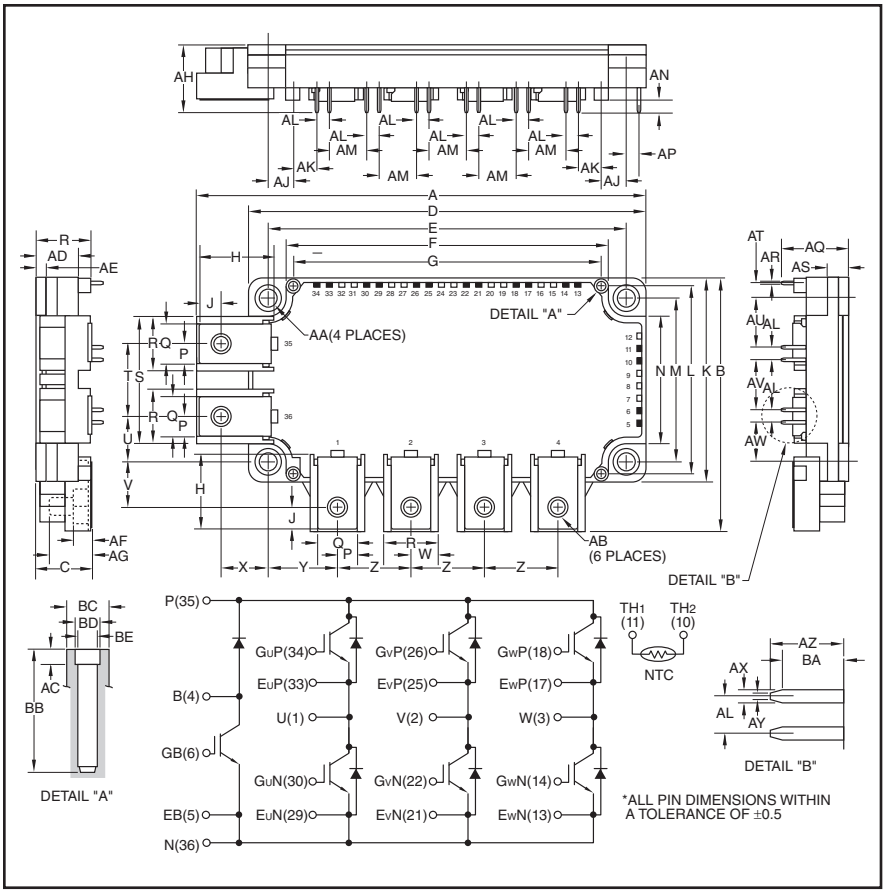
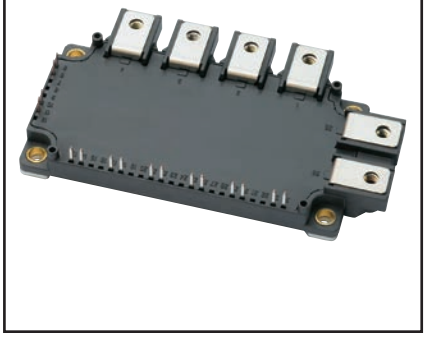
Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272

CM150RX-12A

Six IGBTMOD™ + Brake NX-Series Module
150 Amperes/600 Volts





Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	5.39	136.9
B	3.03	77.1
C	0.67+0.04/-0.02	17.0+1.0/-0.5
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	0.06	1.5

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	0.05	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.	2.1Dia.

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-12A is a 600V (V_{CES}), 150 Ampere Six-IGBTMOD™ + Brake Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	150	12

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

Characteristics	Symbol	CM150RX-12A	Units
Power Device Junction Temperature	T_j	-40 to 150	°C
Storage Temperature	T_{stg}	-40 to 125	°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, AC 1 minute, 60Hz Sinusoidal	V_{ISO}	2500	Volts

Inverter Sector

Collector-Emitter Voltage (G-E Short)	V_{CES}	600	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	±20	Volts
Collector Current (T_C = 63°C)*	I_C	150	Amperes
Peak Collector Current**	I_{CM}	300	Amperes
Emitter Current (T_C = 25°C, T_j < 150°C)*	I_E***	150	Amperes
Peak Emitter Current (T_j < 150°C)**	I_{EM}***	300	Amperes
Maximum Collector Dissipation (T_C = 25°C, T_j < 150°C)*	P_C	520	Watts

