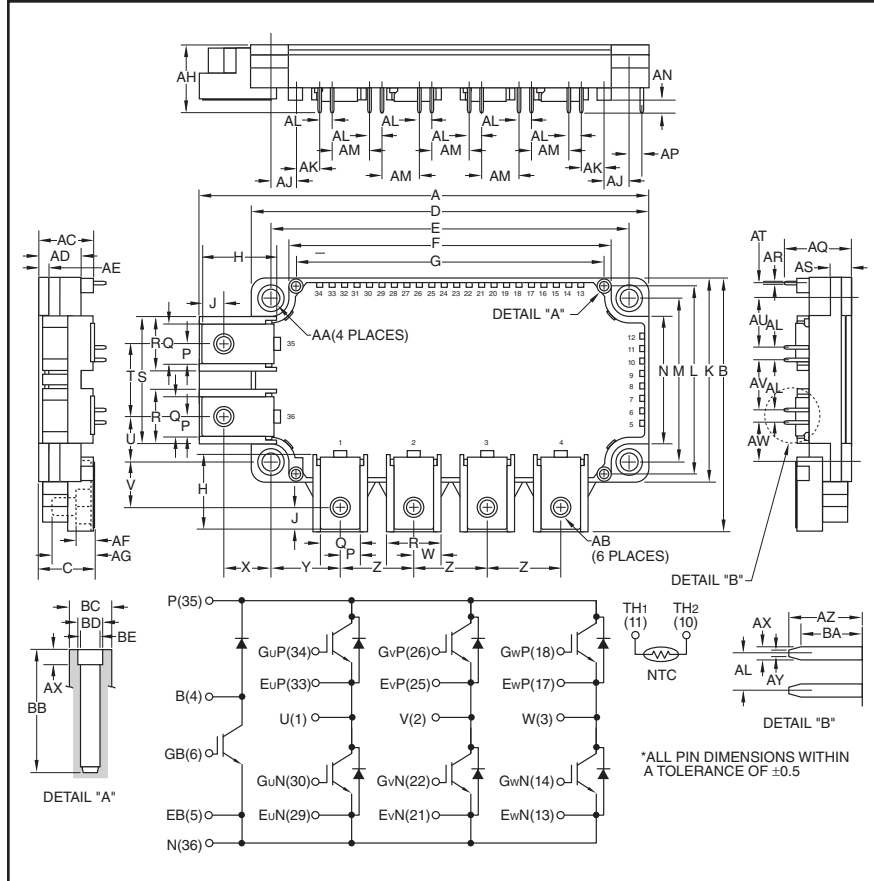


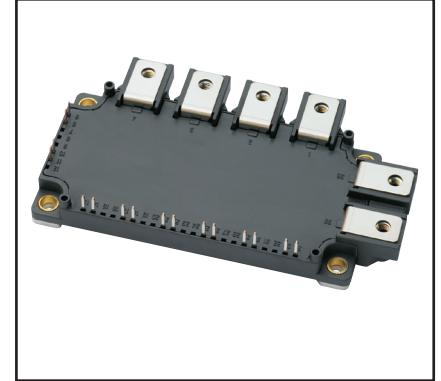
Six IGBTMOD™ + Brake NX-S Series Module 150 Amperes/1200 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	5.39	136.9
B	3.03	77.1
C	0.67	17.0
D	4.79	121.7
E	4.33±0.02	110.0±0.5
F	3.89	99.0
G	3.72	94.5
H	0.83	21.14
J	0.37	6.5
K	2.44	62.0
L	2.26	57.5
M	1.97±0.02	50.0±0.5
N	1.53	39.0
P	0.24	6.0
Q	0.48	12.0
R	0.67	17.0
S	1.53	39.0
T	0.87	22.0
U	0.55	14.0
V	0.54	13.64
W	0.33	8.5
X	0.53	13.5
Y	0.81	20.71
Z	0.9	22.86
AA	0.22 Dia.	5.5 Dia.
AB	M5	M5
AC	0.67	17.0

