

IGBT SIP MODULE

Short Circuit Rated Fast IGBT

Features

- Short Circuit Rated - $10\mu\text{s}$ @ 125°C , $V_{GE} = 15\text{V}$
- 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

14 A_{RMS} with $T_C = 90^\circ\text{C}$, $T_J = 125^\circ\text{C}$, 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.

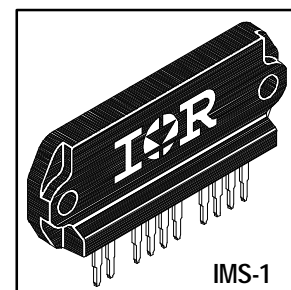
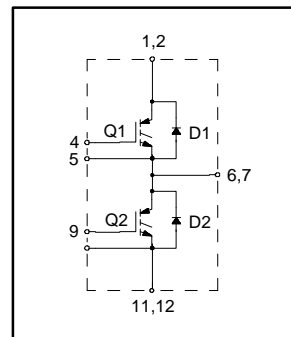
These new short circuit rated devices are especially suited for motor control and other totem-pole applications requiring short circuit withstand capability.

Absolute Maximum Ratings

	Parameter	Max.	Units
V_{CES}	Collector-to-Emitter Voltage	600	V
I_C @ $T_C = 25^\circ\text{C}$	Continuous Collector Current, each IGBT	42	A
I_C @ $T_C = 100^\circ\text{C}$	Continuous Collector Current, each IGBT	23	
I_{CM}	Pulsed Collector Current ①	120	
I_{LM}	Clamped Inductive Load Current ②	120	
I_F @ $T_C = 100^\circ\text{C}$	Diode Continuous Forward Current	15	
I_{FM}	Diode Maximum Forward Current	120	
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 @ $T_C = 25^\circ\text{C}$	Maximum Power Dissipation, each IGBT	83	W
P_D @ $T_C = 100^\circ\text{C}$	Maximum Power Dissipation, each IGBT	33	
T_J	Operating Junction and	-40 to +150	$^\circ\text{C}$
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.	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	—	1.5	$^\circ\text{C/W}$
$R_{\theta JC}$ (DIODE)	Junction-to-Case, each diode, one diode in conduction	—	2.0	
$R_{\theta CS}$ (MODULE)	Case-to-Sink, flat, greased surface	0.1	—	
Wt	Weight of module	20 (0.7)	—	g (oz)



CPU165MM



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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage ③	600	—	—	V	$V_{GE} = 0V, I_C = 250\mu A$
$\Delta V_{(BR)CES}/\Delta T_J$	Temp.Coeff. of Breakdown Voltage	—	0.62	—	V/ $^\circ\text{C}$	$V_{GE} = 0V, I_C = 1.0mA$
$V_{CE(on)}$	Collector-to-Emitter Saturation Voltage	—	1.8	2.0	V	$I_C = 35A, V_{GE} = 15V$
		—	2.3	—		$I_C = 60A$
		—	2.0	—		$I_C = 35A, T_J = 150^\circ\text{C}$
$V_{GE(th)}$	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/ $^\circ\text{C}$	$V_{CE} = V_{GE}, I_C = 250\mu A$
g_{fe}	Forward Transconductance ④	11	20	—	S	$V_{CE} = 100V, I_C = 35A$
I_{CES}	Zero Gate Voltage Collector Current	—	—	250	μA	$V_{GE} = 0V, V_{CE} = 600V$
		—	—	6500		$V_{GE} = 0V, V_{CE} = 600V, T_J = 150^\circ\text{C}$
V_{FM}	Diode Forward Voltage Drop	—	1.3	1.7	V	$I_C = 25A$
		—	1.2	1.5		$I_C = 25A, T_J = 150^\circ\text{C}$
I_{GES}	Gate-to-Emitter Leakage Current	—	—	± 500	nA	$V_{GE} = \pm 20V$

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge (turn-on)	—	120	180	nC	$I_C = 35A$
Q_{ge}	Gate - Emitter Charge (turn-on)	—	25	38		$V_{CC} = 400V$
Q_{gc}	Gate - Collector Charge (turn-on)	—	40	60		
$t_{d(on)}$	Turn-On Delay Time	—	78	—	ns	$T_J = 25^\circ\text{C}$
t_r	Rise Time	—	110	—		$I_C = 35A, V_{CC} = 480V$
$t_{d(off)}$	Turn-Off Delay Time	—	340	510		$V_{GE} = 15V, R_G = 5.0\Omega$
t_f	Fall Time	—	265	400		Energy losses include "tail" and diode reverse recovery.
E_{on}	Turn-On Switching Loss	—	2.1	—	mJ	
E_{off}	Turn-Off Switching Loss	—	4.0	—		
E_{ts}	Total Switching Loss	—	6.1	9.5		
t_{sc}	Short Circuit Withstand Time	10	—	—	μs	$V_{CC} = 360V, T_J = 125^\circ\text{C}$ $V_{GE} = 15V, R_G = 5.0\Omega, V_{CPK} < 500V$
$t_{d(on)}$	Turn-On Delay Time	—	80	—	ns	$T_J = 150^\circ\text{C}$
t_r	Rise Time	—	110	—		$I_C = 35A, V_{CC} = 480V$
$t_{d(off)}$	Turn-Off Delay Time	—	610	—		$V_{GE} = 15V, R_G = 5.0\Omega$
t_f	Fall Time	—	440	—		Energy losses include "tail" and diode reverse recovery.
E_{ts}	Total Switching Loss	—	9.4	—	mJ	
C_{ies}	Input Capacitance	—	2900	—	pF	$V_{GE} = 0V$
C_{oes}	Output Capacitance	—	230	—		$V_{CC} = 30V$
C_{res}	Reverse Transfer Capacitance	—	30	—		$f = 1.0MHz$
t_{rr}	Diode Reverse Recovery Time	—	50	75	ns	$T_J = 25^\circ\text{C}$
		—	105	160		$T_J = 125^\circ\text{C}$
I_{rr}	Diode Peak Reverse Recovery Current	—	4.5	10	A	$T_J = 25^\circ\text{C}$
		—	8.0	15		$T_J = 125^\circ\text{C}$
Q_{rr}	Diode Reverse Recovery Charge	—	112	375	nC	$T_J = 25^\circ\text{C}$
		—	420	1200		$T_J = 125^\circ\text{C}$
$di_{(rec)M}/dt$	Diode Peak Rate of Fall of Recovery During t_b	—	250	—	A/ μs	$T_J = 25^\circ\text{C}$
		—	160	—		$T_J = 125^\circ\text{C}$

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

② $V_{CC}=80\%(V_{CES})$, $V_{GE}=20V$, $L=10\mu H$, $R_G=5.0\Omega$.

④ Pulse width 5.0 μs , single shot.

③ Pulse width $\leq 80\mu s$; duty factor $\leq 0.1\%$.

Refer to Section D for the following.

Package Outline 4 - IMS-1 Package (10 pins) Section D - page D-13