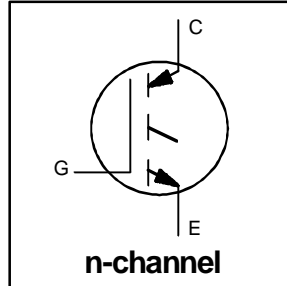


**Features**

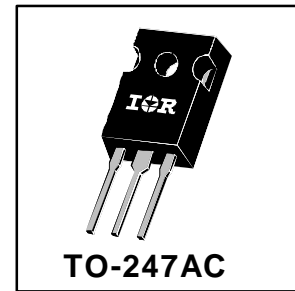
- Switching-loss rating includes all "tail" losses
- Optimized for line frequency operation (to 400Hz)



$V_{CES} = 1200V$
$V_{CE(sat)} \leq 3.0V$
@ $V_{GE} = 15V, I_C = 13A$

**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	22	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	13	
$I_{CM}$	Pulsed Collector Current ①	44	
$I_{LM}$	Clamped Inductive Load Current ②	44	
$V_{GE}$	Gate-to-Emitter Voltage	$\pm 20$	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	13	
$T_J$	Operating Junction and	-55 to +150	°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	—	—	1.2	°C/W
$R_{\theta CS}$	Case-to-Sink, flat, greased surface	—	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient, typical socket mount	—	—	40	
$W_t$	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	20	—	—	V	$V_{GE} = 0V, I_C = 1.0A$	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	1.5	—	$V/^\circ\text{C}$	$V_{GE} = 0V, I_C = 1.0mA$	
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	2.0	3.0	V	See Fig. 2, 5 $I_C = 13A$	
		—	2.8	—			$I_C = 22A$
		—	2.6	—			$I_C = 13A, T_J = 150^\circ\text{C}$
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	5.5		$V_{CE} = V_{GE}, I_C = 250\mu A$	
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	—	-12	—	$mV/^\circ\text{C}$	$V_{CE} = V_{GE}, I_C = 250\mu A$	
$g_{fe}$	Forward Transconductance ⑤	3.1	6.3	—	S	$V_{CE} = 100V, I_C = 13A$	
$I_{CES}$	Zero Gate Voltage Collector Current	—	—	250	$\mu A$	$V_{GE} = 0V, V_{CE} = 1200V$	
		—	—	1000		$V_{GE} = 0V, V_{CE} = 1200V, T_J = 150^\circ\text{C}$	
$I_{GES}$	Gate-to-Emitter Leakage Current	—	—	$\pm 100$	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)	—	28	42	nC	$I_C = 13A$ $V_{CC} = 400V$ $V_{GE} = 15V$
$Q_{ge}$	Gate - Emitter Charge (turn-on)	—	8.2	12		
$Q_{gc}$	Gate - Collector Charge (turn-on)	—	6.8	10		
$t_{d(on)}$	Turn-On Delay Time	—	28	—	ns	$T_J = 25^\circ\text{C}$ $I_C = 13A, V_{CC} = 960V$ $V_{GE} = 15V, R_G = 23\Omega$ Energy losses include "tail"
$t_r$	Rise Time	—	22	—		
$t_{d(off)}$	Turn-Off Delay Time	—	1200	1800		
$t_f$	Fall Time	—	680	1140		
$E_{on}$	Turn-On Switching Loss	—	0.90	—	mJ	$T_J = 150^\circ\text{C}$ , $I_C = 13A, V_{CC} = 960V$ $V_{GE} = 15V, R_G = 23\Omega$ Energy losses include "tail"
$E_{off}$	Turn-Off Switching Loss	—	12	—		
$E_{ts}$	Total Switching Loss	—	13	19		
$t_{d(on)}$	Turn-On Delay Time	—	26	—	ns	$T_J = 150^\circ\text{C}$ , $I_C = 13A, V_{CC} = 960V$ $V_{GE} = 15V, R_G = 23\Omega$ Energy losses include "tail"
$t_r$	Rise Time	—	27	—		
$t_{d(off)}$	Turn-Off Delay Time	—	1280	—		
$t_f$	Fall Time	—	2000	—		
$E_{ts}$	Total Switching Loss	—	23	—	mJ	
$L_E$	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package
$C_{ies}$	Input Capacitance	—	685	—	pF	$V_{GE} = 0V$ $V_{CC} = 30V$ $f = 1.0MHz$
$C_{oes}$	Output Capacitance	—	43	—		
$C_{res}$	Reverse Transfer Capacitance	—	8.3	—		

### Notes:

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

Refer to Section D - page D-13

Package Outline 3 - JEDEC Outline TO-247AC (TO-3P)