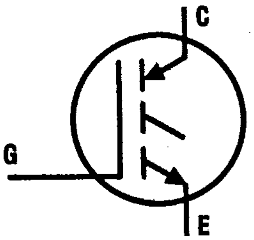
Data Sheet No. PD-9.663

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.

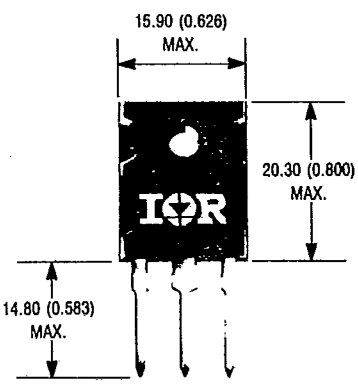
The efficient geometry and unique processing of this latch-free design achieves ultra low forward voltage drop.

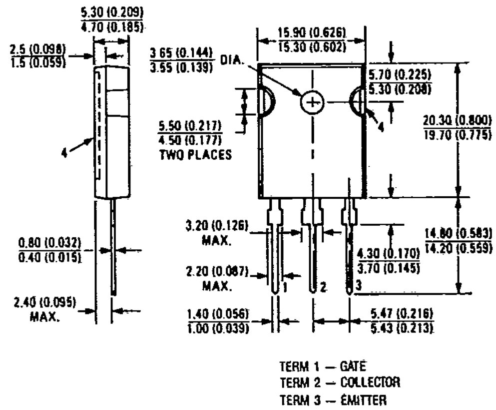
These devices are ideal for application in ac and dc motor drives, uninterruptible power supplies, welding equipment, power supplies, induction heaters, and high energy pulse circuits.

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)

T-39-03

Absolute Maximum Ratings

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

Electrical Characteristics @ T_J = 25°C (Unless Otherwise Specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
BV_{CES}	Collector-to-Emitter Breakdown Voltage	600	—	—	V	V_{GE} = 0V, I_C = 250 μA
BV_{ECS}	Emitter-to-Collector Breakdown Voltage ③	15	22	—		V_{GE} = 0V, I_C = 1.0A
$\Delta BV_{CES}/\Delta T_J$	BV_{CES} Temperature Coefficient	—	0.75	—	V/°C	V_{GE} = 0V, I_C = 1 mA
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage ③	—	1.6	2.0	V	V_{GE} = 15V, I_C = 31A
		—	2.2	—		V_{GE} = 15V, I_C = 60A
		—	1.7	—		V_{GE} = 15V, I_C = 31A, T_J = 150°C
$\Delta V_{GE(th)}$	Gate Threshold Voltage	2.5	—	5.0		V_{CE} = V_{GE}, I_C = 250 μA
$\Delta V_{GE(th)}/\Delta T_J$	$V_{GE(th)}$ Temperature Coefficient	—	-9.3	—	mV/°C	V_{CE} = V_{GE}, I_C = 250 μA
g_{FE}	Forward Transconductance ④	12	21	30	S (Ω)	V_{CE} = 100V, I_C = 31A
I_{CES}	Zero Gate Voltage Collector Current	—	—	250	μA	V_{GE} = 0V, V_{CE} = 600V, T_J = 25°C
		—	—	1000		V_{GE} = 0V, V_{CE} = 600V, T_J = 150°C
I_{GES}	Gate-to-Emitter Leakage Current	—	—	±500	nA	V_{GE} = ±20V

Switching Characteristics @ T_J = 25°C (Unless Otherwise Specified)

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
Q_g	Total Gate Charge (turn on)	40	62	90	nC	I_C = 31A, V_{CC} = 480V
Q_{ge}	Gate-to-Emitter Charge (turn-on)	5	10	15		
Q_{gc}	Gate-to-Collector Charge (turn-on)	13	27	40		See Fig. 7
$t_{d(on)}$	Turn-On Delay Time	—	79	—	nS	I_C = 31A, V_{CC} = 480V, T_J = 25°C V_{GE} = 15V, R_G = 50Ω
t_r	Rise Time	—	90	—		
$t_{d(off)}$	Turn-Off Delay Time	—	1246	—		
t_f	Fall Time	—	556	—		
E_{on}	Turn-On Switching Loss	—	1.64	—	mJ	
E_{off}	Turn-Off Switching Loss	—	10.2	—		
E_{ts}	Total Switching Loss	—	11.9	18.0		
		—	20.8	—		I_C = 31A, V_{CC} = 480V, T_J = 150°C V_{GE} = 15V, R_G = 50Ω
L_E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package
C_{ies}	Input Capacitance	—	1600	—	pF	V_{GE} = 0V, V_{CC} = 25V f = 1.0 MHz
C_{oes}	Output Capacitance	—	140	—		
C_{res}	Reverse Transfer Capacitance	—	22	—		