Dimensions	Inches	Millimeters
AD	0.51	13.0
AE	0.12	3.0
AF	0.21	5.4
AG	0.49	12.5
AH	0.81	20.5
AJ	0.30	7.75
AK	0.28	7.25
AL	0.15	3.81
AM	0.45	11.44
AN	0.14	3.5
AP	0.16	4.06
AQ	0.78	20.05
AR	0.03	0.8
AS	0.27	7.0
AT	0.16	4.2
AU	0.61	15.48
AV	0.60	15.24
AW	0.46	11.66
AX	0.04	1.15
AY	0.02	0.65
AZ	0.29	7.4
BA	0.24	6.2
BB	0.49	12.5
BC	0.17 Dia.	4.3 Dia.
BD	0.10 Dia.	2.5 Dia.
BE	0.08 Dia.	2.1 Dia.



Description:

Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of six IGBT Transistors in a three phase bridge configuration and a seventh IGBT with free-wheel diode for dynamic braking. 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
- ☐ Photovoltaic/Fuel Cell

Ordering Information:

Example: Select the complete module number you desire from the table below -i.e. CM150RX-24S is a 1200V (V_{CES}), 150 Ampere Six-IGBTMOD™ + Brake Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	150	24



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

CM150RX-24S

Six IGBTMOD™ + Brake NX-S Series Module

150 Amperes/1200 Volts

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

Characteristics	Symbol	CM150RX-24S	Units
Maximum Junction Temperature	$T_{j(\max)}$	+175	$^\circ\text{C}$
Operating Power Device Junction Temperature	$T_{j(\text{op})}$	-40 to 150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to 125	$^\circ\text{C}$
Mounting Torque, M5 Mounting Screws	—	31	in-lb
Mounting Torque, M5 Main Terminal Screws	—	31	in-lb
Module Weight (Typical)	—	330	Grams
Isolation Voltage (Terminals to Baseplate, $f = 60\text{Hz}$, AC 1 minute)	V_{ISO}	2500	V_{rms}

Inverter Sector

Collector-Emitter Voltage ($V_{\text{GE}} = 0\text{V}$)	V_{CES}	1200	Volts
Gate-Emitter Voltage ($V_{\text{CE}} = 0\text{V}$)	V_{GES}	± 20	Volts
Collector Current (DC, $T_C = 119^\circ\text{C}$)*1,*5	I_C	150	Amperes
Collector Current (Pulse)*4	I_{CRM}	300	Amperes
Total Power Dissipation ($T_C = 25^\circ\text{C}$)*1,*5	P_{tot}	1150	Watts
Emitter Current, Free Wheeling Diode Forward Current ($T_C = 25^\circ\text{C}$)*1,*5	I_E^{*3}	150	Amperes
Emitter Current, Free Wheeling Diode Forward Current (Pulse)*4	I_{ERM}^{*3}	300	Amperes

Brake Sector

Collector-Emitter Voltage ($V_{\text{GE}} = 0\text{V}$)	V_{CES}	1200	Volts
Gate-Emitter Voltage ($V_{\text{CE}} = 0\text{V}$)	V_{GES}	± 20	Volts
Collector Current (DC, $T_C = 121^\circ\text{C}$)*1,*5	I_C	75	Amperes
Collector Current (Pulse)*4	I_{CRM}	150	Amperes
Total Power Dissipation ($T_C = 25^\circ\text{C}$)*1,*5	P_{tot}	600	Watts
Repetitive Peak Reverse Voltage	V_{RRM}^{*3}	1200	Volts
Forward Current ($T_C = 25^\circ\text{C}$)*1,*5	I_F^{*3}	75	Amperes
Forward Current (Pulse)*4	I_{FM}^{*3}	150	Amperes

*1 Case temperature (T_C) and heatsink temperature (T_H) measured point is just under the chips.