Brake Sector

Collector-Emitter Voltage (G-E Short)	V_{CES}	600	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	±20	Volts
Collector Current (T_C = 70°C)*	I_C	75	Amperes
Peak Collector Current**	I_{CM}	150	Amperes
Maximum Collector Dissipation (T_C = 25°C, T_j < 150°C)*	P_C	280	Watts
Repetitive Peak Reverse Voltage (Clamp Diode Part)	V_{RRM}***	600	Volts
Forward Current (T_C = 25°C)*	I_F***	75	Amperes
Forward Current (Clamp Diode Part)**	I_{FM}***	150	Amperes

*T_C, T_f measured point is just under the chips.
**Pulse width and repetition rate should be such that device junction temperature (T_j) does not exceed $T_{j(max)}$ rating.
***Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

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Electrical and Mechanical Characteristics, T_j = 25°C unless otherwise specified

Inverter Sector

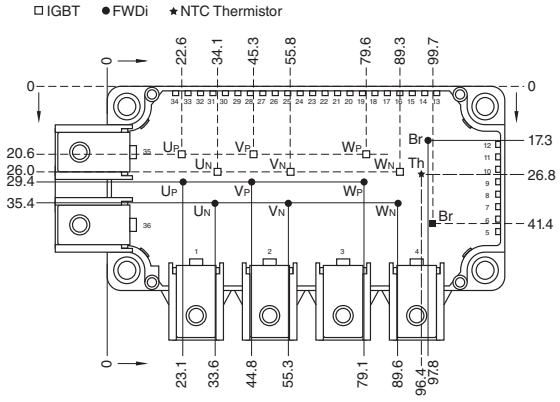
Characteristics		Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector Cutoff Current		I_{CES}	$V_{CE} = V_{CES}$, V_{GE} = 0V	—	—	1.0	mA
Gate-Emitter Threshold Voltage		$V_{GE(th)}$	I_C = 15mA, V_{CE} = 10V	5	6	7	Volts
Gate Leakage Current		I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	—	—	0.5	µA
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$	I_C = 150A, V_{GE} = 15V, T_j = 25°C	—	1.7	2.1	Volts
			I_C = 150A, V_{GE} = 15V, T_j = 125°C	—	1.9	—	Volts
			I_C = 150A, V_{GE} = 15V, Chip	—	1.6	—	Volts
Input Capacitance		C_{ies}	V_{CE} = 10V, V_{GE} = 0V	—	—	18.0	nF
Output Capacitance		C_{oes}		—	—	2.0	nF
Reverse Transfer Capacitance		C_{res}		—	—	0.6	nF
Total Gate Charge		Q_G	V_{CC} = 300V, I_C = 150A, V_{GE} = 15V	—	400	—	nC
Inductive	Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 300V, I_C = 150A, V_{GE} = ±15V, R_G = 6.2Ω, I_E = 150A, Inductive Load Switching Operation	—	—	120	ns
Load	Turn-on Rise Time	t_r		—	—	100	ns
Switch	Turn-off Delay Time	$t_{d(off)}$		—	—	350	ns
Time	Turn-off Fall Time	t_f		—	—	600	ns
Reverse Recovery Time*		t_{rr}		—	—	200	ns
Reverse Recovery Charge*		Qrr		—	5.0	—	µC
Emitter-Collector Voltage*		V_{EC}	I_E = 150A, V_{GE} = 0V, T_j = 25°C	—	2.0	2.8	Volts
			I_E = 150A, V_{GE} = 0V, T_j = 125°C	—	1.95	—	Volts
			I_E = 150A, V_{GE} = 0V, Chip	—	1.9	—	Volts

Thermal and Mechanical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case**	$R_{th(j-c)}Q$	Per IGBT	—	—	0.24	°C/W
Thermal Resistance, Junction to Case**	$R_{th(j-c)}D$	Per FWDi	—	—	0.46	°C/W
Contact Thermal Resistance**	$R_{th(c-f)}$	Thermal Grease Applied	—	0.015	—	°C/W
Internal Gate Resistance	R_{Gint}	T_C = 25°C	—	0	—	Ω
External Gate Resistance	R_G		4.1	—	41	Ω

*Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).
**T_C, T_f measured point is just under the chips.

