

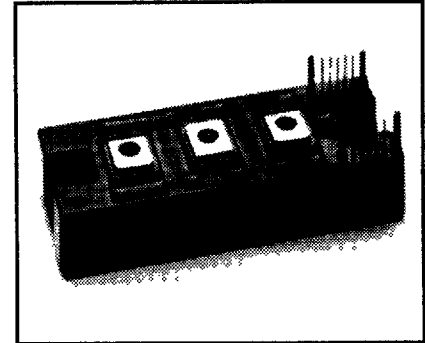
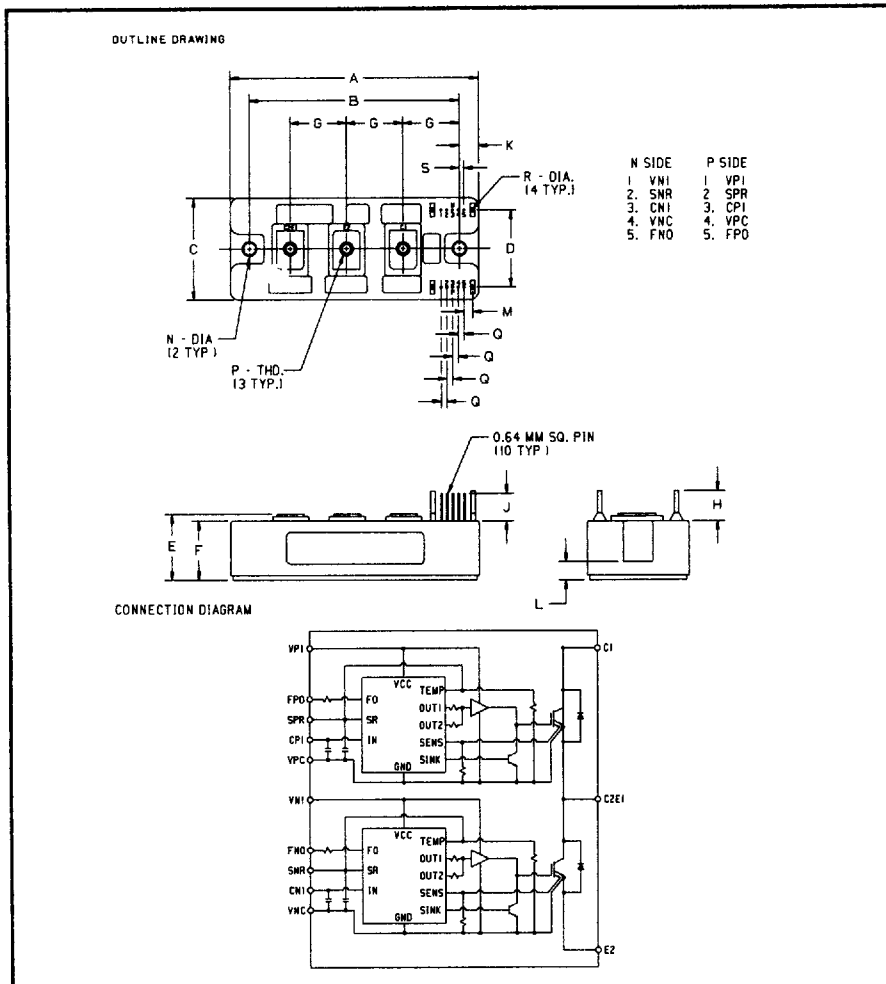


PM75DHA120

T-57-29

Powerex, Inc., Hillis Street, Youngwood, Pennsylvania 15697 (412) 925-7272  
 Powerex, Europe, S.A. 428 Avenue G. Durand, BP107, 72003 Le Mans, France (43) 41.14.14

**Intellimod™-3 Modules**  
**Single Phase**  
**IGBT Inverter Output**  
**75 Amperes/460 Volt Line**



### Description

Powerex Intellimod-3 Modules are designed for applications requiring a high frequency (20kHz) output switching inverter. The modules are isolated from the baseplate, consisting of complete drive, control and protection circuitry for the IGBT inverter.