*3 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDI).

*4 Pulse width and repetition rate should be such that device junction temperature (T_j) does not exceed $T_{j(\max)}$ rating.

*5 Junction temperature (T_j) should not increase beyond maximum junction temperature ($T_{j(\max)}$) rating.

CM150RX-24S
Six IGBTMOD™ + Brake NX-S Series Module
 150 Amperes/1200 Volts

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

Inverter Sector

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, V_{GE} = 0V$	—	—	1	mA
Gate Leakage Current	I_{GES}	$\pm V_{GE} = V_{GES}, V_{CE} = 0V$	—	—	0.5	μA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 15mA, V_{CE} = 10V$	5.4	6	6.6	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$ (Chip)	$I_C = 150A, V_{GE} = 15V, T_j = 25^\circ\text{C}$	—	1.7	2.15	Volts
		$I_C = 150A, V_{GE} = 15V, T_j = 125^\circ\text{C}$	—	1.9	—	Volts
		$I_C = 150A, V_{GE} = 15V, T_j = 150^\circ\text{C}$	—	1.95	—	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$ (Terminal)	$I_C = 150A, V_{GE} = 15V, T_j = 25^\circ\text{C}^{*6}$	—	1.8	2.25	Volts
		$I_C = 150A, V_{GE} = 15V, T_j = 125^\circ\text{C}^{*6}$	—	2.0	—	Volts
		$I_C = 150A, V_{GE} = 15V, T_j = 150^\circ\text{C}^{*6}$	—	2.05	—	Volts
Input Capacitance	C_{ies}		—	—	15	nF
Output Capacitance	C_{oes}	$V_{GE} = 0V, V_{CE} = 10V$	—	—	3.0	nF
Reverse Transfer Capacitance	C_{res}		—	—	0.25	nF
Total Gate Charge	Q_G	$V_{CC} = 600V, I_C = 150A, V_{GE} = 15V$	—	350	—	nC
Inductive	Turn-on Delay Time	$V_{CC} = 600V, I_C = 150A, ^{*7}$ $V_{GE} = \pm 15V,$ $R_G = 5.1\Omega, \text{ Inductive Load,}$ $I_E = 150A$	—	—	800	ns
Load	Turn-on Rise Time		—	—	200	ns
Switch	Turn-off Delay Time		—	—	600	ns
Time	Turn-off Fall Time		—	—	300	ns
Reverse Recovery Time	t_{rr}^{*3}		—	—	300	ns
Reverse Recovery Charge	Q_{rr}^{*3}		—	8.0	—	μC
Turn-on Switching Loss per Pulse	E_{on}	$V_{CC} = 600V, I_C (I_E) = 150A, ^{*7}$	—	25	—	mJ
Turn-off Switching Loss per Pulse	E_{off}	$V_{GE} = \pm 15V, R_G = 5.1\Omega,$	—	16	—	mJ
Reverse Recovery Loss per Pulse	E_{rec}^{*3}	$T_j = 150^\circ\text{C}, \text{ Inductive Load}$	—	9.0	—	mJ
Emitter-Collector Voltage	V_{EC}^{*3} (Chip)	$I_E = 150A, V_{GE} = 0V, T_j = 25^\circ\text{C}$	—	1.7	2.15	Volts
		$I_E = 150A, V_{GE} = 0V, T_j = 125^\circ\text{C}$	—	1.7	—	Volts
		$I_E = 150A, V_{GE} = 0V, T_j = 150^\circ\text{C}$	—	1.7	—	Volts
Emitter-Collector Voltage	V_{EC}^{*3} (Terminal)	$I_E = 150A, V_{GE} = 0V, T_j = 25^\circ\text{C}^{*6}$	—	1.8	2.25	Volts
		$I_E = 150A, V_{GE} = 0V, T_j = 125^\circ\text{C}^{*6}$	—	1.8	—	Volts
		$I_E = 150A, V_{GE} = 0V, T_j = 150^\circ\text{C}^{*6}$	—	1.8	—	Volts

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case ^{*1}	$R_{th(j-c)Q}$	Per IGBT	—	—	0.13	K/W
Thermal Resistance, Junction to Case ^{*1}	$R_{th(j-c)D}$	Per FWDi	—	—	0.23	K/W
Internal Gate Resistance	r_g	Per Switch	—	13	—	Ω

^{*1} Case temperature (T_C) and heatsink temperature (T_H) measured point is just under the chips.