CHIP LOCATION (TOP VIEW)



Dimensions in mm (Tolerance: ±1mm)

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Electrical and Mechanical Characteristics, T_j = 25°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	—	—	1.0	mA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 7.5mA	5	6	7	Volts
Gate Leakage Current	I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	—	—	0.5	µA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 75A, V_{GE} = 15V, T_j = 25°C	—	1.7	2.1	Volts
		I_C = 75A, V_{GE} = 15V, T_j = 125°C	—	1.9	—	Volts
		I_C = 75A, V_{GE} = 15V, Chip	—	1.6	—	Volts
Input Capacitance	C_{ies}	V_{CE} = 10V, V_{GE} = 0V	—	—	9.3	nF
Output Capacitance	C_{oes}		—	—	1.0	nF
Reverse Transfer Capacitance	C_{res}		—	—	0.3	nF
Total Gate Charge	Q_G	V_{CC} = 300V, I_C = 75A, V_{GE} = 15V	—	200	—	nC
Repetitive Reverse Current*	I_{RRM}	$V_R = V_{RRM}$	—	—	1.0	mA
Forward Voltage Drop *	V_F	I_F = 75A, T_j = 25°C	—	2.0	2.8	Volts
		I_F = 75A, T_j = 125°C	—	1.95	—	Volts
		I_F = 75A, Chip	—	1.9	—	Volts

Thermal and Mechanical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case**	$R_{th(j-c)}Q$	Per IGBT	—	—	0.44	°C/W
Thermal Resistance, Junction to Case**	$R_{th(j-c)}D$	Per FWDi	—	—	0.85	°C/W
Contact Thermal Resistance**	$R_{th(j-f)}$	Thermal Grease Applied	—	0.015	—	°C/W
Internal Gate Resistance	R_{Gint}	T_C = 25°C	—	0	—	Ω
External Gate Resistance	R_G		8	—	83	Ω

NTC Thermistor Sector, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Zero Power Resistance	R	T_C = 25°C	4.85	5.00	5.15	kΩ
Deviation of Resistance	ΔR/R	T_C = 100°C, R_{100} = 493Ω	–7.3	—	+7.8	%
B Constant	$B_{(25/50)}$	$B = (\ln R_1 - \ln R_2) / (1/T_1 - 1/T_2)$***	—	3375	—	K
Power Dissipation	P_{25}	T_C = 25°C	—	—	10	mW

*Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).
**T_C, T_f measured point is just under the chips.
***R1: Resistance at Absolute Temperature T_1(K), R_2: Resistance at Absolute Temperature T_2(K), T(K) = t(°C) + 273.15

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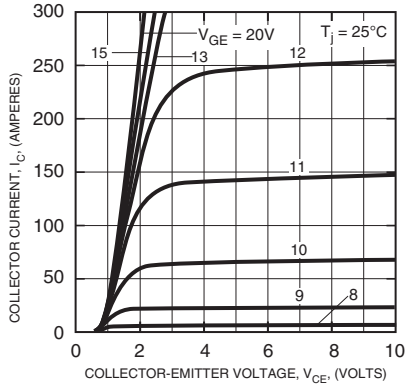
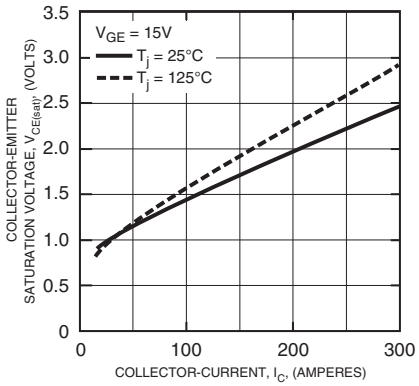
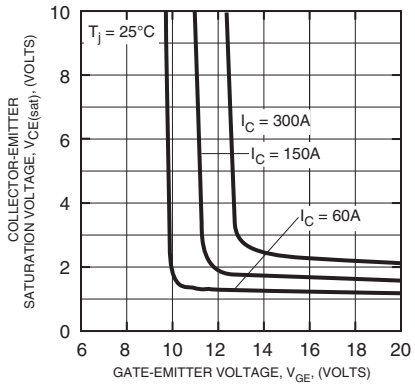
OUTPUT CHARACTERISTICS (INVERTER PART - TYPICAL)