### Features:

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

### Applications:

- ☐ Inverters
- ☐ Small UPS
- ☐ Motion/Servo Control
- ☐ AC Motor Control

**Ordering Information**  
 PM75DHA120

460 Volt Line, PM75DHA120 Outline Drawing

| Dimensions | Inches          | Millimeters   |
|------------|-----------------|---------------|
| A          | 4.33            | 110.0         |
| B          | 3.66±0.01       | 93.0±0.25     |
| C          | 1.77            | 45.0          |
| D          | 1.34            | 34.0          |
| E          | 1.14+0.04/-0.02 | 29.0+1.0/-0.5 |
| F          | 1.02            | 26.0          |
| G          | 0.98            | 25.0          |
| H          | 0.51            | 13.0          |
| J          | 0.47            | 12.0          |

| Dimensions | Inches    | Millimeters |
|------------|-----------|-------------|
| K          | 0.33      | 8.5         |
| L          | 0.31      | 8.0         |
| M          | 0.23      | 5.84        |
| N          | 0.22 Dia. | 5.5 Dia.    |
| P          | Metric M5 | M5          |
| Q          | 0.1       | 2.54        |
| R          | 0.8 Dia.  | 2.0 Dia.    |
| S          | 0.08      | 2.0         |



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PM75DHA120

IntelliMod-3 Modules

Single Phase IGBT Inverter Output

75 Amperes/460 Volt Line

T-57-29

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

| Characteristics                                                                      | Symbol                 | PM75DHA120  | 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                                                  | —                      | 20          | Kg-cm            |
| Mounting Torque, M5 Main Terminal Screws                                             | —                      | 20          | Kg-cm            |
| Module Weight (Typical)                                                              | —                      | 340         | Grams            |
| Supply Voltage Protected by OC and SC ( $V_D = 13.5 - 16.5\text{V}$ , Inverter Part) | $V_{\text{CC(prot.)}}$ | 800         | Volts            |
| Isolation Voltage AC 1 minute, 60Hz                                                  | $V_{\text{RMS}}$       | 2500        | Volts            |

### Control Sector

|                                                                                    |                  |    |       |
|------------------------------------------------------------------------------------|------------------|----|-------|
| Supply Voltage Applied between ( $V_{P1} - V_{PC}, V_{N1} - V_{NC}$ )              | $V_D$            | 20 | Volts |
| Input Voltage Applied between ( $C_{P1} - V_{PC}, C_{N1} - V_{NC}$ )               | $V_{\text{CIN}}$ | 10 | Volts |
| Fault Output Supply Voltage Applied between ( $F_{PO} - V_{PC}, F_{NO} - V_{NC}$ ) | $V_{\text{FO}}$  | 20 | Volts |
| Fault Output Current (Sink Current at $F_{PO}, F_{NO}$ Terminals)                  | $I_{\text{FO}}$  | 20 | mA    |

### IGBT Inverter Sector

|                                              |                        |      |         |
|----------------------------------------------|------------------------|------|---------|
| Collector-Emitter Voltage                    | $V_{\text{CES}}$       | 1200 | Volts   |
| Collector Current $\pm$                      | $I_C$                  | 75   | Amperes |
| Peak Collector Current $\pm$                 | $I_{\text{CP}}$        | 150  | Amperes |
| Supply Voltage (Applied between P - N)       | $V_{\text{CC}}$        | 900  | Volts   |
| Supply Voltage (Surge) Applied between P - N | $V_{\text{CC(surge)}}$ | 1000 | Volts   |
| Collector Dissipation                        | $P_C$                  | 595  | Watts   |



