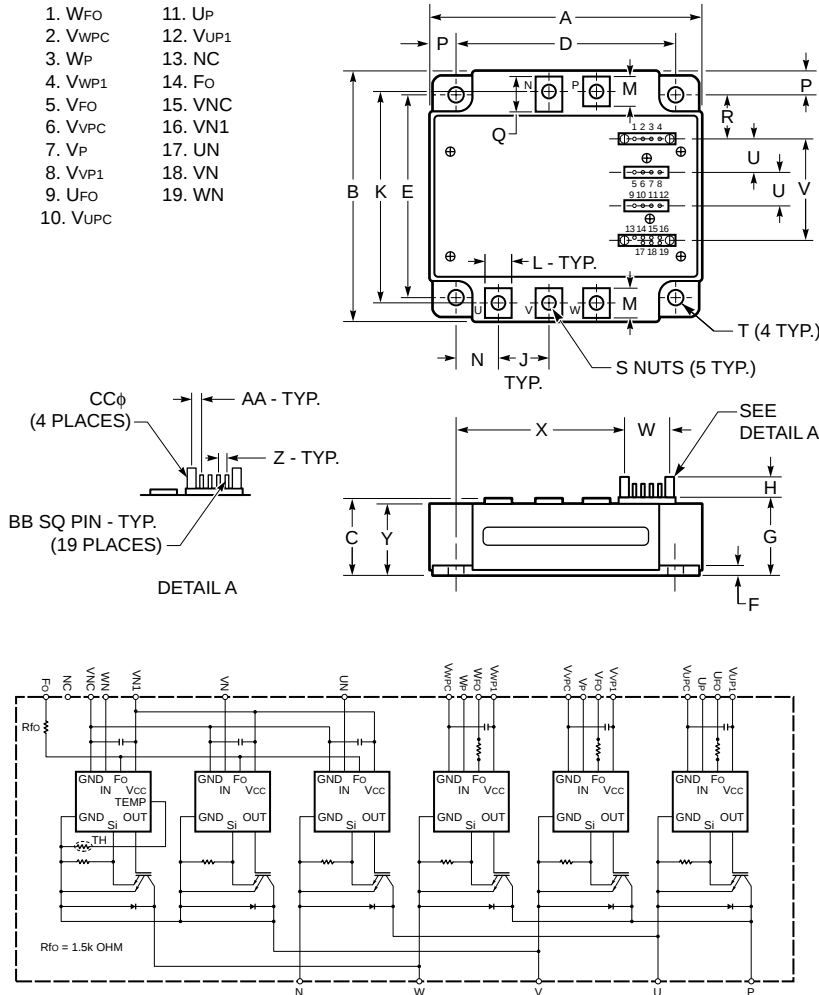


# PM75CVA120

FLAT-BASE TYPE  
INSULATED PACKAGE

## TERMINAL CODE

- |          |          |
|----------|----------|
| 1. WFO   | 11. Up   |
| 2. VWPC  | 12. VUP1 |
| 3. Wp    | 13. NC   |
| 4. VWP1  | 14. Fo   |
| 5. VFO   | 15. VNC  |
| 6. VVPC  | 16. VN1  |
| 7. Vp    | 17. UN   |
| 8. VVP1  | 18. VN   |
| 9. UFO   | 19. WN   |
| 10. VUPC |          |



## Outline Drawing and Circuit Diagram

| Dimensions | Inches          | Millimeters    |
|------------|-----------------|----------------|
| A          | 4.72            | 120.0          |
| B          | 4.02            | 102.0          |
| C          | 0.95+0.04/-0.02 | 24.1 +1.0/-0.5 |
| D          | 4.13±0.010      | 105.0±0.25     |
| E          | 3.43±0.010      | 87.0±0.25      |
| F          | 0.16            | 4.0            |
| G          | 0.95            | 24.1           |
| H          | 0.42            | 10.6           |
| J          | 0.87            | 22.0           |
| K          | 3.51±0.02       | 89.2±0.5       |
| L          | 0.47            | 12.0           |
| M          | 0.48            | 12.3           |
| N          | 0.77            | 19.5           |
| P          | 0.30            | 7.5            |

| Dimensions | Inches          | Millimeters  |
|------------|-----------------|--------------|
| Q          | 0.59            | 15.1         |
| R          | 0.72            | 18.25        |
| S          | M5 Metric       | M5           |
| T          | 0.22 Dia.       | Dia. 5.5     |
| U          | 0.56±0.010      | 14.1±0.25    |
| V          | 1.72±0.012      | 43.57±0.3    |
| W          | 0.57±0.012      | 14.6±0.3     |
| X          | 3.35            | 85.2         |
| Y          | 0.85            | 21.6         |
| Z          | 0.10±0.010      | 2.54±0.25    |
| AA         | 1.37±0.010      | 3.49±0.25    |
| BB         | 0.02 SQ         | 0.64 SQ      |
| CC         | 0.12+0.04/-0.02 | 3.0+1.0/-0.5 |



