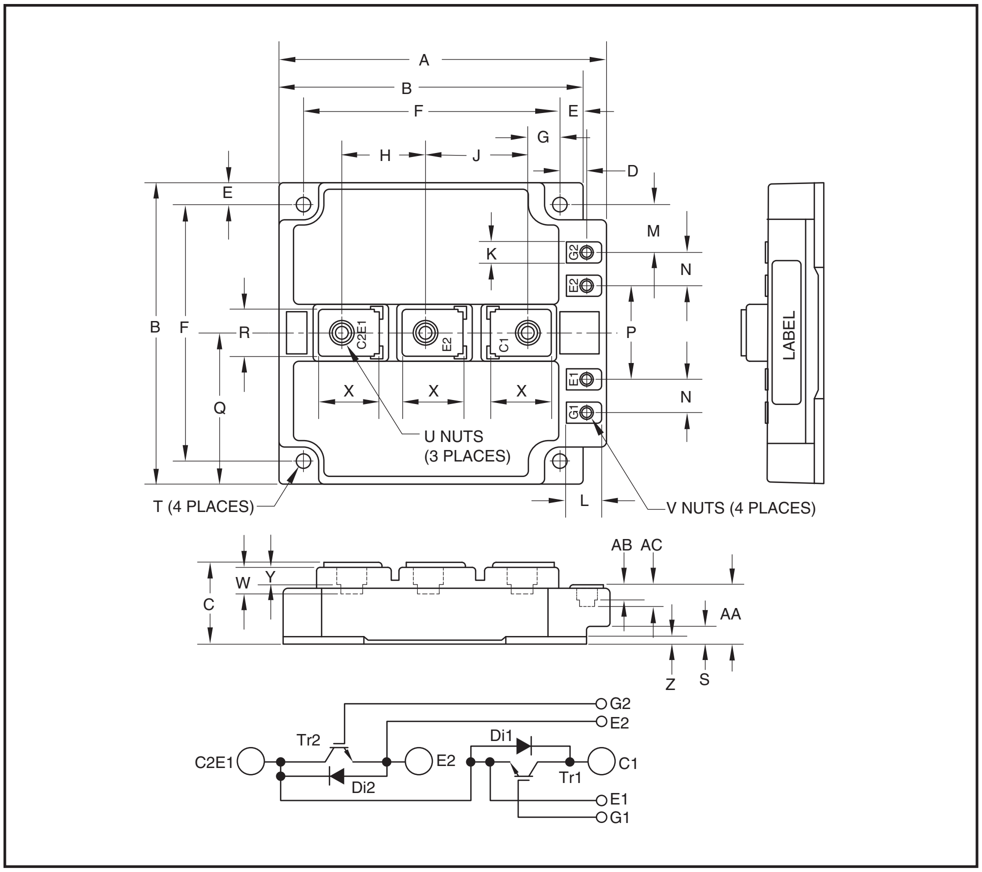
CM800DY-24S

*Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272*
www.pwrx.com

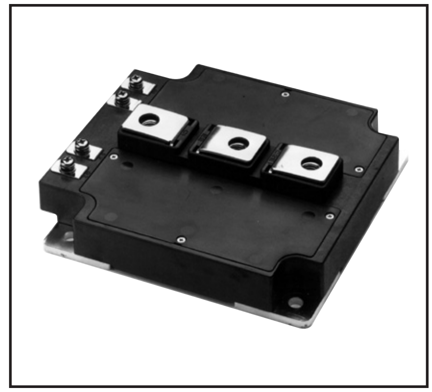
# Dual IGBT
# S-Series Module
## 800 Amperes/1200 Volts




**Outline Drawing and Circuit Diagram**

| Dimensions | Inches | Millimeters |
|---|---|---|
| A | 5.51 | 140.0 |
| B | 5.12 | 130.0 |
| C | 1.38+0.04/-0.02 | 35.0+1.0/-0.5 |
| D | 0.45 | 11.5 |
| E | 0.39 | 10.0 |
| F | 4.33±0.001 | 110.0±0.25 |
| G | 0.54 | 13.8 |
| H | 1.42 | 36.0 |
| J | 1.72 | 43.8 |
| K | 0.35 | 9.0 |
| L | 0.59 | 15.0 |
| M | 0.80 | 20.4 |
| N | 0.57 | 14.5 |
| P | 1.57 | 40.0 |

| Dimensions | Inches | Millimeters |
|---|---|---|
| Q | 2.56 | 65.0 |
| R | 0.79 | 20.0 |
| S | 0.32 | 8.0 |
| T | 0.26 Dia. | 6.5 Dia. |
| U | M8 Metric | M8 |
| V | M4 Metric | M4 |
| W | 0.51 | 13.0 |
| X | 1.02 | 26.0 |
| Y | 0.36 | 9.3 |
| Z | 0.16 | 4.0 |
| AA | 0.96+0.04/-0.02 | 24.5+1.0/-0.5 |
| AB | 0.15 | 3.9 |
| AC | 0.27 | 6.9 |



