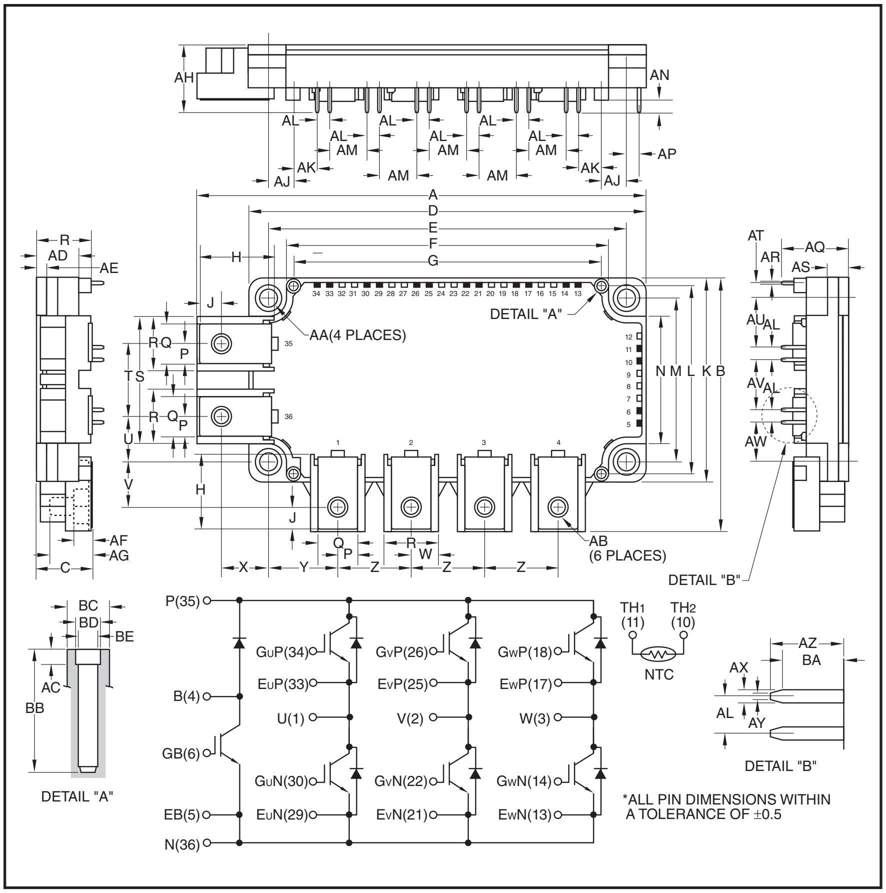
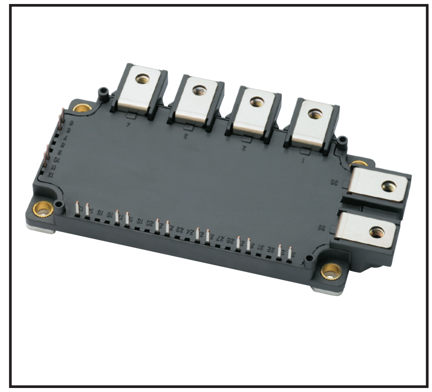
Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272

Six IGBTMOD™ + Brake NX-Series Module

100 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. CM100RX-12A is a 600V (V_{CES}), 100 Ampere Six-IGBTMOD™ + Brake Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	100	12

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CM100RX-12A
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100 Amperes/600 Volts

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

Characteristics	Symbol	CM100RX-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
Baseplate Flatness, On Centerline X, Y (See Below)	—	±0 ~ +100	µm
Isolation Voltage, AC 1 minute, 60Hz Sinusoidal	V_{ISO}	2500	Volts

Inverter Sector

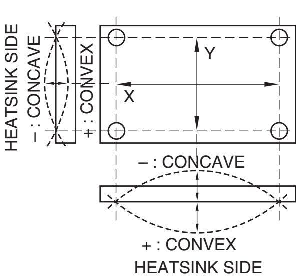
Characteristics	Symbol	CM100RX-12A	Units
Collector-Emitter Voltage (G-E Short)	V_{CES}	600	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	±20	Volts
Collector Current (T_C = 75°C)*1	I_C	100	Amperes
Peak Collector Current (Pulse)*3	I_{CM}	200	Amperes
Emitter Current (T_C = 25°C)*1	I_E*2	100	Amperes
Peak Emitter Current*3	I_{EM}*2	200	Amperes
Maximum Collector Dissipation (T_C = 25°C)*1*4	P_C	400	Watts

