

IRG4PSH71KPbF

INSULATED GATE BIPOLAR TRANSISTOR

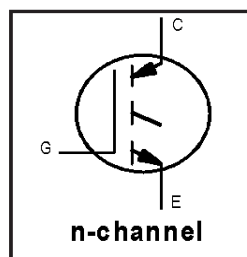
Short Circuit Rated
UltraFast IGBT

Features

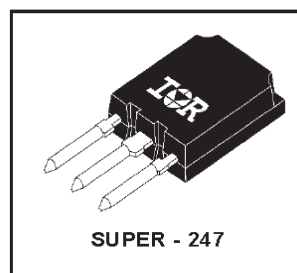
- Hole-less clip/pressure mount package compatible with TO-247 and TO-264, with reinforced pins
- High short circuit rating IGBTs, optimized for motorcontrol
- Minimum switching losses combined with low conduction losses
- Tightest parameter distribution
- Creepage distance increased to 5.35mm
- Lead-Free

Benefits

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



$V_{CES} = 1200V$
$V_{CE(on)} \text{ typ.} = 2.97V$
@ $V_{GE} = 15V, I_C = 42A$



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Breakdown Voltage	1200	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	78	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	42	
I_{CM}	Pulsed Collector Current ①	156	
I_{LM}	Clamped Inductive Load Current ②	156	
t_{SC}	Short Circuit Withstand Time	10	μs
V_{GE}	Gate-to-Emitter Voltage	± 20	V
E_{ARV}	Reverse Voltage Avalanche Energy ③	170	mJ
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	350	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	140	
T_J	Operating Junction and	-55 to + 150	$^\circ C$
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	1200	—	—	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	—	1.1	—	V/°C	$V_{GE} = 0V, I_C = 10mA$
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	—	2.97	3.9	V	$I_C = 42A, V_{GE} = 15V$
		—	3.44	—		$I_C = 78A, V_{GE} = 15V$
		—	2.60	—		$I_C = 42A, T_J = 150^\circ\text{C}$
$V_{GE(th)}$	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	—	-12	—	mV/°C	$V_{CE} = V_{GE}, I_C = 1.5mA$
g_{fe}	Forward Transconductance ⑤	25	38	—	S	$V_{CE} = 50V, I_C = 42A$
I_{CES}	Zero Gate Voltage Collector Current	—	—	500	μA	$V_{GE} = 0V, V_{CE} = 1200V$
		—	—	2.0		$V_{GE} = 0V, V_{CE} = 10V, T_J = 25^\circ\text{C}$
		—	—	5.0	mA	$V_{GE} = 0V, V_{CE} = 1200V, T_J = 150^\circ\text{C}$
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)	—	410	610	nC	$I_C = 42A$
Q_{ge}	Gate - Emitter Charge (turn-on)	—	47	70		$V_{CC} = 400V$
Q_{gc}	Gate - Collector Charge (turn-on)	—	145	220		$V_{GE} = 15V$
$t_{d(on)}$	Turn-On Delay Time	—	45	—	ns	$T_J = 25^\circ\text{C}$
t_r	Rise Time	—	38	—		$I_C = 42A, V_{CC} = 960V$
$t_{d(off)}$	Turn-Off Delay Time	—	220	340		$V_{GE} = 15V, R_G = 5.0\Omega$
t_f	Fall Time	—	160	250		Energy losses include "tail"
E_{on}	Turn-On Switching Loss	—	2.35	—	mJ	See Fig. 9,10,14
E_{off}	Turn-Off Switching Loss	—	3.14	—		
E_{ts}	Total Switching Loss	—	5.49	8.3		
t_{sc}	Short Circuit Withstand Time	10	—	—	μs	$V_{CC} = 720V, T_J = 125^\circ\text{C}$ $V_{GE} = 20V, R_G = 5.0\Omega$
$t_{d(on)}$	Turn-On Delay Time	—	42	—	ns	$T_J = 150^\circ\text{C}$
t_r	Rise Time	—	41	—		$I_C = 42A, V_{CC} = 960V$
$t_{d(off)}$	Turn-Off Delay Time	—	460	—		$V_{GE} = 15V, R_G = 5.0\Omega$
t_f	Fall Time	—	250	—		Energy losses include "tail"
E_{ts}	Total Switching Loss	—	11.5	—	mJ	See Fig. 10,11,14
L_E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package
C_{ies}	Input Capacitance	—	5770	—	pF	$V_{GE} = 0V$
C_{oes}	Output Capacitance	—	400	—		$V_{CC} = 30V$
C_{res}	Reverse Transfer Capacitance	—	100	—		$f = 1.0MHz$

