

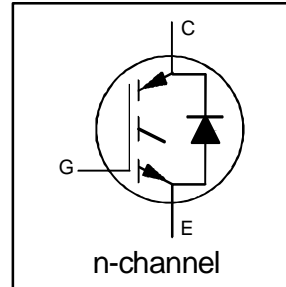
IRGPH40MD2

INSULATED GATE BIPOLAR TRANSISTOR
WITH ULTRAFAST SOFT RECOVERY

Short Circuit Rated
Fast CoPack IGBT

DIODE Features

- Short circuit rated -10 μ s @125°C, $V_{GE} = 15V$
- Switching-loss rating includes all "tail" losses
- HEXFRED™ soft ultrafast diodes
- Optimized for medium operating frequency (1 to 10kHz)



$$V_{CES} = 1200V$$

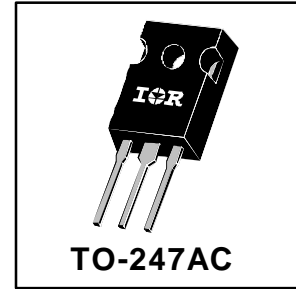
$$V_{CE(sat)} \leq 3.4V$$

$$@V_{GE} = 15V, I_C = 18A$$

Description

Co-packaged IGBTs are a natural extension of International Rectifier's well known IGBT line. They provide the convenience of an IGBT and an ultrafast recovery diode in one package, resulting in substantial benefits to a host of high-voltage, high-current, applications.

These new short circuit rated devices are especially suited for motor control and other applications requiring short circuit withstand capability.



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	1200	V
$I_C @ T_C = 25^\circ C$	Continuous Collector Current	31	A
$I_C @ T_C = 100^\circ C$	Continuous Collector Current	18	
I_{CM}	Pulsed Collector Current ①	62	
I_{LM}	Clamped Inductive Load Current ②	62	
$I_F @ T_C = 100^\circ C$	Diode Continuous Forward Current	8.0	
I_{FM}	Diode Maximum Forward Current	62	μ s
t_{sc}	Short Circuit Withstand Time	10	
V_{GE}	Gate-to-Emitter Voltage	± 20	V
$P_D @ T_C = 25^\circ C$	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 (1.1 N•m)	

Thermal Resistance

	Parameter	Min.	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case - IGBT	—	—	0.77	$^\circ C/W$
$R_{\theta JC}$	Junction-to-Case - Diode	—	—	1.7	
$R_{\theta CS}$	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)

IRGPH40MD2



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

	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)CES}	Collector-to-Emitter Breakdown Voltage ③	1200	—	—	V	V _{GE} = 0V, I _C = 250μA
ΔV _{(BR)CES} /ΔT _J	Temp. Coeff. of Breakdown Voltage	—	1.1	—	V/°C	V _{GE} = 0V, I _C = 1.0mA
V _{CE(on)}	Collector-to-Emitter Saturation Voltage	—	2.3	3.4	V	I _C = 18A V _{GE} = 15V
		—	3.0	—		I _C = 31A
		—	2.8	—		I _C = 18A, T _J = 150°C
V _{GE(th)}	Gate Threshold Voltage	3.0	—	5.5		V _{CE} = V _{GE} , I _C = 250μA
ΔV _{GE(th)} /ΔT _J	Temp. Coeff. of Threshold Voltage	—	-14	—	mV/°C	V _{CE} = V _{GE} , I _C = 250μA
g _{fe}	Forward Transconductance ④	4.0	10	—	S	V _{CE} = 100V, I _C = 18A
I _{CES}	Zero Gate Voltage Collector Current	—	—	250	μA	V _{GE} = 0V, V _{CE} = 1200V
		—	—	3500		V _{GE} = 0V, V _{CE} = 1200V, T _J = 150°C
V _{FM}	Diode Forward Voltage Drop	—	2.6	3.3	V	I _C = 8A
		—	2.3	3.0		I _C = 8A, 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
Q _g	Total Gate Charge (turn-on)	—	50	75	nC	I _C = 18A
Q _{ge}	Gate - Emitter Charge (turn-on)	—	11	21		V _{CC} = 400V
Q _{gc}	Gate - Collector Charge (turn-on)	—	15	30		
t _{d(on)}	Turn-On Delay Time	—	67	—	ns	T _J = 25°C
t _r	Rise Time	—	89	—		I _C = 18A, V _{CC} = 800V
t _{d(off)}	Turn-Off Delay Time	—	340	930		V _{GE} = 15V, R _G = 10Ω
t _f	Fall Time	—	510	930		Energy losses include "tail" and diode reverse recovery.
E _{on}	Turn-On Switching Loss	—	2.1	—	mJ	
E _{off}	Turn-Off Switching Loss	—	5.9	—		
E _{ts}	Total Switching Loss	—	8.0	13		
t _{sc}	Short Circuit Withstand Time	10	—	—	μs	V _{CC} = 720V, T _J = 125°C V _{GE} = 15V, R _G = 10Ω, V _{CPK} < 1000V
t _{d(on)}	Turn-On Delay Time	—	64	—	ns	T _J = 150°C,
t _r	Rise Time	—	74	—		I _C = 18A, V _{CC} = 800V
t _{d(off)}	Turn-Off Delay Time	—	550	—		V _{GE} = 15V, R _G = 10Ω
t _f	Fall Time	—	1200	—		Energy losses include "tail" and diode reverse recovery.
E _{ts}	Total Switching Loss	—	16	—	mJ	
L _E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package
C _{ies}	Input Capacitance	—	1400	—	pF	V _{GE} = 0V
C _{oes}	Output Capacitance	—	100	—		V _{CC} = 30V
C _{res}	Reverse Transfer Capacitance	—	15	—		f = 1.0MHz
t _{rr}	Diode Reverse Recovery Time	—	63	95	ns	T _J = 25°C
		—	106	160		T _J = 125°C
I _{rr}	Diode Peak Reverse Recovery Current	—	4.5	8.0	A	T _J = 25°C
		—	6.2	11		T _J = 125°C
Q _{rr}	Diode Reverse Recovery Charge	—	140	380	nC	T _J = 25°C
		—	335	880		T _J = 125°C
di _(rec) M/dt	Diode Peak Rate of Fall of Recovery During t _b	—	133	—	A/μs	T _J = 25°C
		—	85	—		T _J = 125°C

Notes: ① Repetitive rating; V_{GE}=20V, pulse width limited by max. junction temperature.

② V_{CC}=80%(V_{CES}), V_{GE}=20V, L=10μH, R_G = 10Ω

④ Pulse width 5.0μs, single shot.

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

Refer to Section D - page D-13 for Package Outline 3 - JEDEC Outline TO-247AC