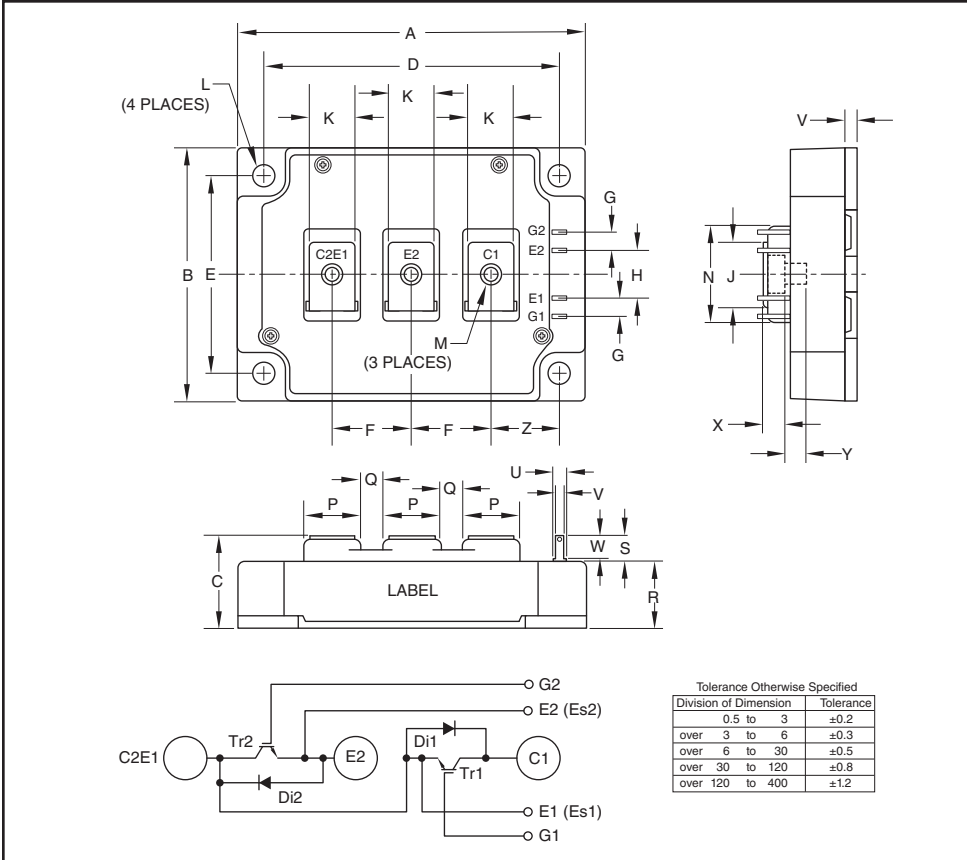


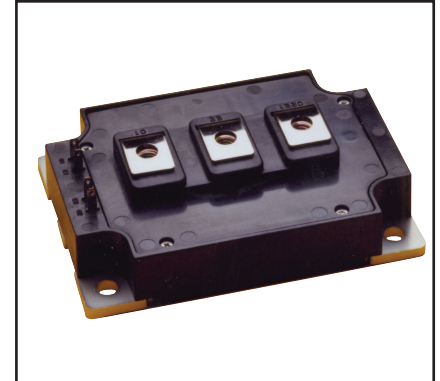
**Dual IGBT**  
**S-Series Module**  
**600 Amperes/1200 Volts**



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.33	110.0
B	3.15	80.0
C	1.14+0.04/-0.02	29.0+1.0/-0.5
D	3.66±0.01	93.0±0.25
E	2.44±0.01	62.0±0.25
F	0.98	25.0
G	0.24	6.0
H	0.59	15.0
J	0.81	20.5
K	0.55	14.0
L	0.26 Dia.	6.5 Dia.
M	M6 Metric	M6

Dimensions	Inches	Millimeters
N	1.18	30.0
P	0.71	18.0
Q	0.28	7.0
R	0.83	21.2
S	0.33	8.5
T	0.016	0.4
U	0.16	4.0
V	0.11	2.8
W	0.30	7.5
X	0.21	6.3
Y	0.47	12.0
Z	0.85	21.5



**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. CM600DY-24S is a 1200V ( $V_{CES}$ ), 600 Ampere Dual IGBT Power Module.