## 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 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. PM75CVA120 is a 1200V, 75 Ampere Intelligent Power Module.

| Type | Current Rating<br>Amperes | V <sub>CES</sub><br>Volts (x 10) |
|------|---------------------------|----------------------------------|
| PM   | 75                        | 120                              |

# PM75CVA120

FLAT-BASE TYPE  
INSULATED PACKAGE

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

| Ratings                                                                                                           | Symbol                 | PM75CVA120 | 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, M5 Mounting Screws                                                                               | —                      | 2.5 ~ 3.5  | N · m            |
| Mounting Torque, M5 Main Terminal Screws                                                                          | —                      | 2.5 ~ 3.5  | N · m            |
| Module Weight (Typical)                                                                                           | —                      | 730        | Grams            |
| Supply Voltage (Applied between P - N)                                                                            | $V_{\text{CC(surge)}}$ | 1000       | Volts            |
| Supply Voltage Protected by SC ( $V_D = 13.5 \sim 16.5\text{V}$ , Inverter Part, $T_j = 125^\circ\text{C}$ Start) | $V_{\text{CC(prot.)}}$ | 800        | Volts            |
| Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)                                                         | $V_{\text{iso}}$       | 2500       | Vrms             |

## Control Sector

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

## IGBT Inverter Sector

|                                                                                  |                  |      |         |
|----------------------------------------------------------------------------------|------------------|------|---------|
| Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ ) | $V_{\text{CES}}$ | 1200 | Volts   |
| Collector Current, ( $T_C = 25^\circ\text{C}$ )                                  | $I_C$            | 75   | Amperes |
| Peak Collector Current, ( $T_C = 25^\circ\text{C}$ )                             | $I_{\text{CP}}$  | 150  | Amperes |
| Collector Dissipation ( $T_C = 25^\circ\text{C}$ )                               | $P_C$            | 500  | Watts   |

**PM75CVA120****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>                                   |                      |                                                                                      |      |      |      |                  |
| Short Circuit Trip Level                                | SC                   | $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$             | 105  | —    | —    | Amperes          |
| Short Circuit Current Delay Time                        | $t_{\text{off(SC)}}$ | $V_D = 15\text{V}$                                                                   | —    | 10   | —    | $\mu\text{s}$    |
| Over Temperature Protection                             | OT                   | Trip Level                                                                           | 100  | 110  | 120  | $^\circ\text{C}$ |
| ( $V_D = 15\text{V}$ , Lower Arm)                       | $\text{OT}_r$        | Reset Level                                                                          | 85   | 95   | 105  | $^\circ\text{C}$ |
| Supply Circuit Under Voltage Protection                 | UV                   | Trip Level                                                                           | 11.5 | 12.0 | 12.5 | Volts            |
| ( $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ ) | $\text{UV}_r$        | Reset Level                                                                          | —    | 12.5 | —    | Volts            |
| Circuit Current                                         | $I_D$                | $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ , $V_{\text{N1}}-V_{\text{NC}}$   | —    | 40   | 55   | mA               |
|                                                         |                      | $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ , $V_{\text{XP1}}-V_{\text{XPC}}$ | —    | 13   | 18   | mA               |
| Input ON Threshold Voltage                              | $V_{\text{th(on)}}$  | Applied between $U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ ,                        | 1.2  | 1.5  | 1.8  | Volts            |
| Input OFF Threshold Voltage                             | $V_{\text{th(off)}}$ | $W_P-V_{\text{WPC}}$ , $U_N \cdot V_N \cdot W_N-V_{\text{NC}}$                       | 1.7  | 2.0  | 2.3  | Volts            |
| 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               |

\* Fault output is given only when the internal SC, OT, and UV protections circuits of either an upper-arm or a lower-arm device operate to protect it.

