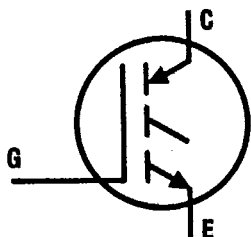


T-39-03

International
IOR Rectifier

INSULATED GATE BIPOLAR TRANSISTOR

**IRGPC46****600V, 60A****600V, 60A, TO-247AC IGBT**

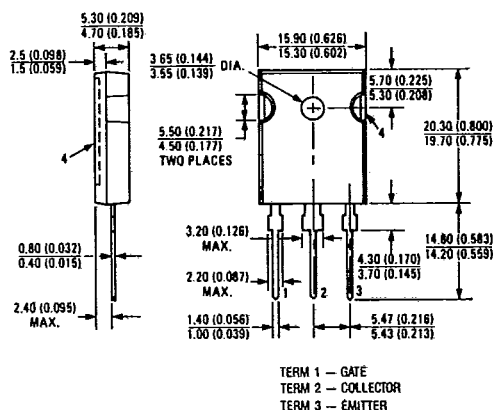
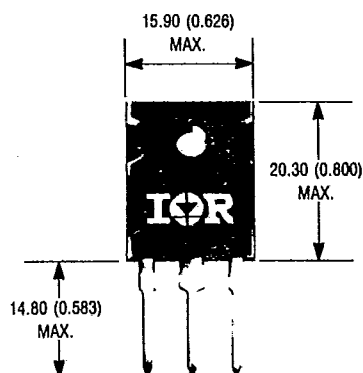
International Rectifier's IRG series of Insulated Gate Bipolar Transistors (IGBT) combines the best features of power MOSFET and bipolar transistors. The ease of drive and rugged operation of HEXFETs[®], coupled with the low on-state voltage drop of bipolar devices, results in an optimum solution for low-to-medium frequency power converters up to 5 KHz.

The efficient geometry and unique processing of this latch-free design achieves ultra low forward voltage drop.

These devices are ideal for application in ac and dc motor drives, uninterruptible power supplies, welding equipment, power supplies, induction heaters, and high energy pulse circuits.

FEATURES

- Latch-free operation
- Simple drive requirements
- Guaranteed low switching loss
- Ultra low forward voltage drop
- Ease of paralleling

CASE STYLE AND DIMENSIONS

Conforms to JEDEC Outline TO-247AC (TO-3P)
 Dimensions in Millimeters and (Inches)

Absolute Maximum Ratings

Parameter		Units
$I_C @ T_C = 25^\circ\text{C}$	Continuous Collector Current	60
$I_C @ T_C = 100^\circ\text{C}$	Continuous Collector Current	31
I_{CM}	Pulsed Collector Current ①	120
V_{CE}	Collector-to-Emitter Voltage	600
V_{GE}	Gate-to-Emitter Voltage	± 20
I_{LM}	Clamped Inductive Load Current ②	62
E_{RV}	Reverse Voltage Avalanche Energy	40
$P_D @ T_C = 25^\circ\text{C}$	Maximum Power Dissipation	160
$P_D @ T_C = 100^\circ\text{C}$	Maximum Power Dissipation	65
T_J	Operating and Storage Temperature Range	-55 to 150

Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (Unless Otherwise Specified)

Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV_{CES}	600	—	—	V	$V_{GE} = 0V, I_C = 250 \mu A$
BV_{ECS}	15	22	—	V	$V_{GE} = 0V, I_C = 1.0A$
$\Delta BV_{CES}/\Delta T_J$	—	0.75	—	V/ $^\circ\text{C}$	$V_{GE} = 0V, I_C = 1 \text{ mA}$
$V_{CE(on)}$	—	1.6	2.0	V	$V_{GE} = 15V, I_C = 31A$
	—	2.2	—	V	$V_{GE} = 15V, I_C = 60A$
	—	1.7	—	V	$V_{GE} = 15V, I_C = 31A, T_J = 150^\circ\text{C}$
$\Delta V_{GE(th)}$	2.5	—	5.0	V	$V_{CE} = V_{GE}, I_C = 250 \mu A$
$\Delta V_{GE(th)}/\Delta T_J$	—	-9.3	—	mV/ $^\circ\text{C}$	$V_{CE} = V_{GE}, I_C = 250 \mu A$
G_{FE}	12	21	30	S (Ω)	$V_{CE} = 100V, I_C = 31A$
I_{CES}	—	—	250	μA	$V_{GE} = 0V, V_{CE} = 600V, T_J = 25^\circ\text{C}$
	—	—	1000	μA	$V_{GE} = 0V, V_{CE} = 600V, T_J = 150^\circ\text{C}$
I_{GES}	—	—	± 500	nA	$V_{GE} = \pm 20V$

