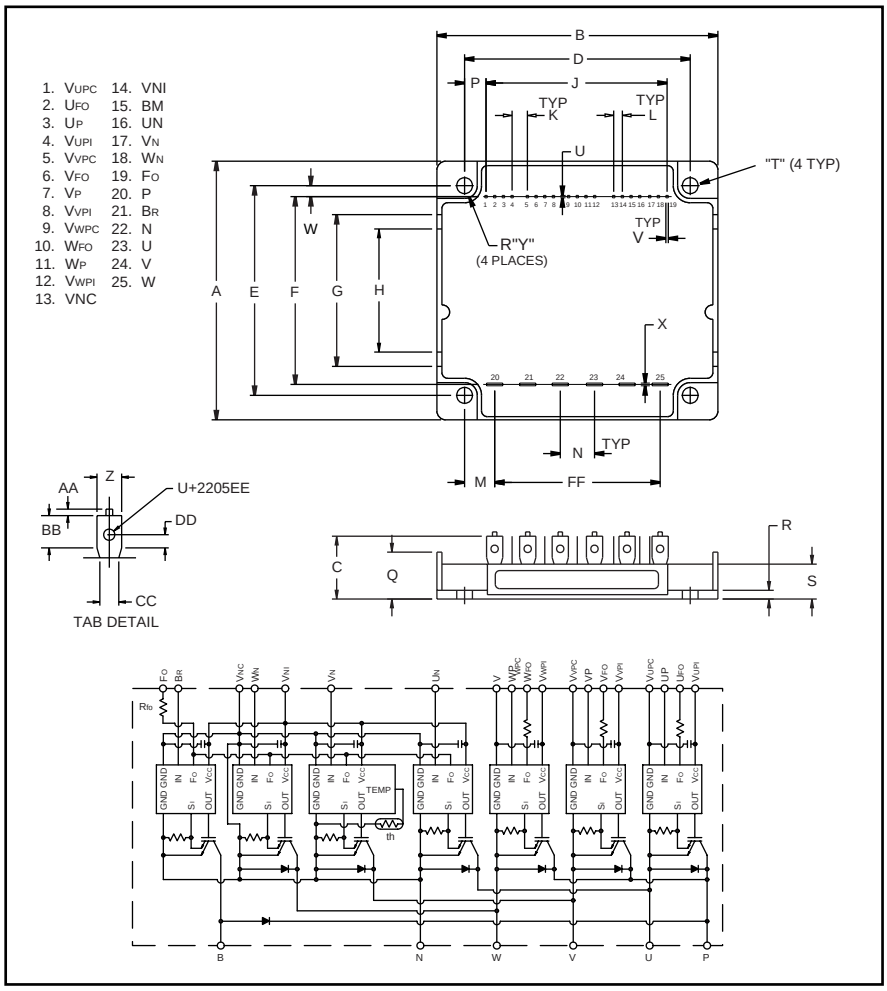
MITSUBISHI INTELLIGENT POWER MODULES

PM75RSK060

FLAT-BASE TYPE
INSULATED PACKAGE



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	2.76±0.04	70.0±1.0
B	4.29±0.04	109.0±1.0
C	0.83±0.04	21.0±1.0
D	3.78±0.02	96.0±0.5
E	2.31±0.02	58.5±0.5
F	2.22±0.03	56.5±0.8
G	1.61	41.0
H	1.30	33.0
J	2.40±0.03	60.96±0.8
K	0.30	7.62
L	0.10±0.01	2.54±0.25
M	0.66	16.75
N	0.49±0.01	12.5±0.25
P	0.69	17.52
Q	0.53	13.5

Dimensions	Inches	Millimeters
R	0.21	5.4
S	0.39	10.0
T	0.18	4.5
U	0.02	0.6
V	0.02	0.4
W	0.03	0.75
X	0.03	0.8
Y	0.20	5.0
Z	0.25	6.35
AA	0.04	1.0
BB	0.39	9.95
CC	0.24	6.0
DD	0.21	5.4
EE	0.07	1.65
FF	2.46±0.03	62.5±0.8

Description:
Mitsubishi Intelligent Power Modules are isolated base modules designed for power switching applications operating at frequencies to 20kHz. Built-in control circuits provide optimum gate drive and protection for the IGBT and free wheel diode power devices.

