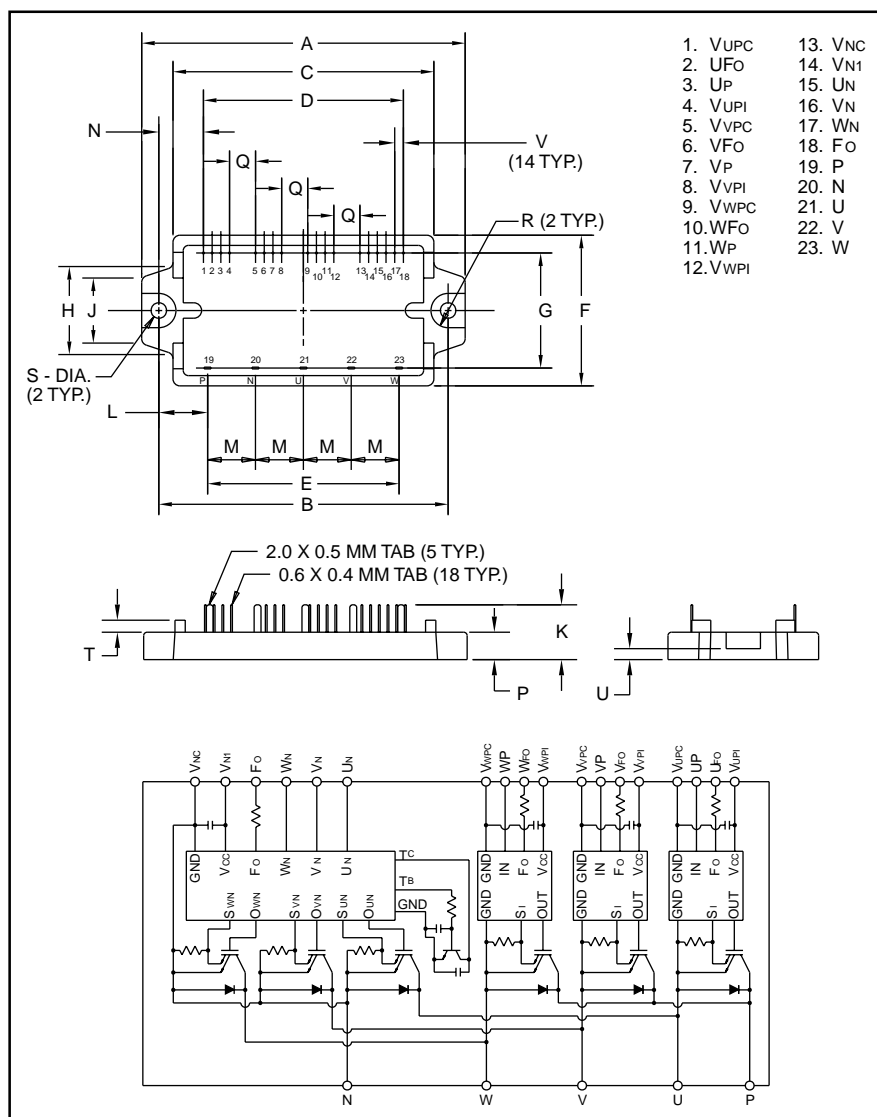


# PM10CSJ060

## FLAT-BASE TYPE INSULATED PACKAGE



**Description:**

**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. PM10CSJ060 is a 600V, 10 Ampere Intelligent Power Module.

Type	Current Rating Amperes	V <sub>CES</sub> Volts (x 10)
PM	10	60

### Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	3.72±0.04	94.5±1.0
B	3.33±0.02	84.5±0.5
C	2.99	76.0
D	2.300±0.02	58.42±0.5
E	2.20±0.02	56.0±0.5
F	1.73±0.04	44.0±1.0
G	1.32±0.03	33.6±0.8
H	1.01	25.7
J	0.75	19.0
K	0.71±0.04	18.0±1.0

Dimensions	Inches	Millimeters
L	0.561	14.25
M	0.55±0.01	14.0±0.25
N	0.513	13.04
P	0.31±0.02	8.0±0.5
Q	0.300	7.62
R	0.20 Rad.	Rad. 5.0
S	0.18 Dia.	Dia. 4.5
T	0.14	3.5
U	0.13±0.02	3.2±0.5
V	0.100±0.01	2.54±0.25

# PM10CSJ060

FLAT-BASE TYPE  
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## Absolute Maximum Ratings, $T_j = 25^{\circ}\text{C}$ unless otherwise specified

