International
IOR Rectifier

PD -90813A

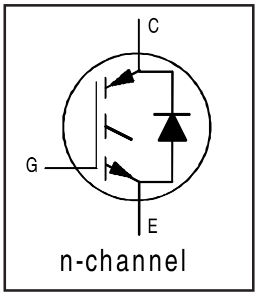
IRGMIC50U

INSULATED GATE BIPOLAR TRANSISTOR WITH ON-BOARD REVERSE DIODE

Ultra Fast Speed IGBT

Features

- Electrically Isolated and Hermetically Sealed
- Simple Drive Requirements
- Latch-proof
- Ultra Fast operation > 10 kHz
- Switching-loss rating includes all "tail" losses



$V_{CES} = 600V$

$V_{CE(on)\ max} = 3.0V$

$@V_{GE} = 15V, I_C = 27A$

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.

The performance of various IGBTs varies greatly with frequency. Note that IR now provides the designer with a speed benchmark ($f_{Ic/2}$, or the "half-current frequency "), as well as an indication of the current handling capability of the device.

TO-259AA

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Breakdown Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current	45*	A
I_C @ T_C = 100°C	Continuous Collector Current	27	
I_{CM}	Pulsed Collector Current ①	220	
I_{LM}	Clamped Inductive Load Current ②	180	
V_{GE}	Gate-to-Emitter Voltage	±20	V
P_D @ T_C = 25°C	Maximum Power Dissipation	200	W
P_D @ T_C = 100°C	Maximum Power Dissipation	80	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 150	°C
	Lead Temperature	300 (0.063in./1.6mm from case for 10s)	
	Weight	10.5 (typical)	g

*Current is limited by pin diameter

Thermal Resistance

	Parameter	Min	Typ	Max	Units	Test Conditions
R_{thJC}	Junction-to-Case-IGBT	—	—	0.625	°C/W	
R_{thJC}	Junction-to-Case-Diode	—	—	1.0		
R_{thCS}	Case-to-Sink	—	0.21	—		
R_{thJA}	Junction-to-Ambient	—	—	30		

For footnotes refer to the last page

Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions	
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	600	——	——	V	V_{GE} = 0V, I_C = 1.0 mA	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	——	0.6	——	V/°C	V_{GE} = 0V, I_C = 1.0 mA	
$V_{CE(ON)}$	Collector-to-Emitter Saturation Voltage	——	——	3.0	V	I_C = 27A	V_{GE} = 15V
		——	——	3.25		I_C = 45A	See Fig. 5
		——	——	2.85		I_C = 27A , T_J = 125°C	
$V_{GE(th)}$	Gate Threshold Voltage	3.0	——	5.5		V_{CE} = V_{GE}, I_C = 250 µA	
$\Delta V_{GE(th)}/\Delta T_J$	Temperature Coeff. of Threshold Voltage	——	-13	——	mV/°C	V_{CE} = V_{GE}, I_C = 250 µA	
g_{fe}	Forward Transconductance ③	16	——	——	S	V_{CE} = 100V, I_C = 27A	
I_{CES}	Zero Gate Voltage Collector Current	——	——	250	µA	V_{GE} = 0V, V_{CE} = 480V	
		——	——	5000		V_{GE} = 0V, V_{CE} = 480V, T_J = 125°C	
I_{GES}	Gate-to-Emitter Leakage Current	——	——	±100	nA	V_{GE} = ±20	
V_{FM}	Diode Forward Voltage Drop	——	——	1.7	V	I_C = 27A	
		——	——	1.5		I_C = 27A , T_J = 125°C	

Switching Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge (turn-on)	——	——	140	nC	I_C = 27A
Q_{ge}	Gate - Emitter Charge (turn-on)	——	——	35		V_{CC} = 300V See Fig. 8
Q_{gc}	Gate - Collector Charge (turn-on)	——	——	70		V_{GE} = 15V
$t_{d(on)}$	Turn-On Delay Time	——	——	50	ns	I_C = 27A, V_{CC} = 480V
t_r	Rise Time	——	——	75		V_{GE} = 15V, R_G = 2.35Ω
$t_{d(off)}$	Turn-Off Delay Time	——	——	300		Energy losses include "tail"
t_f	Fall Time	——	——	210		See Fig. 9, 10, 13
E_{on}	Turn-On Switching Loss	——	0.12	——	mJ	
E_{off}	Turn-off Switching Loss	——	1.6	——		
E_{ts}	Total Switching Loss	——	1.7	2.8		
$t_{d(on)}$	Turn-On Delay Time	——	24	——	ns	T_J = 125°C
t_r	Rise Time	——	27	——		$_C$ = 27A, V_{CC} = 480V
$t_{d(off)}$	Turn-Off Delay Time	——	180	——		V_{GE} = 15V, R_G = 2.35Ω
t_f	Fall Time	——	130	——		Energy losses include "tail"
E_{ts}	Total Switching Loss	——	2.7	——	mJ	See Fig. 11, 13
L_C+L_E	Total Inductance	——	6.8	——	nH	Measured from Collector lead (6mm/ 0.25in. from package) to Emitter lead (6mm / 0.25in. from package)
C_{ies}	Input Capacitance	——	2900	——	pF	V_{GE} = 0V
C_{oes}	Output Capacitance	——	330	——		V_{CC} = 30V See Fig. 7
C_{res}	Reverse Transfer Capacitance	——	41	——		f = 1.0MHz
T_{rr}	Diode Peak Reverse Recovery Time	——	——	100	ns	di/dt = 200A/µS, I_F = 27A $V_R \leq$ 200V
Q_{rr}	Diode Peak Reverse Recovery Charge	——	——	375	nC	di/dt = 200A/µS, I_F = 27A T_J = 125°C, $V_R \leq$ 200V

Note: Corresponding Spice and Saber models are available on the Website.
For footnotes refer to the last page