Type	Current Rating Amperes	$V_{CES}$ Volts (x 50)
CM	600	24

**CM600DY-24S**  
**Dual IGBT S-Series Module**  
 600 Amperes/1200 Volts

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

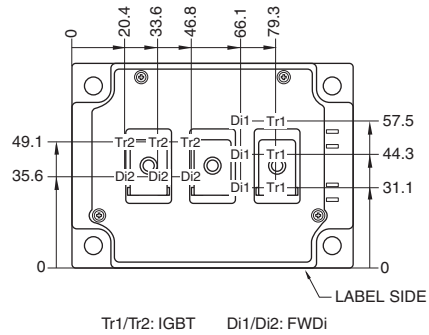
Characteristics	Symbol	Rating	Units
Collector-Emitter Voltage (G-E Short-Circuited)	$V_{CES}$	1200	Volts
Gate-Emitter Voltage (C-E Short-Circuited)	$V_{GES}$	$\pm 20$	Volts
Collector Current (DC, $T_C = 112^\circ\text{C}$ ) <sup>*2,*4</sup>	$I_C$	600	Amperes
Collector Current (Pulse, Repetitive) <sup>*3</sup>	$I_{CRM}$	1200	Amperes
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ ) <sup>*2,*4</sup>	$P_{tot}$	4050	Watts
Emitter Current <sup>*2</sup>	$I_E^{*1}$	600	Amperes
Emitter Current (Pulse, Repetitive) <sup>*3</sup>	$I_{ERM}^{*1}$	1200	Amperes
Isolation Voltage (Terminals to Baseplate, RMS, f = 60Hz, AC 1 minute)	$V_{ISO}$	2500	Volts
Maximum Junction Temperature	$T_{j(max)}$	175	$^\circ\text{C}$
Maximum Case Temperature <sup>*4</sup>	$T_{C(max)}$	125	$^\circ\text{C}$
Operating Junction Temperature (Under Switching)	$T_{j(opr)}$	-40 to +150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-40 to +125	$^\circ\text{C}$

\*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.