Features:
- ☐ Complete Output Power Circuit
- ☐ Gate Drive Circuit
- ☐ Protection Logic
  - – Short Circuit
  - – Over Current
  - – Over Temperature
  - – Under Voltage

Applications:
- ☐ Inverters
- ☐ UPS
- ☐ Motion/Servo Control
- ☐ Power Supplies

Ordering Information:
Example: Select the complete part number from the table below -i.e. PM75RSK060 is a 600V, 75 Ampere Intelligent Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 10)
PM	75	60

MITSUBISHI ELECTRIC

PM75RSK060

FLAT-BASE TYPE
INSULATED PACKAGE

Absolute Maximum Ratings, T_j = 25 °C unless otherwise specified

	Symbol	Ratings	Units
Junction Temperature	T_j	–20 to 150	°C
Storage Temperature	T_{stg}	–40 to 125	°C
Case Operating Temperature	T_C	–20 to 100	°C
Mounting Torque M4 Mounting Screws	–	0.98 ~ 1.47	N · m
Module Weight (Typical)	–	150	Grams
Supply Voltage Protected by OC and SC (V_D = 13.5 ~ 16.5V, Inverter Part)	$V_{CC(prot)}$	400	Volts
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	V_{iso}	2500	Vrms

Control Sector

Supply Voltage (Applied between V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}, V_{N1}-V_{NC})	V_D	20	Volts
Input Voltage (Applied between U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC}, U_N · V_N · W_N · B_r-V_{NC})	V_{CIN}	20	Volts
Fault Output Supply Voltage (Applied between U_{FO}-V_{UPC}, V_{FO}-V_{VPC}, W_{FO}-V_{WPC}, F_O-V_{NC})	V_{FO}	20	Volts
Fault Output Current (Sink Current of U_{FO}, V_{FO}, W_{FO} and F_O Terminal)	I_{FO}	20	mA

IGBT Inverter Sector

Collector-Emitter Voltage (V_D = 15V, V_{CIN} = 15V)	V_{CES}	600	Volts
Collector Current, ±	I_C	75	Amperes
Peak Collector Current, ±	I_{CP}	150	Amperes
Supply Voltage (Applied between P-N)	V_{CC}	450	Volts
Supply Voltage, Surge (Applied between P-N, Surge Value)	$V_{CC\ (surge)}$	500	Volts
Collector Dissipation	P_C	125	Watts

Brake Sector

Collector-Emitter Voltage (V_D = 15V, V_{CIN} = 15V)	V_{CES}	600	Volts
Collector Current, (T_C = 25°C)	I_C	30	Amperes
Peak Collector Current, (T_C = 25°C)	I_{CP}	60	Amperes
Supply Voltage (Applied between P-N)	V_{CC}	450	Volts
Supply Voltage, Surge (Applied between P-N, Surge Value)	$V_{CC\ (surge)}$	500	Volts
Collector Dissipation	P_C	75	Watts
Diode Forward Current	I_F	30	Amperes
Diode DC Reverse Voltage	$V_{R(DC)}$	600	Volts

