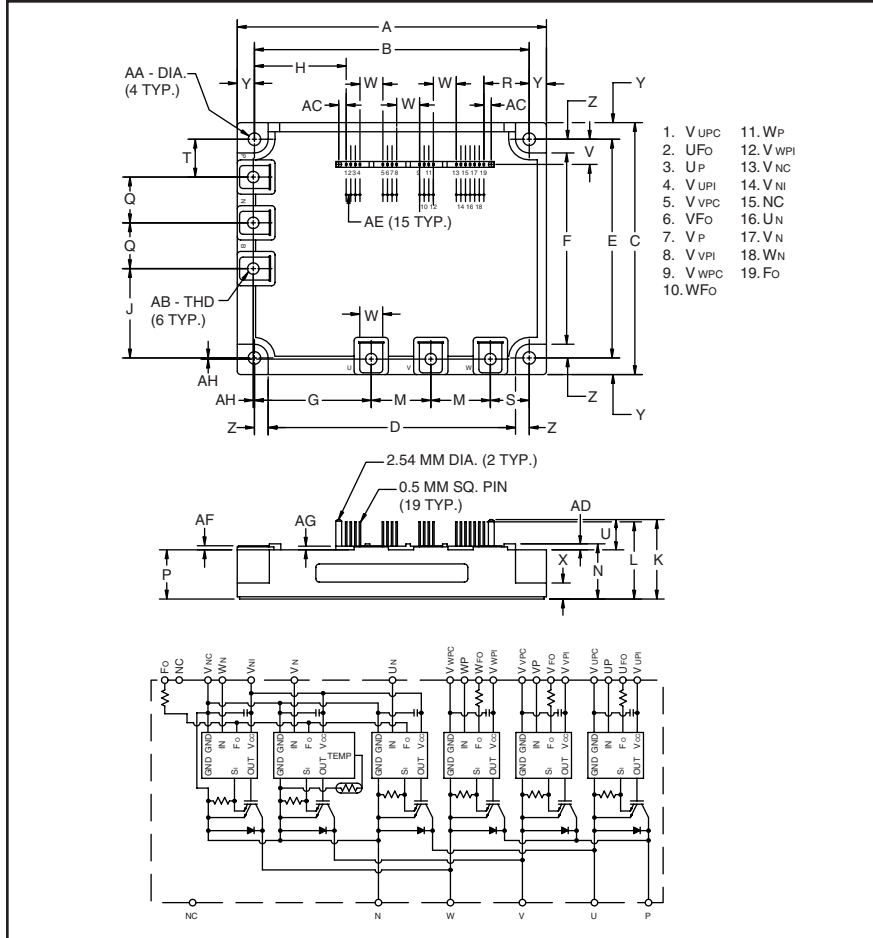


Intellimod™ Module

Three Phase

IGBT Inverter Output

100 Amperes/1200 Volts



Description:

Powerex Intellimod™ 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. PM100CSA120 is a 1200V, 100 Ampere Intellimod™ Intelligent Power Module.

Outline Drawing and Circuit Diagram

| Dimensions | Inches | Millimeters |
|------------|-----------------|----------------|
| A | 5.31±0.04 | 135.0±1.0 |
| B | 4.74±0.02 | 120.5±0.5 |
| C | 4.33±0.04 | 110.0±1.0 |
| D | 4.27 | 108.5 |
| E | 3.76±0.02 | 95.5±0.5 |
| F | 3.29 | 83.5 |
| G | 2.01 | 51.0 |
| H | 1.602 | 40.68 |
| J | 1.54 | 39.0 |
| K | 1.37 | 34.7 |
| L | 1.33 | 33.7 |
| M | 1.02 | 26.0 |
| N | 0.95 +0.06/-0.0 | 24.1 +1.5/-0.0 |
| P | 0.85 | 21.5 |
| Q | 0.79 | 20.0 |
| R | 0.780 | 19.82 |