**CM600DY-24S**  
**Dual IGBT S-Series Module**  
 600 Amperes/1200 Volts

**Electrical Characteristics,  $T_j = 25^\circ\text{C}$  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	mA
Gate-Emitter Leakage Current	$I_{GES}$	$V_{GE} = V_{GES}$ , C-E Short-Circuited	—	—	5	$\mu\text{A}$
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 60\text{mA}$ , $V_{CE} = 10\text{V}$	5.4	6	6.6	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$ (Terminal)	$I_C = 600\text{A}$ , $V_{GE} = 15\text{V}$ , $T_j = 25^\circ\text{C}^{*5}$	—	1.85	2.25	Volts
		$I_C = 600\text{A}$ , $V_{GE} = 15\text{V}$ , $T_j = 125^\circ\text{C}^{*5}$	—	2.05	—	Volts
		$I_C = 600\text{A}$ , $V_{GE} = 15\text{V}$ , $T_j = 150^\circ\text{C}^{*5}$	—	2.10	—	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$ (Chip)	$I_C = 600\text{A}$ , $V_{GE} = 15\text{V}$ , $T_j = 25^\circ\text{C}^{*5}$	—	1.70	2.15	Volts
		$I_C = 600\text{A}$ , $V_{GE} = 15\text{V}$ , $T_j = 125^\circ\text{C}^{*5}$	—	1.90	—	Volts
		$I_C = 600\text{A}$ , $V_{GE} = 15\text{V}$ , $T_j = 150^\circ\text{C}^{*5}$	—	1.95	—	Volts
Input Capacitance	$C_{ies}$		—	—	60	nF
Output Capacitance	$C_{oes}$	$V_{CE} = 10\text{V}$ , G-E Short-Circuited	—	—	12	nF
Reverse Transfer Capacitance	$C_{res}$		—	—	1.0	nF
Gate Charge	$Q_G$	$V_{CC} = 600\text{V}$ , $I_C = 600\text{A}$ , $V_{GE} = 15\text{V}$	—	1400	—	nC
Turn-on Delay Time	$t_{d(on)}$		—	—	800	ns
Rise Time	$t_r$	$V_{CC} = 600\text{V}$ , $I_C = 600\text{A}$ , $V_{GE} = \pm 15\text{V}$ ,	—	—	200	ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 0\Omega$ , Inductive Load	—	—	600	ns
Fall Time	$t_f$		—	—	300	ns
Emitter-Collector Voltage	$V_{EC}^{*1}$ (Terminal)	$I_E = 600\text{A}$ , $V_{GE} = 0\text{V}$ , $T_j = 25^\circ\text{C}^{*5}$	—	1.85	2.30	Volts
		$I_E = 600\text{A}$ , $V_{GE} = 0\text{V}$ , $T_j = 125^\circ\text{C}^{*5}$	—	1.85	—	Volts
		$I_E = 600\text{A}$ , $V_{GE} = 0\text{V}$ , $T_j = 150^\circ\text{C}^{*5}$	—	1.85	—	Volts
Emitter-Collector Voltage	$V_{EC}^{*1}$ (Chip)	$I_E = 600\text{A}$ , $V_{GE} = 0\text{V}$ , $T_j = 25^\circ\text{C}^{*5}$	—	1.70	2.15	Volts
