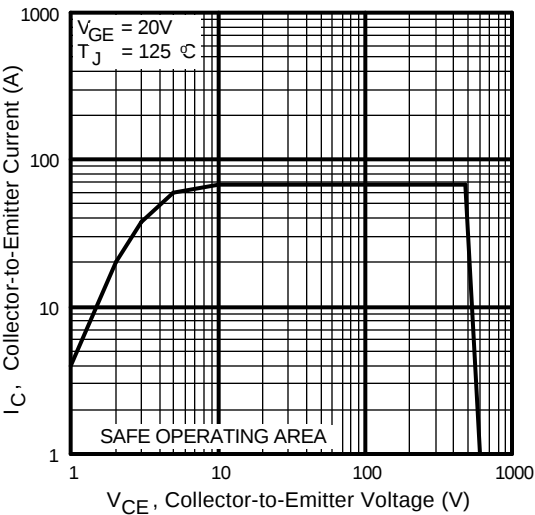
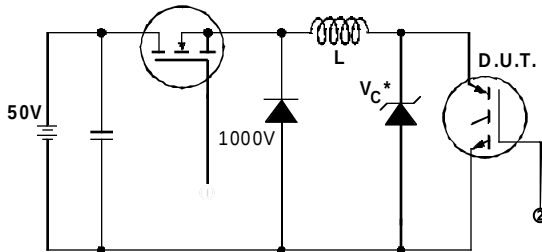


Fig. 12 - Turn-Off SOA



* 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

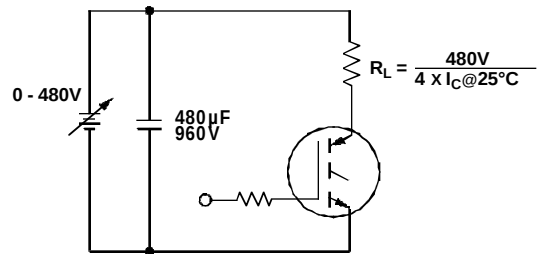


Fig. 13b - Pulsed Collector Current Test Circuit

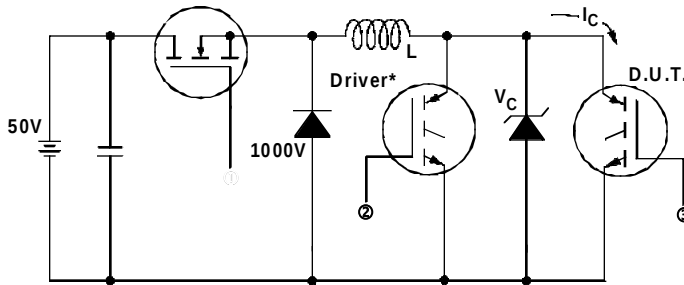


Fig. 14a - Switching Loss Test Circuit

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

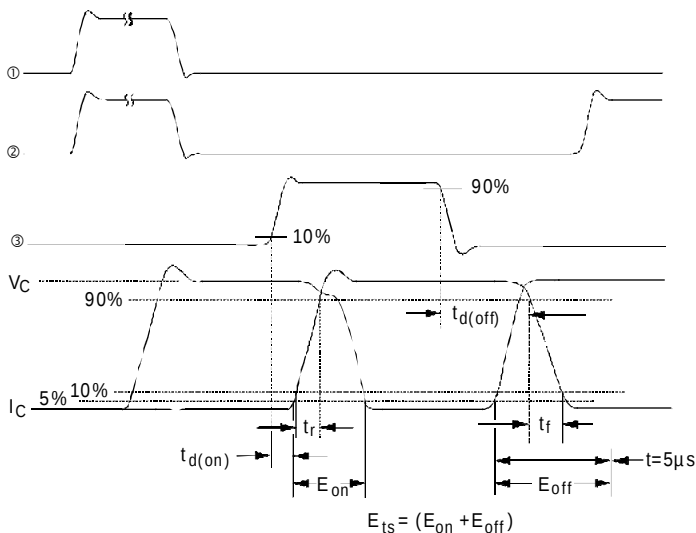


Fig. 14b - Switching Loss Waveforms

The technical drawing illustrates the TO-247AC (TO-3P) transistor package. It includes three views: a top view, a side view, and a lead view. The top view shows a square base with a central circular feature and four leads extending from the corners. The side view shows the package's profile with a flat top and a central mounting tab. The lead view shows the four leads, labeled 1 (Gate), 2 (Collector), 3 (Emitter), and 4 (Collector). Dimensions are provided in both millimeters and inches, with millimeters in parentheses. The drawing also includes feature callouts for specific dimensions and tolerances.

Top View Dimensions:

- Overall width: 15.90 (.626)
- Width between leads: 15.30 (.602)
- Lead width: 3.65 (.143)
- Lead spacing: 3.55 (.140)
- Lead diameter: $\phi 0.25$ (.010) (M) D B (M)
- Lead length: 5.50 (.217)
- Lead diameter: $2 \times \phi 5.50$ (.217)
- Lead diameter: 4.50 (.177)
- Lead length: 4.30 (.170)
- Lead length: 3.70 (.145)
- Lead length: 1.40 (.056)
- Lead length: 1.00 (.039)
- Lead length: 3.40 (.133)
- Lead length: 3.00 (.118)
- Lead length: 2.40 (.094)
- Lead length: 2.00 (.079)
- Lead length: 5.45 (.215)
- Lead length: 2.00 (.079)
- Lead length: 2.40 (.094)
- Lead length: 14.80 (.583)
- Lead length: 14.20 (.559)
- Lead length: 20.30 (.800)
- Lead length: 19.70 (.775)

Side View Dimensions:

- Overall height: 5.30 (.209)
- Height between leads: 4.70 (.185)
- Lead height: 2.50 (.089)
- Lead height: 1.50 (.059)
- Lead height: 4

Lead View Dimensions:

- Lead width: 0.80 (.031)
- Lead width: 0.40 (.016)
- Lead width: 2.60 (.102)
- Lead width: 2.20 (.087)

Notes:

- 1 DIMENSIONS & TOLERANCING PER ANSI Y14.5M, 1982.
- 2 CONTROLLING DIMENSION : INCH.
- 3 DIMENSIONS ARE SHOWN MILLIMETERS (INCHES).
- 4 CONFORMS TO JEDEC OUTLINE TO-247AC.

Lead Assignments:

- 1 - GATE
- 2 - COLLECTOR
- 3 - EMITTER
- 4 - COLLECTOR

Longer Leaded (20mm) Version Available (TO-247AD)

TO ORDER ADD "E" SUFFIX TO PART NUMBER

CONFORMS TO JEDEC OUTLINE TO-247AC (TO-3P)

Dimensions in Millimeters and (Inches)

<http://www.irf.com/> Data and specifications subject to change without notice.2/97