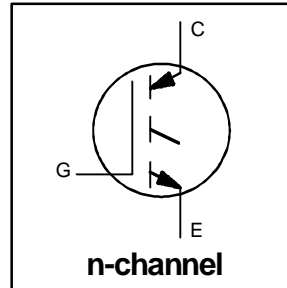


Features

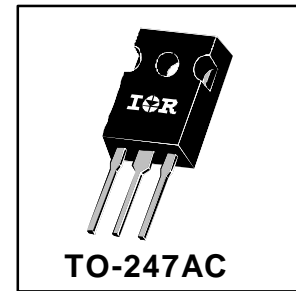
- Switching-loss rating includes all "tail" losses
- Optimized for line frequency operation (to 400Hz)



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

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 | ± 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 $I_C = 13A$ $I_C = 22A$ $I_C = 13A, T_J = 150^\circ\text{C}$ |
| | | — | 2.8 | — | | |
| | | — | 2.6 | — | | |
| $V_{GE(th)}$ | 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 | μA | $V_{GE} = 0V, V_{CE} = 1200V$ |
| | | — | — | 1000 | | $V_{GE} = 0V, V_{CE} = 1200V, T_J = 150^\circ\text{C}$ |
| I_{GES} | Gate-to-Emitter Leakage Current | — | — | ± 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 | |
| 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 μs , single shot.

Refer to Section D - page D-13

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