		$I_E = 600\text{A}$ , $V_{GE} = 0\text{V}$ , $T_j = 125^\circ\text{C}^{*5}$	—	1.70	—	Volts
		$I_E = 600\text{A}$ , $V_{GE} = 0\text{V}$ , $T_j = 150^\circ\text{C}^{*5}$	—	1.70	—	Volts
Reverse Recovery Time	$t_{rr}^{*1}$	$V_{CC} = 600\text{V}$ , $I_E = 600\text{A}$ , $V_{GE} = \pm 15\text{V}$	—	—	300	ns
Reverse Recovery Charge	$Q_{rr}^{*1}$	$R_G = 0\Omega$ , Inductive Load	—	32	—	$\mu\text{C}$
Turn-on Switching Energy per Pulse	$E_{on}$	$V_{CC} = 600\text{V}$ , $I_C = I_E = 600\text{A}$ ,	—	65.9	—	mJ
Turn-off Switching Energy per Pulse	$E_{off}$	$V_{GE} = \pm 15\text{V}$ , $R_G = 0\Omega$ ,	—	79.1	—	mJ
Reverse Recovery Energy per Pulse	$E_{rr}^{*1}$	$T_j = 150^\circ\text{C}$ , Inductive Load	—	55.2	—	mJ
Internal Gate Resistance	$r_g$	Per Switch	—	3.3	—	$\Omega$

\*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.

**CM600DY-24S**  
**Dual IGBT S-Series Module**  
 600 Amperes/1200 Volts

**Thermal Resistance Characteristics,  $T_j = 25^\circ\text{C}$  unless otherwise specified**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case <sup>*4</sup>	$R_{th(j-c)Q}$	Per IGBT	—	—	37	K/kW
Thermal Resistance, Junction to Case <sup>*4</sup>	$R_{th(j-c)D}$	Per IFWDi	—	—	60	K/kW
Contact Thermal Resistance, Case to Heatsink <sup>*4</sup>	$R_{th(c-s)}$	Thermal Grease Applied (Per 1/2 Module) <sup>*6</sup>	—	18	—	K/kW

**Mechanical Characteristics**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Mounting Torque	$M_t$	Main Terminals, M6 Screw	31	35	40	in-lb
	$M_s$	Mounting to Heatsink, M6 Screw	31	35	40	in-lb
Weight	m		—	580	—	Grams
Flatness of Baseplate	$e_c$	On Centerline X, Y <sup>*7</sup>	-100	—	+100	$\mu\text{m}$

**Recommended Operating Conditions,  $T_a = 25^\circ\text{C}$**

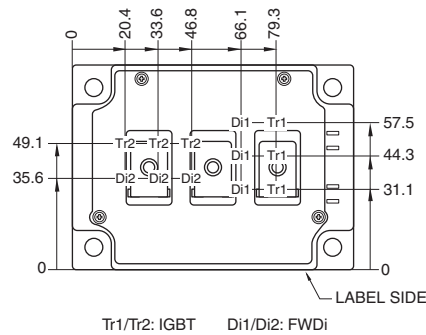
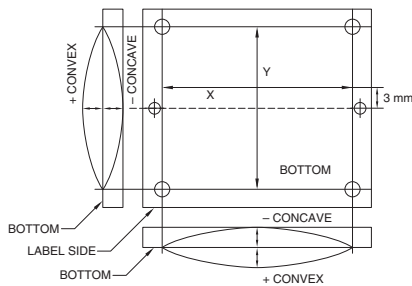
Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
(DC) Supply Voltage	$V_{CC}$	Applied Across C1-E2	—	600	850	Volts
Gate (-Emitter Drive) Voltage	$V_{GE(on)}$	Applied Across G1-Es1 / G2-Es2	13.5	15.0	16.5	Volts
External Gate Resistance	$R_G$	Per Switch	0	—	7.5	$\Omega$

\*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.