Switching Characteristics @ $T_J = 25^\circ\text{C}$ (Unless Otherwise Specified)

Parameter	Min.	Typ.	Max.	Units	Test Conditions
Q_g	40	62	90	nC	$I_C = 31A, V_{CC} = 480V$
Q_{ge}	5	10	15	nC	
Q_{gc}	13	27	40	nC	See Fig. 7
$t_{d(on)}$	—	79	—	nS	
t_r	—	90	—	nS	
$t_{d(off)}$	—	1246	—	nS	
t_f	—	556	—	nS	
E_{on}	—	1.64	—	mJ	$I_C = 31A, V_{CC} = 480V, T_J = 25^\circ\text{C}$
E_{off}	—	10.2	—	mJ	$V_{GE} = 15V, R_G = 50\Omega$
E_{is}	—	11.9	18.0	mJ	
	—	20.8	—	mJ	$I_C = 31A, V_{CC} = 480V, T_J = 150^\circ\text{C}$
				mJ	$V_{GE} = 15V, R_G = 50\Omega$
L_E	—	13	—	nH	Measured 5mm from package
C_{ies}	—	1600	—	pF	$V_{GE} = 0V, V_{CC} = 25V$
C_{oes}	—	140	—	pF	$f = 1.0 \text{ MHz}$
C_{res}	—	22	—	pF	

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Thermal Resistance

Parameter	Min.	Typ.	Max.	Units	Test Conditions
R_{thJC}	—	—	0.77	K/W ⑤	Mounting surface flat, smooth and greased, leads soldered to DUT
R_{thCS}	—	0.24	—		
R_{thJA}	—	—	40		Typical socket mount
Mounting Torque	—	—	10	in • lbs	Standard 6-32 screw

- ① Repetitive Rating; Pulse width limited by maximum junction temperature (see figure 5b)
 ② $V_{CC} = 80\% BV_{CES}$, $L = 50 \mu H$, $R_G = 50 \Omega$ (see figure 5a)
 ③ Pulse width $80 \mu S$; Duty Factor $\leq 0.1\%$
 ④ Pulse width $5 \mu S$, single shot
 ⑤ K/W same as $^{\circ}C/W$