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units	Test Conditions
R_{thJC}	Junction-to-Case	—	—	0.77	K/W ⑤	Mounting surface flat, smooth and greased, leads soldered to DUT
R_{thCS}	Case-to-Sink	—	0.24	—		
R_{thJA}	Junction-to-Ambient	—	—	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 μH, R_G = 50Ω (see figure 5a)

③ Pulse width 80 μS; Duty Factor ≤ 0.1%

④ Pulse width 5 μS, single shot

⑤ K/W same as °C/W

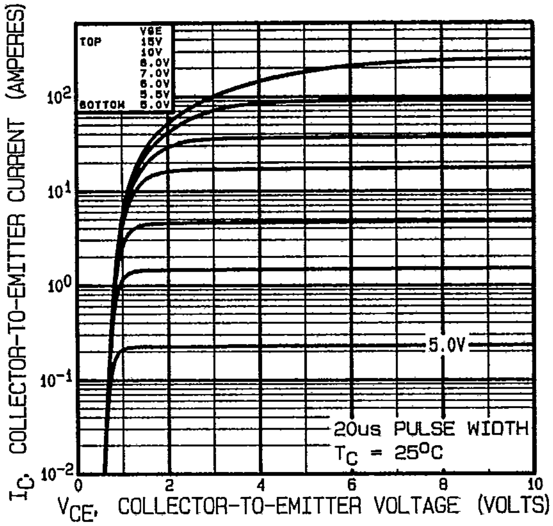


Fig. 1 — Typical Output Characteristics, T_C = 25°C