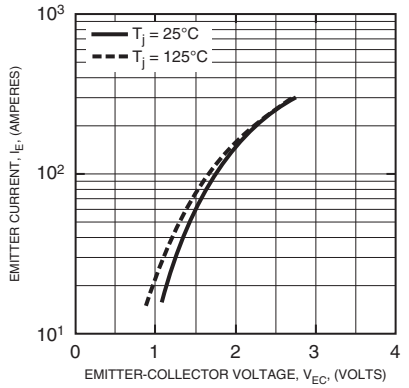
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (INVERTER PART - TYPICAL)



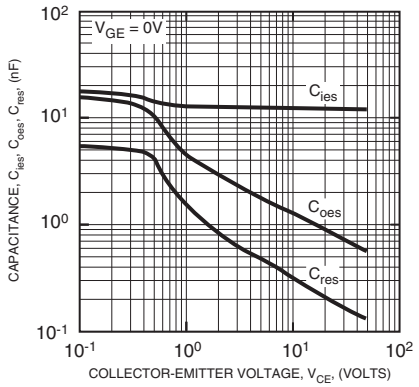
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (INVERTER PART - TYPICAL)



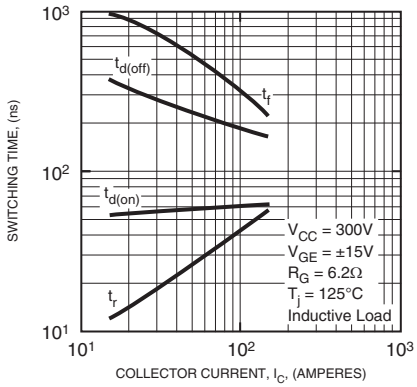
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (INVERTER PART - TYPICAL)



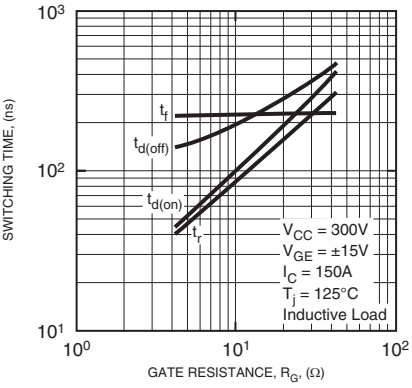
CAPACITANCE VS. V_{CE} (INVERTER PART - TYPICAL)



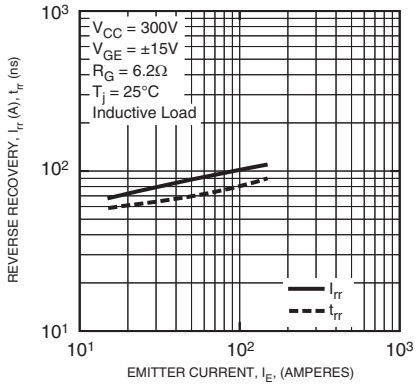
HALF-BRIDGE SWITCHING CHARACTERISTICS (INVERTER PART - TYPICAL)



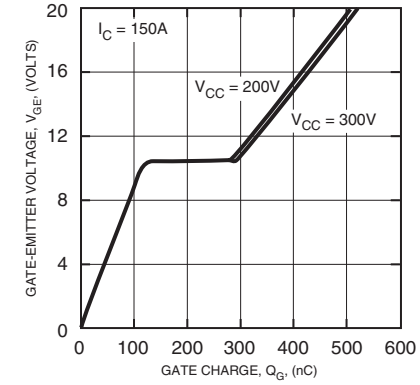
SWITCHING TIME VS. GATE RESISTANCE (INVERTER PART - TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (INVERTER PART - TYPICAL)