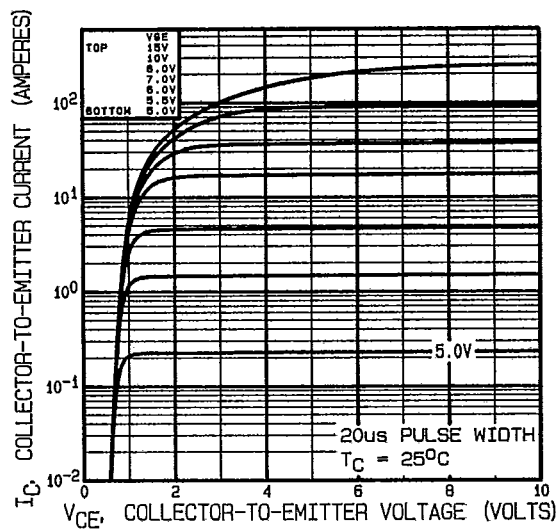


Fig. 1 — Typical Output Characteristics,
 $T_C = 25^{\circ}C$

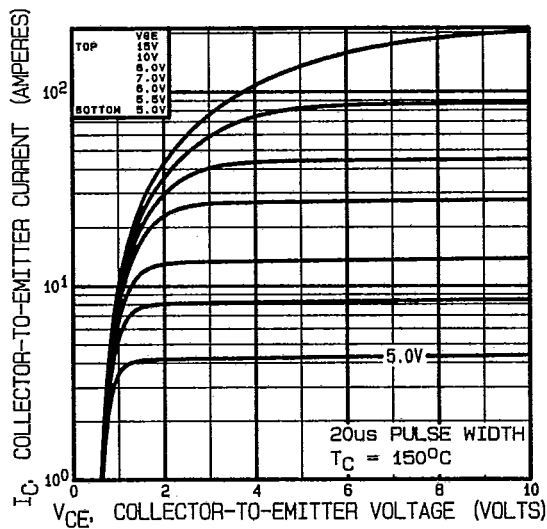
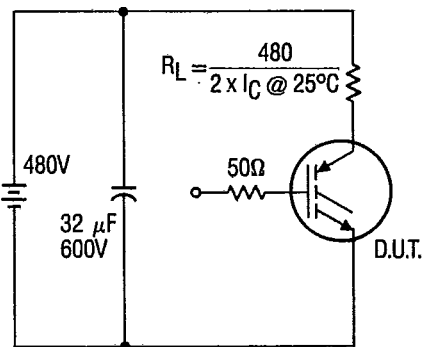
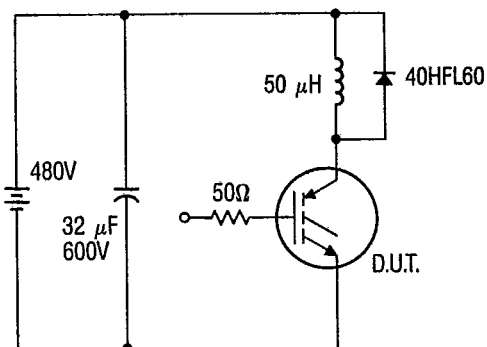
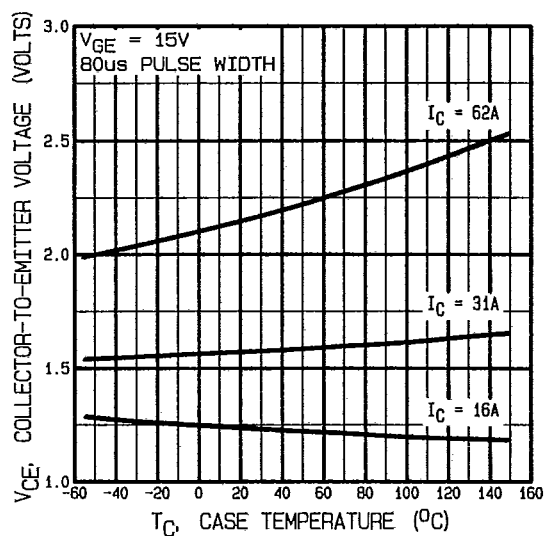
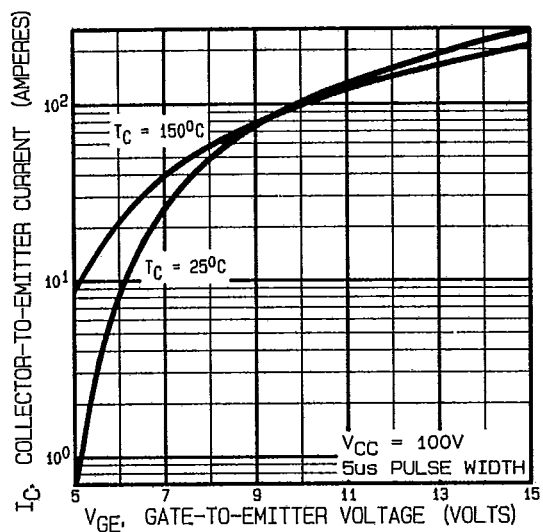