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

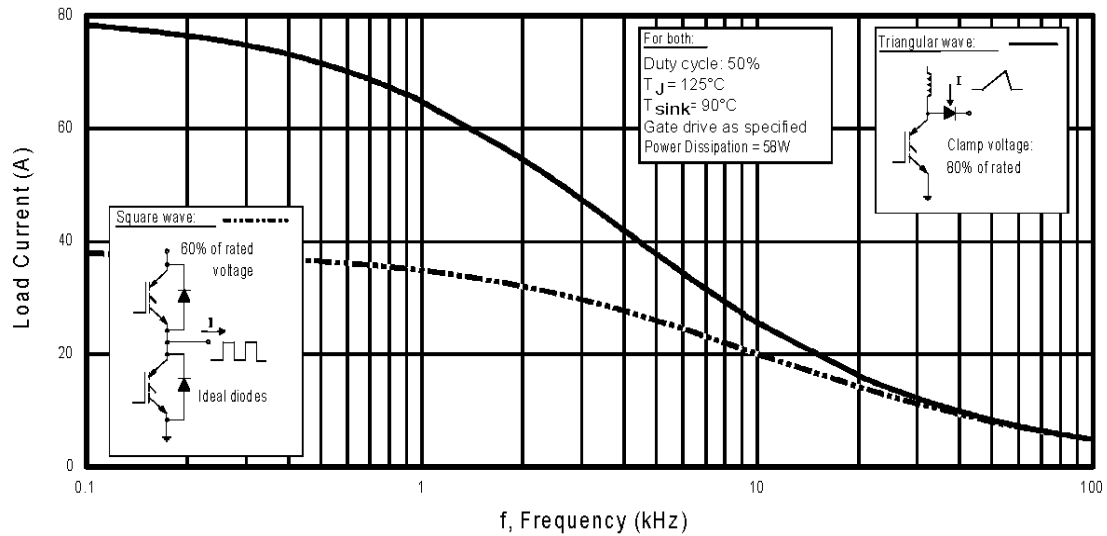


Fig. 1 - Typical Load Current vs. Frequency
(For square wave, $I = I_{RMS}$ of fundamental; for triangular wave, $I = I_{PK}$)