Ratings	Symbol	PM10CSJ060	Units
Power Device Junction Temperature	$T_j$	-20 to 150	$^{\circ}\text{C}$
Storage Temperature	$T_{\text{stg}}$	-40 to 125	$^{\circ}\text{C}$
Case Operating Temperature	$T_C$	-20 to 100	$^{\circ}\text{C}$
Mounting Torque, M4 Mounting Screws	—	0.98 ~ 1.47	N · m
Module Weight (Typical)	—	60	Grams
Supply Voltage Protected by OC and SC ( $V_D = 13.5 - 16.5\text{V}$ , Inverter Part)	$V_{\text{CC(prot.)}}$	400	Volts
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	$V_{\text{iso}}$	2500	Vrms

## Control Sector

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

## IGBT Inverter Sector

Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ )	$V_{\text{CES}}$	600	Volts
Collector Current, ( $T_C = 25^{\circ}\text{C}$ )	$I_C$	10	Amperes
Peak Collector Current, ( $T_C = 25^{\circ}\text{C}$ )	$I_{\text{CP}}$	20	Amperes
Supply Voltage (Applied between P - N)	$V_{\text{CC}}$	450	Volts
Supply Voltage, Surge (Applied between P - N)	$V_{\text{CC(surge)}}$	500	Volts
Collector Dissipation	$P_C$	39	Watts

# PM10CSJ060

FLAT-BASE TYPE  
INSULATED PACKAGE

## Electrical and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>Control Sector</b>						
Over Current Trip Level Inverter Part	OC	$-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	12	18	—	Amperes
Short Circuit Trip Level Inverter Part	SC	$-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$	—	27	—	Amperes
Over Current Delay Time	$t_{\text{off(OC)}}$	$V_D = 15\text{V}$	—	10	—	$\mu\text{s}$
Over Temperature Protection	OT	Trip Level	100	110	120	$^\circ\text{C}$
	$\text{OT}_r$	Reset Level	—	90	—	$^\circ\text{C}$
Supply Circuit Under Voltage Protection	UV	Trip Level	11.5	12.0	12.5	Volts
	$\text{UV}_r$	Reset Level	—	12.5	—	Volts
Supply Voltage	$V_D$	Applied between $V_{\text{UP1}}-V_{\text{UPC}}$ , $V_{\text{VP1}}-V_{\text{VPC}}$ , $V_{\text{WP1}}-V_{\text{WPC}}$ , $V_{\text{N1}}-V_{\text{NC}}$	13.5	15	16.5	Volts
Circuit Current	$I_D$	$V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ , $V_{\text{N1}}-V_{\text{NC}}$	—	18	25	mA
		$V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ , $V_{\text{XP1}}-V_{\text{XPC}}$	—	7	10	mA
Input ON Threshold Voltage	$V_{\text{th(on)}}$	Applied between	1.2	1.5	1.8	Volts
Input OFF Threshold Voltage	$V_{\text{th(off)}}$	$U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ , $W_P-V_{\text{WPC}}$ , $U_N \cdot V_N \cdot W_N-V_{\text{NC}}$	1.7	2.0	2.3	Volts
PWM Input Frequency	$f_{\text{PWM}}$	3- $\phi$ Sinusoidal	—	15	20	kHz
Fault Output Current	$I_{\text{FO(H)}}$	$V_D = 15\text{V}$ , $V_{\text{FO}} = 15\text{V}$	—	—	0.01	mA
	$I_{\text{FO(L)}}$	$V_D = 15\text{V}$ , $V_{\text{FO}} = 15\text{V}$	—	10	15	mA
Minimum Fault Output Pulse Width	$t_{\text{FO}}$	$V_D = 15\text{V}$	1.0	1.8	—	ms

# PM10CSJ060

FLAT-BASE TYPE  
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## Electrical and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
<b>IGBT Inverter Sector</b>						
Collector Cutoff Current	$I_{CES}$	$V_{CIN} = 15\text{V}, V_{CE} = V_{CES}, T_j = 25^\circ\text{C}$	—	—	1.0	mA
		$V_{CIN} = 15\text{V}, V_{CE} = V_{CES}, T_j = 125^\circ\text{C}$	—	—	10	mA
Diode Forward Voltage	$V_{EC}$	$-I_C = 10\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$	—	1.8	3.0	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 10\text{A}$	—	1.8	2.5	Volts
		$V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 10\text{A}, T_j = 125^\circ\text{C}$	—	1.9	2.6	Volts
Inductive Load Switching Times	$t_{on}$		0.3	0.5	1.5	$\mu\text{s}$
	$t_{rr}$	$V_D = 15\text{V}, V_{CIN} = 0 \leftrightarrow 15\text{V}$	—	0.12	0.3	$\mu\text{s}$
	$t_{C(on)}$	$V_{CC} = 300\text{V}, I_C = 10\text{A}$	—	0.2	0.8	$\mu\text{s}$
	$t_{off}$	$T_j = 125^\circ\text{C}$	—	1.5	2.3	$\mu\text{s}$
	$t_{C(off)}$		—	0.4	1.2	$\mu\text{s}$