Fig. 2 — Typical Output Characteristics,
 $T_C = 150^{\circ}C$

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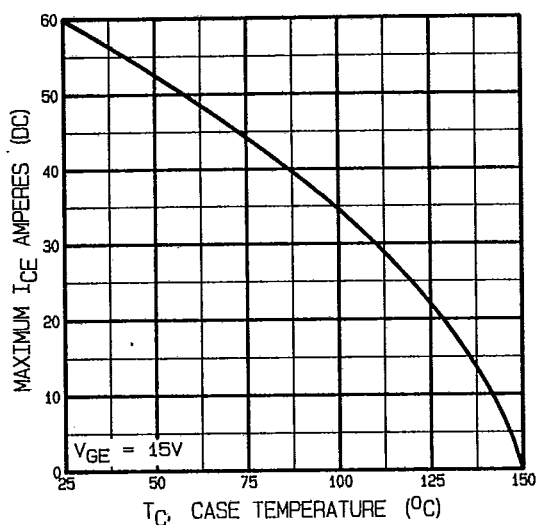


Fig. 6 — Maximum Collector Current
Vs. Case Temperature

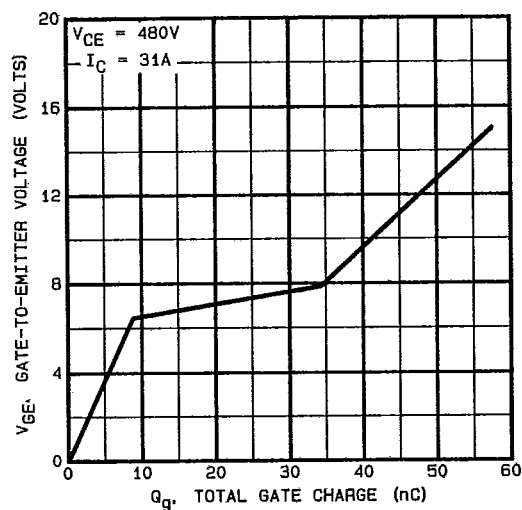


Fig. 7 — Typical Gate Charge Vs.
Gate-to-Emitter Voltage

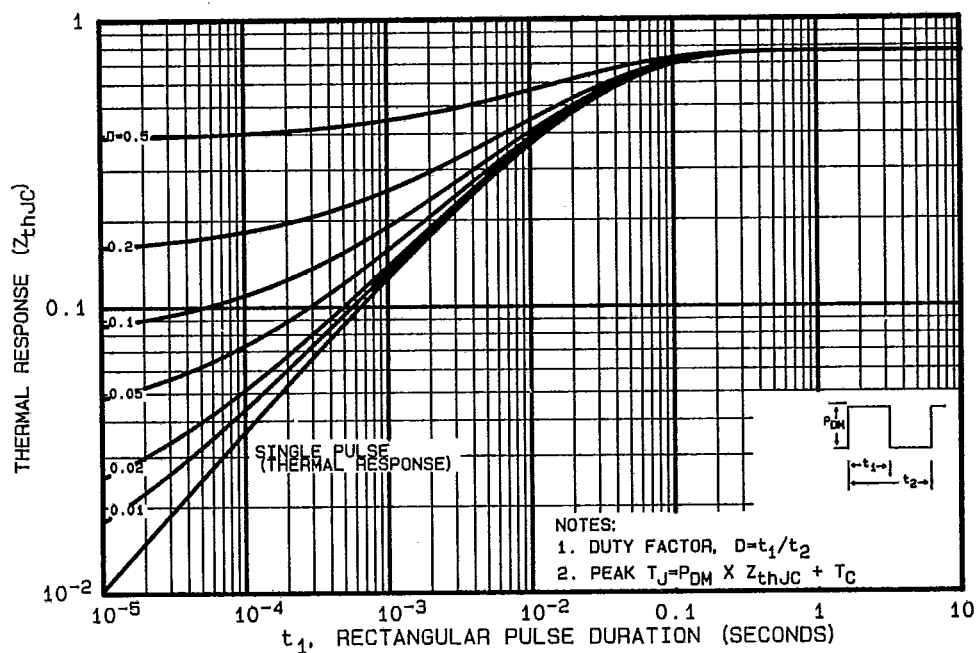


Fig. 8 — Maximum Effective Transient Thermal Impedance, Junction-to-Case

IRGPC46