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



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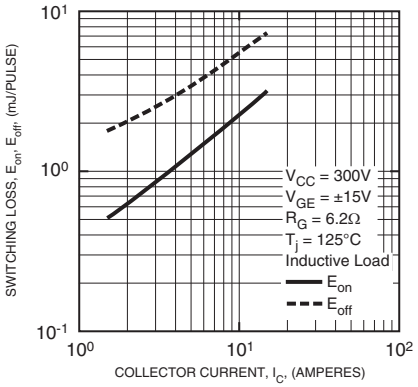
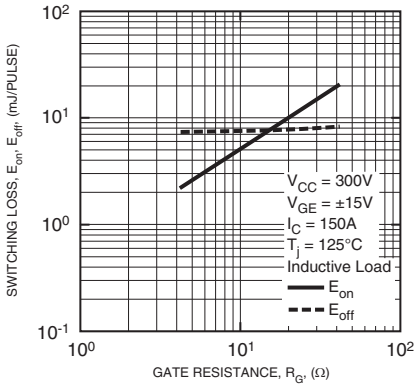
150 Amperes/600 Volts

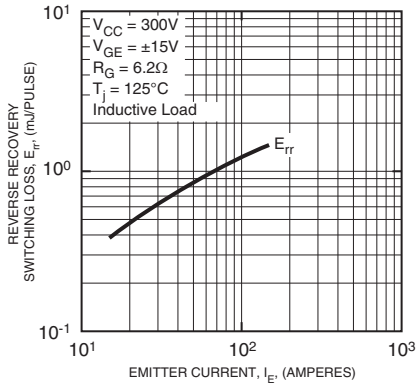
SWITCHING LOSS VS. COLLECTOR CURRENT (INVERTER PART - TYPICAL)



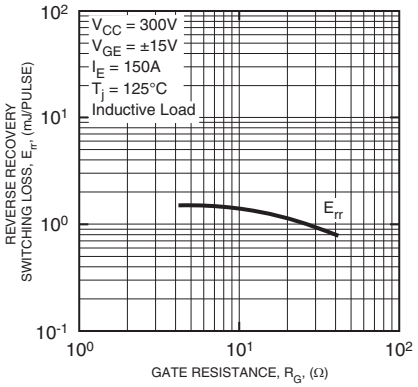
SWITCHING LOSS VS. GATE RESISTANCE (INVERTER PART - TYPICAL)



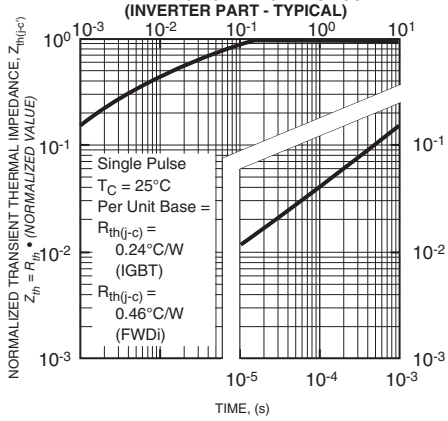
REVERSE RECOVERY SWITCHING LOSS VS. EMITTER CURRENT (INVERTER PART - TYPICAL)



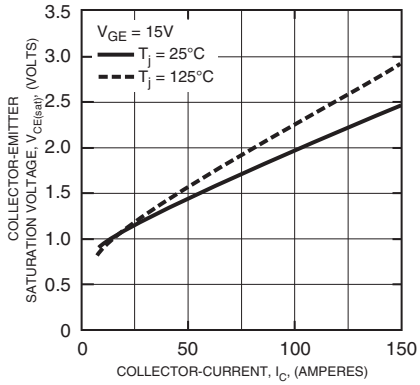
REVERSE RECOVERY SWITCHING LOSS VS. GATE RESISTANCE (INVERTER PART - TYPICAL)



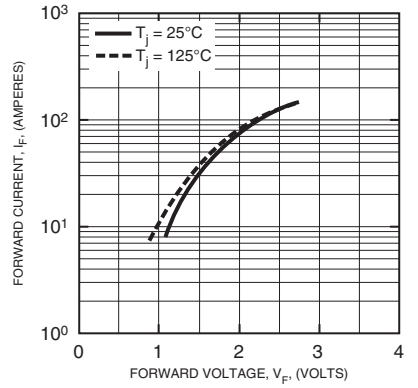
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (INVERTER PART - TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (BRAKE PART - TYPICAL)



FREE-WHEEL DIODE FORWARD CHARACTERISTICS (BRAKE PART - TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (BRAKE PART - TYPICAL)