Brake Sector

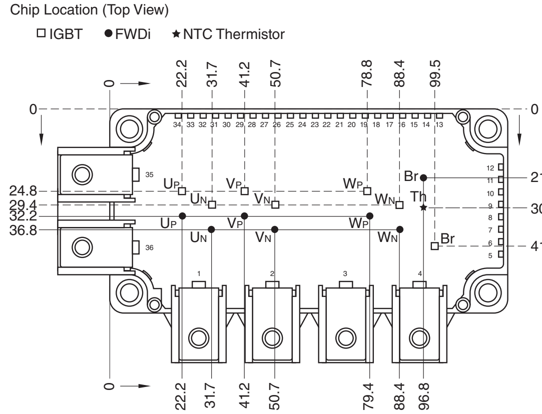
Characteristics	Symbol	CM100RX-12A	Units
Collector-Emitter Voltage (G-E Short)	V_{CES}	600	Volts
Gate-Emitter Voltage (C-E Short)	V_{GES}	±20	Volts
Collector Current (T_C = 97°C)*1	I_C	50	Amperes
Peak Collector Current (Pulse)*3	I_{CM}	100	Amperes
Maximum Collector Dissipation (T_C = 25°C)*1*4	P_C	280	Watts
Repetitive Peak Reverse Voltage (Clamp Diode Part)	V_{RRM}*2	600	Volts
Forward Current (T_C = 25°C)*1	I_F*2	50	Amperes
Forward Current (Pulse)*3	I_{FM}*2	100	Amperes

*1 Case temperature (T_C) and heatsink temperature (T_f) are defined on the surface of the baseplate and heatsink at just under the chip.
*2 I_E, I_{EM}, V_{EC}, t_{rr} and Q_{rr} represent ratings and characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).
I_F, I_{FM}, I_{RRM}, V_{FM} and V_{RRM} represent ratings and characteristics of the clamp diode.
*3 Pulse width and repetition rate should be such that device junction temperature (T_j) does not exceed $T_{j(max)}$ rating.
*4 Junction temperature (T_j) should not increase beyond $T_{j(max)}$ rating.

BASEPLATE FLATNESS
MEASUREMENT POINT



CHIP LOCATION (TOP VIEW)



Dimensions in mm (Tolerance: ±1mm)

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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 = 10mA, 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 = 100A, V_{GE} = 15V, T_j = 25°C*5	—	1.7	2.1	Volts
			I_C = 100A, V_{GE} = 15V, T_j = 125°C*5	—	1.9	—	Volts
			I_C = 100A, V_{GE} = 15V, Chip	—	1.6	—	Volts
Input Capacitance		C_{ies}		—	—	13.3	nF
Output Capacitance		C_{oes}	V_{CE} = 10V, V_{GE} = 0V	—	—	1.4	nF
Reverse Transfer Capacitance		C_{res}		—	—	0.45	nF
Total Gate Charge		Q_G	V_{CC} = 300V, I_C = 100A, V_{GE} = 15V	—	270	—	nC
Inductive	Turn-on Delay Time	$t_{d(on)}$		—	—	100	ns
Load	Turn-on Rise Time	t_r	V_{CC} = 300V, I_C = 100A,	—	—	100	ns
Switch	Turn-off Delay Time	$t_{d(off)}$	V_{GE} = ±15V,	—	—	300	ns
Time	Turn-off Fall Time	t_f	R_G = 6.2Ω, I_E = 100A,	—	—	600	ns
Reverse Recovery Time		t_{rr}*2	Inductive Load Switching Operation	—	—	200	ns
Reverse Recovery Charge		Qrr*2		—	4.8	—	µC
Emitter-Collector Voltage		V_{EC}*2	I_E = 100A, V_{GE} = 0V, T_j = 25°C*5	—	2.0	2.8	Volts
			I_E = 100A, V_{GE} = 0V, T_j = 125°C*5	—	1.95	—	Volts
			I_E = 100A, 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*1	—	—	0.31	°C/W
Thermal Resistance, Junction to Case**	$R_{th(j-c)}D$	Per FWDi*1	—	—	0.59	°C/W
Contact Thermal Resistance**	$R_{th(j-f)}$	Case to Heatsink (Per 1 Module) Thermal Grease Applied*1*7	—	0.015	—	°C/W
Internal Gate Resistance	R_{Gint}	T_C = 25°C	—	0	—	Ω
External Gate Resistance	R_G		6	—	62	Ω