**Description:**
Powerex Dual IGBT Modules are designed for use in switching applications. Each module consists of two IGBT Transistors in a half-bridge configuration with each transistor having a reverse-connected super-fast recovery free-wheel diode. All components and interconnects are isolated from the heat sinking baseplate, offering simplified system assembly and thermal management.

**Features:**
- ☐ Low Drive Power
- ☐ Low $V_{CE(sat)}$
- ☐ Discrete Super-Fast Recovery Free-Wheel Diode
- ☐ Isolated Baseplate for Easy Heat Sinking

**Applications:**
- ☐ AC Motor Control
- ☐ Motion/Servo Control
- ☐ UPS
- ☐ Welding Power Supplies
- ☐ Laser Power Supplies

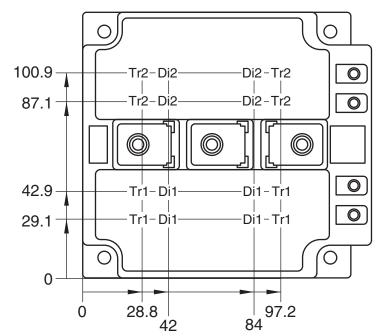
**Ordering Information:**
Example: Select the complete module number you desire from the table - i.e. CM800DY-24S is a 1200V ($V_{CES}$), 800 Ampere Dual IGBT Power Module.

| Type | Current Rating Amperes | $V_{CES}$ Volts (x 50) |
|---|---|---|
| CM | 800 | 24 |

## Absolute Maximum Ratings, $T_j$ = 25°C unless otherwise specified

| Characteristics | Symbol | Rating | Units |
|---|---|---|---|
| Collector-Emitter Voltage (G-E Short-Circuited) | $V_{CES}$ | 1200 | Volts |
| Gate-Emitter Voltage (C-E Short-Circuited) | $V_{GES}$ | ±20 | Volts |
| Collector Current (DC, $T_C$ = 117°C)*2,*4 | $I_C$ | 790 | Amperes |
| Collector Current (Pulse, Repetitive)*3 | $I_{CRM}$ | 1600 | Amperes |
| Total Power Dissipation ($T_C$ = 25°C)*2,*4 | $P_{tot}$ | 5355 | Watts |
| Emitter Current*2 | $I_E$*1 | 790 | Amperes |
| Emitter Current (Pulse, Repetitive)*3 | $I_{ERM}$*1 | 1600 | Amperes |
| Isolation Voltage (Terminals to Baseplate, RMS, f = 60Hz, AC 1 minute) | $V_{ISO}$ | 2500 | Volts |
| Maximum Junction Temperature, Instantaneous Event (Overload) | $T_{j(max)}$ | 175 | °C |
| Case Temperature*4 | $T_{C(max)}$ | 125 | °C |
| Operating Junction Temperature, Continuous Operation (Under Switching) | $T_{j(opr)}$ | -40 ~ +150 | °C |
| Storage Temperature | $T_{stg}$ | -40 ~ +125 | °C |

*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).
*2 Junction temperature ($T_j$) should not increase beyond maximum junction temperature ($T_{j(max)}$) rating.
*3 Pulse width and repetition rate should be such that device junction temperature ($T_j$) does not exceed $T_{j(max)}$ rating.
*4 Case temperature ($T_C$) and heatsink temperature ($T_s$) is measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips. Refer to the figure to the right for chip location. The heatsink thermal resistance should be measured just under the chips.