**PM75CVA120****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 |
|-----------------|--------|-----------------|------|------|------|-------|
|-----------------|--------|-----------------|------|------|------|-------|

**IGBT Inverter Sector**

|                                      |               |                                                                                                                                              |     |      |      |               |
|--------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----|------|------|---------------|
| Collector-Emitter Cutoff Current     | $I_{CES}$     | $V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 25^\circ\text{C}$                                                                                 | —   | —    | 1.0  | mA            |
|                                      |               | $V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 125^\circ\text{C}$                                                                                | —   | —    | 10.0 | mA            |
| FWDi Forward Voltage                 | $V_{EC}$      | $-I_C = 75\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$                                                                                  | —   | 2.50 | 3.50 | Volts         |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 75\text{A},$<br>Pulsed, $T_j = 25^\circ\text{C}$                                               | —   | 2.65 | 3.30 | Volts         |
|                                      |               | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 75\text{A},$<br>Pulsed, $T_j = 125^\circ\text{C}$                                              | —   | 2.60 | 3.25 | Volts         |
| Inductive Load Switching Times       | $t_{on}$      | $V_D = 15\text{V}, V_{CIN} = 0\text{V} \leftrightarrow 15\text{V}$<br>$V_{CC} = 600\text{V}, I_C = 75\text{A},$<br>$T_j = 125^\circ\text{C}$ | 0.4 | 0.9  | 2.3  | $\mu\text{s}$ |
|                                      | $t_{rr}$      |                                                                                                                                              | —   | 0.2  | 0.3  | $\mu\text{s}$ |
|                                      | $t_{C(on)}$   |                                                                                                                                              | —   | 0.4  | 1.0  | $\mu\text{s}$ |
|                                      | $t_{off}$     |                                                                                                                                              | —   | 2.4  | 3.4  | $\mu\text{s}$ |
|                                      | $t_{C(off)}$  |                                                                                                                                              | —   | 0.7  | 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 Inverter IGBT                                | —    | —    | 0.25  | $^\circ\text{C/Watt}$ |
|                                     | $R_{th(j-c)F}$ | Each Inverter FWDi                                | —    | —    | 0.51  | $^\circ\text{C/Watt}$ |
| Contact Thermal Resistance          | $R_{th(c-f)}$  | Case to Fin Per Module,<br>Thermal Grease Applied | —    | —    | 0.025 | $^\circ\text{C/Watt}$ |

**Recommended Conditions for Use**

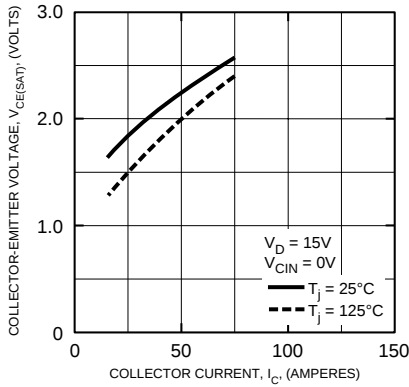
| Characteristic                  | Symbol          | Condition                                                                                 | Value        | Units         |
|---------------------------------|-----------------|-------------------------------------------------------------------------------------------|--------------|---------------|
| Supply Voltage                  | $V_{CC}$        | Applied across P-N Terminals                                                              | $\leq 800$   | Volts         |
|                                 | $V_{CE(surge)}$ | Applied across P-N Terminals                                                              | $\leq 1000$  | Volts         |
|                                 | $V_D$           | Applied between $V_{UP1}-V_{UPC},$<br>$V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}^*, V_{N1}-V_{NC}$ | $15 \pm 1.5$ | Volts         |
| Input ON Voltage                | $V_{CIN(on)}$   | Applied between                                                                           | $\leq 0.8$   | Volts         |
| Input OFF Voltage               | $V_{CIN(off)}$  | $U_P-V_{UPC}, V_P-V_{VPC}, W_P-V_{WPC}, U_N \cdot V_N \cdot W_N-V_{NC}$                   | $\geq 4.0$   | Volts         |
| Arm Shoot-Through Blocking Time | $t_{dead}$      | For IPM's each Input Signal                                                               | $\geq 3.0$   | $\mu\text{s}$ |

\*With ripple satisfying the following conditions,  $dv/dt$  swing  $\leq 5\text{V}/\mu\text{s}$ , Variation  $\leq 2\text{V}$  peak to peak.

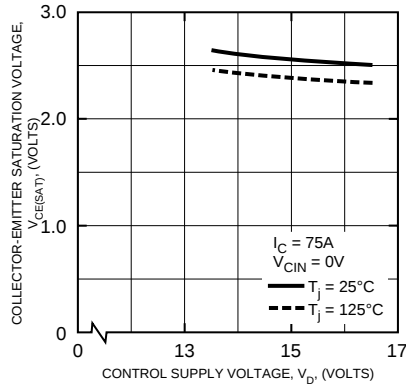
# PM75CVA120

FLAT-BASE TYPE  
INSULATED PACKAGE

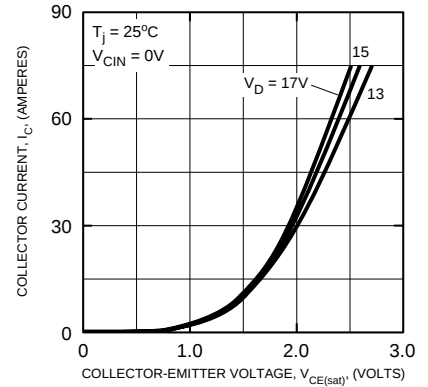
SATURATION VOLTAGE CHARACTERISTICS  
(TYPICAL)



