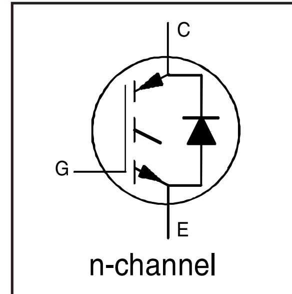
International
IOR Rectifier

PD - 97316

IRG4PC50SDPbF

INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE

Standard Speed CoPack IGBT



n-channel

$V_{CES} = 600V$

$V_{CE(on)\ typ.} = 1.28V$

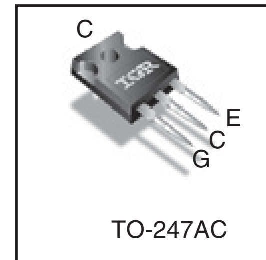
$@V_{GE} = 15V, I_C = 41A$

Features

- Standard: Optimized for minimum saturation voltage and low operating frequencies (<1kHz)
- IGBT co-packaged with HEXFRED^{TM} ultrafast, ultra-soft-recovery anti-parallel diodes for use in bridge configurations
- Industry standard TO-247AC package

Benefits

- Generation -4 IGBT's offer highest efficiencies available
- IGBT's optimized for specific application conditions
- HEXFRED diodes optimized for performance with IGBT's . Minimized recovery characteristics require less/no snubbing



TO-247AC

G	C	E
Gate	Collector	Emitter

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Breakdown Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current	70	A
I_C @ T_C = 100°C	Continuous Collector Current	41	
I_{CM}	Pulsed Collector Current ①	140	
I_{LM}	Clamped Inductive Load Current ②	140	
I_F @ T_C = 100°C	Diode Continous Forward Current	25	
I_{FM}	Diode Maximum Forward Current ③	280	
V_{GE}	Continuous 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	78	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to +150	°C
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	
	Mounting Torque, 6-32 or M3 Screw	10 lbf·in (1.1 N·m)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$ (IGBT)	Thermal Resistance Junction-to-Case-(each IGBT)	——	——	0.64	°C/W
$R_{\theta JC}$ (Diode)	Thermal Resistance Junction-to-Case-(each Diode)	——	——	0.83	
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink (flat, greased surface)	——	0.24	——	
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (typical socket mount)	——	——	40	

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

	Parameter	Min.	Typ.	Max.	Units	Conditions	Ref.Fig
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage	600	—	—	V	V_{GE} = 0V, I_C = 250µA	
$\Delta V_{(BR)CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	—	0.75	—	V/°C	V_{GE} = 0V, I_C = 1mA (25°C-150°C)	
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	1.28	1.36	V	I_C = 41A, V_{GE} = 15V, T_J = 25°C	2
		—	1.62	—		I_C = 80A, V_{GE} = 15V, T_J = 25°C	
		—	1.25	—		I_C = 41A, V_{GE} = 15V, T_J = 150°C	
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	6.0	V	V_{CE} = V_{GE}, I_C = 250µA	3
$\Delta V_{GE(th)}/\Delta TJ$	Threshold Voltage temp. coefficient	—	-9.3	—	mV/°C	V_{CE} = V_{GE}, I_C = 250µA (25°C - 150°C)	
gfe	Forward Transconductance	17	34	—	S	V_{CE} = 100V, I_C = 41A	
I_{CES}	Collector-to-Emitter Leakage Current	—	—	250	µA	V_{GE} = 0V, V_{CE} = 600V	
		—	—	2.0		V_{GE} = 0V, V_{CE} = 10V, T_J = 25°C	
		—	—	1000		V_{GE} = 0V, V_{CE} = 600V, T_J = 150°C	
V_{FM}	Diode Forward Voltage Drop	—	1.3	1.7	V	I_F = 25A	13
		—	1.2	1.5		I_F = 25A, T_J = 150°C	
I_{GES}	Gate-to-Emitter Leakage Current	—	—	±100	nA	V_{GE} = ±20V	

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

	Parameter	Min.	Typ.	Max.	Units	Conditions	Ref.Fig
Q_g	Total Gate Charge (turn-on)	—	180	280	nC	I_C = 41A	8
Q_{ge}	Gate-to-Emitter Charge (turn-on)	—	24	37		V_{GE} = 15V	
Q_{gc}	Gate-to-Collector Charge (turn-on)	—	61	92		V_{CC} = 400V	
E_{on}	Turn-On Switching Loss	—	0.72	—	mJ	I_C = 41A, V_{CC} = 480V, V_{GE} = 15V	18a, 18b
E_{off}	Turn-Off Switching Loss	—	8.27	—		R_G = 5.0Ω, T_J = 25°C	18c
E_{total}	Total Switching Loss	—	8.99	13		Energy losses include tail & diode reverse recovery	
$t_{d(on)}$	Turn-On delay time	—	33	—	ns	I_C = 41A, V_{CC} = 480V, V_{GE} = 15V	18a, 18b
t_r	Rise time	—	30	—		R_G = 5.0Ω, L = 200µH, T_J = 25°C	18c
$t_{d(off)}$	Turn-Off delay time	—	650	980			
t_f	Fall time	—	400	600			
E_{total}	Total Switching Loss	—	15	—	mJ		
$t_{d(on)}$	Turn-On delay time	—	31	—	ns	I_C = 41A, V_{CC} = 480V, V_{GE} = 15V	18a, 18b
t_r	Rise time	—	31	—		R_G = 5.0Ω, L = 200µH	18c
$t_{d(off)}$	Turn-Off delay time	—	1080	—		T_J = 150°C	
t_f	Fall time	—	620	—			
C_{ies}	Input Capacitance	—	4100	—	pF	V_{GE} = 0V	7
C_{oes}	Output Capacitance	—	250	—		V_{CC} = 30V	
C_{res}	Reverse Transfer Capacitance	—	48	—		f = 1.0Mhz	
t_{rr}	Diode Reverse Recovery Time	—	50	75	ns	T_J = 25°C, V_R = 200V, I_F = 25A, di/dt=200A/µs	14
			105	160		T_J = 125°C, V_R = 200V, I_F = 25A, di/dt=200A/µs	18a, 18d
I_{rr}	Peak Reverse Recovery Current	—	4.5	10	A	T_J = 25°C, V_R = 200V, I_F = 25A, di/dt=200A/µs	15
		—	8.0	15		T_J = 125°C, V_R = 200V, I_F = 25A, di/dt=200A/µs	18a, 18d
Q_{rr}	Peak Reverse Recovery Current	—	112	375	nC	T_J = 25°C, V_R = 200V, I_F = 25A, di/dt=200A/µs	16
		—	420	1200		T_J = 125°C, V_R = 200V, I_F = 25A, di/dt=200A/µs	18a, 18d
$di_{(rec)M}/dt$	Peak Rate of Fall of Recovery During t_b	—	250	—	A/µs	T_J = 25°C, V_R = 200V, I_F = 25A, di/dt=200A/µs	17
		—	160	—		T_J = 125°C, V_R = 200V, I_F = 25A, di/dt=200A/µs	

Notes:

① Repetitive rating: V_{GE}=15V; pulse width limited by maximum junction temperature. (See figure 20)

② V_{CC}=80%(V_{CES}), V_{GE}=15V, R_G = 5.0Ω. (See figure 19)

③ Pulse width ≤ 80µs; duty factor ≤ 0.1%.