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***CM800DY-24S***
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## Electrical Characteristics, $T_j$ = 25°C unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Collector-Emitter Cutoff Current | $I_{CES}$ | $V_{CE} = V_{CES}$, G-E Short-Circuited | — | — | 1.0 | mA |
| Gate-Emitter Leakage Current | $I_{GES}$ | $V_{GE} = V_{GES}$, C-E Short-Circuited | — | — | 0.5 | µA |
| Gate-Emitter Threshold Voltage | $V_{GE(th)}$ | $I_C$ = 80mA, $V_{CE}$ = 10V | 5.4 | 6.0 | 6.6 | Volts |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ (Terminal) | $I_C$ = 800A, $V_{GE}$ = 15V, $T_j$ = 25°C*5 | — | 1.95 | 2.40 | Volts |
| | | $I_C$ = 800A, $V_{GE}$ = 15V, $T_j$ = 125°C*5 | — | 2.25 | — | Volts |
| | | $I_C$ = 800A, $V_{GE}$ = 15V, $T_j$ = 150°C*5 | — | 2.35 | — | Volts |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ (Chip) | $I_C$ = 800A, $V_{GE}$ = 15V, $T_j$ = 25°C*5 | — | 1.70 | 2.15 | Volts |
| | | $I_C$ = 800A, $V_{GE}$ = 15V, $T_j$ = 125°C*5 | — | 1.90 | — | Volts |
| | | $I_C$ = 800A, $V_{GE}$ = 15V, $T_j$ = 150°C*5 | — | 1.95 | — | Volts |
| Input Capacitance | $C_{ies}$ | $V_{CE}$ = 10V, G-E Short-Circuited | — | — | 80 | nF |
| Output Capacitance | $C_{oes}$ | | — | — | 16 | nF |
| Reverse Transfer Capacitance | $C_{res}$ | | — | — | 1.32 | nF |
| Gate Charge | $Q_G$ | $V_{CC}$ = 600V, $I_C$ = 800A, $V_{GE}$ = 15V | — | 1868 | — | nC |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{CC}$ = 600V, $I_C$ = 800A, $V_{GE}$ = ±15V, $R_G$ = 0Ω, Inductive Load | — | — | 800 | ns |
| Rise Time | $t_r$ | | — | — | 200 | ns |
| Turn-off Delay Time | $t_{d(off)}$ | | — | — | 600 | ns |
| Fall Time | $t_f$ | | — | — | 300 | ns |
| Emitter-Collector Voltage | $V_{EC}$*1 (Terminal) | $I_E$ = 800A, $V_{GE}$ = 0V, $T_j$ = 25°C*5 | — | 1.85 | 2.30 | Volts |
| | | $I_E$ = 800A, $V_{GE}$ = 0V, $T_j$ = 125°C*5 | — | 1.85 | — | Volts |
| | | $I_E$ = 800A, $V_{GE}$ = 0V, $T_j$ = 150°C*5 | — | 1.85 | — | Volts |
| Emitter-Collector Voltage | $V_{EC}$*1 (Chip) | $I_E$ = 800A, $V_{GE}$ = 0V, $T_j$ = 25°C*5 | — | 1.70 | 2.15 | Volts |
| | | $I_E$ = 800A, $V_{GE}$ = 0V, $T_j$ = 125°C*5 | — | 1.70 | — | Volts |
| | | $I_E$ = 800A, $V_{GE}$ = 0V, $T_j$ = 150°C*5 | — | 1.70 | — | Volts |
| Reverse Recovery Time | $t_{rr}$*1 | $V_{CC}$ = 600V, $I_E$ = 800A, $V_{GE}$ = ±15V | — | — | 300 | ns |
| Reverse Recovery Charge | $Q_{rr}$*1 | $R_G$ = 0Ω, Inductive Load | — | 42.8 | — | µC |
| Turn-on Switching Energy per Pulse | $E_{on}$ | $V_{CC}$ = 600V, $I_C = I_E$ = 800A, | — | 107 | — | mJ |
| Turn-off Switching Energy per Pulse | $E_{off}$ | $V_{GE}$ = ±15V, $R_G$ = 0Ω, | — | 82 | — | mJ |
| Reverse Recovery Energy per Pulse | $E_{rr}$*1 | $T_j$ = 150°C, Inductive Load | — | 71 | — | mJ |
| Internal Lead Resistance | $R_{CC' + EE'}$ | Main Terminals-Chip, Per Switch, $T_C$ = 25°C*2 | — | — | 0.4 | mΩ |
| Internal Gate Resistance | $r_g$ | Per Switch | — | 2.45 | — | Ω |

*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).
*5 Pulse width and repetition rate should be such as to cause negligible temperature rise.