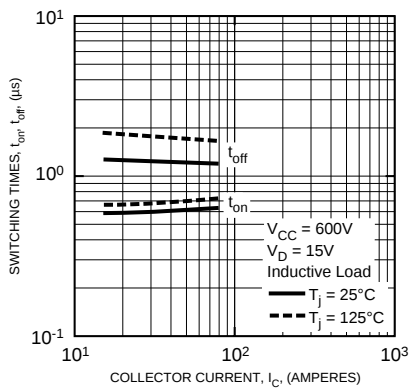
COLLECTOR-EMITTER  
SATURATION VOLTAGE CHARACTERISTICS  
(TYPICAL)



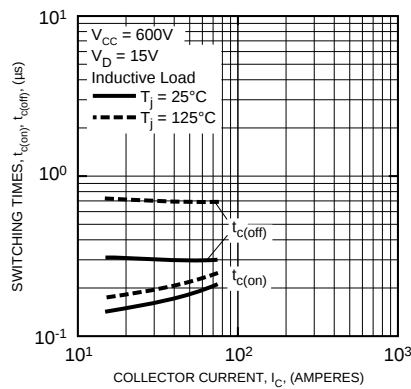
OUTPUT CHARACTERISTICS  
(TYPICAL)



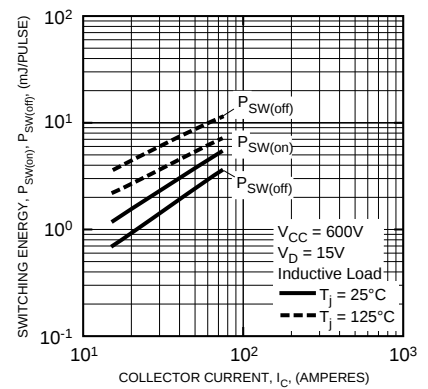
SWITCHING TIME VS.  
COLLECTOR CURRENT (TYPICAL)



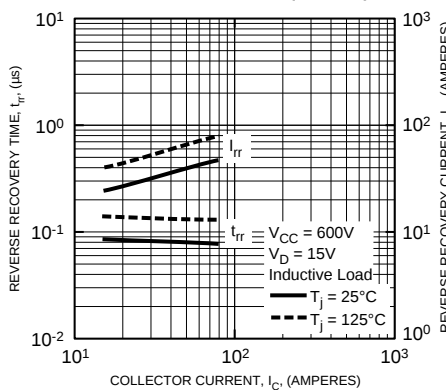
SWITCHING TIME VS.  
COLLECTOR CURRENT (TYPICAL)



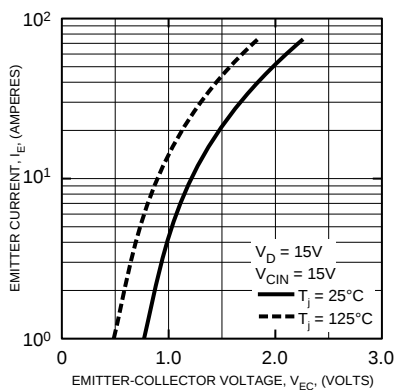
SWITCHING LOSS  
CHARACTERISTICS (TYPICAL)



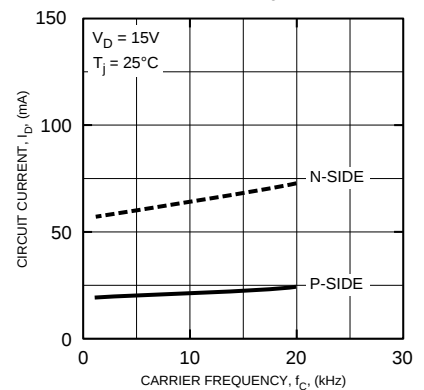
REVERSE RECOVERY CURRENT VS.  
COLLECTOR CURRENT (TYPICAL)



DIODE FORWARD CHARACTERISTICS



CIRCUIT CURRENT VS.  
CARRIER FREQUENCY



# PM75CVA120

FLAT-BASE TYPE  
INSULATED PACKAGE

