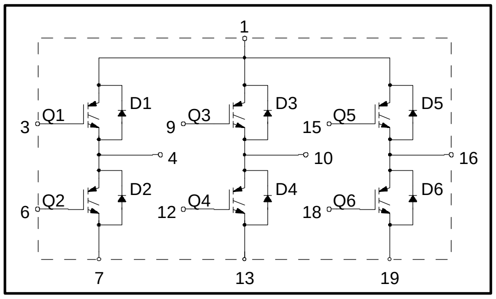
International IOR Rectifier

Preliminary Data Sheet PD - 5.035

CPV364MM

IGBT SIP MODULE

Short Circuit Rated Fast IGBT



Features

- Short Circuit Rated - 10µs @ 125°C, V_{GE} = 15V
- Fully isolated printed circuit board mount package
- Switching-loss rating includes all "tail" losses
- HEXFRED™ soft ultrafast diodes
- Optimized for medium operating frequency (1 to 10kHz)

Product Summary

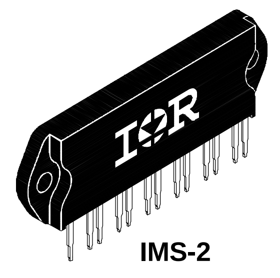
Output Current in a Typical 5.0 kHz Motor Drive

13 A_{RMS} per phase (4.1 kW total) with T_C = 90°C, T_J = 125°C, Supply Voltage 360Vdc, Power Factor 0.8, Modulation Depth 80%

Description

The IGBT technology is the key to International Rectifier's advanced line of IMS (Insulated Metal Substrate) Power Modules. These modules are more efficient than comparable bipolar transistor modules, while at the same time having the simpler gate-drive requirements of the familiar power MOSFET. This superior technology has now been coupled to a state of the art materials system that maximizes power throughput with low thermal resistance. This package is highly suited to power applications and where space is at a premium.

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



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
I_C @ T_C = 25°C	Continuous Collector Current, each IGBT	22	A
I_C @ T_C = 100°C	Continuous Collector Current, each IGBT	12	
I_{CM}	Pulsed Collector Current ①	44	
I_{LM}	Clamped Inductive Load Current ②	44	
I_F @ T_C = 100°C	Diode Continuous Forward Current	9.3	
I_{FM}	Diode Maximum Forward Current	44	
t_{sc}	Short Circuit Withstand Time	10	µs
V_{GE}	Gate-to-Emitter Voltage	± 20	V
V_{ISOL}	Isolation Voltage, any terminal to case, 1 minute	2500	V_{RMS}
P_D @ T_C = 25°C	Maximum Power Dissipation, each IGBT	62.5	W
P_D @ T_C = 100°C	Maximum Power Dissipation, each IGBT	25	
T_J T_{STG}	Operating Junction and Storage Temperature Range	-40 to +150	°C
	Soldering Temperature, for 10 sec.	300 (0.063 in. (1.6mm) from case)	
	Mounting torque, 6-32 or M3 screw.	5-7 lbf•in (0.55 - 0.8 N•m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$ (IGBT)	Junction-to-Case, each IGBT, one IGBT in conduction	—	2.0	°C/W
$R_{\theta JC}$ (DIODE)	Junction-to-Case, each diode, one diode in conduction	—	3.0	
$R_{\theta CS}$ (MODULE)	Case-to-Sink, flat, greased surface	0.1	—	
Wt	Weight of module	20 (0.7)	—	g (oz)

Revision 2

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

	Parameter	Min.	Typ.	Max.	Units	Conditions	
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage ③	600	—	—	V	V_{GE} = 0V, I_C = 250µA	
$\Delta V_{(BR)CES}/\Delta T_J$	Temp. Coeff. of Breakdown Voltage	—	0.69	—	V/°C	V_{GE} = 0V, I_C = 1.0mA	
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	1.7	—	V	I_C = 12A	V_{GE} = 15V
		—	2.0	—		I_C = 22A	
		—	1.9	—		I_C = 12A, T_J = 150°C	
$V_{GE(th)}$	Gate Threshold Voltage	3.0	—	5.5		$V_{CE} = V_{GE}$, I_C = 250µA	
$\Delta V_{GE(th)}/\Delta T_J$	Temp. Coeff. of Threshold Voltage	—	-12	—	mV/°C	$V_{CE} = V_{GE}$, I_C = 250µA	
g_{fe}	Forward Transconductance ④	9.2	12	—	S	V_{CE} = 100V, I_C = 24A	
I_{CES}	Zero Gate Voltage Collector Current	—	—	250	µA	V_{GE} = 0V, V_{CE} = 600V	
		—	—	3500		V_{GE} = 0V, V_{CE} = 600V, T_J = 150°C	
V_{FM}	Diode Forward Voltage Drop	—	1.3	1.7	V	I_C = 15A	
		—	1.2	1.6		I_C = 15A, T_J = 150°C	
I_{GES}	Gate-to-Emitter Leakage Current	—	—	±500	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)	—	59	80	nC	I_C = 24A V_{CC} = 400V	
Q_{ge}	Gate - Emitter Charge (turn-on)	—	8.6	10			
Q_{gc}	Gate - Collector Charge (turn-on)	—	25	42			
$t_{d(on)}$	Turn-On Delay Time	—	26	—	ns	T_J = 25°C I_C = 24A, V_{CC} = 480V V_{GE} = 15V, R_G = 10Ω Energy losses include "tail" and diode reverse recovery.	
t_r	Rise Time	—	37	—			
$t_{d(off)}$	Turn-Off Delay Time	—	240	410			
t_f	Fall Time	—	230	420			
E_{on}	Turn-On Switching Loss	—	0.75	—	mJ		
E_{off}	Turn-Off Switching Loss	—	1.65	—			
E_{ts}	Total Switching Loss	—	2.4	3.6			
t_{sc}	Short Circuit Withstand Time	10	—	—	µs	V_{CC} = 360V, T_J = 125°C V_{GE} = 15V, R_G = 10Ω, V_{CPK} < 500V	
$t_{d(on)}$	Turn-On Delay Time	—	28	—	ns	T_J = 150°C, I_C = 24A, V_{CC} = 480V V_{GE} = 15V, R_G = 10Ω Energy losses include "tail" and diode reverse recovery.	
t_r	Rise Time	—	37	—			
$t_{d(off)}$	Turn-Off Delay Time	—	380	—			
t_f	Fall Time	—	460	—			
E_{ts}	Total Switching Loss	—	4.5	—	mJ		
C_{ies}	Input Capacitance	—	1500	—	pF	V_{GE} = 0V V_{CC} = 30V f = 1.0MHz	
C_{oes}	Output Capacitance	—	190	—			
C_{res}	Reverse Transfer Capacitance	—	20	—			
t_{rr}	Diode Reverse Recovery Time	—	42	60	ns	T_J = 25°C	I_F = 15A V_R = 200V di/dt = 200A/µs
		—	74	120		T_J = 125°C	
I_{rr}	Diode Peak Reverse Recovery Current	—	4.0	6.0	A	T_J = 25°C	
		—	6.5	10		T_J = 125°C	
Q_{rr}	Diode Reverse Recovery Charge	—	80	180	nC	T_J = 25°C	
		—	220	600		T_J = 125°C	
$di_{(rec)M}/dt$	Diode Peak Rate of Fall of Recovery During t_b	—	188	—	A/µs	T_J = 25°C	
		—	160	—		T_J = 125°C	

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

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

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

④ Pulse width 5.0µs, single shot.

Refer to Section D for the following:

Package Outline 5 - IMS-2 **Section D - page D-14**