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## Thermal Resistance Characteristics, $T_j$ = 25°C unless otherwise specified

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Thermal Resistance, Junction to Case*4 | $R_{th(j-c)}Q$ | Per IGBT | — | — | 28 | K/kW |
| Thermal Resistance, Junction to Case*4 | $R_{th(j-c)}D$ | Per IFWDi | — | — | 45 | K/kW |
| Contact Thermal Resistance, Case to Heatsink*4 | $R_{th(c-s)}$ | Thermal Grease Applied (Per 1/2 Module)*6 | — | 15 | — | K/kW |

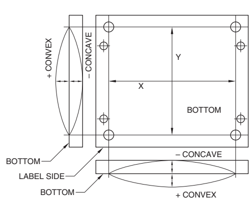
## Mechanical Characteristics

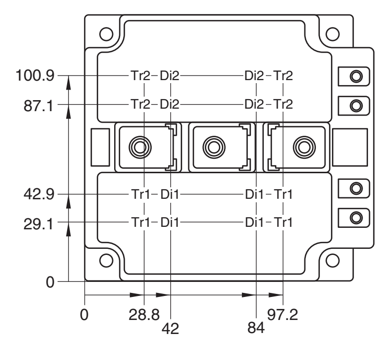
| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Mounting Torque | $M_t$ | Main Terminals, M8 Screw | 78 | 85 | 95 | in-lb |
| | $M_t$ | Auxiliary G/Es Terminals, M4 Screw | 11 | 13 | 15 | in-lb |
| | $M_s$ | Mounting to Heatsink, M6 Screw | 31 | 35 | 40 | in-lb |
| Weight | m | | — | 1200 | — | Grams |
| Flatness of Baseplate | $e_c$ | On Centerline X, Y*7 | -100 | — | +100 | µm |

## Recommended Operating Conditions, $T_a$ = 25°C

| Characteristics | Symbol | Test Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| (DC) Supply Voltage | $V_{CC}$ | Applied Across C1-E2 | — | 600 | 850 | Volts |
| Gate (-Emitter Drive) Voltage | $V_{GE(on)}$ | Applied Across G1-Es1 / G2-Es2 | 13.5 | 15.0 | 16.5 | Volts |
| External Gate Resistance | $R_G$ | Per Switch | 0 | — | 5.1 | Ω |

*4 Case temperature ($T_C$) and heatsink temperature ($T_s$) is measured on the surface (mounting side) of the baseplate and the heatsink side just under the chips. Refer to the figure to the right for chip location. The heatsink thermal resistance should be measured just under the chips.
*6 Typical value is measured by using thermally conductive grease of $\lambda$ = 0.9 [W/(m • K)].
*7 Baseplate (mounting side) flatness measurement points (X, Y) are shown in the figure below.



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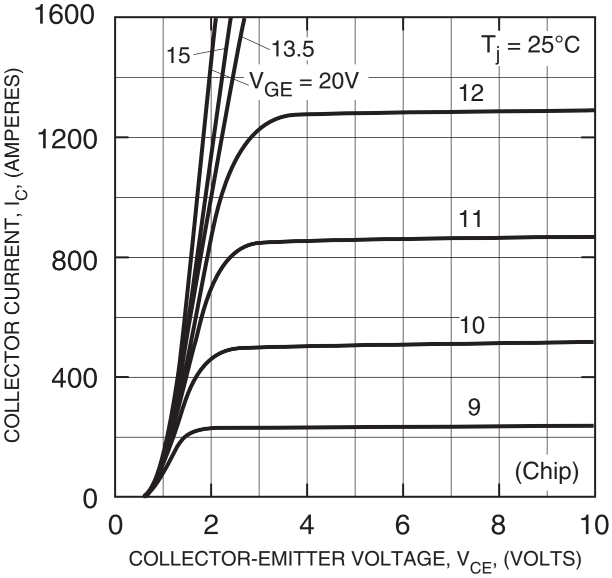
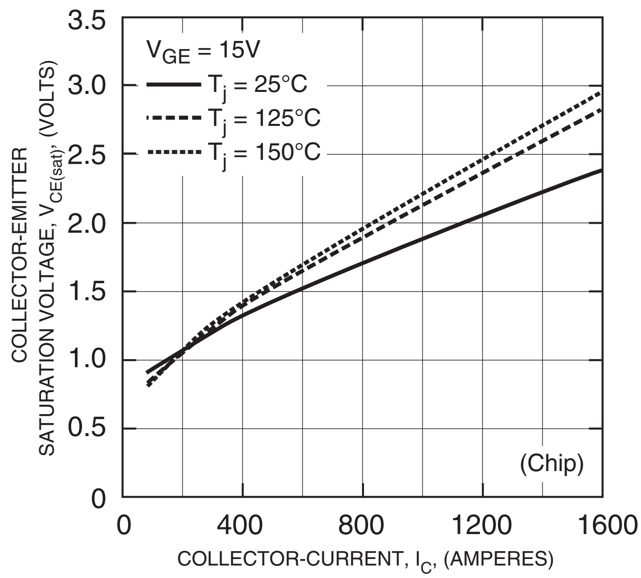
**OUTPUT CHARACTERISTICS (TYPICAL)**