^{*3} Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).

^{*6} Pulse width and repetition rate should be such as to cause negligible temperature rise.

^{*7} Recommended maximum collector supply voltage V_{CC} is 800V_{dc}.

CM150RX-24S

Six IGBTMOD™ + Brake NX-S Series Module

150 Amperes/1200 Volts

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

Brake Sector

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector Cutoff Current	I_{CES}	$V_{CE} = V_{CES}, V_{GE} = 0V$	—	—	1	mA
Gate Leakage Current	I_{GES}	$\pm V_{GE} = V_{GES}, V_{CE} = 0V$	—	—	0.5	μA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 7.5\text{mA}, V_{CE} = 10V$	5.4	6	6.6	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$ (Chip)	$I_C = 75A, V_{GE} = 15V, T_j = 25^\circ\text{C}$	—	1.7	2.15	Volts
		$I_C = 75A, V_{GE} = 15V, T_j = 125^\circ\text{C}$	—	1.9	—	Volts
		$I_C = 75A, V_{GE} = 15V, T_j = 150^\circ\text{C}$	—	1.95	—	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$ (Terminal)	$I_C = 75A, V_{GE} = 15V, T_j = 25^\circ\text{C}^{*6}$	—	1.8	2.25	Volts
		$I_C = 75A, V_{GE} = 15V, T_j = 125^\circ\text{C}^{*6}$	—	2.0	—	Volts
		$I_C = 75A, V_{GE} = 15V, T_j = 150^\circ\text{C}^{*6}$	—	2.05	—	Volts
Input Capacitance	C_{ies}		—	—	7.5	nF
Output Capacitance	C_{oes}	$V_{GE} = 0V, V_{CE} = 10V$	—	—	1.5	nF
Reverse Transfer Capacitance	C_{res}		—	—	0.13	nF
Total Gate Charge	Q_G	$V_{CC} = 600V, I_C = 75A, V_{GE} = 15V$	—	175	—	nC
Repetitive Peak Reverse Current	I_{RRM}^{*3}	$V_R = V_{RRM}$	—	—	1	mA
Forward Voltage Drop	V_{EC}^{*3} (Chip)	$I_E = 75A, V_{GE} = 0V, T_j = 25^\circ\text{C}$	—	1.7	2.15	Volts
		$I_E = 75A, V_{GE} = 0V, T_j = 125^\circ\text{C}$	—	1.7	—	Volts
		$I_E = 75A, V_{GE} = 0V, T_j = 150^\circ\text{C}$	—	1.7	—	Volts
Forward Voltage Drop	V_{EC}^{*3} (Terminal)	$I_E = 75A, V_{GE} = 0V, T_j = 25^\circ\text{C}^{*6}$	—	1.8	2.25	Volts
		$I_E = 75A, V_{GE} = 0V, T_j = 125^\circ\text{C}^{*6}$	—	1.8	—	Volts
		$I_E = 75A, V_{GE} = 0V, T_j = 150^\circ\text{C}^{*6}$	—	1.8	—	Volts

*3 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDI).

*6 Pulse width and repetition rate should be such as to cause negligible temperature rise.



