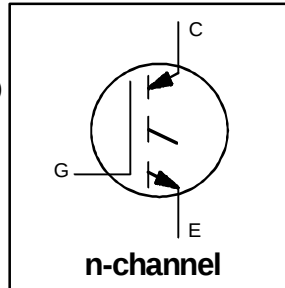


Features

- Switching-loss rating includes all "tail" losses
- Optimized for line frequency operation (to 400Hz)



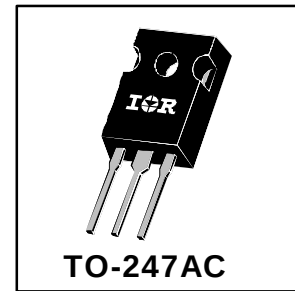
$$V_{CES} = 1200V$$

$$V_{CE(sat)} \leq 3.0V$$

$$@V_{GE} = 15V, I_C = 20A$$

Description

Insulated Gate Bipolar Transistors (IGBTs) from International Rectifier have higher usable current densities than comparable bipolar 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	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	33	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	20	
I_{CM}	Pulsed Collector Current ①	66	
I_{LM}	Clamped Inductive Load Current ②	66	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
E_{ARV}	Reverse Voltage Avalanche Energy ③	15	mJ
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	160	W
$P_D @ T_C = 100^\circ C$	Maximum Power Dissipation	65	
T_J	Operating Junction and	-55 to +150	$^\circ C$
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	
	Mounting torque, 6-32 or M3 screw.	10 lbf•in (1.1N•m)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	—	0.77	$^\circ C/W$
$R_{\theta CS}$	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	1200	—	—	V	$V_{GE} = 0\text{V}$, $I_C = 250\mu\text{A}$
$V_{(BR)ECS}$	Emitter-to-Collector Breakdown Voltage ④	20	—	—	V	$V_{GE} = 0\text{V}$, $I_C = 1.0\text{A}$
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	1.3	—	$^\circ\text{C}$	$V_{GE} = 0\text{V}$, $I_C = 1.0\text{mA}$
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	2.5	3.0	V	$I_C = 20\text{A}$ $V_{GE} = 15\text{V}$
		—	2.9	—		$I_C = 33\text{A}$
		—	2.8	—		$I_C = 20\text{A}$, $T_J = 150^\circ\text{C}$
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	5.5		$V_{CE} = V_{GE}$, $I_C = 250\mu\text{A}$
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-12	—	$\text{mV}/^\circ\text{C}$	$V_{CE} = V_{GE}$, $I_C = 250\mu\text{A}$
g_{fe}	Forward Transconductance ⑤	—	12	—	S	$V_{CE} = 100\text{V}$, $I_C = 20\text{A}$
I_{CES}	Zero Gate Voltage Collector Current	—	—	250	μA	$V_{GE} = 0\text{V}$, $V_{CE} = 1200\text{V}$
		—	—	1000		$V_{GE} = 0\text{V}$, $V_{CE} = 1200\text{V}$, $T_J = 150^\circ\text{C}$
I_{GES}	Gate-to-Emitter Leakage Current	—	—	± 100	nA	$V_{GE} = \pm 20\text{V}$

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	—	nC	$I_C = 20A$
Q_{ge}	Gate - Emitter Charge (turn-on)	—	14	—		$V_{CC} = 400V$
Q_{gc}	Gate - Collector Charge (turn-on)	—	12	—		$V_{GE} = 15V$
$t_{d(on)}$	Turn-On Delay Time	—	30	—	ns	$T_J = 25^{\circ}C$
t_r	Rise Time	—	22	—		$I_C = 20A, V_{CC} = 960V$
$t_{d(off)}$	Turn-Off Delay Time	—	1400	—		$V_{GE} = 15V, R_G = 10\Omega$
t_f	Fall Time	—	680	—		Energy losses include "tail"
E_{on}	Turn-On Switching Loss	—	1.4	—	mJ	
E_{off}	Turn-Off Switching Loss	—	20	—		
E_{ts}	Total Switching Loss	—	21.4	—		
$t_{d(on)}$	Turn-On Delay Time	—	28	—	ns	$T_J = 150^{\circ}C,$
t_r	Rise Time	—	27	—		$I_C = 20A, V_{CC} = 960V$
$t_{d(off)}$	Turn-Off Delay Time	—	1300	—		$V_{GE} = 15V, R_G = 10\Omega$
t_f	Fall Time	—	2100	—		Energy losses include "tail"
E_{ts}	Total Switching Loss	—	50	—	mJ	Measured 5mm from package
L_E	Internal Emitter Inductance	—	13	—	nH	
C_{ies}	Input Capacitance	—	1650	—	pF	
C_{oes}	Output Capacitance	—	73	—		$V_{CC} = 30V$
C_{res}	Reverse Transfer Capacitance	—	14	—		$f = 1.0MHz$

Notes:

- ① Repetitive rating; $V_{GE}=20\text{V}$, pulse width limited by max. junction temperature. ③ Repetitive rating; pulse width limited by maximum junction temperature. ⑤ Pulse width 5.0 μs , single shot.
- ② $V_{CC}=80\%(V_{CES})$, $V_{GE}=20\text{V}$, $L=10\mu\text{H}$, $R_G=10\Omega$ ④ Pulse width $\leq 80\mu\text{s}$; duty factor $\leq 0.1\%$.

Refer to Section D - page D-13
Package Outline 3 - JEDEC Outline TO-247AC (TO-3P)