**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)**

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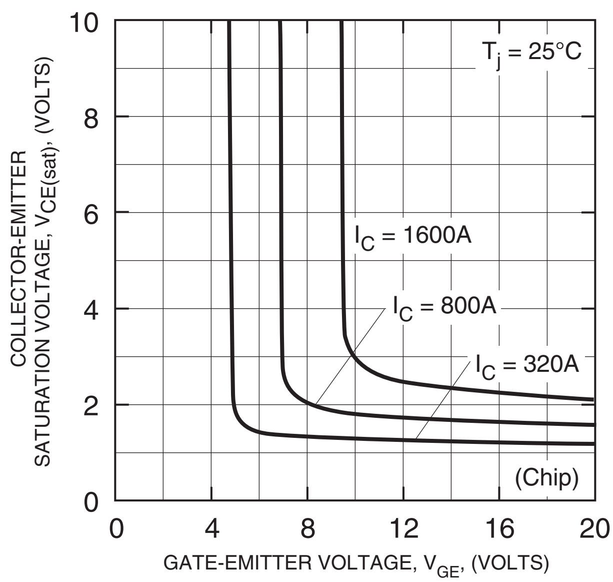
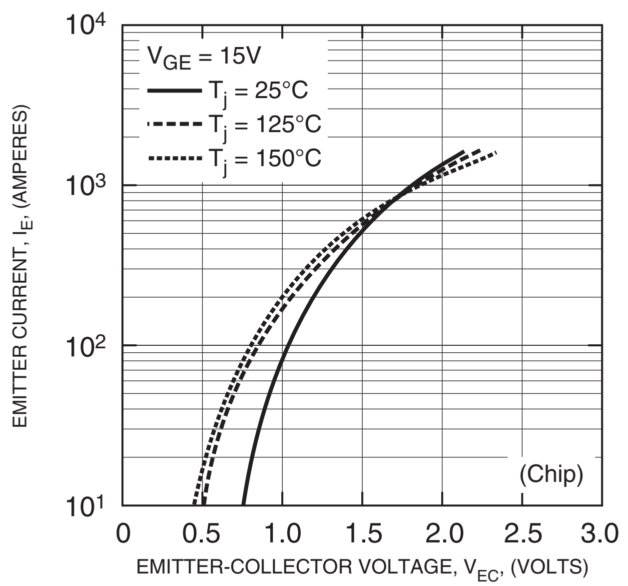



**FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)**



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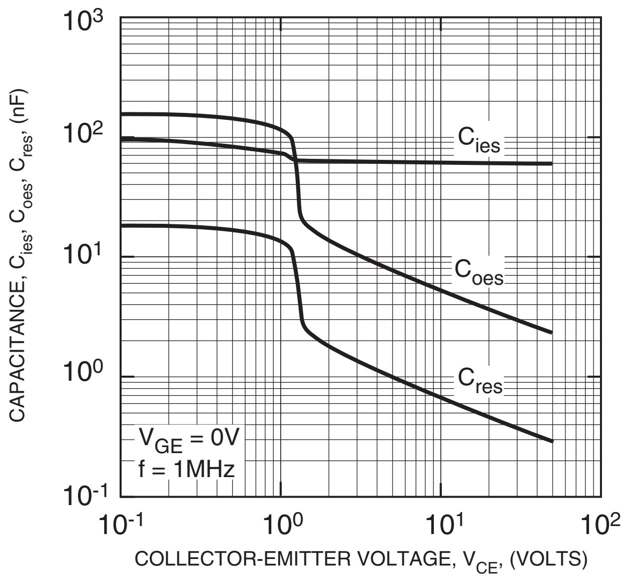
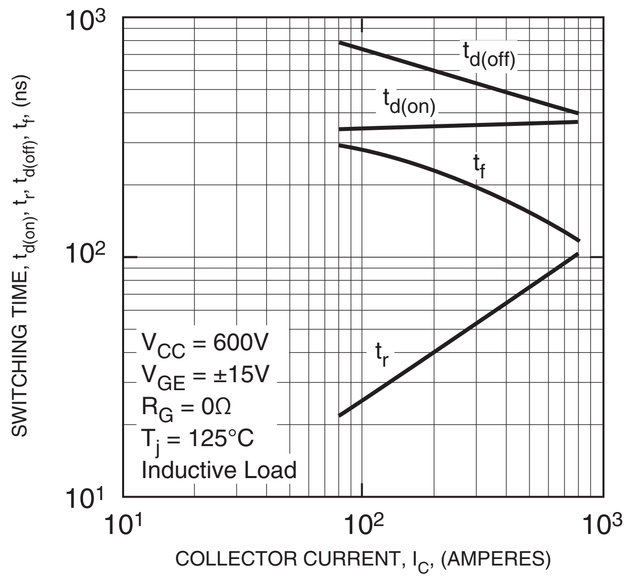
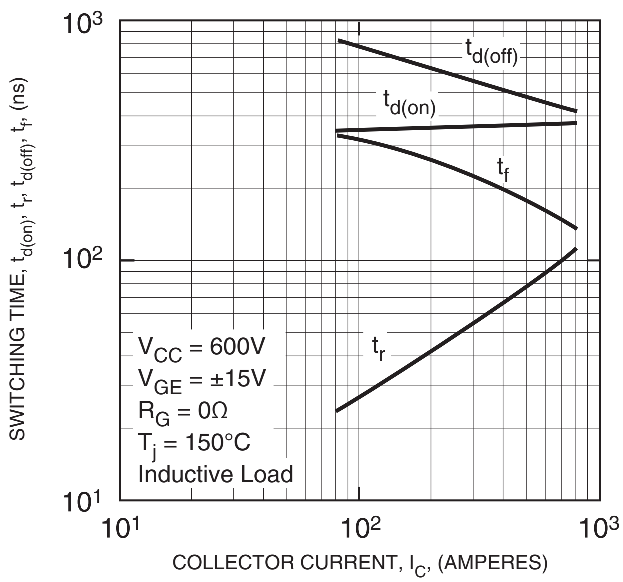
**CAPACITANCE VS. $V_{CE}$ (TYPICAL)**