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CM150RX-24S
Six IGBTMOD™ + Brake NX-S Series Module
 150 Amperes/1200 Volts

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

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case*1	$R_{th(j-c)Q}$	Per IGBT	—	—	0.25	K/W
Thermal Resistance, Junction to Case*1	$R_{th(j-c)D}$	Per Clamp Diode	—	—	0.40	K/W
Internal Gate Resistance	R_g	Per Switch	—	0	—	Ω

NTC Thermistor Sector, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Zero Power Resistance	R	$T_C = 25^\circ\text{C}$	4.85	5.00	5.15	k Ω
Deviation of Resistance	$\Delta R/R$	$T_C = 100^\circ\text{C}$, $R_{100} = 493\Omega$	-7.3	—	+7.8	%
B Constant	$B_{(25/50)}$	Approximate by Equation*9	—	3375	—	K
Power Dissipation	P_{25}	$T_C = 25^\circ\text{C}$	—	—	10	mW

Module, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Lead Resistance (Main Terminals-Chip)	R_{lead}	$T_C = 25^\circ\text{C}$ (Per Switch)	—	—	1.8	m Ω
Contact Thermal Resistance*1 (Case to Heatsink)	$R_{th(c-f)}$	Thermal Grease Applied (Per 1 Module)*2	—	0.015	—	K/W

*1 Case temperature (T_C) and heatsink temperature (T_f) measured point is just under the chips.

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

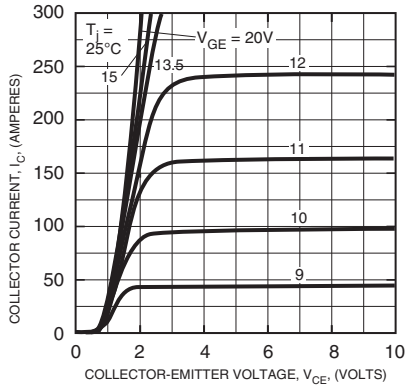
*9 $B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right) / \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right)$ R_{25} : Resistance at Absolute Temperature T_{25} [K], R_{50} : resistance at Absolute Temperature T_{50} [K],
 $T_{25} = 25 [^\circ\text{C}] + 273.15 = 298.15 \text{ [K]}$, $T_{50} = 50 [^\circ\text{C}] + 273.15 = 323.15 \text{ [K]}$

CM150RX-24S

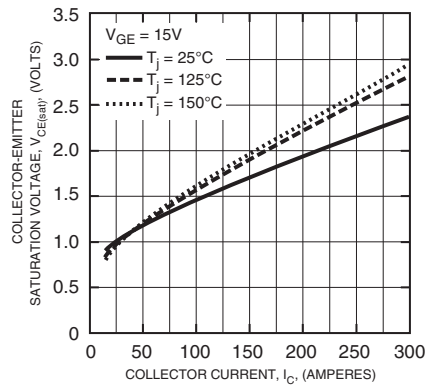
Six IGBTMOD™ + Brake NX-S Series Module

150 Amperes/1200 Volts

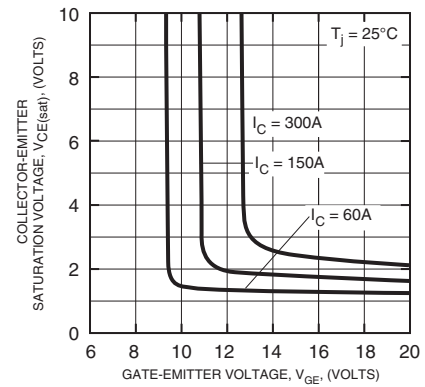
OUTPUT CHARACTERISTICS
(INVERTER PART - CHIP - TYPICAL)



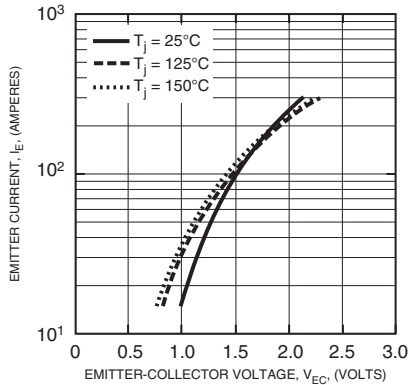
COLLECTOR-EMITTER
SATURATION VOLTAGE CHARACTERISTICS
(INVERTER PART - CHIP - TYPICAL)