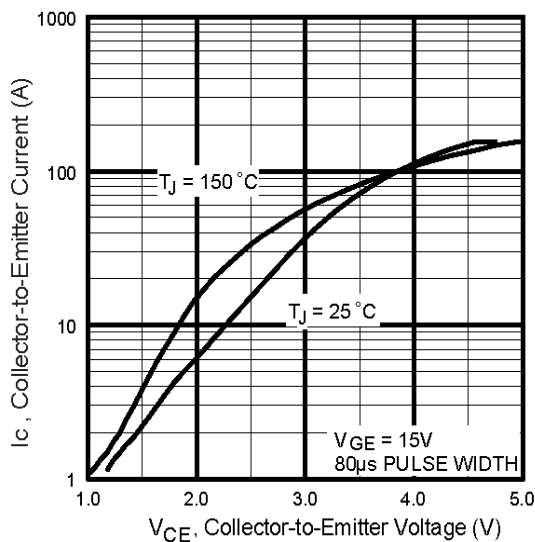


Fig. 2 - Typical Output Characteristics

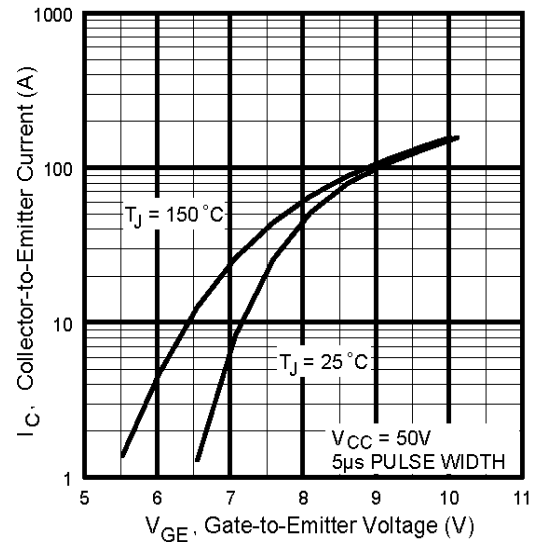


Fig. 3 - Typical Transfer Characteristics

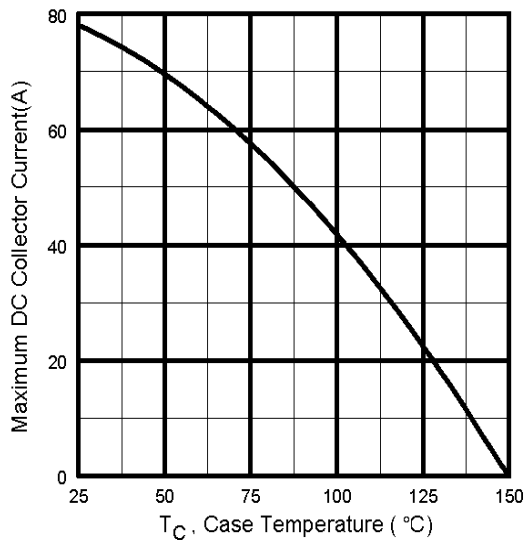


Fig. 4 - Maximum Collector Current vs. Case Temperature

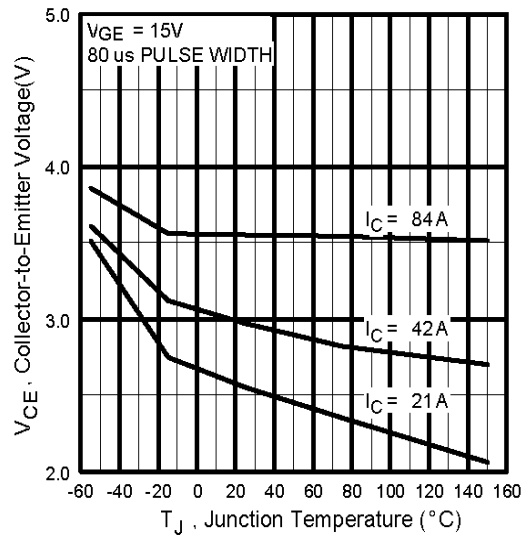


Fig. 5 - Collector-to-Emitter Voltage vs. Junction Temperature

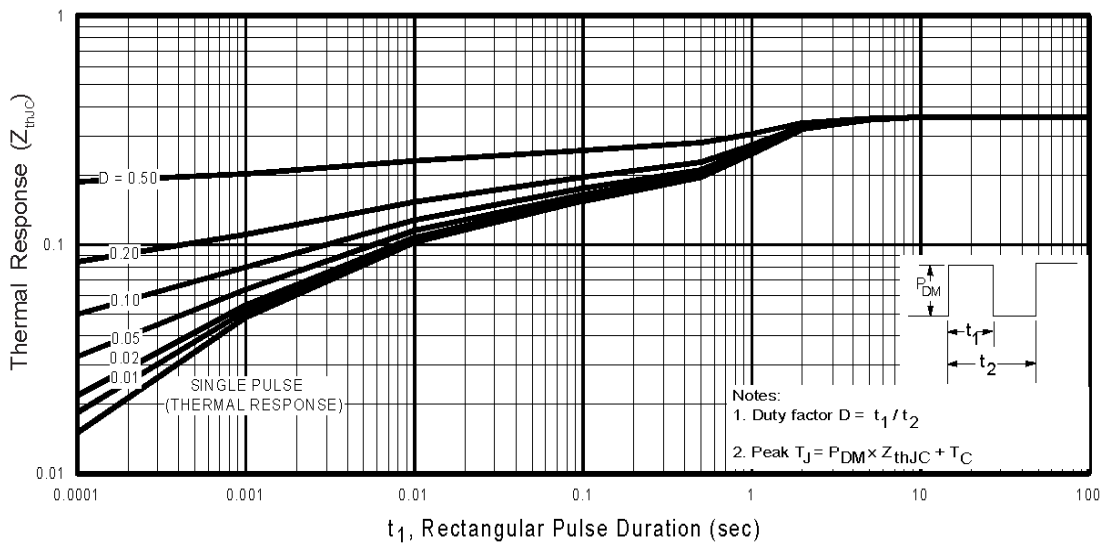


Fig. 6 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

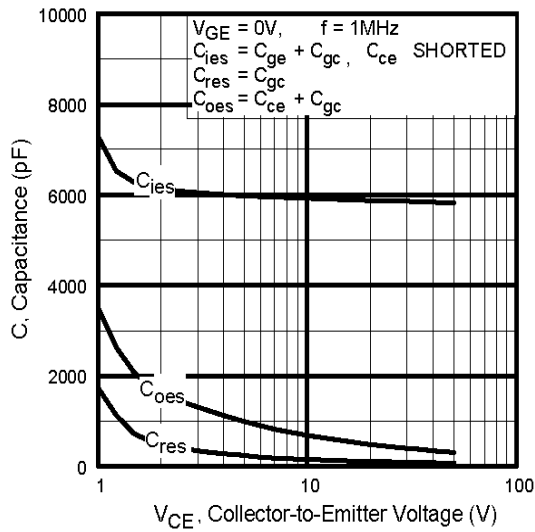