**Thermal resistance values are per 1 element.
*1 Case temperature (T_C) and heatsink temperature (T_f) are defined on the surface of the baseplate and heatsink at just under the chip.
*2 I_E, I_{EM}, V_{EC}, t_{rr} and Q_{rr} represent ratings and characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).
I_F, I_{FM}, I_{RRM}, V_{FM} and V_{RRM} represent ratings and characteristics of the clamp diode.
*5 Pulse width and repetition rate should be such as to cause negligible temperature rise.
*7 Typical value is measured by using thermally conductive grease of λ = 0.9 [W/(m • K)].

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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 = 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 = 50A, V_{GE} = 15V, T_j = 25°C*5	—	1.7	2.1	Volts
		I_C = 50A, V_{GE} = 15V, T_j = 125°C*5	—	1.9	—	Volts
		I_C = 50A, 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 = 50A, V_{GE} = 15V	—	200	—	nC
Repetitive Reverse Current	I_{RRM}*2	$V_R = V_{RRM}$	—	—	1.0	mA
Forward Voltage Drop	V_{FM}*2	I_F = 50A, T_j = 25°C*5	—	2.0	2.8	Volts
		I_F = 50A, T_j = 125°C*5	—	1.95	—	Volts
		I_F = 50A, 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*1	—	—	0.44	°C/W
Thermal Resistance, Junction to Case**	$R_{th(j-c)}D$	Per FWDi*1	—	—	0.85	°C/W
Contact Thermal Resistance**	$R_{th(j-f)}$	Case to Heatsink (Per 1 Module) Thermal Grease Applied*1*7	—	0.015	—	°C/W
Internal Gate Resistance	R_{Gint}	T_C = 25°C	—	0	—	Ω
External Gate Resistance	R_G		13	—	125	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*1	4.85	5.00	5.15	kΩ
Deviation of Resistance	ΔR/R	T_C = 100°C, R_{100} = 493Ω*1	–7.3	—	+7.8	%
B Constant	$B_{(25/50)}$	B = $(lnR_1 - lnR_2) / (1/T_1 - 1/T_2)$*6	—	3375	—	K
Power Dissipation	P_{25}	T_C = 25°C*1	—	—	10	mW

**Thermal resistance values are per 1 element.
*1 Case temperature (T_C) and heatsink temperature (T_f) are defined on the surface of the baseplate and heatsink at just under the chip.
*2 I_E, I_{EM}, V_{EC}, t_{rr} and Q_{rr} represent ratings and characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).
I_F, I_{FM}, I_{RRM}, V_{FM} and V_{RRM} represent ratings and characteristics of the clamp diode.
*5 Pulse width and repetition rate should be such as to cause negligible temperature rise.
*7 Typical value is measured by using thermally conductive grease of λ = 0.9 [W/(m • K)].

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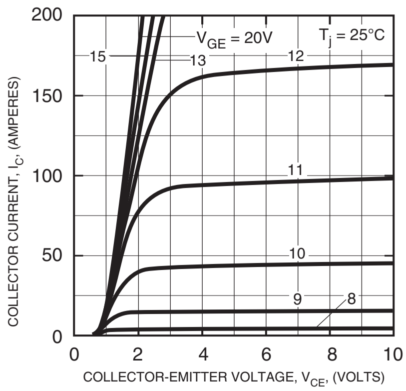
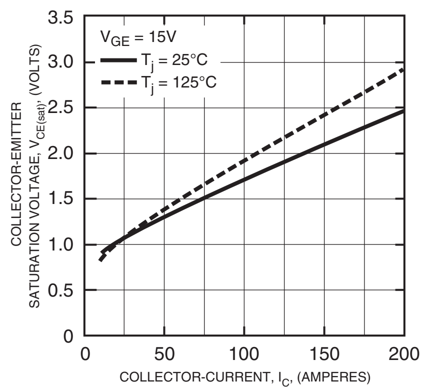
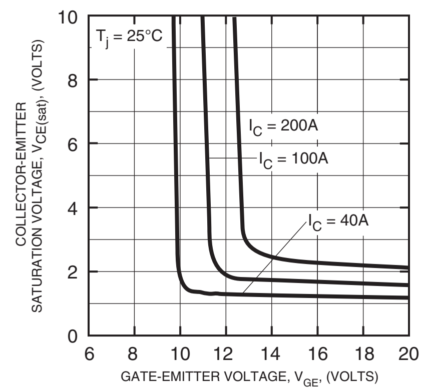
OUTPUT CHARACTERISTICS (INVERTER PART - TYPICAL)



