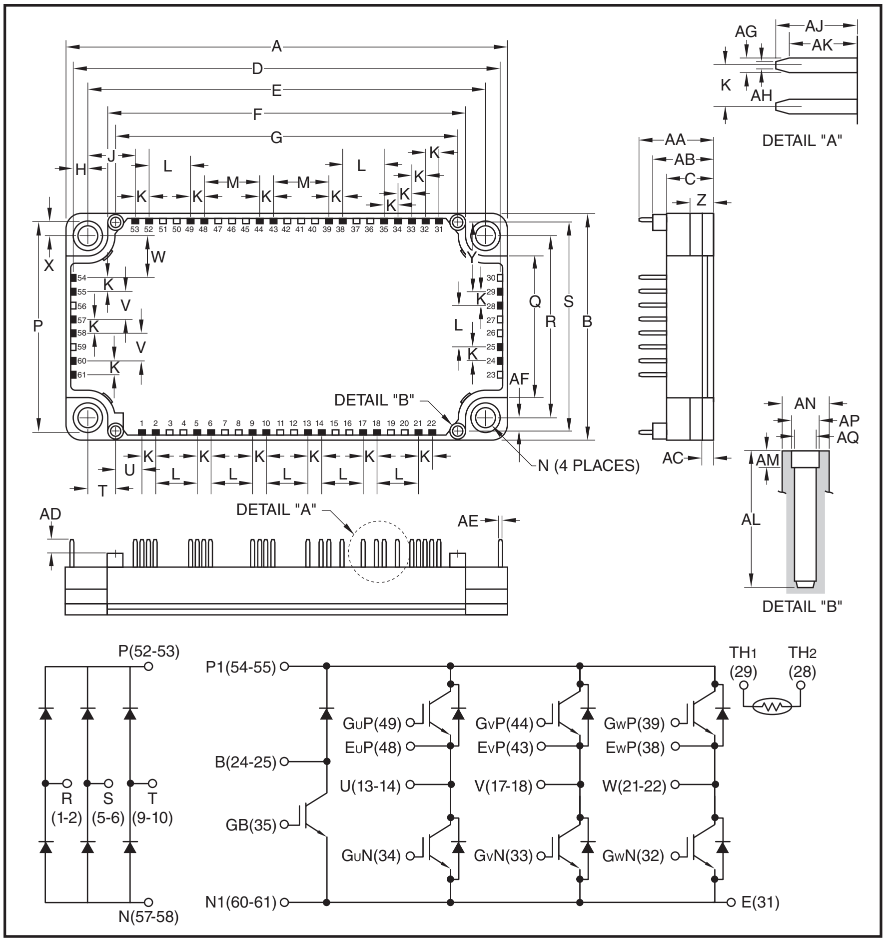
CM100MX-12A

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

NX-Series CIB Module

(3Ø Converter + 3Ø Inverter + Brake)

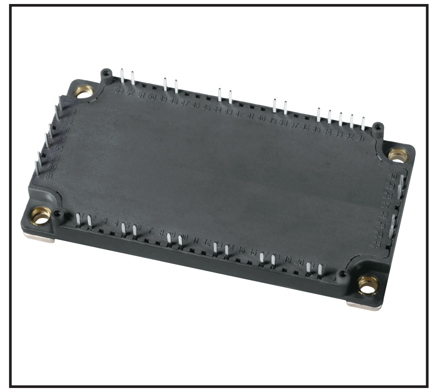
100 Amperes/600 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.79	121.7
B	2.44	62.0
C	0.51	13.0
D	4.65	118.1
E	4.33±0.02	110.0±0.5
F	3.89	99.0
G	3.72	94.5
H	0.16	4.06
J	0.51	13.09
K	0.15	3.81
L	0.45	11.43
M	0.6	15.24
N	0.22 Dia.	5.5 Dia.
P	2.30	58.4
Q	1.53	39.0
R	1.97±0.02	50.0±0.5
S	2.26	57.5
T	0.30	7.75
U	0.28	7.25
V	0.3	7.62

Dimensions	Inches	Millimeters
W	0.46	11.66
X	0.16	4.2
Y	0.61	15.48
Z	0.27	7.0
AA	0.81	20.5
AB	0.67	17.0
AC	0.12	3.0
AD	0.14	3.5
AE	0.03	0.8
AF	0.15	3.75
AG	0.05	1.15
AH	0.025	0.65
AJ	0.29	7.4
AK	0.24	6.2
AL	0.49	12.5
AM	0.06	1.5
AN	0.17 Dia.	4.3 Dia.
AP	0.10 Dia.	2.5 Dia.
AQ	0.08 Dia.	2.1 Dia.