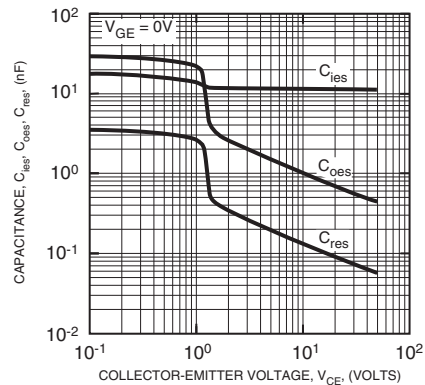
COLLECTOR-EMITTER
SATURATION VOLTAGE CHARACTERISTICS
(INVERTER PART - CHIP - TYPICAL)



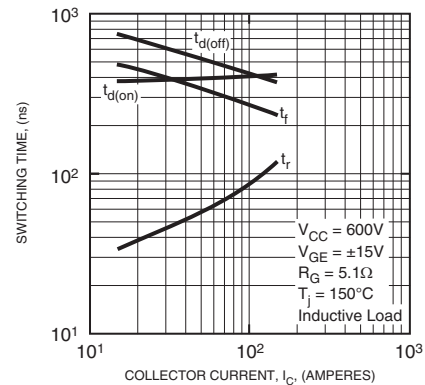
FREE-WHEEL DIODE
FORWARD CHARACTERISTICS
(INVERTER PART - CHIP - TYPICAL)



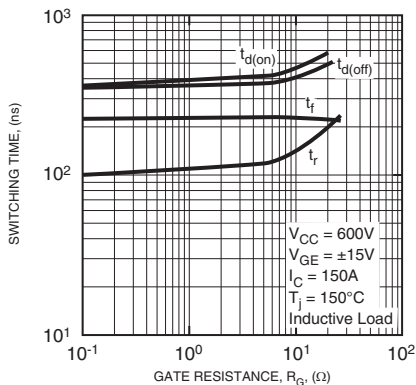
CAPACITANCE VS. V_{CE}
(INVERTER PART - TYPICAL)



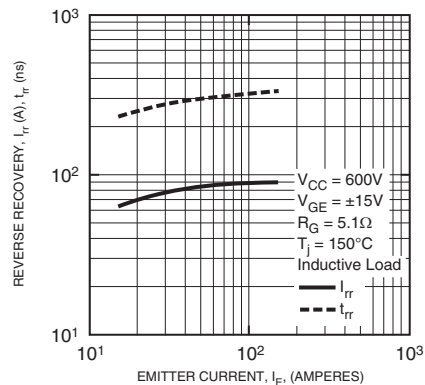
HALF-BRIDGE
SWITCHING CHARACTERISTICS
(INVERTER PART - TYPICAL)



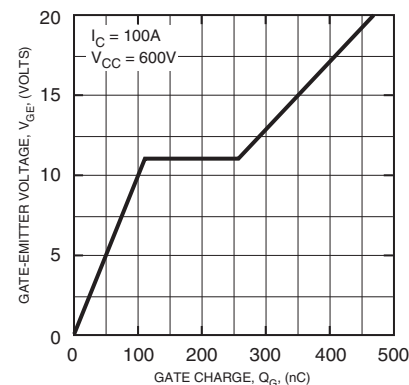
SWITCHING TIME VS.
GATE RESISTANCE
(INVERTER PART - TYPICAL)



REVERSE RECOVERY CHARACTERISTICS
(INVERTER PART - TYPICAL)



GATE CHARGE VS. V_{GE}
(INVERTER PART)



CM150RX-24S

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150 Amperes/1200 Volts