## Thermal Characteristics

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Units
Junction to Case Thermal Resistance	$R_{th(j-c)Q}$	Each IGBT	—	—	3.2	$^\circ\text{C}/\text{Watt}$
	$R_{th(j-c)F}$	Each FWDi	—	—	4.5	$^\circ\text{C}/\text{Watt}$
Contact Thermal Resistance	$R_{th(c-f)}$	Case to Fin Thermal Grease Applied	—	—	0.083	$^\circ\text{C}/\text{Watt}$

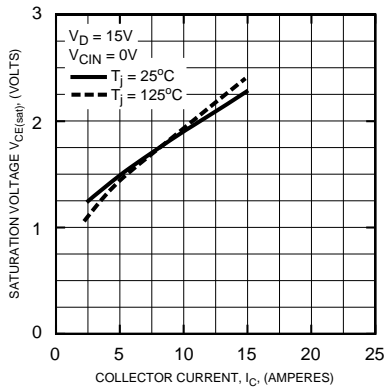
## Recommended Conditions for Use

Characteristic	Symbol	Condition	Value	Units
Supply Voltage	$V_{CC}$	Applied across P-N Terminals	0 ~ 400	Volts
	$V_D$	Applied between $V_{UP1}-V_{UPC}, V_{N1}-V_{NC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}$	$15 \pm 1.5$	Volts
Input ON Voltage	$V_{CIN(on)}$	Applied between $U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC}, U_N \cdot V_N \cdot W_N-V_{NC}$	0 ~ 0.8	Volts
Input OFF Voltage	$V_{CIN(off)}$		$4.0 \sim V_D$	Volts
PWM Input Frequency	$f_{PWM}$	Using Application Circuit	5 ~ 20	kHz
Minimum Dead Time	$t_{dead}$	Input Signal	$\geq 2.0$	$\mu\text{s}$

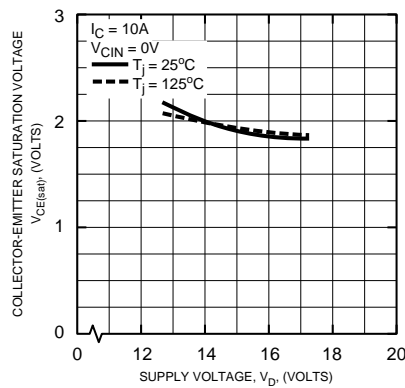
# PM10CSJ060

FLAT-BASE TYPE  
INSULATED PACKAGE

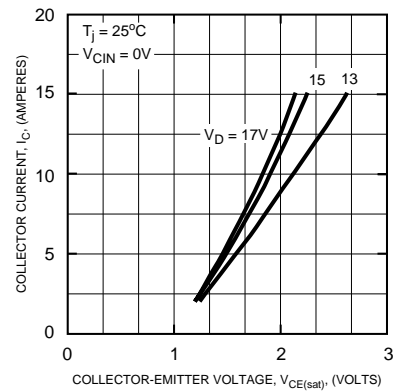
SATURATION VOLTAGE  
CHARACTERISTICS (TYPICAL)



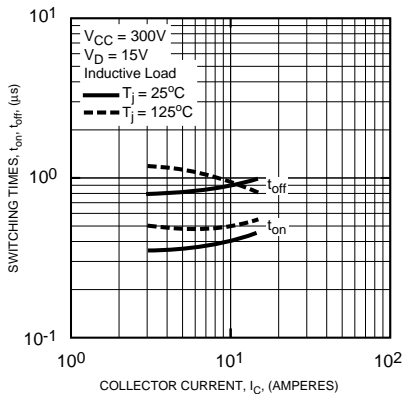
COLLECTOR-EMITTER SATURATION  
VOLTAGE CHARACTERISTICS (TYPICAL)



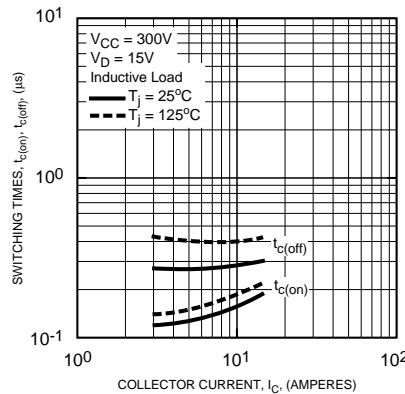
OUTPUT CHARACTERISTICS  
(TYPICAL)