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PM75DHA120

Intellimod-3 Modules

Single Phase IGBT Inverter Output

75 Amperes/460 Volt Line

T-57-29

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

| Characteristics                         | Symbol                | Test Conditions                                                                                         | Min. | Typ. | Max. | Units            |
|-----------------------------------------|-----------------------|---------------------------------------------------------------------------------------------------------|------|------|------|------------------|
| <b>Control Sector</b>                   |                       |                                                                                                         |      |      |      |                  |
| Overcurrent Trip Level                  | OC                    | $-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$ , Fig. 5                                              | 105  | 170  | —    | Amperes          |
| Short Circuit Trip Level                | SC                    | $-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$ , Fig. 5                                              | 150  | 250  | —    | Amperes          |
| Over Current Delay Time                 | $t_{\text{off(OC)}}$  | $V_D = 15\text{V}$ , Fig. 5                                                                             | —    | 5    | —    | $\mu\text{S}$    |
| Over Temperature Protection             | OT                    | Trip Level                                                                                              | 100  | 110  | 120  | $^\circ\text{C}$ |
| Over Temperature Protection             | $\text{OT}_R$         | Reset Level                                                                                             | 85   | 95   | 105  | $^\circ\text{C}$ |
| Supply Circuit Under Voltage Protection | UV                    | Trip Level                                                                                              | 11.5 | 12.0 | 12.5 | Volts            |
| Supply Circuit Under Voltage Protection | $\text{UV}_R$         | Reset Level                                                                                             | —    | 12.5 | —    | Volts            |
| Supply Voltage                          | $V_D$                 | Applied between<br>$V_{P1} - V_{PC}$ , $V_{N1} - V_{NC}$                                                | 13.5 | 15   | 16.5 | Volts            |
| Circuit Current                         | $I_D$                 | $V_D = 15\text{V}$ , $V_{\text{CIN}} = 5\text{V}$ , $V_{N1} - V_{NC}$                                   | —    | 13   | 20   | mA               |
|                                         | $I_D$                 | $V_D = 15\text{V}$ , $V_{\text{CIN}} = 5\text{V}$ , $V_{P1} - V_{PC}$                                   | —    | 13   | 20   | mA               |
| Input On Voltage                        | $V_{\text{CIN(on)}}$  | Applied between                                                                                         | 1.2  | 1.5  | 1.8  | Volts            |
| Input Off Voltage                       | $V_{\text{CIN(off)}}$ | $C_{P1} - V_{PC}$ , $C_{N1} - V_{NC}$                                                                   | 1.7  | 2.0  | 2.3  | Volts            |
| PWM Input Frequency                     | $f_{\text{PWM}}$      | 3- $\emptyset$ Sinusoidal                                                                               | —    | 15   | 20   | kHz              |
| Dead Time                               | $t_{\text{DEAD}}$     | For each Input Pulse                                                                                    | 4.0  | —    | —    | $\mu\text{S}$    |
|                                         |                       | Using example Interface Circuit*                                                                        | 6.0  | —    | —    | $\mu\text{S}$    |
| 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               |
| SXR Terminal Output Voltage             | $V_{\text{SXR}}$      | $T_J = 125^\circ\text{C}$ , $R_{\text{IN}} = 6.8\text{k}\Omega$ , ( $S_{\text{PR}}$ , $S_{\text{NR}}$ ) | 4.5  | 5.1  | 5.6  | Volts            |

\*See Intellimod-3 Applications Data Section 4.3.