| Dimensions | Inches | Millimeters |
|------------|-----------|-------------|
| S | 0.69 | 17.5 |
| T | 0.65 | 16.5 |
| U | 0.52 | 13.2 |
| V | 0.43 | 11.0 |
| W | 0.39 | 10.0 |
| X | 0.31 | 8.0 |
| Y | 0.285 | 7.25 |
| Z | 0.24 | 6.0 |
| AA | 0.22 Dia. | Dia. 5.5 |
| AB | Metric M5 | M5 |
| AC | 0.128 | 3.22 |
| AD | 0.10 | 2.6 |
| AE | 0.08 | 2.0 |
| AF | 0.07 | 1.8 |
| AG | 0.06 | 1.6 |
| AH | 0.02 | 0.5 |

| Type | Current Rating Amperes | V _{CEs} Volts (x 10) |
|------|---------------------------|----------------------------------|
| PM | 100 | 120 |



Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

PM100CSA120
Intellimod™ Module
Three Phase IGBT Inverter Output
100 Amperes/1200 Volts

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

| Characteristics | Symbol | PM100CSA120 | Units |
|--|------------------------|-------------|------------------|
| Power Device Junction Temperature | T_j | -20 to 150 | $^\circ\text{C}$ |
| Storage Temperature | T_{stg} | -40 to 125 | $^\circ\text{C}$ |
| Case Operating Temperature | T_C | -20 to 100 | $^\circ\text{C}$ |
| Mounting Torque, M5 Mounting Screws | — | 17 | in-lb |
| Mounting Torque, M5 Main Terminal Screws | — | 17 | in-lb |
| Module Weight (Typical) | — | 920 | Grams |
| Supply Voltage Protected by OC and SC ($V_D = 13.5 - 16.5\text{V}$, Inverter Part, $T_j = 125^\circ\text{C}$) | $V_{\text{CC(prot.)}}$ | 800 | Volts |
| Isolation Voltage, AC 1 minute, 60Hz Sinusoidal | V_{RMS} | 2500 | Volts |

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 ($U_P, V_P, W_P, U_N, V_N, W_N$) | V_{CIN} | 20 | Volts |
| Fault Output Supply Voltage (Applied between F_O and V_C) | V_{FO} | 20 | Volts |
| Fault Output Current | I_{FO} | 20 | mA |

IGBT Inverter Sector

| | | | |
|--|------------------------|------|---------|
| Collector-Emitter Voltage ($V_D = 15\text{V}$, $V_{\text{CIN}} = 15\text{V}$) | V_{CES} | 1200 | Volts |
| Collector Current, \pm | I_C | 100 | Amperes |
| Peak Collector Current, \pm | I_{CP} | 200 | Amperes |
| Supply Voltage (Applied between P - N) | V_{CC} | 900 | Volts |
| Supply Voltage, Surge (Applied between P - N) | $V_{\text{CC(surge)}}$ | 1000 | Volts |
| Collector Dissipation | P_C | 595 | Watts |



Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

PM100CSA120
Intellimod™ Module
Three Phase IGBT Inverter Output
100 Amperes/1200 Volts

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

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|-----------------------|--|------|------|------|------------------|
| Control Sector | | | | | | |
| Over Current Trip Level Inverter Part | OC | $-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$ | 145 | 230 | — | Amperes |
| Short Circuit Trip Level Inverter Part | SC | $-20^\circ\text{C} \leq T \leq 125^\circ\text{C}$ | — | 340 | — | Amperes |
| Over Current Delay Time | $t_{\text{off(OC)}}$ | $V_D = 15\text{V}$ | — | 10 | — | μS |
| Over Temperature Protection | OT | Trip Level | 111 | 118 | 125 | $^\circ\text{C}$ |
| | OT_R | Reset Level | — | 100 | — | $^\circ\text{C}$ |
| 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 | 16.5 | Volts |
| Circuit Current | I_D | $V_D = 15\text{V}$, $V_{CIN} = 15\text{V}$, $V_{N1}-V_{NC}$ | — | 40 | 55 | mA |
| | | $V_D = 15\text{V}$, $V_{CIN} = 15\text{V}$, $V_{XP1}-V_{XPC}$ | — | 13 | 18 | mA |
| Input ON Threshold Voltage | $V_{CIN(\text{on})}$ | Applied between | 1.2 | 1.5 | 1.8 | Volts |
| Input OFF Threshold Voltage | $V_{CIN(\text{off})}$ | $U_P, V_P, W_P, U_N, V_N, W_N$ | 1.7 | 2.0 | 2.3 | Volts |
| PWM Input Frequency | f_{PWM} | 3- \emptyset 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_{FO} | $V_D = 15\text{V}$ | 1.0 | 1.8 | — | mS |



Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

PM100CSA120
Intellimod™ Module
Three Phase IGBT Inverter Output
100 Amperes/1200 Volts

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 Cutoff Current | I_{CES} | $V_{CE} = V_{CES}, T_j = 25^\circ\text{C}$ | — | — | 1.0 | mA |
| | | $V_{CE} = V_{CES}, T_j = 125^\circ\text{C}$ | — | — | 10 | mA |
| Diode Forward Voltage | V_{FM} | $-I_C = 100\text{A}, V_D = 15\text{V}, V_{CIN} = 0\text{V}$ | — | 2.5 | 3.5 | Volts |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_D = 15\text{V}, V_{CIN} = 15\text{V}, I_C = 100\text{A}$ | — | 2.5 | 3.5 | Volts |
| | | $V_D = 15\text{V}, V_{CIN} = 15\text{V}, I_C = 100\text{A}, T_j = 125^\circ\text{C}$ | — | 2.2 | 3.2 | Volts |
| Inductive Load Switching Times | t_{on} | | 0.5 | 1.0 | 2.5 | μS |
| | t_{rr} | $V_D = 15\text{V}, V_{CIN} = 0 \sim 15\text{V}$ | — | 0.15 | 0.3 | μS |
| | $t_{C(on)}$ | $V_{CC} = 600\text{V}, I_C = 100\text{A}$ | — | 0.4 | 1.0 | μS |
| | t_{off} | $T_j = 125^\circ\text{C}$ | — | 2.0 | 3.0 | μS |
| | $t_{C(off)}$ | | — | 0.7 | 1.2 | μS |

Thermal Characteristics

| Characteristic | Symbol | Condition | Min. | Typ. | Max. | Units |
|-------------------------------------|----------------|---|------|------|-------|-----------------------|
| Junction to Case Thermal Resistance | $R_{th(j-c)Q}$ | Each IGBT | — | — | 0.21 | $^\circ\text{C/Watt}$ |
| | $R_{th(j-c)D}$ | Each FWDi | — | — | 0.35 | $^\circ\text{C/Watt}$ |
| Contact Thermal Resistance | $R_{th(c-f)}$ | Case to Fin Per Module, Thermal Grease Applied | — | — | 0.018 | $^\circ\text{C/Watt}$ |

Recommended Conditions for Use

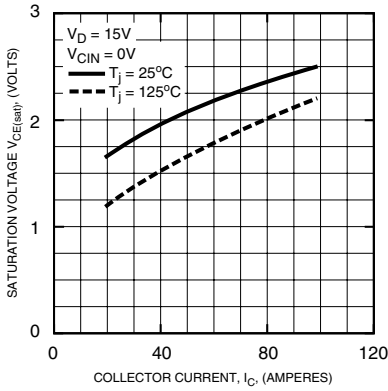
| Characteristic | Symbol | Condition | Value | Units |
|---------------------|----------------|--|----------------|---------------|
| Supply Voltage | V_{CC} | Applied across P-N Terminals | 0 ~ 800 | Volts |
| | V_D | Applied between $V_{UP1}-V_{UPC}, V_{N1}-V_{NC}, V_{VP1}-V_{VPC}, V_{WP1}-V_{WPC}$ | 15 ± 1.5 | Volts |
| Input ON Voltage | $V_{CIN(on)}$ | Applied between | 0 ~ 0.8 | Volts |
| Input OFF Voltage | $V_{CIN(off)}$ | $U_B, V_B, W_B, U_N, V_N, W_N$ | $4.0 \sim V_D$ | Volts |
| PWM Input Frequency | f_{PWM} | Using Application Circuit | 5 ~ 20 | kHz |
| Minimum Dead Time | t_{DEAD} | Input Signal | ≥ 2.5 | μS |



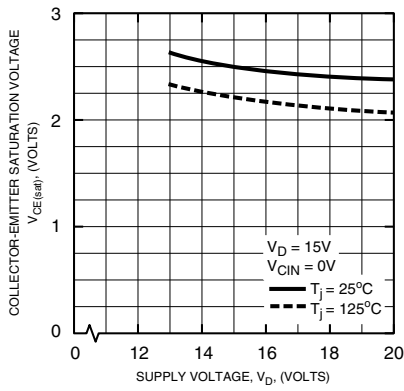
Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

PM100CSA120
Intellimod™ Module
Three Phase IGBT Inverter Output
100 Amperes/1200 Volts

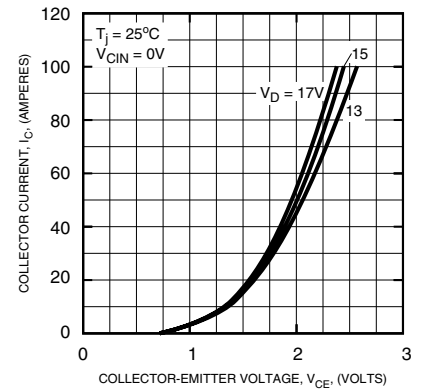
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



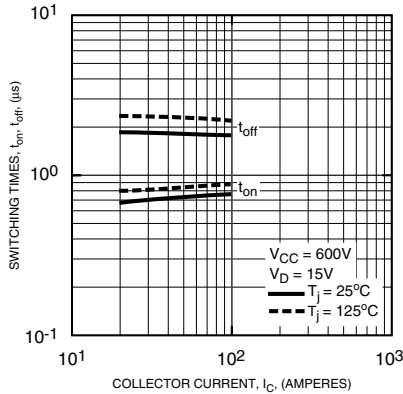
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



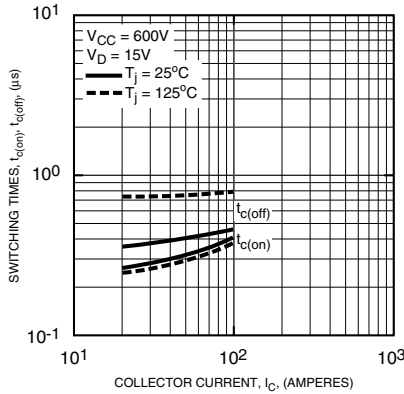
OUTPUT CHARACTERISTICS (TYPICAL)



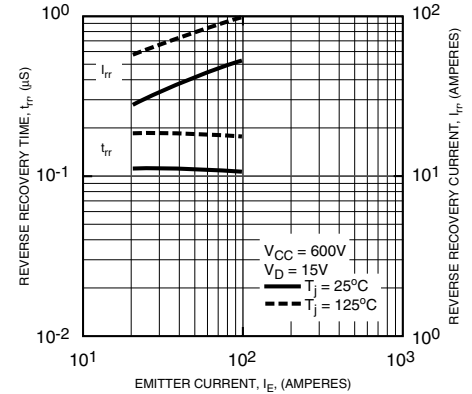
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



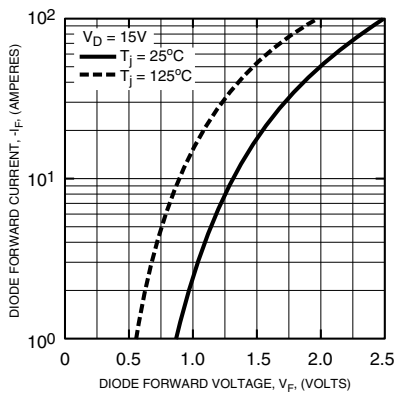
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



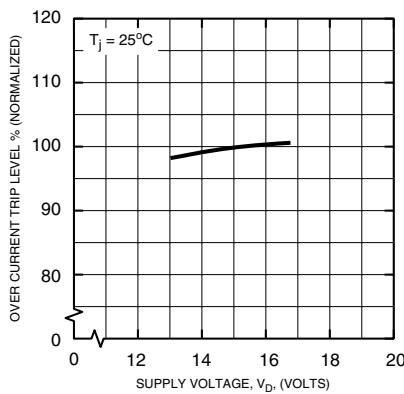
REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)



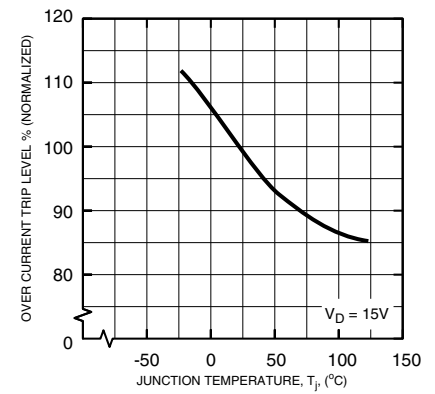
DIODE FORWARD CHARACTERISTICS



OVER CURRENT TRIP LEVEL VS. SUPPLY VOLTAGE (TYPICAL)



OVER CURRENT TRIP LEVEL TEMPERATURE DEPENDENCY (TYPICAL)

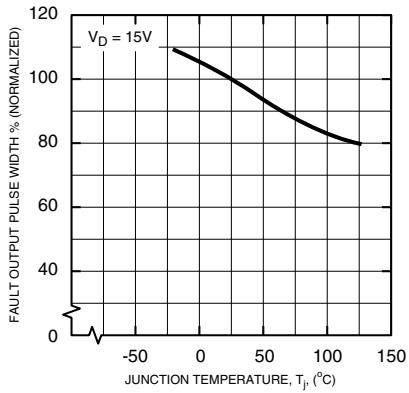




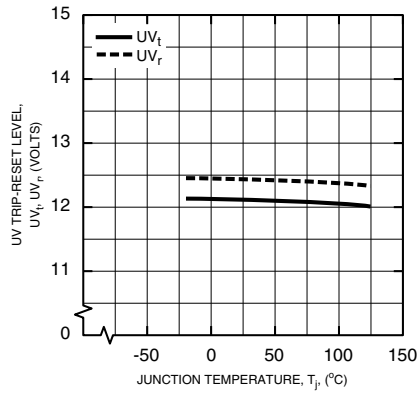
Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

PM100CSA120
Intellimod™ Module
Three Phase IGBT Inverter Output
100 Amperes/1200 Volts

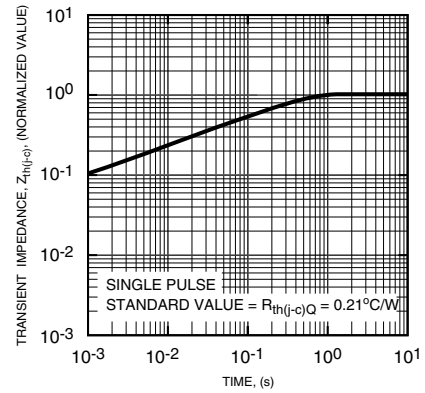
FAULT OUTPUT PULSE WIDTH VS. TEMPERATURE (TYPICAL)



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



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWD)