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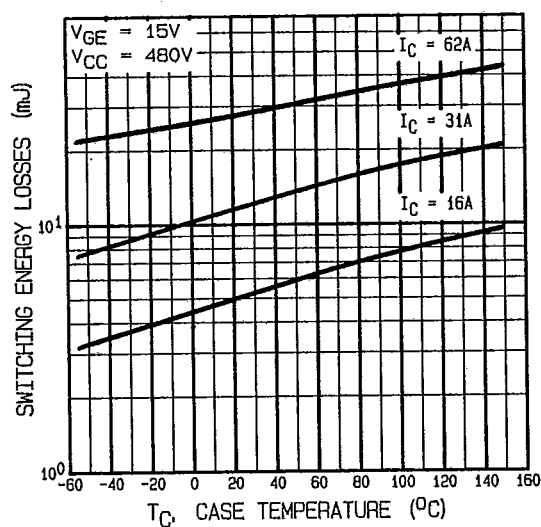


Fig. 9 — Switching Energy Losses Vs. Case Temperature

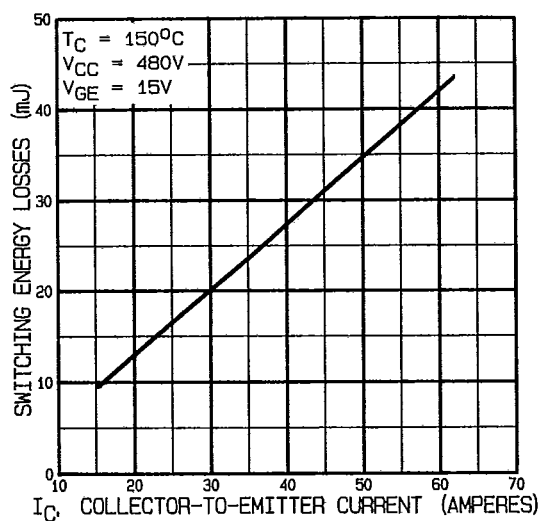


Fig. 10 — Switching Energy Losses Vs. Collector-to-Emitter Current

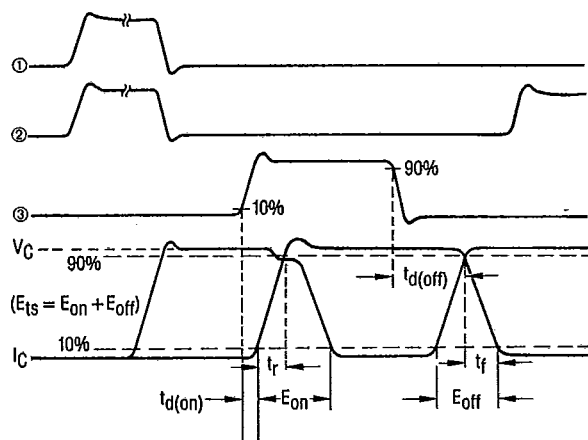
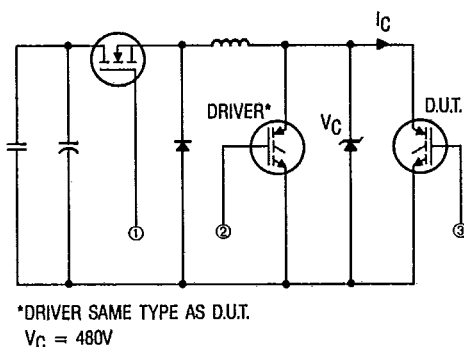


Fig. 11 — Switching Loss Test Circuit and Waveforms



*DRIVER SAME TYPE AS D.U.T.
 $V_C = 480V$