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PM75DHA120

Intellimod-3 Modules

Single Phase IGBT Inverter Output

75 Amperes/460 Volt Line

T-57-29

## Electrical 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             | $I_{CEX}$     | $V_{CE} = V_{CES}$ , $T_J = 25^\circ\text{C}$ , Fig. 4                                                  | —    | —    | 1    | mA            |
| Collector Cutoff Current             | $I_{CEX}$     | $V_{CE} = V_{CES}$ , $T_J = 125^\circ\text{C}$ , Fig. 4                                                 | —    | —    | 10.0 | mA            |
| Diode Forward Voltage                | $V_{FM}$      | $-I_C = 75\text{A}$ , $V_{CIN} = 5\text{V}$ , Fig. 2                                                    | —    | 1.8  | 3.0  | Volts         |
| Collector Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_D = 15\text{V}$ , $V_{CIN} = 0\text{V}$ , $I_C = 75\text{A}$ , Fig. 1                                | —    | 2.8  | 3.8  | Volts         |
| Collector Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_D = 15\text{V}$ , $V_{CIN} = 0\text{V}$ , $I_C = 75\text{A}$ ,<br>$T_J = 125^\circ\text{C}$ , Fig. 1 | —    | 2.4  | 3.4  | Volts         |
| Inductive Load Switching Times       | $t_{on}$      | $V_D = 15\text{V}$ , $V_{CIN} = 0\text{V}$ ,                                                            | 0.5  | 1.4  | 2.5  | $\mu\text{S}$ |
|                                      | $t_{rr}$      | $V_{CC} = 600\text{V}$ , $I_C = 75\text{A}$ ,                                                           | —    | 0.3  | 0.6  | $\mu\text{S}$ |
|                                      | $t_{C(on)}$   | $T_J = 125^\circ\text{C}$                                                                               | —    | 0.4  | 1.0  | $\mu\text{S}$ |
|                                      | $t_{off}$     | Fig. 3                                                                                                  | —    | 3.5  | 4.0  | $\mu\text{S}$ |
|                                      | $t_{C(off)}$  |                                                                                                         | —    | 0.8  | 1.2  | $\mu\text{S}$ |

## Thermal Characteristics

| Characteristics                      | Symbol         | Test Conditions                     | Min. | Typ. | Max. | Units              |
|--------------------------------------|----------------|-------------------------------------|------|------|------|--------------------|
| Thermal Resistances Junction to Case | $R_{th(l-c)Q}$ | Inverter IGBT                       | —    | —    | 0.21 | $^\circ\text{C/W}$ |
|                                      | $R_{th(l-c)F}$ | Inverter FWD                        | —    | —    | 0.47 | $^\circ\text{C/W}$ |
| Contact Thermal Resistance           | $R_{th(c-f)}$  | Case to Fin, Thermal Grease Applied | —    | —    | 0.12 | $^\circ\text{C/W}$ |

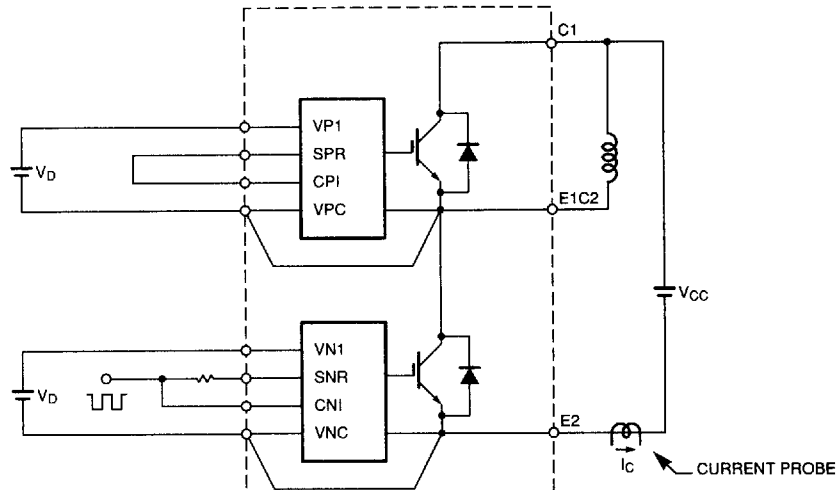
## Recommended Operating Conditions

| Characteristics     | Symbol         | Test Conditions                       | Value         | Units         |
|---------------------|----------------|---------------------------------------|---------------|---------------|
| Supply Voltage      | $V_{CC}$       | Applied across C1 - E2 Terminals      | 0 ~ 800       | Volts         |
|                     | $V_D$          | Applied between                       | 15±1.5        | Volts         |
|                     |                | $V_{P1} - V_{PC}$ , $V_{N1} - V_{NC}$ |               |               |
| Input On Voltage    | $V_{CIN(on)}$  | Applied between                       | 0 ~ 0.8       | Volts         |
| Input Off Voltage   | $V_{CIN(off)}$ | $C_{P1} - V_{PC}$ , $C_{N1} - V_{NC}$ | 4 ~ $V_{SXR}$ | Volts         |
| PWM Input Frequency | $f_{PWM}$      | Using example Interface Circuit*      | 5 ~ 20        | kHz           |
| Minimum Dead Time   | $t_{DEAD}$     | Using example Interface Circuit*      | 6.0           | $\mu\text{S}$ |

\*See Intellimod-3 Applications Data Section 4.3.