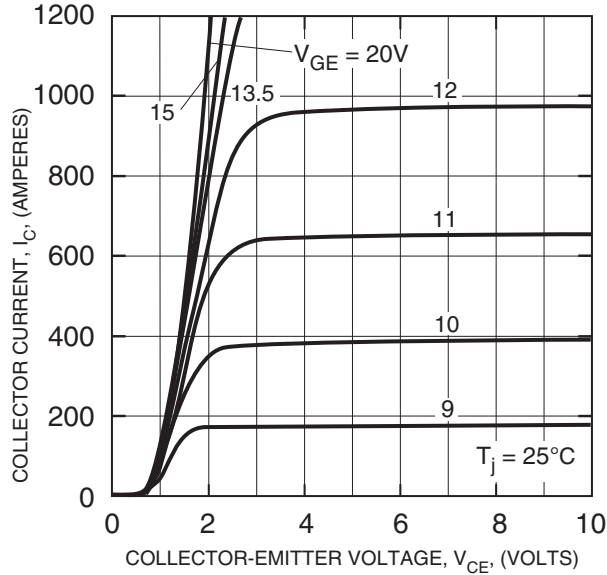
\*6 Typical value is measured by using thermally conductive grease of  $\lambda = 0.9 \text{ [W/(m} \cdot \text{K)]}$ .

\*7 Baseplate (mounting side) flatness measurement points (X, Y) are shown in the figure below.

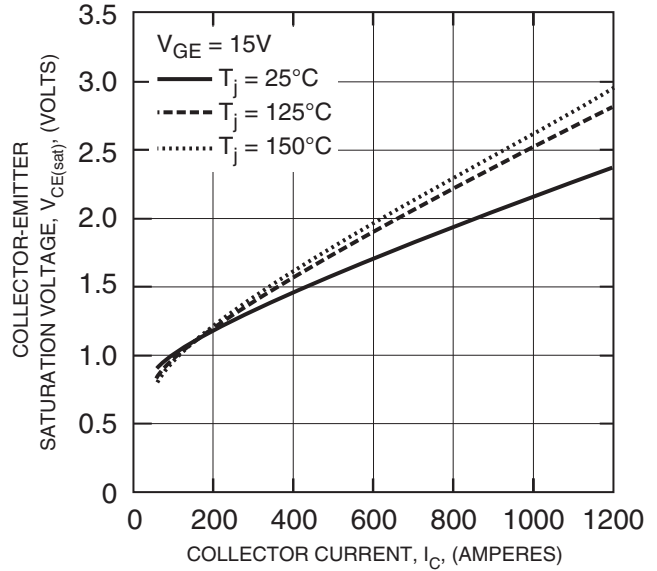


**CM600DY-24S**  
**Dual IGBT S-Series Module**  
 600 Amperes/1200 Volts

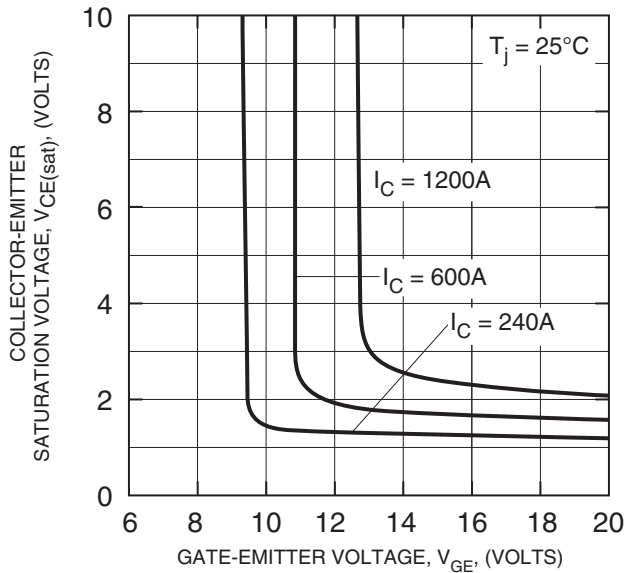
**OUTPUT CHARACTERISTICS**  
(CHIP - TYPICAL)