Fig. 7 - Typical Capacitance vs. Collector-to-Emitter Voltage

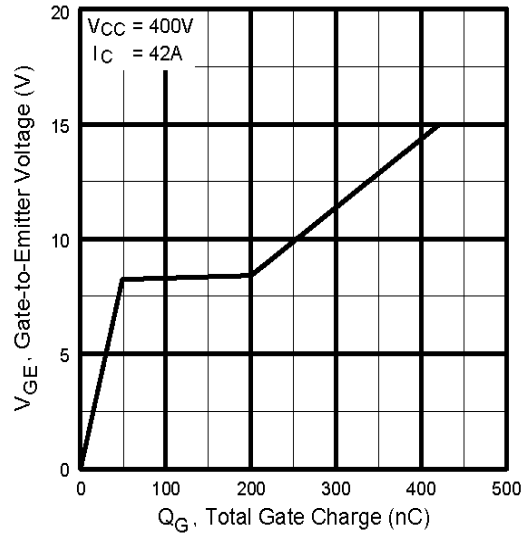


Fig. 8 - Typical Gate Charge vs. Gate-to-Emitter Voltage

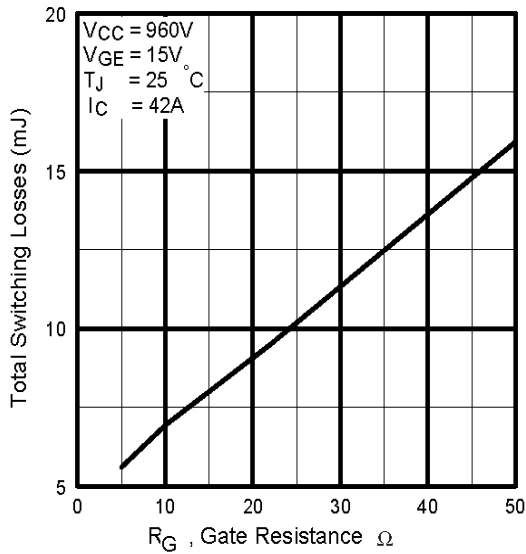


Fig. 9 - Typical Switching Losses vs. Gate Resistance

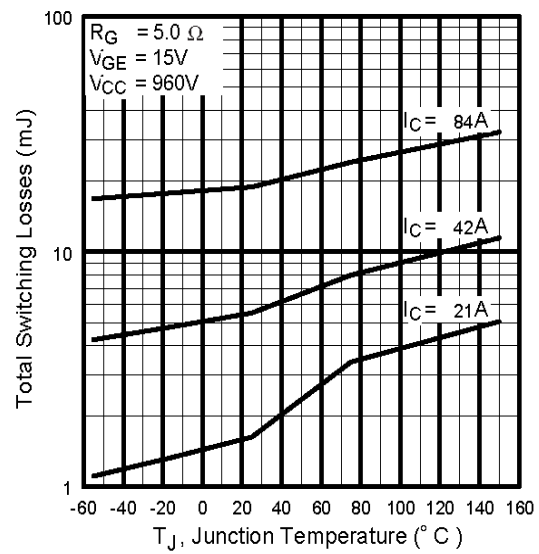


Fig. 10 - Typical Switching Losses vs. Junction Temperature

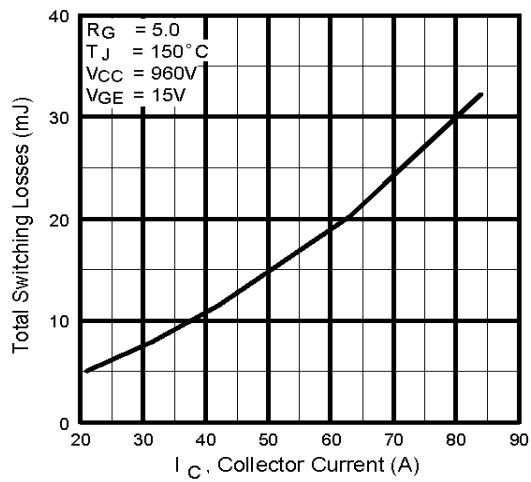


Fig. 11 - Typical Switching Losses vs. Collector-to-Emitter Current

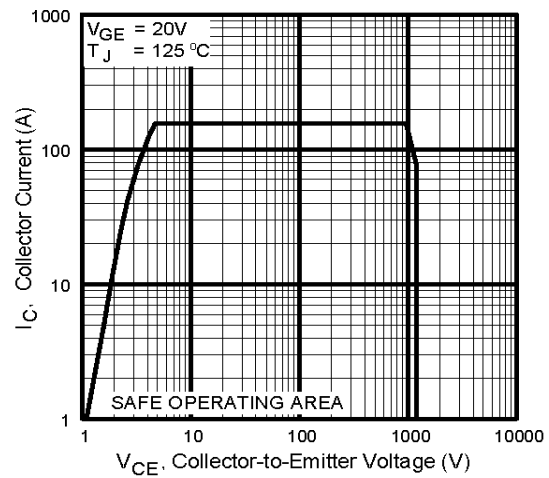
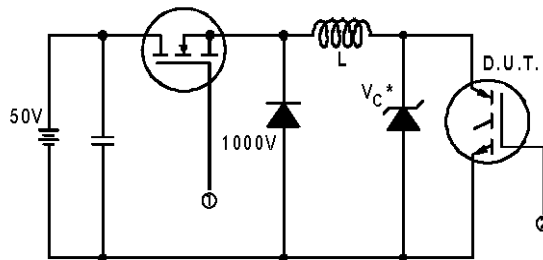