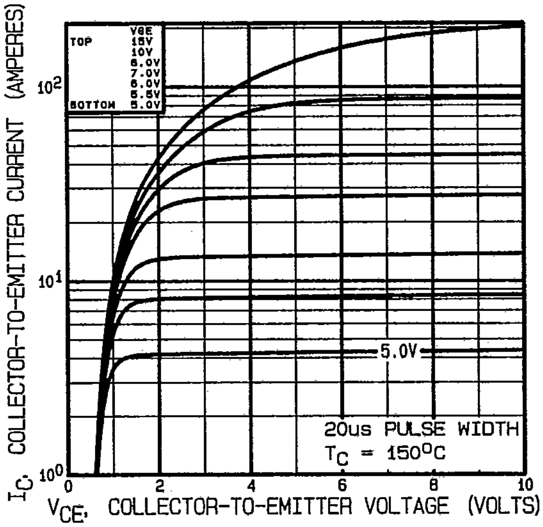


Fig. 2 — Typical Output Characteristics, T_C = 150°C

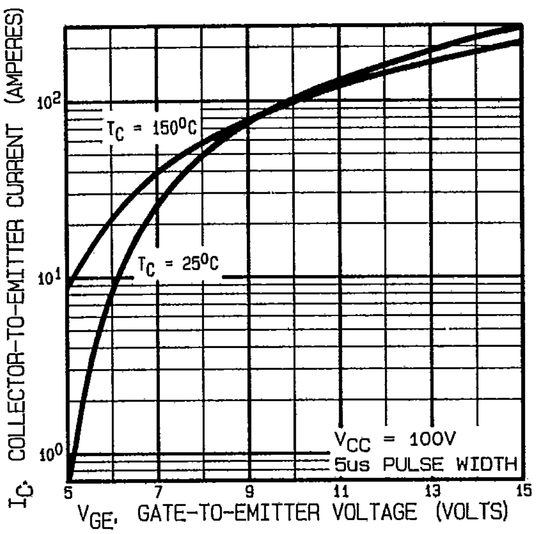


Fig. 3 — Typical Transfer Characteristics

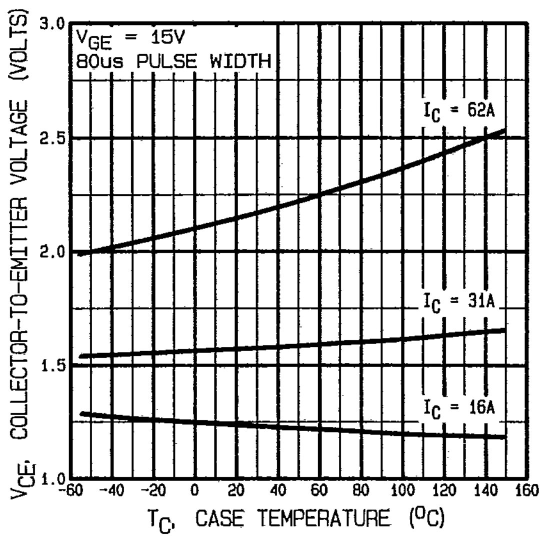


Fig. 4 — Collector-to-Emitter Saturation Voltage Vs. Case Temperature

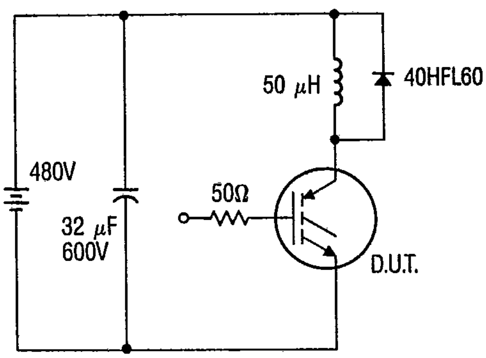


Fig. 5a — Clamped Inductive Load Test Circuit

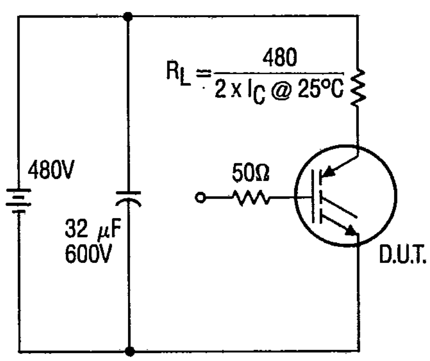


Fig. 5b — Pulsed Collector Current Test Circuit

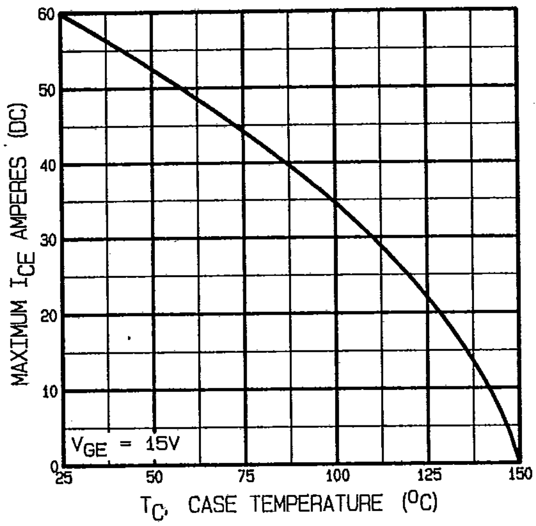


Fig. 6 — Maximum Collector Current Vs. Case Temperature