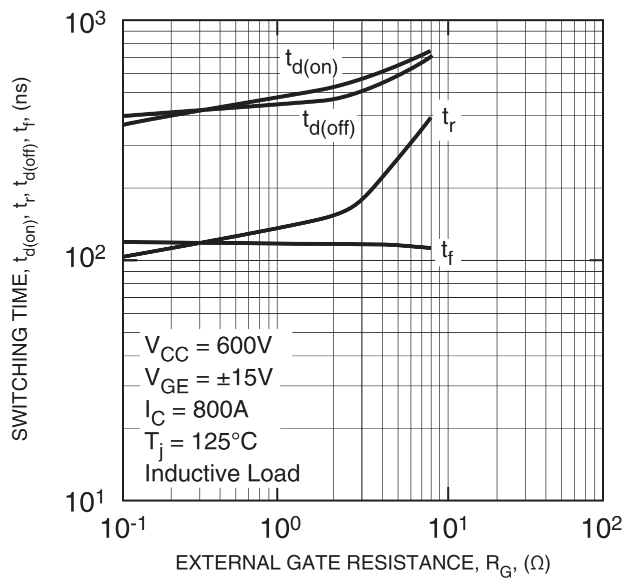

**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**




**SWITCHING TIME VS. COLLECTOR CURRENT (TYPICAL)**




**SWITCHING TIME VS. GATE RESISTANCE (TYPICAL)**



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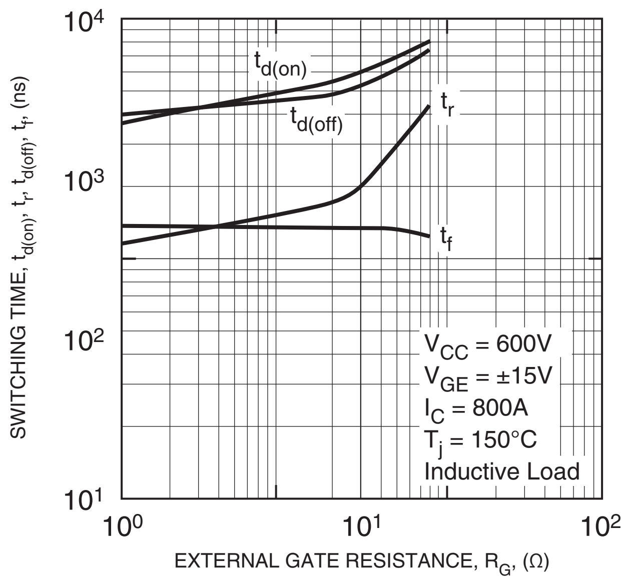