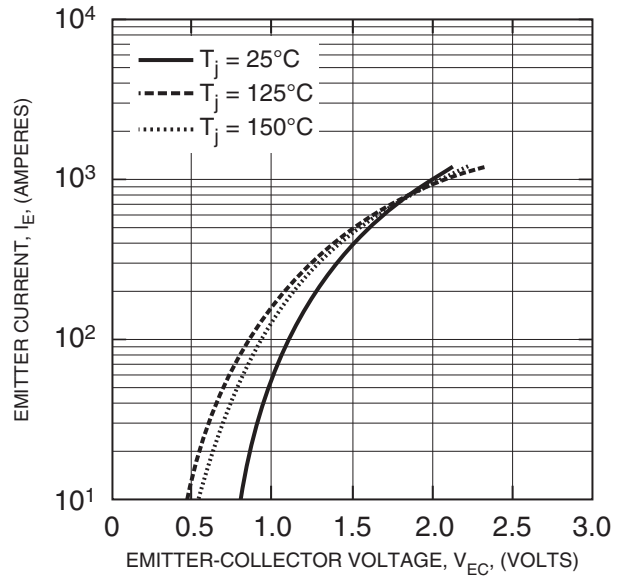
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS**  
(CHIP - TYPICAL)



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

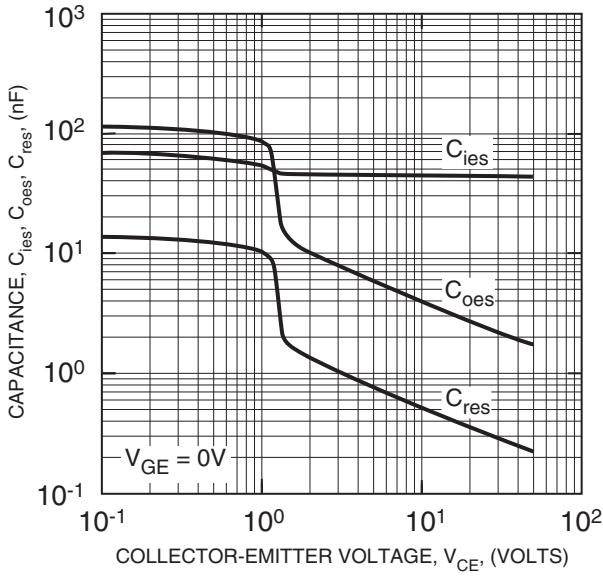


**FREE-WHEEL DIODE FORWARD CHARACTERISTICS**  
(CHIP - TYPICAL)

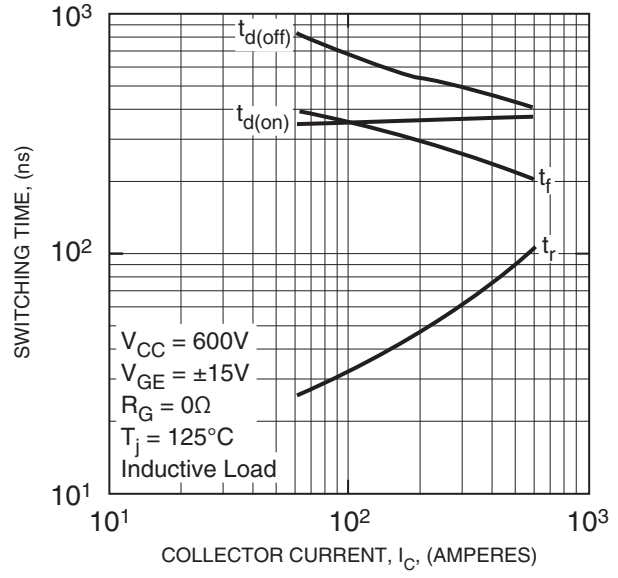


**CM600DY-24S**  
**Dual IGBT S-Series Module**  
 600 Amperes/1200 Volts

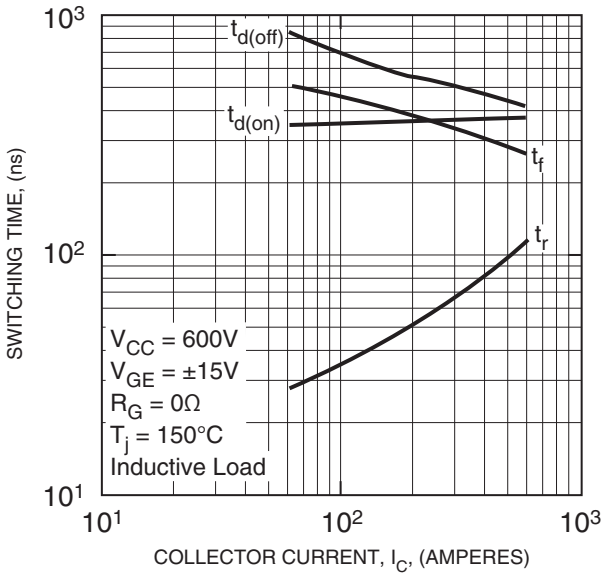
**CAPACITANCE VS.  $V_{CE}$**   
(TYPICAL)



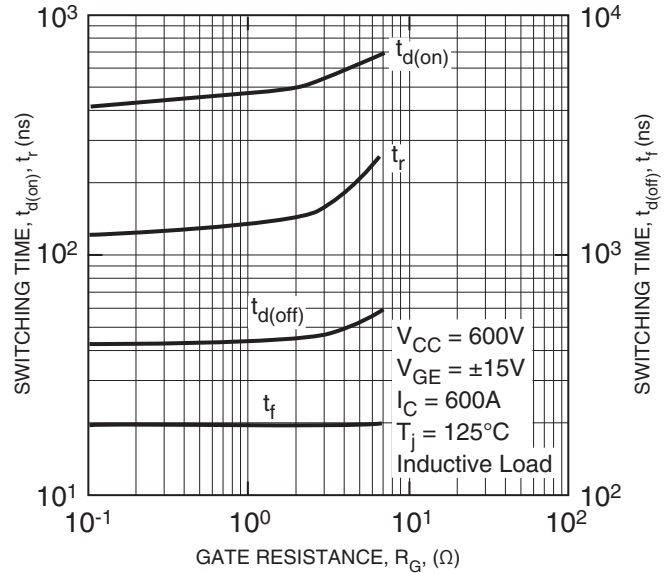
**HALF-BRIDGE SWITCHING CHARACTERISTICS**  
(TYPICAL)



