International

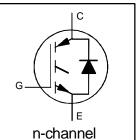
Preliminary Data Sheet PD - 9.1118

IRGPH40MD2

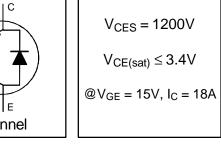
INSULATED GATE BIPOLAR TRANSISTOR WITH ULTRAFAST SOFT RECOVERY DIODE

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)



Short Circuit Rated Fast CoPack IGBT



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°C	Continuous Collector Current	31	
I _C @ T _C = 100°C	Continuous Collector Current	18	
I _{CM}	Pulsed Collector Current ①	62	A
I _{LM}	Clamped Inductive Load Current @	62	
I _F @ T _C = 100°C	Diode Continuous Forward Current	8.0	
I _{FM}	Diode Maximum Forward Current	62	
t _{sc}	Short Circuit Withstand Time	10	μs
V _{GE}	Gate-to-Emitter Voltage	± 20	V
P _D @ T _C = 25°C	Maximum Power Dissipation	160	W
P _D @ T _C = 100°C	Maximum Power Dissipation	65	
TJ	Operating Junction and	-55 to +150	
T _{STG}	Storage Temperature Range		°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.	Тур.	Max.	Units
$R_{\theta JC}$	Junction-to-Case - IGBT	—	—	0.77	
$R_{\theta JC}$	Junction-to-Case - Diode	—	—	1.7	°C/W
R _{0CS}	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)

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Electrical Characteristics @ $T_J = 25^{\circ}C$ (unless otherwise specified)								
	Parameter	Min.	Тур.	Max.	Units	Conditions		
V _{(BR)CES}	Collector-to-Emitter Breakdown Voltage 3	1200	—	—	V	$V_{GE} = 0V, I_{C} = 250\mu A$		
$\Delta V_{(BR)CES} / \Delta T_J$	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		I _C = 18A V _{GE} = 15V		
		_	3.0	-	V	I _C = 31A		
		_	2.8	-		I _C = 18A, T _J = 150°C		
V _{GE(th)}	Gate Threshold Voltage	3.0		5.5		$V_{CE} = V_{GE}, I_C = 250 \mu A$		
$\Delta V_{GE(th)} / \Delta T_J$	Temp. Coeff. of Threshold Voltage		-14	_	mV/°C	$V_{CE} = V_{GE}, I_C = 250 \mu A$		
g _{fe}	Forward Transconductance ④	4.0	10	_	S	V _{CE} = 100V, I _C = 18A		
I _{CES}	Zero Gate Voltage Collector Current		_	250	μA	$V_{GE} = 0V, V_{CE} = 1200V$		
		I		3500		$V_{GE} = 0V, V_{CE} = 1200V, T_{J} = 150^{\circ}C$		
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	$V_{GE} = \pm 20V$		

Switching Characteristics @ $T_J = 25^{\circ}C$ (unless otherwise specified)

	Parameter	Min.	Тур.	Max.	Units	Conditio	ns	
Qg	Total Gate Charge (turn-on)	-	50	75		I _C = 18A		
Qge	Gate - Emitter Charge (turn-on)	_	11	21	nC	$V_{CC} = 400V$		
Q _{gc}	Gate - Collector Charge (turn-on)	_	15	30				
t _{d(on)}	Turn-On Delay Time	_	67	_		$T_J = 25^{\circ}C$		
tr	Rise Time	_	89	-	ns	$I_{C} = 18A, V_{CC} = 800V$		
t _{d(off)}	Turn-Off Delay Time	—	340	930	ĺ	V_{GE} = 15V, R_G = 10 Ω		
t _f	Fall Time	_	510	930		Energy losses include	"tail" and	
Eon	Turn-On Switching Loss	—	2.1			diode reverse recovery		
Eoff	Turn-Off Switching Loss	_	5.9	_	mJ			
ts	Total Switching Loss	_	8.0	13				
t _{sc}	Short Circuit Withstand Time	10	_	—	μs	V _{CC} = 720V, T _J = 125°	С	
						V_{GE} = 15V, R_G = 10 Ω ,	V _{CPK} < 1000V	
t _{d(on)}	Turn-On Delay Time	—	64	—		T _J = 150°C,		
r	Rise Time	—	74	—	ns	$I_{C} = 18A, V_{CC} = 800V$		
t _{d(off)}	Turn-Off Delay Time	—	550	—		V_{GE} = 15V, R_G = 10 Ω		
t _f	Fall Time	—	1200	—		Energy losses include	"tail" and	
Ets	Total Switching Loss	_	16	—	mJ	diode reverse recovery.		
L _E	Internal Emitter Inductance	—	13	—	nH	Measured 5mm from package		
Cies	Input Capacitance	_	1400	—		$V_{GE} = 0V$		
Coes	Output Capacitance	_	100	_	pF	$V_{CC} = 30V$		
Cres	Reverse Transfer Capacitance	_	15	—		f = 1.0MHz		
t _{rr}	Diode Reverse Recovery Time	_	63	95	ns	$T_J = 25^{\circ}C$		
		—	106	160		T _J = 125°C	$I_F = 8A$	
l _{rr}	Diode Peak Reverse Recovery Current	_	4.5	8.0	Α	$T_J = 25^{\circ}C$		
		_	6.2	11		T _J = 125°C	V _R = 200V	
Q _{rr}	Diode Reverse Recovery Charge	—	140	380	nC	T _J = 25°C	1	
		—	335	880	ĺ	T _J = 125°C	di/dt = 200A/µs	
di _{(rec)M} /dt	Diode Peak Rate of Fall of Recovery	—	133	—	A/µs	T _J = 25°C	l ·	
. /	During t _b	_	85	_	1	T _J = 125°C		

limited by max. junction temperature.

 $\label{eq:cc=80%} \begin{array}{ll} (\mathbb{V}_{CC}=80\%(\mathbb{V}_{CES}),\ \mathbb{V}_{GE}=20\mathbb{V},\ \mathbb{L}=10\mu\text{H},\\ \mathbb{R}_{G}=10\Omega\\ \end{array}$ $\label{eq:cc=80\%(\mathbb{V}_{CES}),\ \mathbb{V}_{GE}=20\mathbb{V},\ \mathbb{L}=10\mu\text{H},\\ \mathbb{R}_{G}=10\Omega\\ \end{array}$ single shot.

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