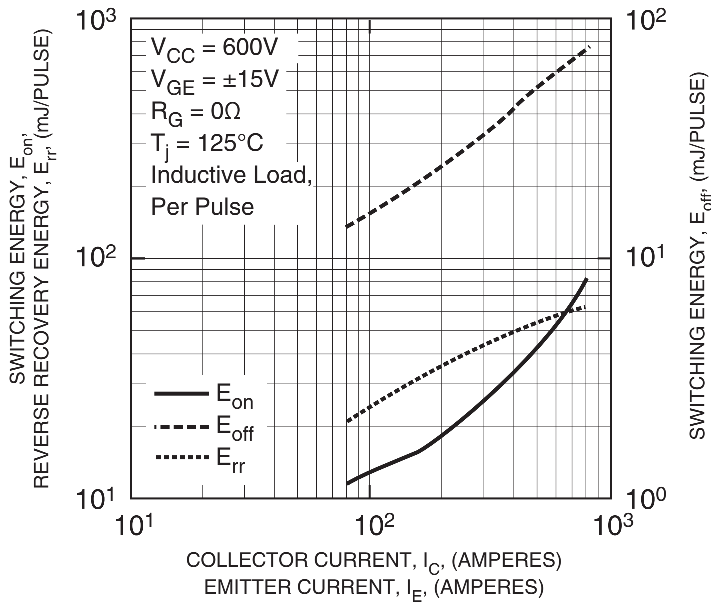
### SWITCHING TIME VS. GATE RESISTANCE (TYPICAL)




### SWITCHING LOSS VS. COLLECTOR CURRENT (TYPICAL)

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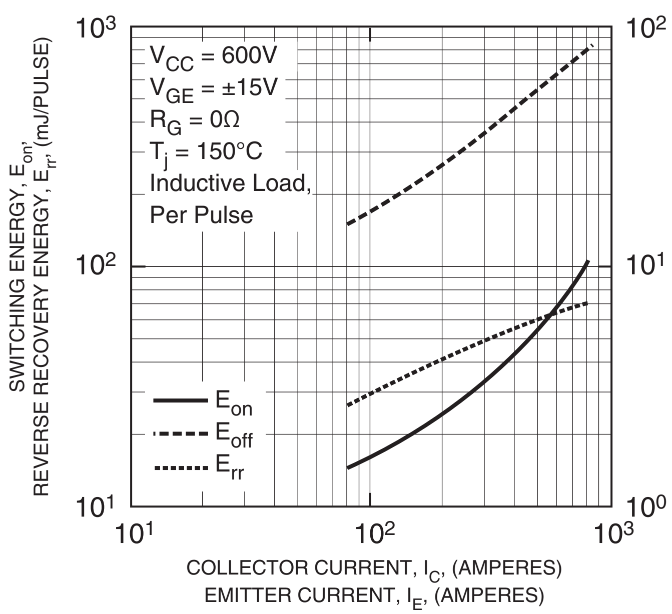
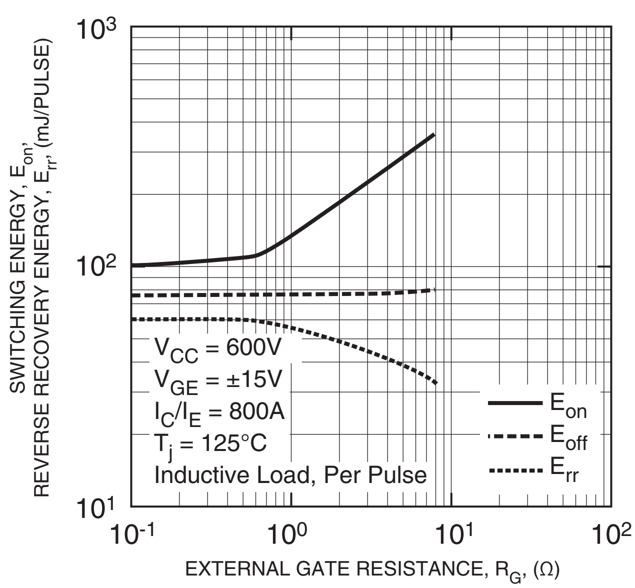
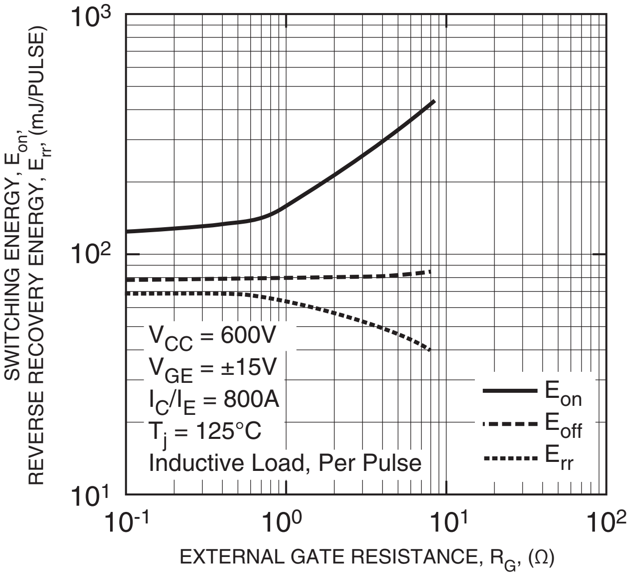