**HALF-BRIDGE SWITCHING CHARACTERISTICS**  
(TYPICAL)

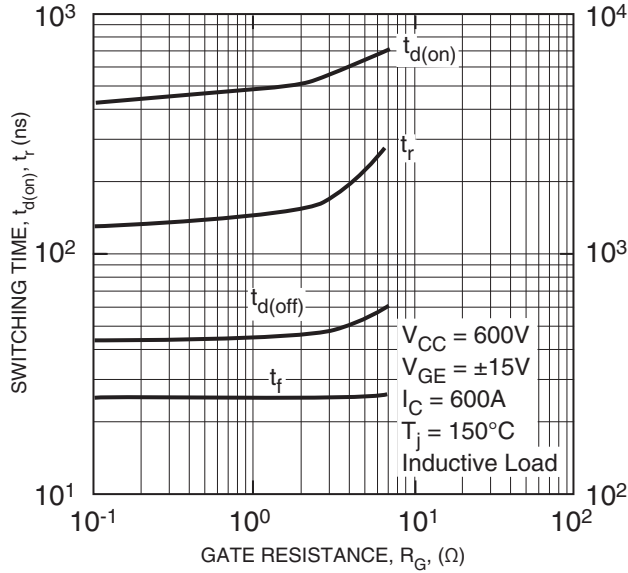


**SWITCHING TIME VS. GATE RESISTANCE**  
(TYPICAL)

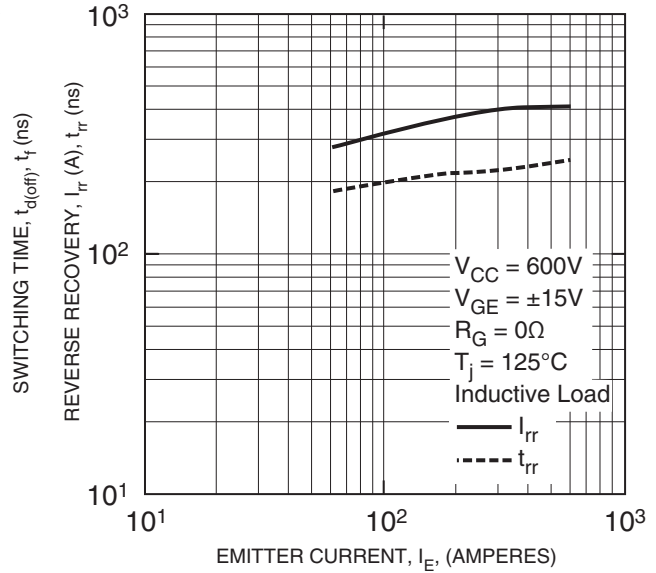


**CM600DY-24S**  
**Dual IGBT S-Series Module**  
 600 Amperes/1200 Volts

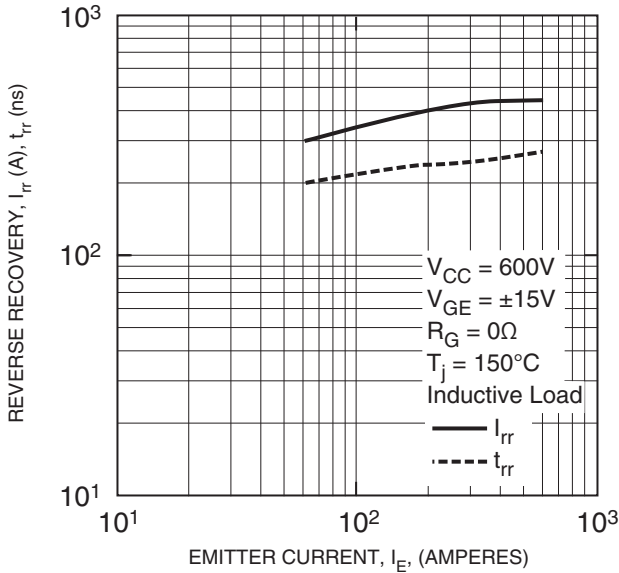
**SWITCHING TIME VS. GATE RESISTANCE (TYPICAL)**



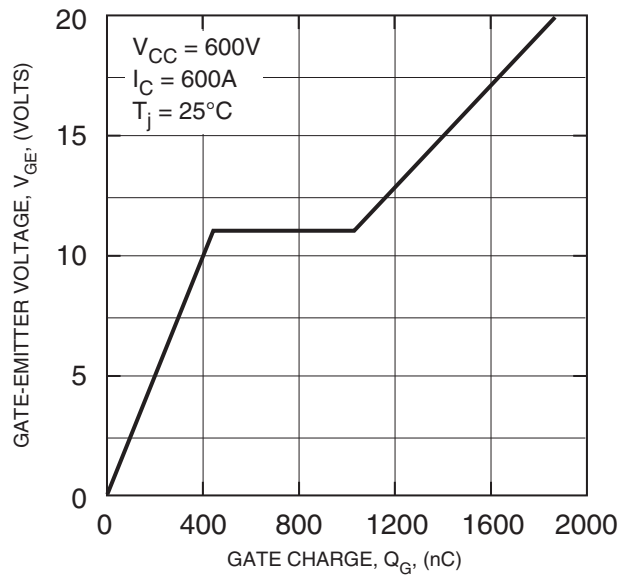
**REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**



