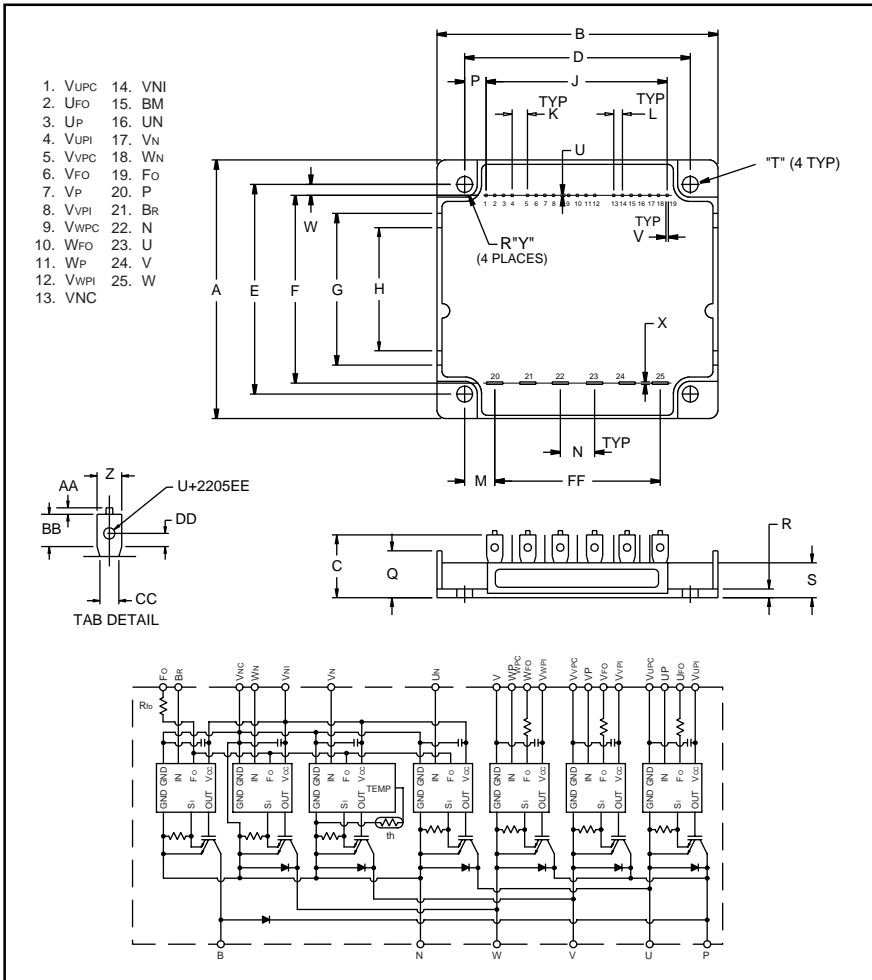


PM75RSK060

FLAT-BASE TYPE
INSULATED PACKAGE



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. PM75RSK060 is a 600V, 75 Ampere Intelligent Power Module.

| Type | Current Rating Amperes | V _{CES} Volts (x 10) |
|------|---------------------------|----------------------------------|
| PM | 75 | 60 |

Outline Drawing and Circuit Diagram

| Dimensions | Inches | Millimeters |
|------------|-----------|-------------|
| A | 2.76±0.04 | 70.0±1.0 |
| B | 4.29±0.04 | 109.0±1.0 |
| C | 0.83±0.04 | 21.0±1.0 |
| D | 3.78±0.02 | 96.0±0.5 |
| E | 2.31±0.02 | 58.5±0.5 |
| F | 2.22±0.03 | 56.5±0.8 |
| G | 1.61 | 41.0 |
| H | 1.30 | 33.0 |
| J | 2.40±0.03 | 60.96±0.8 |
| K | 0.30 | 7.62 |
| L | 0.10±0.01 | 2.54±0.25 |
| M | 0.66 | 16.75 |
| N | 0.49±0.01 | 12.5±0.25 |
| P | 0.69 | 17.52 |
| Q | 0.53 | 13.5 |

| Dimensions | Inches | Millimeters |
|------------|-----------|-------------|
| R | 0.21 | 5.4 |
| S | 0.39 | 10.0 |
| T | 0.18 | 4.5 |
| U | 0.02 | 0.6 |
| V | 0.02 | 0.4 |
| W | 0.03 | 0.75 |
| X | 0.03 | 0.8 |
| Y | 0.20 | 5.0 |
| Z | 0.25 | 6.35 |
| AA | 0.04 | 1.0 |
| BB | 0.39 | 9.95 |
| CC | 0.24 | 6.0 |
| DD | 0.21 | 5.4 |
| EE | 0.07 | 1.65 |
| FF | 2.46±0.03 | 62.5±0.8 |