Fig. 12 - Turn-Off SOA



* 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

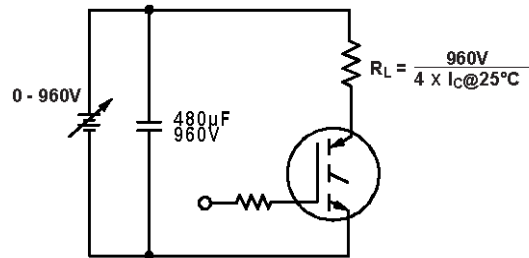


Fig. 13b - Pulsed Collector Current Test Circuit

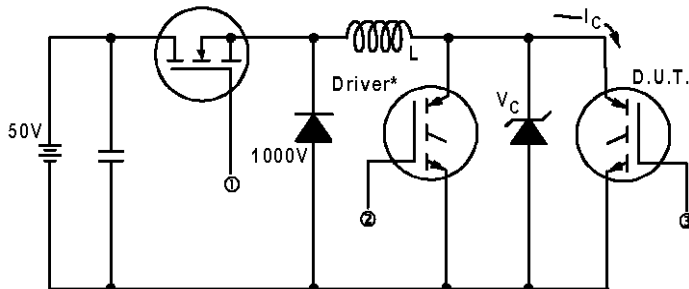


Fig. 14a - Switching Loss Test Circuit

* Driver same type as D.U.T., $V_c = 960V$

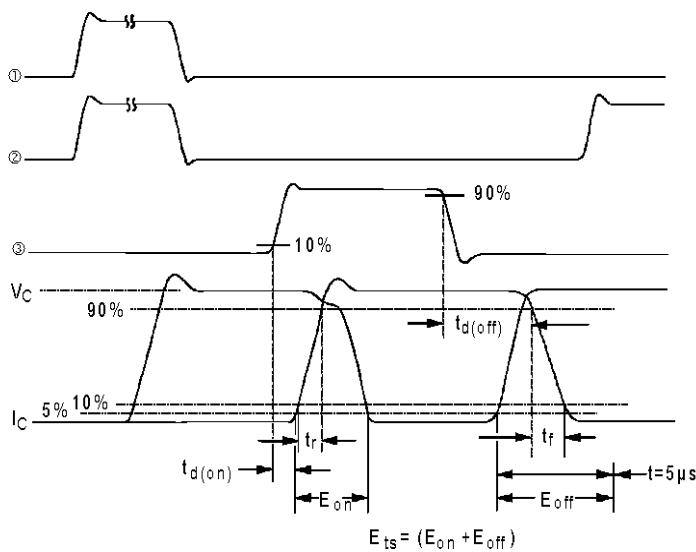


Fig. 14b - Switching Loss Waveforms

International
IOR Rectifier

Technical drawing of a 3-pin connector assembly, showing front, side, and top views with dimensions in mm and inches.