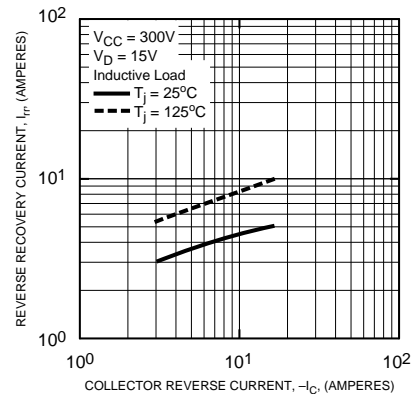
SWITCHING TIME VS.  
COLLECTOR CURRENT (TYPICAL)



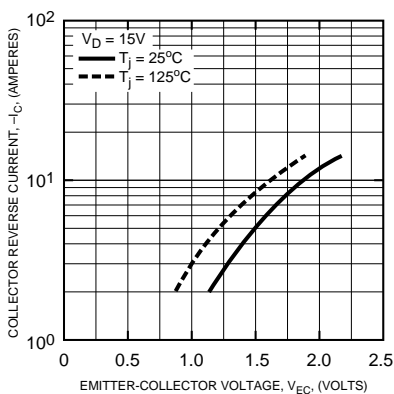
SWITCHING TIME VS.  
COLLECTOR CURRENT (TYPICAL)



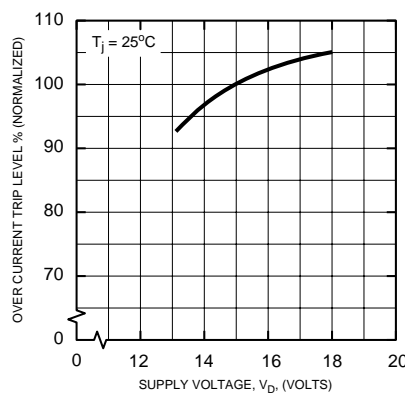
REVERSE RECOVERY CURRENT VS.  
COLLECTOR CURRENT (TYPICAL)



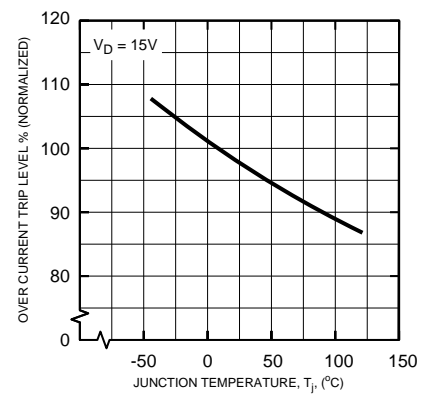
DIODE FORWARD CHARACTERISTICS



OVER CURRENT TRIP LEVEL VS.  
SUPPLY VOLTAGE (TYPICAL)



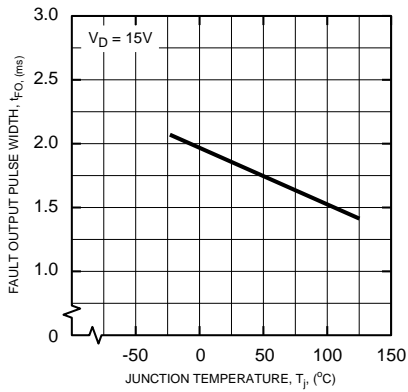
OVER CURRENT TRIP LEVEL  
TEMPERATURE DEPENDENCY (TYPICAL)



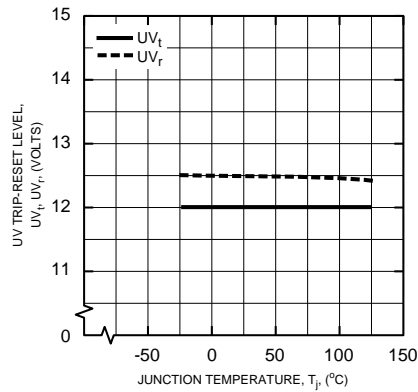
# PM10CSJ060

FLAT-BASE TYPE  
INSULATED PACKAGE

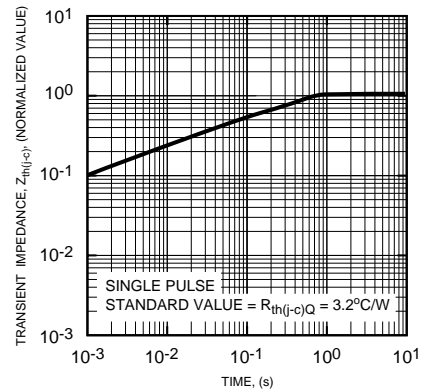
FAULT OUTPUT PULSE WIDTH VS.  
TEMPERATURE (TYPICAL)



CONTROL SUPPLY VOLTAGE TRIP-RESET  
LEVEL TEMPERATURE DEPENDENCY  
(TYPICAL)



TRANSIENT THERMAL  
IMPEDANCE CHARACTERISTICS  
(Each IGBT)



TRANSIENT THERMAL  
IMPEDANCE CHARACTERISTICS  
(Each FWDI)