PM75RSK060

 FLAT-BASE TYPE
 INSULATED PACKAGE

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

| Ratings | Symbol | PM75RSK060 | Units |
|---|----------------|-------------|------------------|
| 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 M4 Mounting Screws | - | 0.98 ~ 1.47 | N · m |
| Module Weight (Typical) | - | 150 | Grams |
| Supply Voltage Protected by OC and SC ($V_D = 13.5 \sim 16.5\text{V}$, Inverter Part) | $V_{CC(prot)}$ | 400 | Volts |
| Isolation Voltage (Main Terminal to Baseplate, AC 1 min.) | V_{iso} | 2500 | Vrms |

Control Sector

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

IGBT Inverter Sector

| | | | |
|---|-----------------|-----|---------|
| Collector-Emitter Voltage ($V_D = 15\text{V}$, $V_{CIN} = 15\text{V}$) | V_{CES} | 600 | Volts |
| Collector Current, \pm | I_C | 75 | Amperes |
| Peak Collector Current, \pm | I_{CP} | 150 | Amperes |
| Supply Voltage (Applied between P-N) | V_{CC} | 450 | Volts |
| Supply Voltage, Surge (Applied between P-N, Surge Value) | $V_{CC(surge)}$ | 500 | Volts |
| Collector Dissipation | P_C | 125 | Watts |

Brake Sector

| | | | |
|---|-----------------|-----|---------|
| Collector-Emitter Voltage ($V_D = 15\text{V}$, $V_{CIN} = 15\text{V}$) | V_{CES} | 600 | Volts |
| Collector Current, ($T_C = 25\text{ }^\circ\text{C}$) | I_C | 30 | Amperes |
| Peak Collector Current, ($T_C = 25\text{ }^\circ\text{C}$) | I_{CP} | 60 | Amperes |
| Supply Voltage (Applied between P-N) | V_{CC} | 450 | Volts |
| Supply Voltage, Surge (Applied between P-N, Surge Value) | $V_{CC(surge)}$ | 500 | Volts |
| Collector Dissipation | P_C | 75 | Watts |
| Diode Forward Current | I_F | 30 | Amperes |
| Diode DC Reverse Voltage | $V_{R(DC)}$ | 600 | Volts |

PM75RSK060

FLAT-BASE TYPE
INSULATED PACKAGE

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

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|----------------------|--|------|------|------|------------------|
| Control Sector | | | | | | |
| Over Current Trip Level Inverter Part | OC | $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$, $V_D = 15\text{V}$ | 115 | 161 | – | Amperes |
| Over Current Trip Level Brake Part | | | 39 | 53 | – | Amperes |
| Short Circuit Trip Level Inverter Part | SC | $-20^\circ\text{C} \leq T_j \leq 125^\circ\text{C}$, $V_D = 15\text{V}$ | – | 241 | – | Amperes |
| Short Circuit Trip Level Brake Part | | | – | 79 | – | Amperes |
| Over Current Delay Time | $t_{\text{off(OC)}}$ | $V_D = 15\text{V}$ | – | 10 | – | μs |
| Over Temperature Protection | OT | Trip Level | 100 | 110 | 120 | $^\circ\text{C}$ |
| | OT_r | Reset Level | – | 90 | – | $^\circ\text{C}$ |
| 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 | 15.0 | 16.5 | Volts |
| Circuit Current | I_D | $V_D = 15\text{V}$, $V_{CIN} = 15\text{V}$, $V_{N1}-V_{NC}$ | – | 44 | 60 | mA |
| | | $V_D = 15\text{V}$, $V_{CIN} = 15\text{V}$, $V_{XP1}-V_{XPC}$ | – | 13 | 18 | 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_{UPC} , V_P-V_{VPC} , W_P-V_{WPC} , $U_N \cdot V_N \cdot W_N \cdot B_r-V_{NC}$ | 1.7 | 2.0 | 2.3 | Volts |
| PWM Input Frequency | f_{PWM} | 3- ϕ Sinusoidal | 5 | 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 |