Description:

CIBs are low profile and thermally efficient. Each module consists of a three-phase diode converter section, a three-phase inverter section and a brake circuit. A thermistor is included in the package for sensing the baseplate temperature. 5th Generation CSTBT chips yield low loss.

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. CM100MX-12A is a 600V (V_{CES}), 100 Ampere CIB Power Module.

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

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

CM100MX-12A
NX-Series CIB Module
(3Ø Converter + 3Ø Inverter + Brake)
100 Amperes/600 Volts

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

Characteristics	Symbol	CM100MX-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
Module Weight (Typical)	—	270	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 = 75°C)*	I_C	100	Amperes
Peak Collector Current**	I_{CM}	200	Amperes
Emitter Current (T_C = 25°C, T_j < 150°C)*	I_E***	100	Amperes
Peak Emitter Current (T_j < 150°C)**	I_{EM}***	200	Amperes
Maximum Collector Dissipation (T_C = 25°C, T_j < 150°C)*	P_C	400	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 = 97°C)*	I_C	50	Amperes
Peak Collector Current**	I_{CM}	100	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***	50	Amperes
Forward Current (Clamp Diode Part)**	I_{FM}***	100	Amperes

Converter Sector

Repetitive Peak Reverse Voltage	V_{RRM}	800	Volts
Recommended Input Voltage	E_a	220	Volts RMS
DC Output Current (3-Phase Full Wave Rectifying, T_C = 137°C)*	I_O	100	Amperes
Surge Forward Current (sine Half-wave 1 Cycle Peak Value, F = 60Hz, Non-repetitive)	I_{FSM}	1000	Amperes
Current Square Time (Value for One Cycle of Surge Current)	I^2t	4160	A^2s

*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).

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

CM100MX-12A
NX-Series CIB Module
(3Ø Converter + 3Ø Inverter + Brake)
100 Amperes/600 Volts

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	—	1.7	2.1	Volts
			I_C = 100A, V_{GE} = 15V, T_j = 125°C	—	1.9	—	Volts
			I_C = 100A, V_{GE} = 15V, Chip	—	1.6	—	Volts
Input Capacitance		C_{ies}	V_{CE} = 10V, V_{GE} = 0V	—	—	11.3	nF
Output Capacitance		C_{oes}		—	—	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	$t_{d(on)}$	V_{CC} = 300V, I_C = 100A,	—	—	100	ns
Load	Turn-on Rise Time	t_r	V_{GE} = ±15V,	—	—	100	ns
Switch	Turn-off Delay Time	$t_{d(off)}$	R_G = 6.2Ω, I_E = 100A,	—	—	300	ns
Time	Turn-off Fall Time	t_f	Inductive Load Switching Operation	—	—	600	ns
Reverse Recovery Time*		t_{rr}		—	—	200	ns
Reverse Recovery Charge*		Qrr		—	3.6	—	μC
Emitter-Collector Voltage*		V_{EC}	I_E = 100A, V_{GE} = 0V	—	2.0	2.8	Volts
			I_E = 100A, V_{GE} = 0V, Chip	—	1.9	—	Volts

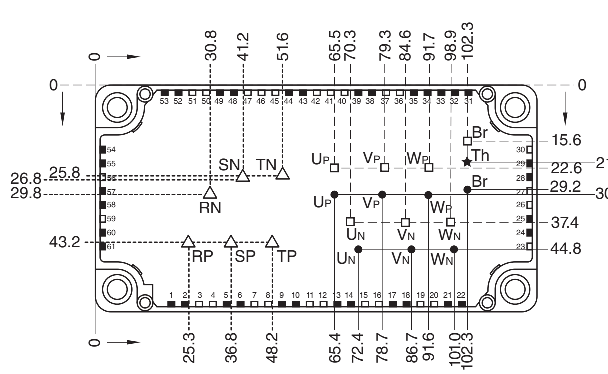
Thermal and Mechanical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case**	$R_{th(j-c)}Q$	Per IGBT	—	—	0.31	°C/W
Thermal Resistance, Junction to Case**	$R_{th(j-c)}D$	Per FWDi	—	—	0.59	°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		6.0	—	63	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)