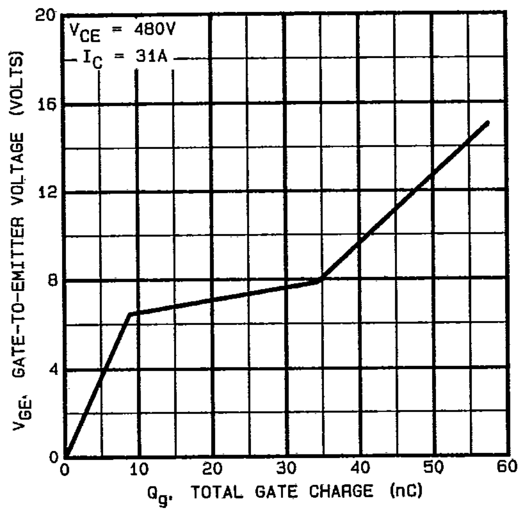


Fig. 7 — Typical Gate Charge Vs. Gate-to-Emitter Voltage

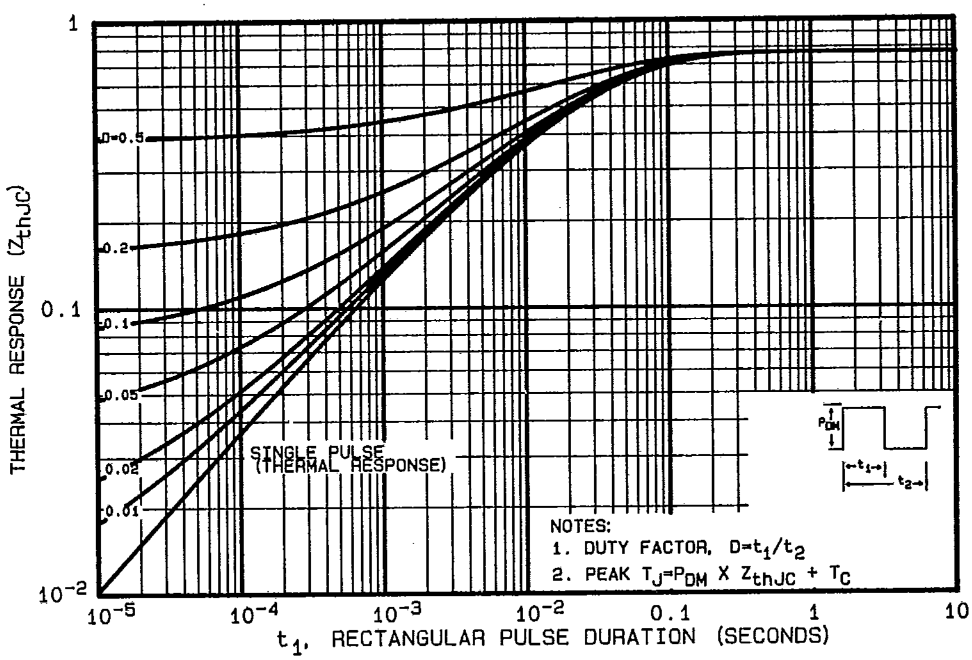


Fig. 8 — Maximum Effective Transient Thermal Impedance, Junction-to-Case

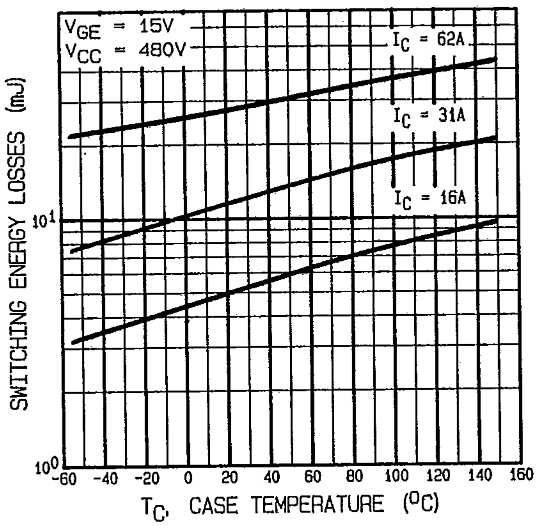


Fig. 9 — Switching Energy Losses Vs. Case Temperature

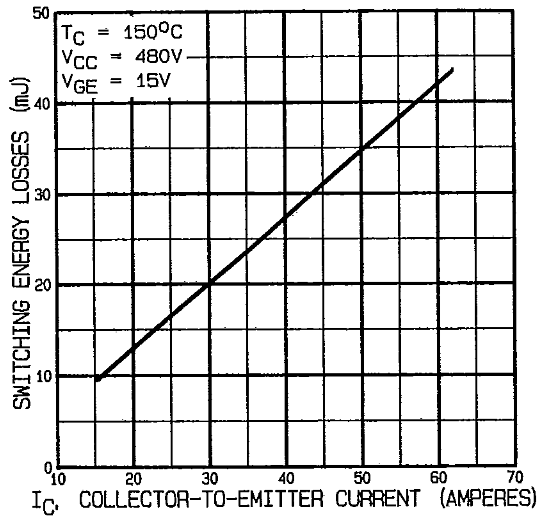


Fig. 10 — Switching Energy Losses Vs. Collector-to-Emitter Current

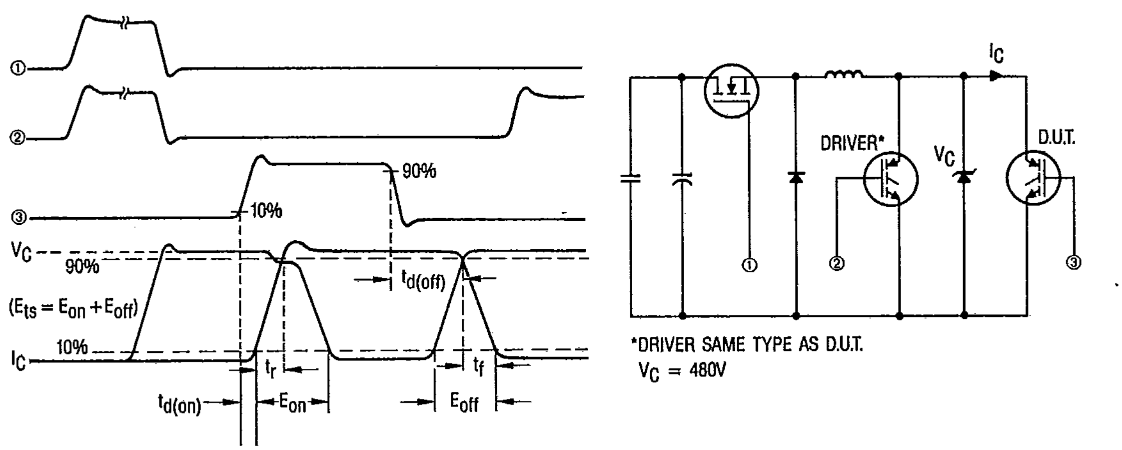


Fig. 11 — Switching Loss Test Circuit and Waveforms