PM75RSK060

 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 | mA |
| | | $V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 125^\circ\text{C}$ | – | – | 10 | mA |
| FWDi Forward Voltage | V_{EC} | $-I_C = 75\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$ | – | 2.2 | 3.3 | Volts |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 75\text{A}, T_j = 25^\circ\text{C}$ | – | 1.8 | 2.7 | Volts |
| | | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 75\text{A}, T_j = 125^\circ\text{C}$ | – | 1.85 | 2.78 | Volts |
| Inductive Load Switching Times | t_{on} | | 0.4 | 0.8 | 2.0 | μs |
| | t_{rr} | $V_D = 15\text{V}, V_{CIN} = 0 \leftrightarrow 15\text{V}$ | – | 0.15 | 0.3 | μs |
| | $t_{C(on)}$ | $V_{CC} = 300\text{V}, I_C = 75\text{A}$ | – | 0.4 | 1.0 | μs |
| | t_{off} | $T_j = 125^\circ\text{C}$, Inductive Load | – | 2.0 | 2.9 | μs |
| | $t_{C(off)}$ | | – | 0.5 | 1.0 | μs |

Brake Sector

| | | | | | | |
|--------------------------------------|---------------|--|---|-----|-----|-------|
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 30\text{A}, T_j = 25^\circ\text{C}$ | – | 1.8 | 2.7 | Volts |
| | | $V_D = 15\text{V}, V_{CIN} = 0\text{V}, I_C = 30\text{A}, T_j = 125^\circ\text{C}$ | – | 1.9 | 2.8 | Volts |
| FWDi Forward Voltage | V_{FM} | $I_F = 30\text{A}, V_D = 15\text{V}, V_{CIN} = 15\text{V}$ | – | 1.7 | 2.7 | Volts |
| Collector-Emitter Cutoff Current | I_{CES} | $V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 25^\circ\text{C}$ | – | – | 1 | mA |
| | | $V_{CE} = V_{CES}, V_D = 15\text{V}, T_j = 125^\circ\text{C}$ | – | – | 10 | mA |

Thermal Characteristics

| Characteristic | Symbol | Condition | Min. | Typ. | Max. | Units |
|-------------------------------------|----------------|--|------|------|-------|-----------------------|
| Junction to Case Thermal Resistance | $R_{th(j-c)Q}$ | Each Inverter IGBT | – | – | 1.0 | $^\circ\text{C/Watt}$ |
| | $R_{th(j-c)F}$ | Each Inverter FWDi | – | – | 0.95 | $^\circ\text{C/Watt}$ |
| | $R_{th(j-c)Q}$ | Each Brake IGBT | – | – | 1.66 | $^\circ\text{C/Watt}$ |
| | $R_{th(j-c)F}$ | Each Brake FWDi | – | – | 1.9 | $^\circ\text{C/Watt}$ |
| Contact Thermal Resistance | $R_{th(c-f)}$ | Case to Fin Per Module Thermal Grease Applied | – | – | 0.036 | $^\circ\text{C/Watt}$ |

Recommended Conditions for Use

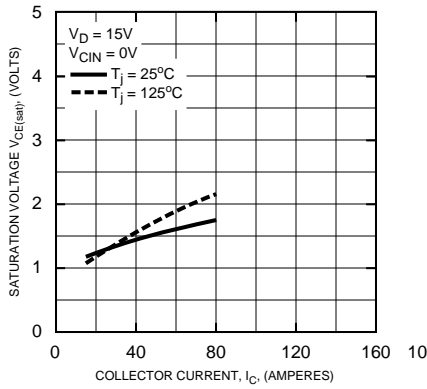
| Characteristic | Symbol | Condition | Value | Units |
|---------------------|----------------|--|----------------|---------------|
| Supply Voltage | V_{CC} | Applied across P-N Terminals | 0 ~ 400 | Volts |
| | V_D | Applied between V_{UP1} - V_{UPC} , V_{N1} - V_{NC} , V_{VP1} - V_{VPC} , V_{WP1} - V_{WPC} | 15 ± 1.5 | Volts |
| Input ON Voltage | $V_{CIN(on)}$ | Applied between | 0 ~ 0.8 | Volts |
| Input OFF Voltage | $V_{CIN(off)}$ | U_P - V_{UPC} , V_P - V_{VPC} , W_P - V_{WPC} , U_N · V_N · W_N · B_r - V_{NC} | $4.0 \sim V_D$ | Volts |
| PWM Input Frequency | f_{PWM} | Using Application Circuit | 5 ~ 20 | kHz |
| Minimum Dead Time | t_{dead} | Input Signal | ≥ 2.5 | μs |