□ IGBT ● FWDi △ Converter Diode ★ NTC Thermistor



Dimensions in mm (Tolerance: ±1mm)

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

CM100MX-12A
NX-Series CIB Module
(3Ø Converter + 3Ø Inverter + Brake)
100 Amperes/600 Volts

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	—	1.7	2.1	Volts
		I_C = 50A, V_{GE} = 15V, T_j = 125°C	—	1.9	—	Volts
		I_C = 50A, V_{GE} = 15V, Chip	—	1.6	—	Volts
Input Capacitance	C_{ies}	V_{CE} = 10V, V_{GE} = 0V	—	—	7.5	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}	$V_R = V_{RRM}$	—	—	1.0	mA
Forward Voltage Drop *	V_F	I_F = 50A	—	2.3	3.2	Volts
		I_F = 50A, Chip	—	2.2	—	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**	$R_{th(c-f)}$	Thermal Grease Applied	—	0.015	—	°C/W
Internal Gate Resistance	R_{Gint}	T_C = 25°C	—	0	—	Ω
External Gate Resistance	R_G		13	—	125	Ω

Converter Sector, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Repetitive Peak Reverse Current	I_{RRM}	$V_R = V_{RRM}$, T_j = 150°C	—	—	20	mA
Forward Voltage Drop	V_F	I_F = 100A	—	1.2	1.6	Volts
Thermal Resistance, Junction to Case**	$R_{th(j-c)}$	Per FWDi	—	—	0.24	K/W
Contact Thermal Resistance**	$R_{th(c-f)}$	Thermal Grease Applied	—	0.015	—	°C/W

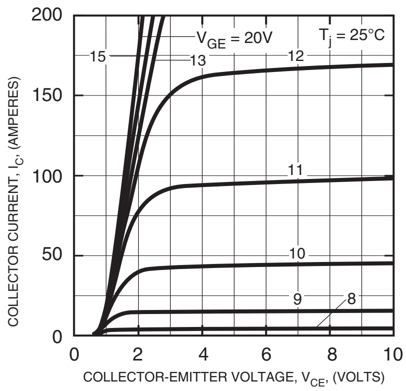
NTC Thermistor Sector, T_j = 25°C unless otherwise specified

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	$B_{(25/50)}$	$B = (lnR_1 - lnR_2) / (1/T_1 - 1/T_2)$***	—	3375	—	K
Power Dissipation	P_{25}	T_C = 25°C	—	—	10	mW

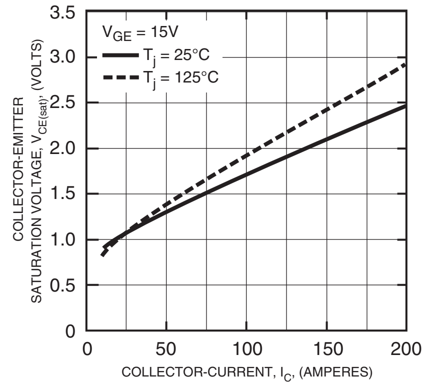
*Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).
**T_C, T_f measured point is just under the chips.
***R1: Resistance at Absolute Temperature T_1(K), R_2: Resistance at Absolute Temperature T_2(K), T(K) = t(°C) + 273.15

CM100MX-12A
NX-Series CIB Module
(3Ø Converter + 3Ø Inverter + Brake)
100 Amperes/600 Volts