Electrical and Mechanical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Control Sector						
Over Current Trip Level Inverter Part	OC	-20°C ≤ T_j ≤ 125°C, V_D =15V	115	161	–	Amperes
Over Current Trip Level Brake Part			39	53	–	Amperes
Short Circuit Trip Level Inverter Part	SC	-20°C ≤ T_j ≤ 125°C, V_D =15V	–	241	–	Amperes
Short Circuit Trip Level Brake Part			–	79	–	Amperes
Over Current Delay Time	$t_{off(OC)}$	V_D = 15V	–	10	–	µs
Over Temperature Protection	OT	Trip Level	100	110	120	°C
	OT_r	Reset Level	–	90	–	°C
Supply Circuit Under Voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
	UV_r	Reset Level	–	12.5	–	Volts
Supply Voltage	V_D	Applied between V_{UP1}-V_{UPC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}, V_{N1}-V_{NC}	13.5	15.0	16.5	Volts
Circuit Current	I_D	V_D = 15V, V_{CIN} = 15V, V_{N1}-V_{NC}	–	44	60	mA
		V_D = 15V, V_{CIN} = 15V, V_{XP1}-V_{XPC}	–	13	18	mA
Input ON Threshold Voltage	$V_{th(on)}$	Applied between	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{th(off)}$	U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC}, U_N · V_N · W_N · B_r-V_{NC}	1.7	2.0	2.3	Volts
PWM Input Frequency	f_{PWM}	3-ϕ Sinusoidal	5	15	20	kHz
Fault Output Current	$I_{FO(H)}$	V_D = 15V, V_{FO} = 15V	–	–	0.01	mA
	$I_{FO(L)}$	V_D = 15V, V_{FO} = 15V	–	10	15	mA
Minimum Fault Output Pulse Width	t_{FO}	V_D = 15V	1.0	1.8	–	ms

Electrical and Mechanical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
IGBT Inverter Sector						
Collector-Emitter Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_D = 15V, T_j = 25°C	–	–	1	mA
		$V_{CE} = V_{CES}$, V_D = 15V, T_j = 125°C	–	–	10	mA
FWDi Forward Voltage	V_{EC}	$-I_C$ = 75A, V_D = 15V, V_{CIN} = 15V	–	2.2	3.3	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, V_{CIN} = 0V, I_C = 75A, T_j = 25°C	–	1.8	2.7	Volts
		V_D = 15V, V_{CIN} = 0V, I_C = 75A, T_j = 125°C	–	1.85	2.78	Volts
Inductive Load Switching Times	t_{on}	V_D = 15V, V_{CIN} = 0 ↔ 15V, V_{CC} = 300V, I_C = 75A, T_j = 125°C, Inductive Load	0.4	0.8	2.0	µs
	t_{rr}		–	0.15	0.3	µs
	$t_{C(on)}$		–	0.4	1.0	µs
	t_{off}		–	2.0	2.9	µs
	$t_{C(off)}$		–	0.5	1.0	µs
Brake Sector						
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_D = 15V, V_{CIN} = 0V, I_C = 30A, T_j = 25°C	–	1.8	2.7	Volts
		V_D = 15V, V_{CIN} = 0V, I_C = 30A, T_j = 125°C	–	1.9	2.8	Volts
FWDi Forward Voltage	V_{FM}	I_F = 30A, V_D = 15V, V_{CIN} = 15V	–	1.7	2.7	Volts
Collector-Emitter Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_D = 15V, T_j = 25°C	–	–	1	mA
		$V_{CE} = V_{CES}$, V_D = 15V, T_j = 125°C	–	–	10	mA

Thermal Characteristics

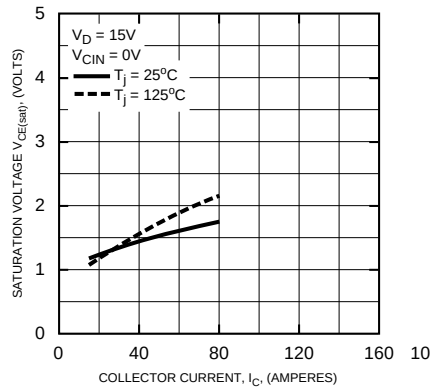
Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each Inverter IGBT	–	–	1.0	°C/Watt
	$R_{th(j-c)F}$	Each Inverter FWDi	–	–	0.95	°C/Watt
	$R_{th(j-c)Q}$	Each Brake IGBT	–	–	1.66	°C/Watt
	$R_{th(j-c)F}$	Each Brake FWDi	–	–	1.9	°C/Watt
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Per Module Thermal Grease Applied	–	–	0.036	°C/Watt