Front View (Left):

- Overall height: 20.8 [0.829] / 19.8 [0.779]
- Pin 1 height: 14.7 [0.579] / 13.7 [0.539]
- Pin 2 height: 14.7 [0.579] / 13.7 [0.539]
- Pin 3 height: 14.7 [0.579] / 13.7 [0.539]
- Pin 1 width: 5.45 [0.214]
- Pin 2 width: 0.25 [0.010]
- Pin 3 width: 0.25 [0.010]
- Pin 1 diameter: 1.60 [0.063] MAXIMUM
- Pin 2 diameter: 1.60 [0.063] MAXIMUM
- Pin 3 diameter: 1.60 [0.063] MAXIMUM
- Pin 1 length: 5.3 [0.209] / 4.7 [0.185]
- Pin 2 length: 5.3 [0.209] / 4.7 [0.185]
- Pin 3 length: 5.3 [0.209] / 4.7 [0.185]
- Pin 1 diameter: 1.60 [0.063] MAXIMUM
- Pin 2 diameter: 1.60 [0.063] MAXIMUM
- Pin 3 diameter: 1.60 [0.063] MAXIMUM

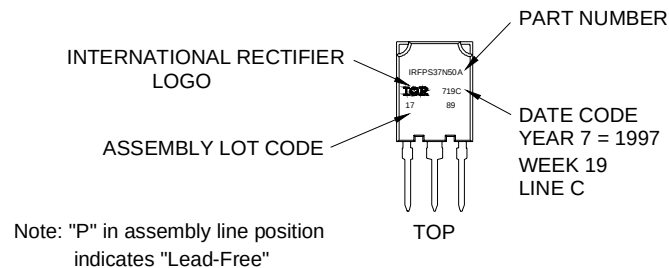
Side View (Right):

- Overall height: 20.8 [0.829] / 19.8 [0.779]
- Pin 1 height: 14.7 [0.579] / 13.7 [0.539]
- Pin 2 height: 14.7 [0.579] / 13.7 [0.539]
- Pin 3 height: 14.7 [0.579] / 13.7 [0.539]
- Pin 1 width: 5.45 [0.214]
- Pin 2 width: 0.25 [0.010]
- Pin 3 width: 0.25 [0.010]
- Pin 1 diameter: 1.60 [0.063] MAXIMUM
- Pin 2 diameter: 1.60 [0.063] MAXIMUM
- Pin 3 diameter: 1.60 [0.063] MAXIMUM
- Pin 1 length: 5.3 [0.209] / 4.7 [0.185]
- Pin 2 length: 5.3 [0.209] / 4.7 [0.185]
- Pin 3 length: 5.3 [0.209] / 4.7 [0.185]
- Pin 1 diameter: 1.60 [0.063] MAXIMUM
- Pin 2 diameter: 1.60 [0.063] MAXIMUM
- Pin 3 diameter: 1.60 [0.063] MAXIMUM

Top View (Bottom):

- Overall width: 20.8 [0.829] / 19.8 [0.779]
- Pin 1 width: 14.7 [0.579] / 13.7 [0.539]
- Pin 2 width: 14.7 [0.579] / 13.7 [0.539]
- Pin 3 width: 14.7 [0.579] / 13.7 [0.539]
- Pin 1 length: 5.45 [0.214]
- Pin 2 length: 0.25 [0.010]
- Pin 3 length: 0.25 [0.010]
- Pin 1 diameter: 1.60 [0.063] MAXIMUM
- Pin 2 diameter: 1.60 [0.063] MAXIMUM
- Pin 3 diameter: 1.60 [0.063] MAXIMUM
- Pin 1 length: 5.3 [0.209] / 4.7 [0.185]
- Pin 2 length: 5.3 [0.209] / 4.7 [0.185]
- Pin 3 length: 5.3 [0.209] / 4.7 [0.185]
- Pin 1 diameter: 1.60 [0.063] MAXIMUM
- Pin 2 diameter: 1.60 [0.063] MAXIMUM
- Pin 3 diameter: 1.60 [0.063] MAXIMUM

EXAMPLE: THIS IS AN IRFPS37N50A WITH
ASSEMBLY LOT CODE 1789
ASSEMBLED ON WW 19, 1997
IN THE ASSEMBLY LINE "C"



Data and specifications subject to change without notice.

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