**REVERSE RECOVERY CHARACTERISTICS (TYPICAL)**

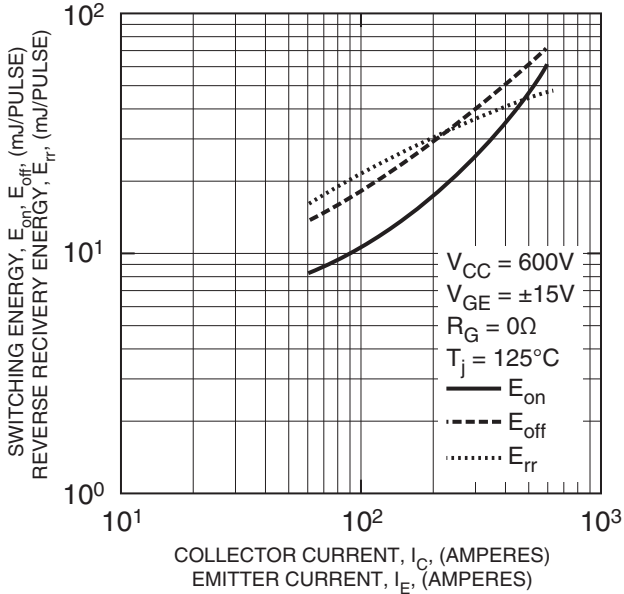


**GATE CHARGE VS.  $V_{GE}$**

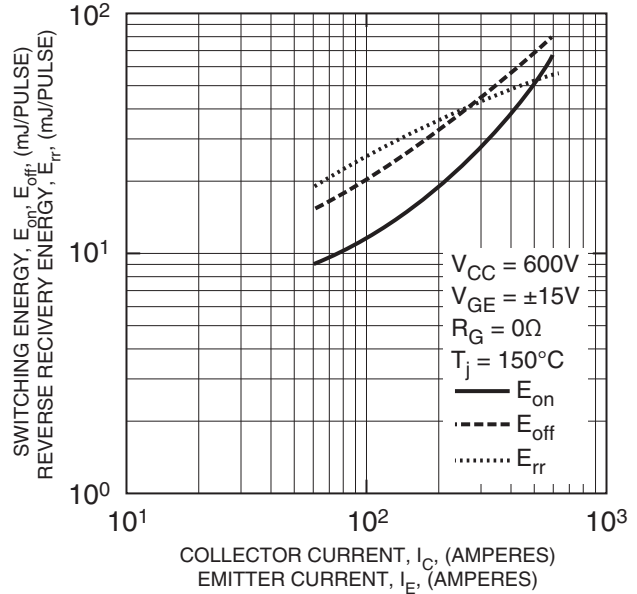


**CM600DY-24S**  
**Dual IGBT S-Series Module**  
 600 Amperes/1200 Volts

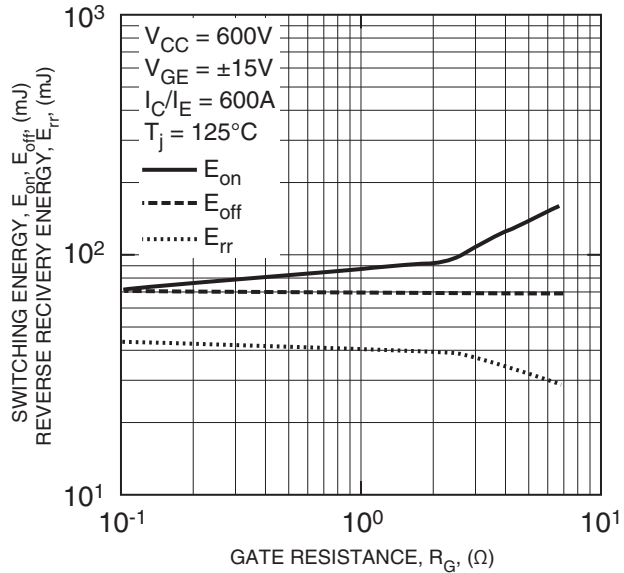
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



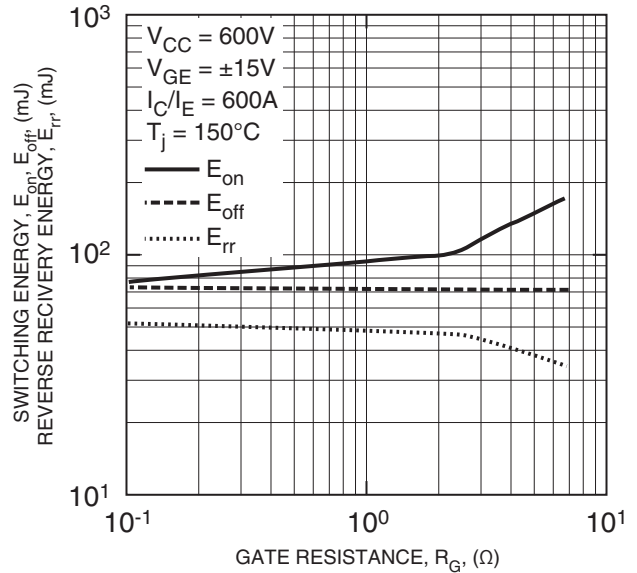
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



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**CM600DY-24S**  
**Dual IGBT S-Series Module**  
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