Recommended Conditions for Use

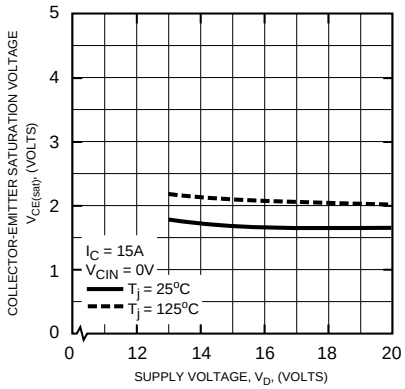
Characteristic	Symbol	Condition	Value	Units
Supply Voltage	V_{CC}	Applied across P-N Terminals	0 ~ 400	Volts
	V_D	Applied between V_{UP1}-V_{UPC}, V_{N1}-V_{NC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}	15 ± 1.5	Volts
Input ON Voltage	$V_{CIN(on)}$	Applied between U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC}, U_N · V_N · W_N · B_r-V_{NC}	0 ~ 0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$		4.0 ~ V_D	Volts
PWM Input Frequency	f_{PWM}	Using Application Circuit	5 ~ 20	kHz
Minimum Dead Time	t_{dead}	Input Signal	≥2.5	µs

Inverter Sector

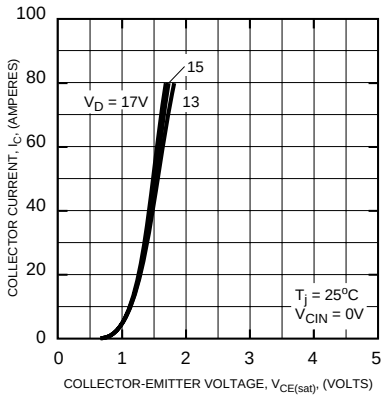
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



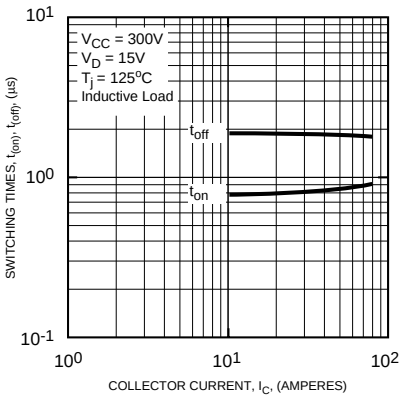
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



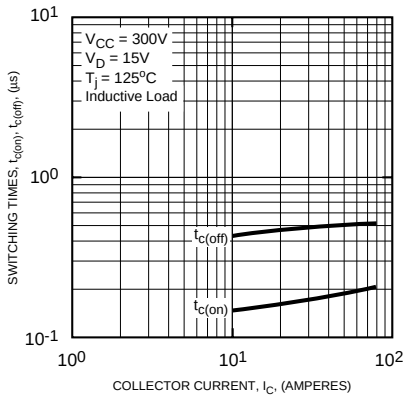
OUTPUT CHARACTERISTICS (TYPICAL)



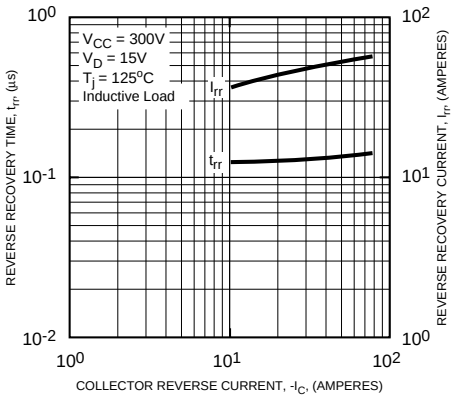
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



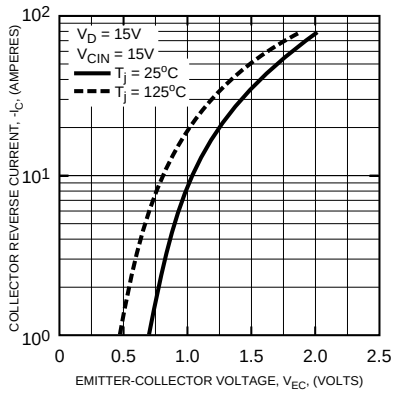
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)