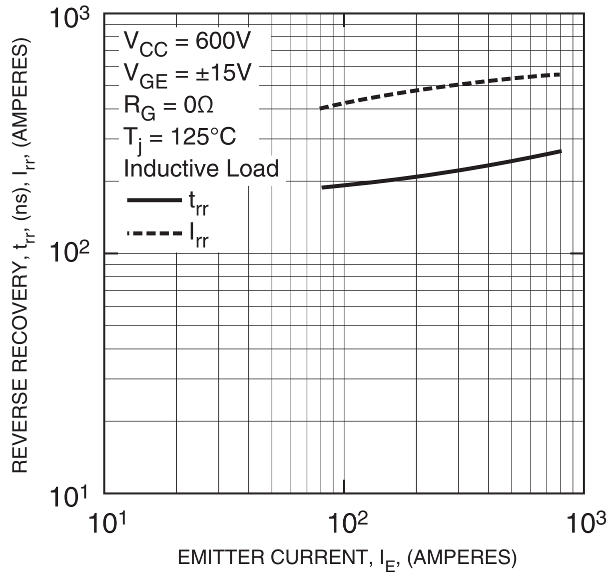

### SWITCHING LOSS VS. GATE RESISTANCE (TYPICAL)



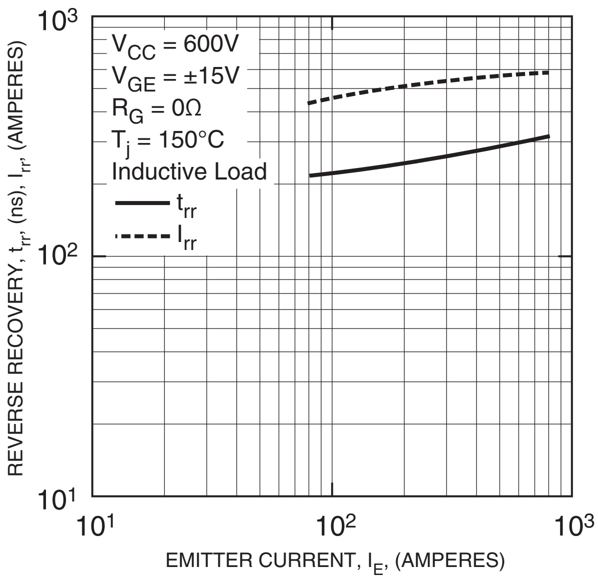
**SWITCHING LOSS VS. GATE RESISTANCE (TYPICAL)**



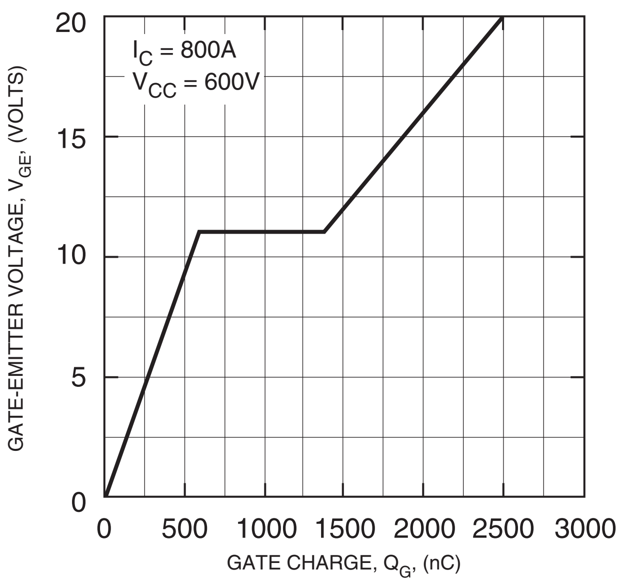

**REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**




**REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**




**GATE CHARGE, $V_{GE}$**



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