PM75RSK060

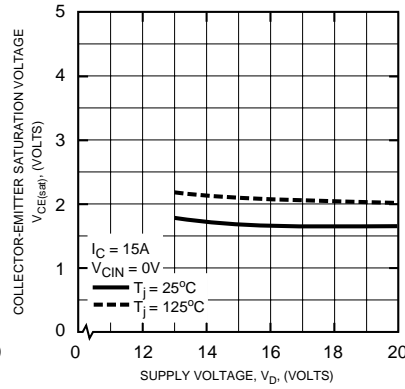
FLAT-BASE TYPE
INSULATED PACKAGE

Inverter Sector

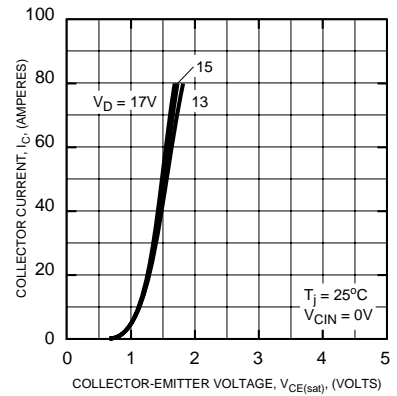
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



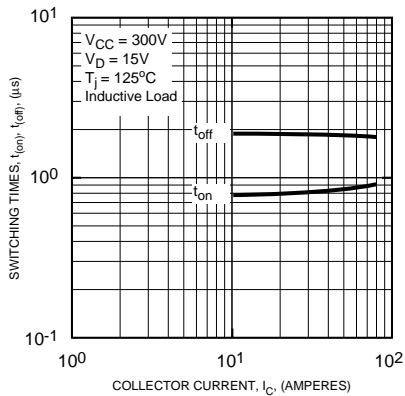
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



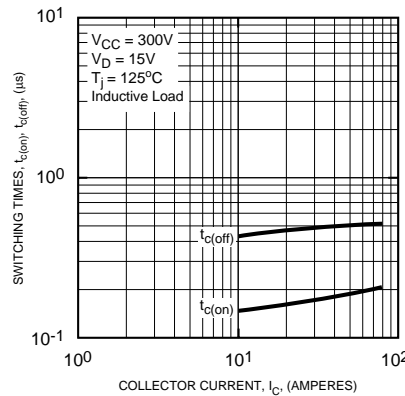
OUTPUT CHARACTERISTICS (TYPICAL)



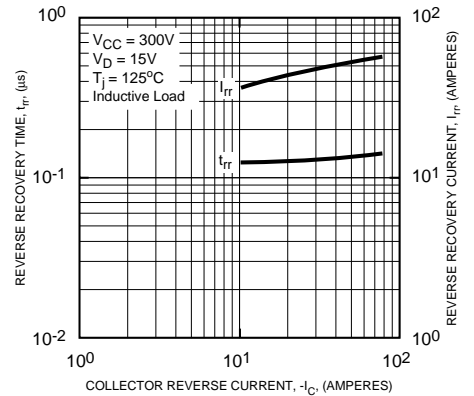
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



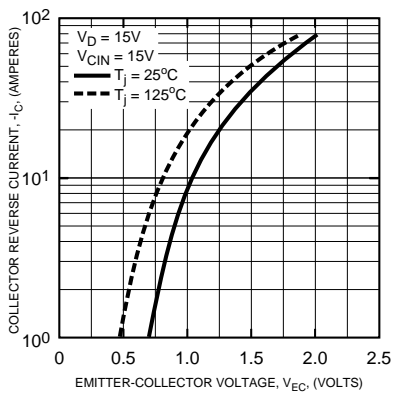
SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)