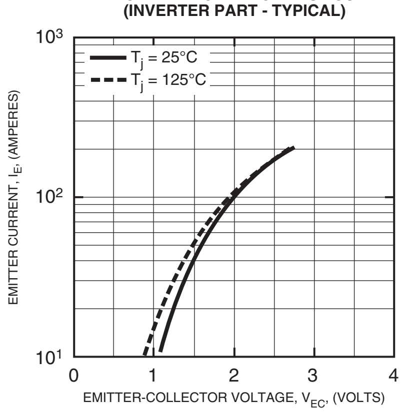
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (INVERTER PART - TYPICAL)



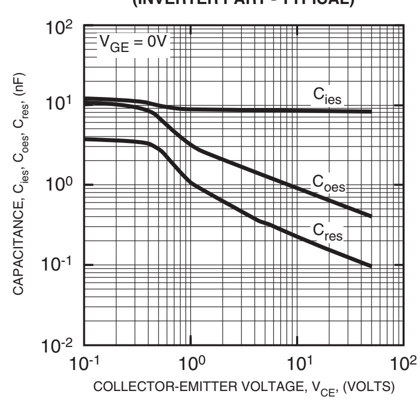
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (INVERTER PART - TYPICAL)



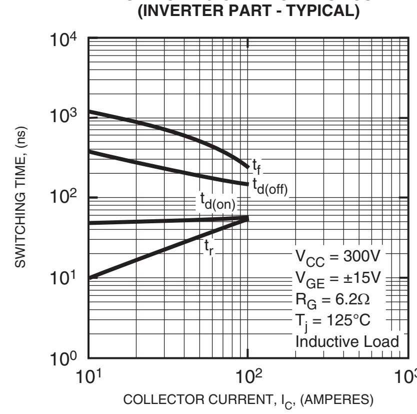
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (INVERTER PART - TYPICAL)



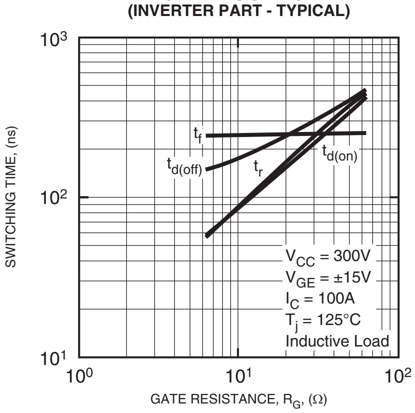
CAPACITANCE VS. V_{CE} (INVERTER PART - TYPICAL)



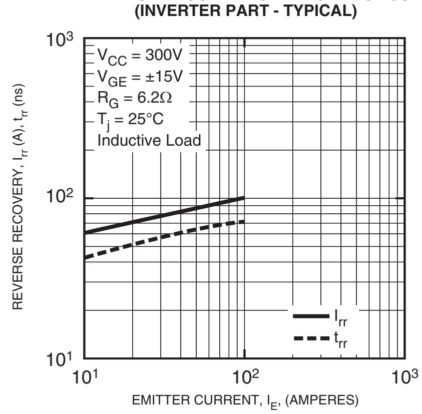
HALF-BRIDGE SWITCHING CHARACTERISTICS (INVERTER PART - TYPICAL)



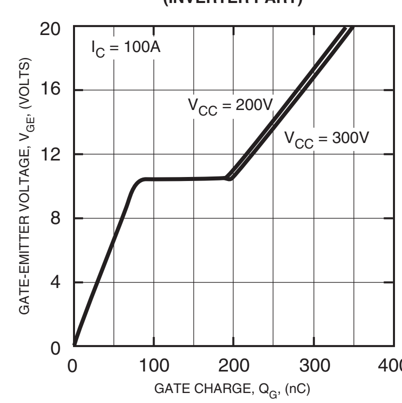
SWITCHING TIME VS. GATE RESISTANCE (INVERTER PART - TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (INVERTER PART - TYPICAL)



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



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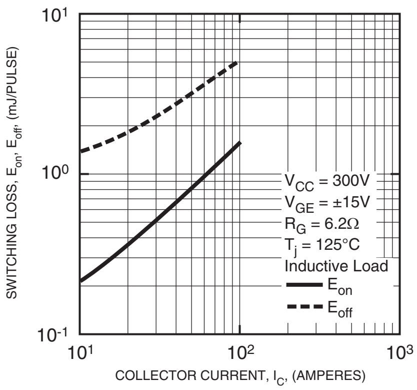
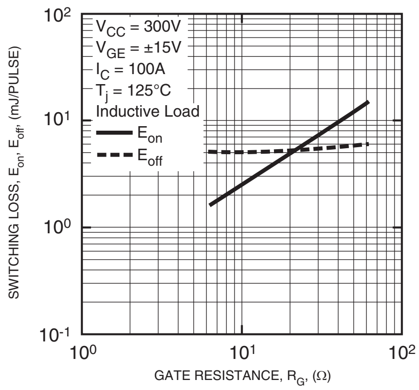
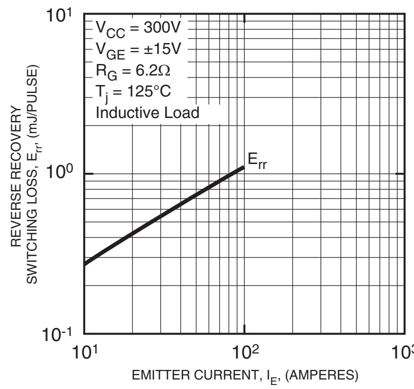
SWITCHING LOSS VS. COLLECTOR CURRENT (INVERTER PART - TYPICAL)



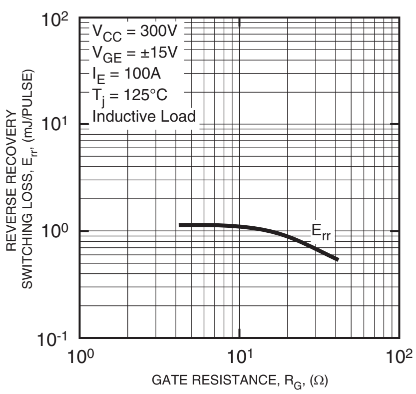
SWITCHING LOSS VS. GATE RESISTANCE (INVERTER PART - TYPICAL)



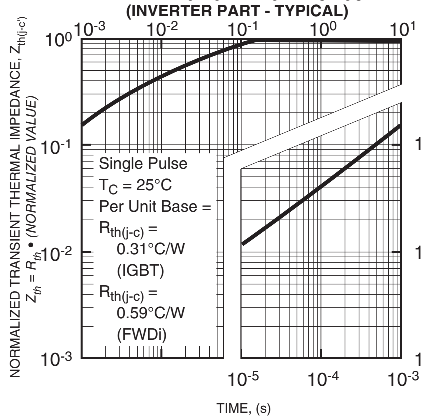
REVERSE RECOVERY SWITCHING LOSS VS. EMITTER CURRENT (INVERTER PART - TYPICAL)



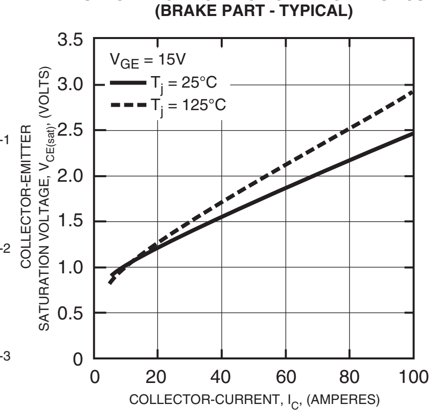
REVERSE RECOVERY SWITCHING LOSS VS. GATE RESISTANCE (INVERTER PART - TYPICAL)



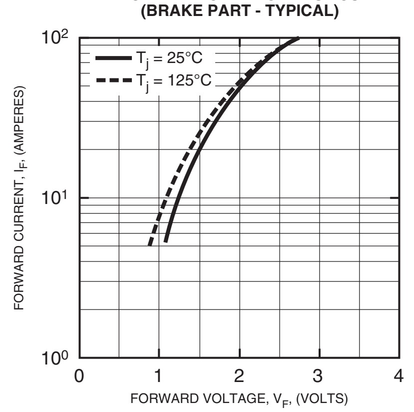
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (INVERTER PART - TYPICAL)



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



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



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (BRAKE PART - TYPICAL)