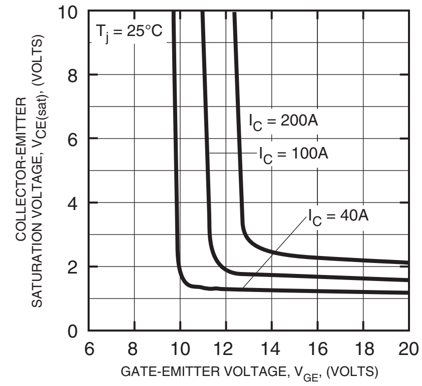
OUTPUT CHARACTERISTICS (INVERTER PART - TYPICAL)



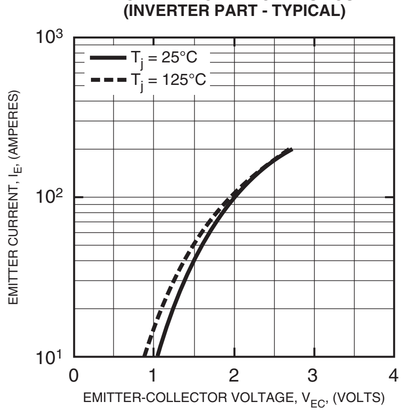
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (INVERTER PART - TYPICAL)



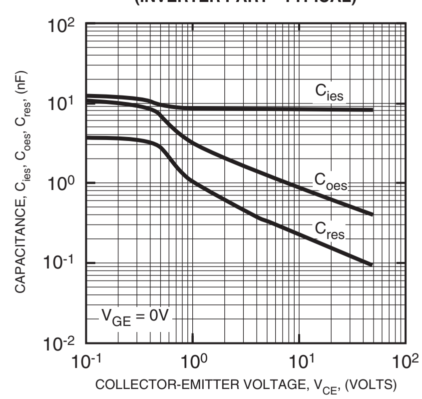
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (INVERTER PART - TYPICAL)



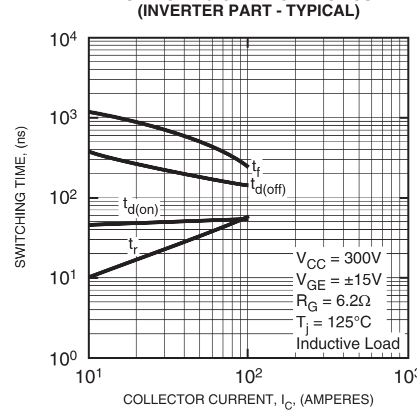
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (INVERTER PART - TYPICAL)



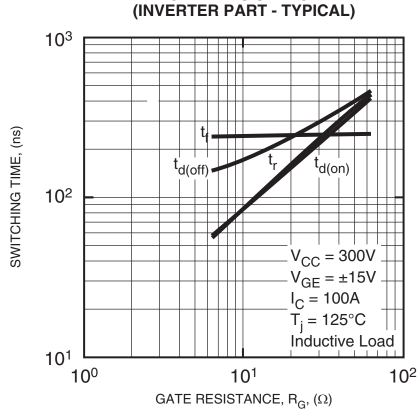
CAPACITANCE VS. V_{CE} (INVERTER PART - TYPICAL)



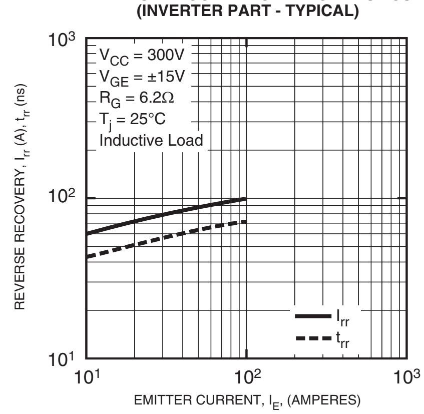
HALF-BRIDGE SWITCHING CHARACTERISTICS (INVERTER PART - TYPICAL)



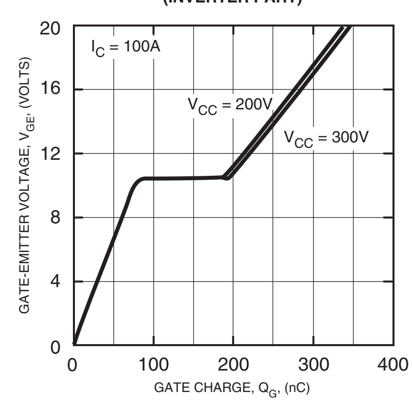
SWITCHING TIME VS. GATE RESISTANCE (INVERTER PART - TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (INVERTER PART - TYPICAL)