REVERSE RECOVERY CURRENT VS. COLLECTOR CURRENT (TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)

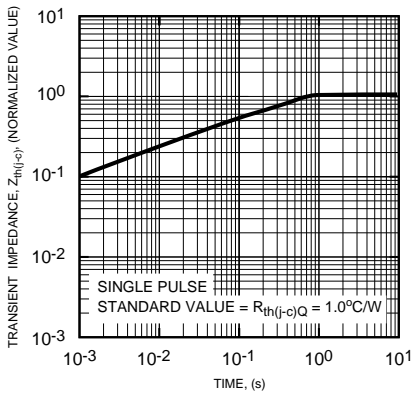


PM75RSK060

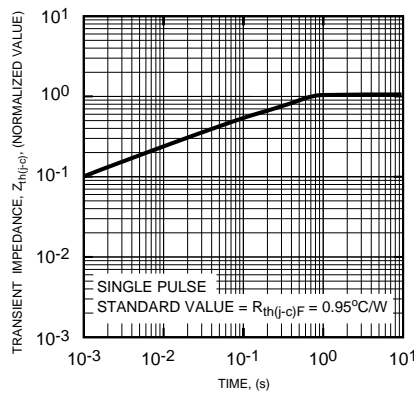
FLAT-BASE TYPE
INSULATED PACKAGE

Inverter Sector

TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each IGBT)

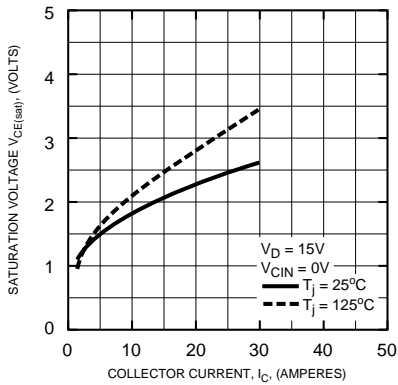


TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (Each FWD)

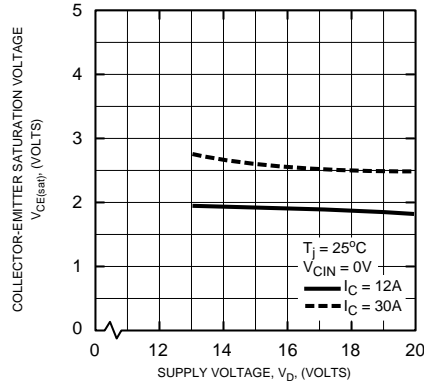


Brake Sector

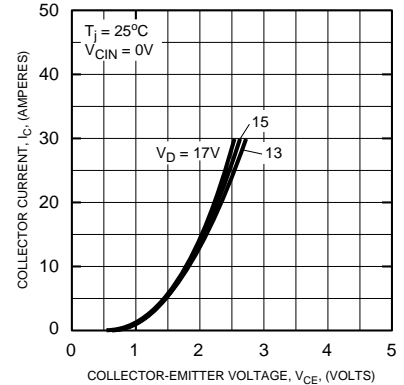
SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



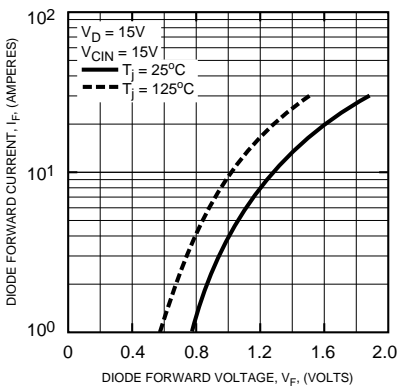
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



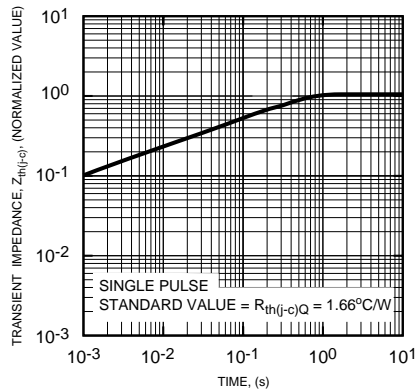
OUTPUT CHARACTERISTICS (TYPICAL)



DIODE FORWARD CHARACTERISTICS



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (FWD)