T-57-29

A) LOWER ARM SWITCHING



B) UPPER ARM SWITCHING

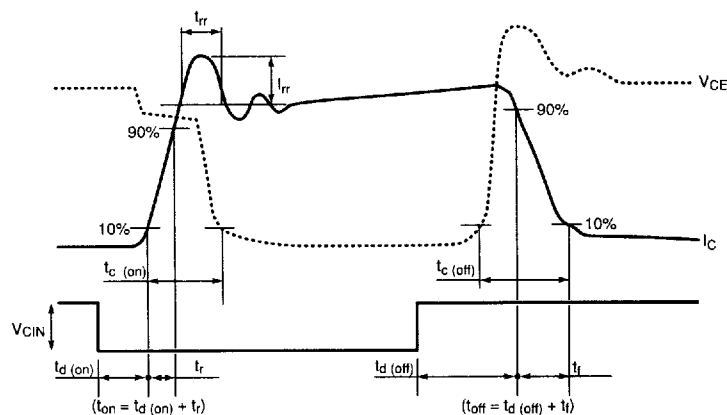
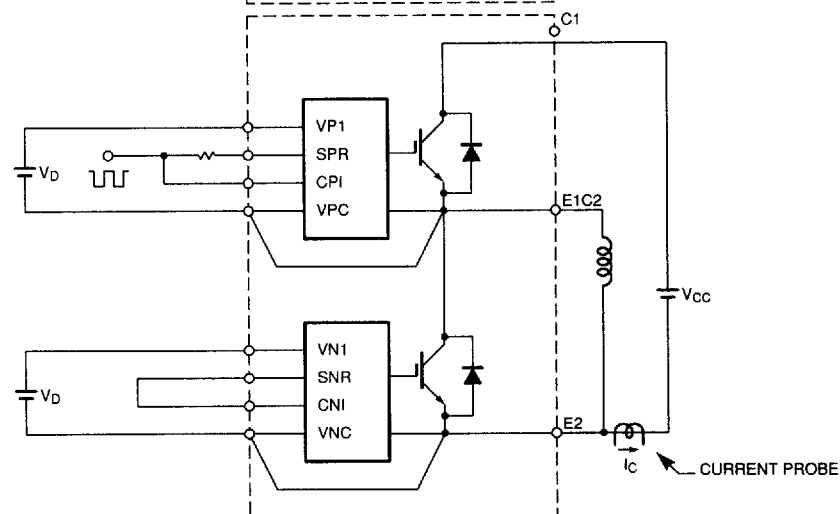


Figure 3 Switching Test



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Single Phase IGBT Inverter Output

75 Amperes/460 Volt Line

T-57-29

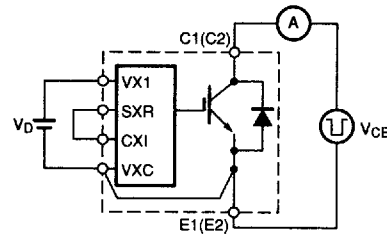


Figure 4  $I_{CES}$  Test

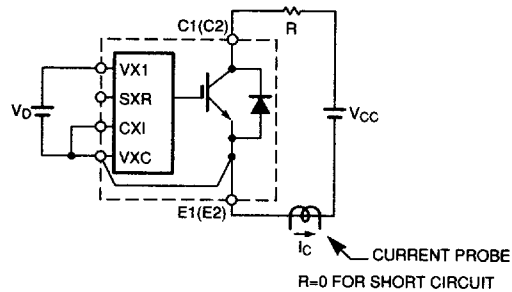


Figure 5 Over Current and Short Circuit Test