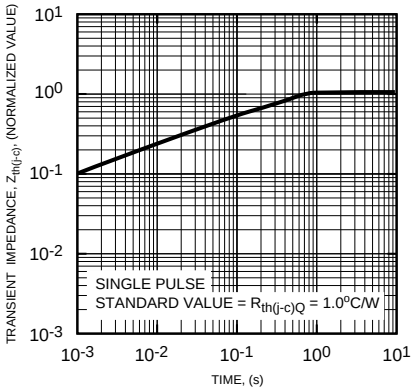


FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)

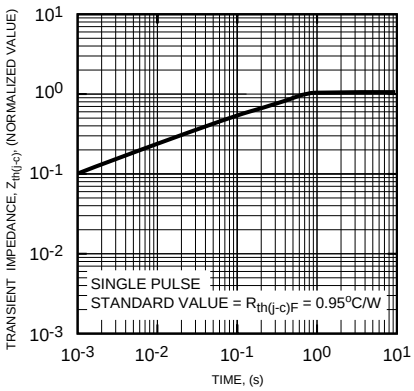


Inverter Sector

TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each IGBT)

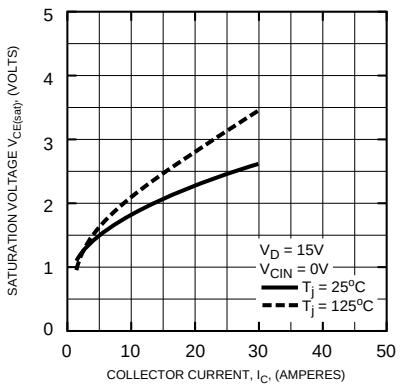


TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each FWDi)

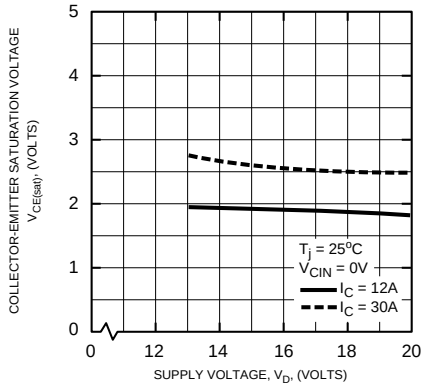


Brake Sector

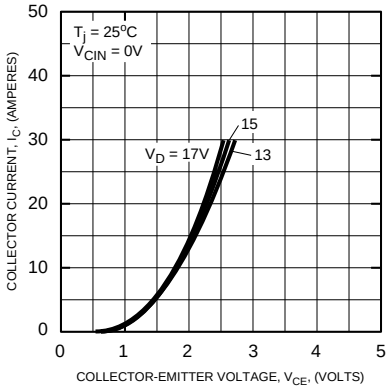
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



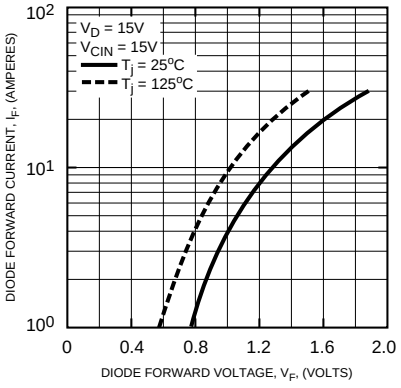
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



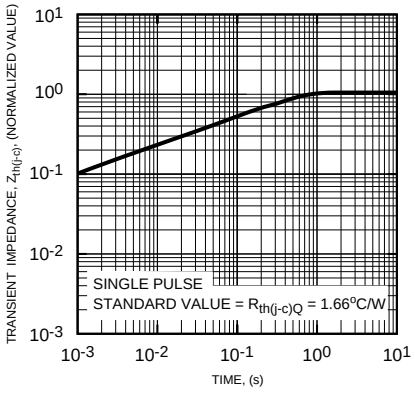
OUTPUT CHARACTERISTICS (TYPICAL)



DIODE FORWARD CHARACTERISTICS



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWDi)