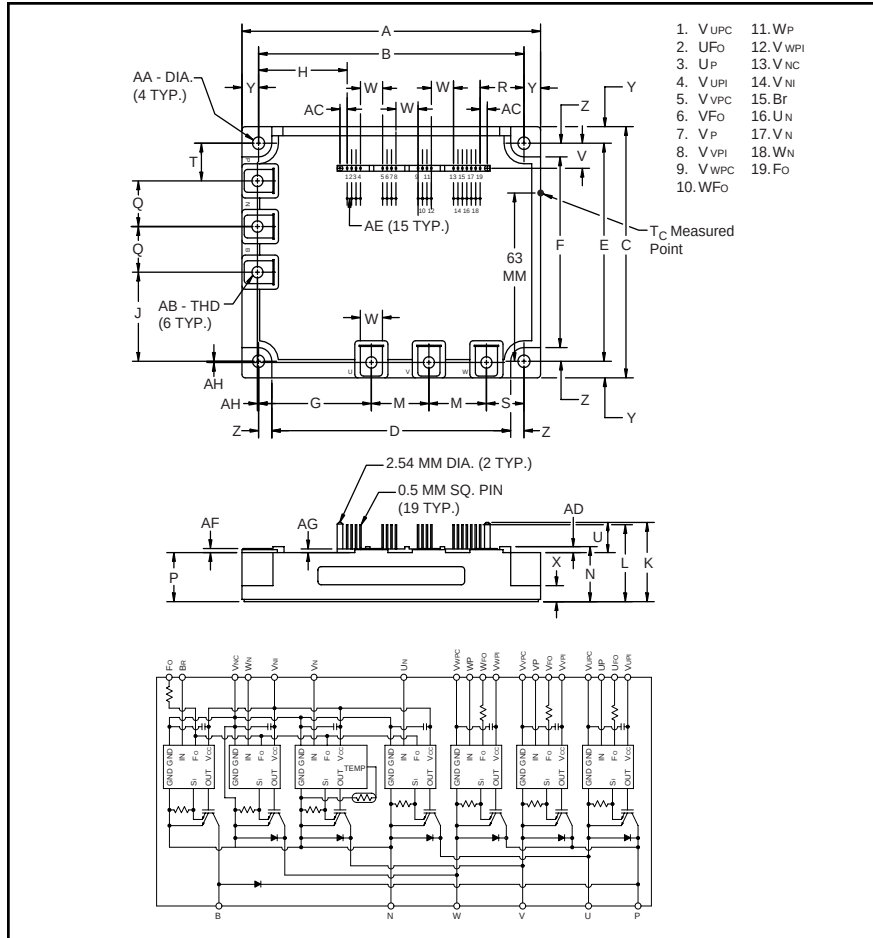


### Intellimod™ Module

Three Phase + Brake  
IGBT Inverter Output  
300 Amperes/600 Volts



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            | 10.5           |
| 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          | 1.56            | 39.5           |
| 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          | 0.30      | 7.7         |
| 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         |



#### 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
- ☐ Low Loss Using 4th Generation IGBT Chip

#### Applications:

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

#### Ordering Information:

Example: Select the complete part number from the table below -i.e. PM300RSD060 is a 600V, 300 Ampere Intellimod™ Intelligent Power Module.

| Type | Current Rating<br>Amperes | V <sub>CES</sub><br>Volts (x 10) |
|------|---------------------------|----------------------------------|
| PM   | 300                       | 60                               |

**PM300RSD060**

**Intellimod™ Module**

**Three Phase + Brake IGBT Inverter Output**

300 Amperes/600 Volts

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

| Characteristics                                                                                                | Symbol                 | PM300RSD060 | 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                                                                            | —                      | 31          | in-lb            |
| Mounting Torque, M5 Main Terminal Screws                                                                       | —                      | 31          | in-lb            |
| Module Weight (Typical)                                                                                        | —                      | 920         | Grams            |
| Supply Voltage Protected by OC and SC ( $V_D = 13.5 - 16.5\text{V}$ , Inverter Part) $T_j = 125^\circ\text{C}$ | $V_{\text{CC(prot.)}}$ | 400         | Volts            |
| Isolation Voltage, AC 1 minute, 60Hz Sinusoidal                                                                | $V_{\text{ISO}}$       | 2500        | Volts            |

**IGBT Inverter Sector**

|                                                                                  |                        |     |         |
|----------------------------------------------------------------------------------|------------------------|-----|---------|
| Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ ) | $V_{\text{CES}}$       | 600 | Volts   |
| Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )                            | $I_C$                  | 300 | Amperes |
| Peak Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )                       | $I_{\text{CP}}$        | 600 | Amperes |
| Supply Voltage (Applied between P - N)                                           | $V_{\text{CC}}$        | 400 | Volts   |
| Supply Voltage, Surge (Applied between P - N)                                    | $V_{\text{CC(surge)}}$ | 500 | Volts   |
| Collector Dissipation ( $T_C = 25^\circ\text{C}$ )                               | $P_C$                  | 781 | Watts   |

**IGBT Brake Sector**

|                                                                                  |                    |     |         |
|----------------------------------------------------------------------------------|--------------------|-----|---------|
| Collector-Emitter Voltage ( $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ ) | $V_{\text{CES}}$   | 600 | Volts   |
| Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )                            | $I_C$              | 100 | Amperes |
| Peak Collector Current, $\pm$ ( $T_C = 25^\circ\text{C}$ )                       | $I_{\text{CP}}$    | 200 | Amperes |
| FWDi Rated DC Reverse Voltage ( $T_C = 25^\circ\text{C}$ )                       | $V_{\text{R(DC)}}$ | 600 | Volts   |
| FWDi Forward Current ( $T_C = 25^\circ\text{C}$ )                                | $I_F$              | 100 | Amperes |
| Collector Dissipation ( $T_C = 25^\circ\text{C}$ )                               | $P_C$              | 416 | Watts   |

**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 ( $U_P-V_{\text{UPC}}$ , $V_P-V_{\text{VPC}}$ , $W_P-V_{\text{WPC}}$ , $U_N-V_{\text{NC}}$ , $W_N-B_T-V_{\text{NC}}$ )                   | $V_{\text{CIN}}$ | 20 | Volts |
| Fault Output Supply Voltage (Applied between $F_O$ and $V_C$ )                                                                                                         | $V_{\text{FO}}$  | 20 | Volts |
| Fault Output Current ( $U_{\text{FO}}$ , $V_{\text{FO}}$ , $W_{\text{FO}}$ , $F_O$ )                                                                                   | $I_{\text{FO}}$  | 20 | mA    |

**PM300RSD060**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**300 Amperes/600 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 <sub>CES</sub>     | V <sub>CE</sub> = V <sub>CES</sub> , T <sub>j</sub> = 25°C,<br>V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V                         | —    | —    | 1.0  | mA    |
|                                      |                      | V <sub>CE</sub> = V <sub>CES</sub> , T <sub>j</sub> = 125°C,<br>V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V                        | —    | —    | 10   | mA    |
| Diode Forward Voltage                | V <sub>EC</sub>      | -I <sub>C</sub> = 300A, V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V                                                                | —    | 2.2  | 3.3  | Volts |
| Collector-Emitter Saturation Voltage | V <sub>CE(sat)</sub> | V <sub>D</sub> = 15V, V <sub>CIN</sub> = 0V, I <sub>C</sub> = 300A,<br>T <sub>j</sub> = 25°C                                        | —    | 1.70 | 2.3  | Volts |
|                                      |                      | V <sub>D</sub> = 15V, V <sub>CIN</sub> = 0V, I <sub>C</sub> = 300A,<br>T <sub>j</sub> = 125°C                                       | —    | 1.70 | 2.3  | Volts |
| Inductive Load Switching Times       | t <sub>on</sub>      | V <sub>D</sub> = 15V, V <sub>CIN</sub> = 0 ~ 15V<br><br>V <sub>CC</sub> = 300V, I <sub>C</sub> = 300A<br><br>T <sub>j</sub> = 125°C | 0.4  | 0.8  | 2.0  | μS    |
|                                      | t <sub>rr</sub>      |                                                                                                                                     | —    | 0.15 | 0.3  | μS    |
|                                      | t <sub>C(on)</sub>   |                                                                                                                                     | —    | 0.4  | 1.0  | μS    |
|                                      | t <sub>off</sub>     |                                                                                                                                     | —    | 2.0  | 2.9  | μS    |
|                                      | t <sub>C(off)</sub>  |                                                                                                                                     | —    | 0.6  | 1.2  | μS    |
| IGBT Brake Sector                    |                      |                                                                                                                                     |      |      |      |       |
| Collector Cutoff Current             | I <sub>CES</sub>     | V <sub>CE</sub> = V <sub>CES</sub> , T <sub>j</sub> = 25°C,<br>V <sub>D</sub> = 15V, V <sub>CIN</sub> = 15V                         | —    | —    | 1.0  | mA    |
|                                      |                      | V <sub>CE</sub> = V <sub>CES</sub> , T <sub>j</sub> = 125°C, V <sub>D</sub> = 15V,<br>V <sub>CIN</sub> = 15V                        | —    | —    | 10   | mA    |
| FWDi Forward Voltage                 | V <sub>FM</sub>      | I <sub>F</sub> = 100A                                                                                                               | —    | 2.2  | 3.3  | Volts |
| Collector-Emitter Saturation Voltage | V <sub>CE(sat)</sub> | V <sub>D</sub> = 15V, V <sub>CIN</sub> = 0V, I <sub>C</sub> = 100A,<br>T <sub>j</sub> = 25°C                                        | —    | 2.35 | 2.80 | Volts |
|                                      |                      | V <sub>D</sub> = 15V, V <sub>CIN</sub> = 0V, I <sub>C</sub> = 100A,<br>T <sub>j</sub> = 125°C                                       | —    | 2.55 | 3.05 | Volts |

## PM300RSD060

### Intellimod™ Module

### Three Phase + Brake IGBT Inverter Output

300 Amperes/600 Volts

## 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<br>( $V_D = 15\text{V}$ )                      | OC                          | $T_j = -20^\circ\text{C}$                                                            | —    | —    | 1270 | Amperes          |
|                                                                                      |                             | $T_j = 25^\circ\text{C}$                                                             | 651  | 766  | 1060 | Amperes          |
|                                                                                      |                             | $T_j = 125^\circ\text{C}$                                                            | 390  | —    | —    | Amperes          |
| Over Current Trip Level Brake Part                                                   | OC                          | $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$             | 140  | 195  | —    | Amperes          |
| Short Circuit Trip Level Inverter Part                                               | SC                          | $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$ , $V_D = 15\text{V}$             | —    | 760  | —    | Amperes          |
| Short Circuit Trip Level Brake Part                                                  |                             |                                                                                      | —    | 292  | —    | Amperes          |
| Over Current Delay Time                                                              | $t_{\text{off}}(\text{OC})$ | $V_D = 15\text{V}$                                                                   | —    | 10   | —    | $\mu\text{s}$    |
| Over Temperature Protection ( $V_D = 15\text{V}$ )                                   | OT                          | Trip Level                                                                           | 111  | 118  | 125  | $^\circ\text{C}$ |
|                                                                                      | $\text{OT}_R$               | Reset Level                                                                          | —    | 100  | —    | $^\circ\text{C}$ |
| Supply Circuit Under Voltage Protection<br>( $-20 \leq T_j \leq 125^\circ\text{C}$ ) | UV                          | Trip Level                                                                           | 11.5 | 12.0 | 12.5 | Volts            |
|                                                                                      | $\text{UV}_R$               | Reset Level                                                                          | —    | 12.5 | —    | Volts            |
| Circuit Current                                                                      | $I_D$                       | $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ , $V_{\text{N1}}-V_{\text{NC}}$   | —    | 60   | 82   | mA               |
|                                                                                      |                             | $V_D = 15\text{V}$ , $V_{\text{CIN}} = 15\text{V}$ , $V_{\text{XP1}}-V_{\text{XPC}}$ | —    | 15   | 20   | mA               |
| Thermal Voltage ON                                                                   | $V_{\text{th(on)}}$         | Applied between                                                                      | 1.2  | 1.5  | 1.8  | Volts            |
| Thermal Voltage OFF                                                                  | $V_{\text{th(off)}}$        | $U_P, V_P, W_P, U_N, V_N, W_N, B_r-V_{\text{NC}}$                                    | 1.7  | 2.0  | 2.3  | Volts            |
| Input ON Threshold Voltage                                                           | $V_{\text{CIN(on)}}$        | Applied between                                                                      | —    | —    | 0.8  | Volts            |
| Input OFF Threshold Voltage                                                          | $V_{\text{CIN(off)}}$       | $U_P, V_P, W_P, U_N, V_N, W_N, B_r-V_{\text{NC}}$                                    | 4.0  | —    | —    | 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 OC, SC, OT and UV protections schemes of either upper or lower device operate to protect it.

**PM300RSD060**  
**Intellimod™ Module**  
**Three Phase + Brake IGBT Inverter Output**  
**300 Amperes/600 Volts**

## Thermal Characteristics

| Characteristic                      | Symbol          | Condition                                         | Min. | Typ. | Max.   | Units   |
|-------------------------------------|-----------------|---------------------------------------------------|------|------|--------|---------|
| Junction to Case Thermal Resistance | $R_{th(j-c)Q}$  | Each IGBT                                         | —    | —    | 0.16   | °C/Watt |
| Inverter Part                       | $R_{th(j-c)F}$  | Each FWDi                                         | —    | —    | 0.24   | °C/Watt |
|                                     | $R_{th(j-c')Q}$ | Each IGBT*                                        | —    | —    | 0.10** | °C/Watt |
|                                     | $R_{th(j-c')F}$ | Each FWDi*                                        | —    | —    | 0.16** | °C/Watt |
| Junction to Case Thermal Resistance | $R_{th(j-c)Q}$  | Each IGBT                                         | —    | —    | 0.30   | °C/Watt |
| Brake Part                          | $R_{th(j-c)F}$  | Each FWDi                                         | —    | —    | 0.80   | °C/Watt |
|                                     | $R_{th(j-c')Q}$ | Each IGBT*                                        | —    | —    | 0.22** | °C/Watt |
|                                     | $R_{th(j-c')F}$ | Each FWDi*                                        | —    | —    | 0.36** | °C/Watt |
| Contact Thermal Resistance          | $R_{th(c-f)}$   | Case to Fin Per Module,<br>Thermal Grease Applied | —    | —    | 0.018  | °C/Watt |

\* $T_C$  measured point is just under chip.

\*\*If you use this value,  $R_{th(f-a)}$  should be measured just under the chips.

## Recommended Conditions for Use

| Characteristic            | Symbol         | Condition                                                                                                      | Value       | Units |
|---------------------------|----------------|----------------------------------------------------------------------------------------------------------------|-------------|-------|
| Supply Voltage            | $V_{CC}$       | Applied across P-N Terminals                                                                                   | 0 ~ 400     | Volts |
| Control Supply Voltage*** | $V_D$          | Applied between $V_{UP1}$ - $V_{UPC}$ ,<br>$V_{N1}$ - $V_{NC}$ , $V_{VP1}$ - $V_{VPC}$ , $V_{WP1}$ - $V_{WPC}$ | 15 ± 1.5    | Volts |
| Input ON Voltage          | $V_{CIN(on)}$  | Applied between                                                                                                | 0 ~ 0.8     | Volts |
| Input OFF Voltage         | $V_{CIN(off)}$ | $U_P$ , $V_P$ , $W_P$ , $U_N$ , $V_N$ , $W_N$ , $B_r$ - $V_{NC}$                                               | 4.0 ~ $V_D$ | Volts |
| PWM Input Frequency       | $f_{PWM}$      | Using Application Circuit                                                                                      | 0 ~ 20      | kHz   |
| Minimum Dead Time         | $t_{DEAD}$     | Input Signal                                                                                                   | ≥ 2.0       | μs    |
|                           |                | $I_F = 12mA$                                                                                                   | ≥ 2.5       | μs    |

\*\*\* With ripple satisfying the following conditions:  $dv/dt$  swing ≤ ±5V/μs, Variation ≤ 2V peak to peak.

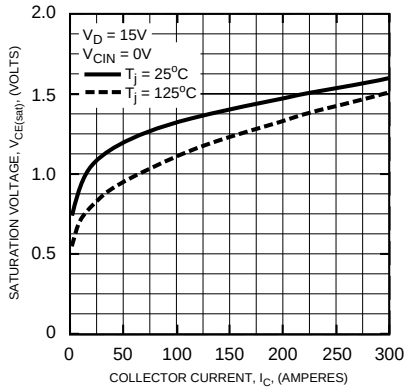
## PM300RSD060

### Intellimod™ Module

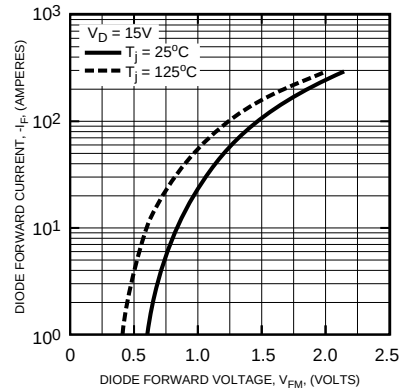
### Three Phase + Brake IGBT Inverter Output

300 Amperes/600 Volts

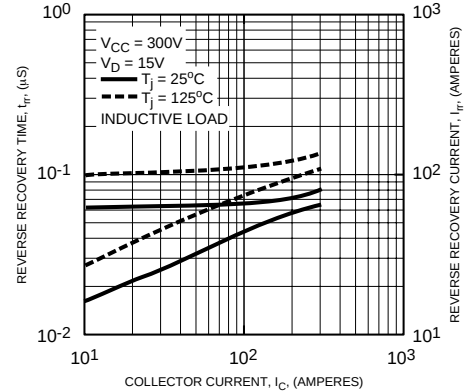
**SATURATION VOLTAGE CHARACTERISTICS (TYPICAL) (INVERTER PART)**



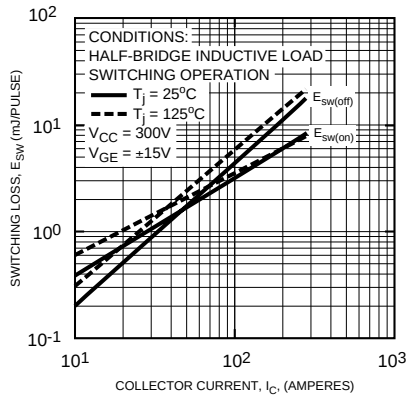
**DIODE FORWARD CHARACTERISTICS (INVERTER PART)**



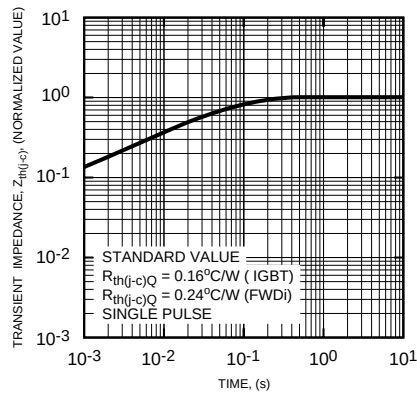
**REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)**



**SWITCHING LOSS CHARACTERISTICS**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDI - INVERTER PART)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDI - BRAKE PART)**