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

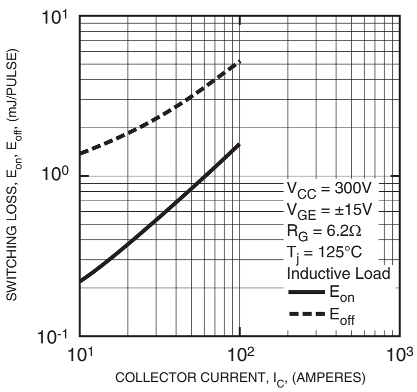


POWEREX

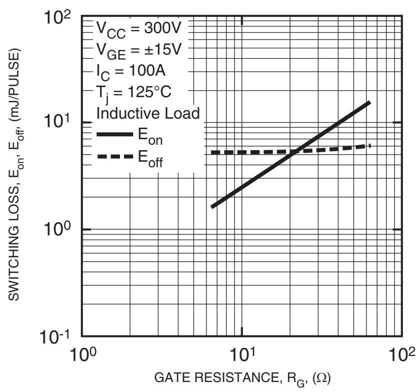
Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272

CM100MX-12A
NX-Series CIB Module
(3Ø Converter + 3Ø Inverter + Brake)
100 Amperes/600 Volts

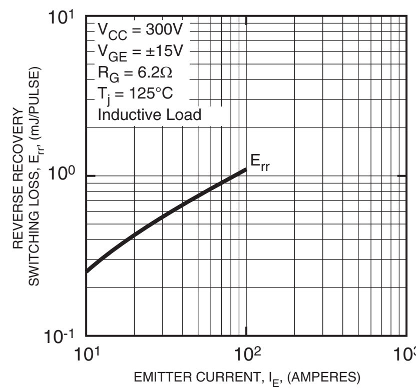
SWITCHING LOSS VS. COLLECTOR CURRENT (INVERTER PART - TYPICAL)



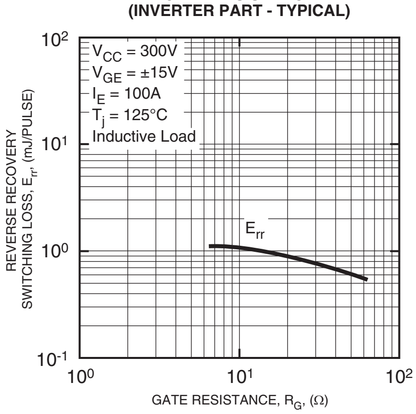
SWITCHING LOSS VS. GATE RESISTANCE (INVERTER PART - TYPICAL)



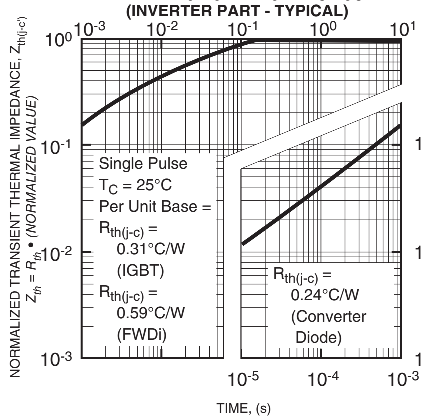
REVERSE RECOVERY SWITCHING LOSS VS. EMITTER CURRENT (INVERTER PART - TYPICAL)



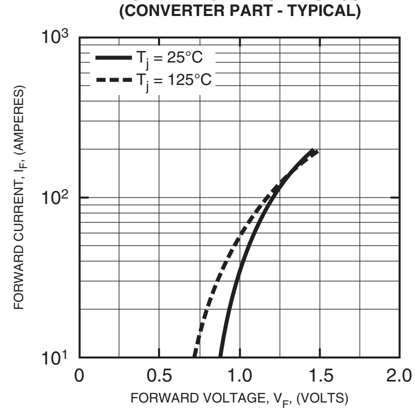
REVERSE RECOVERY SWITCHING LOSS VS. GATE RESISTANCE (INVERTER PART - TYPICAL)



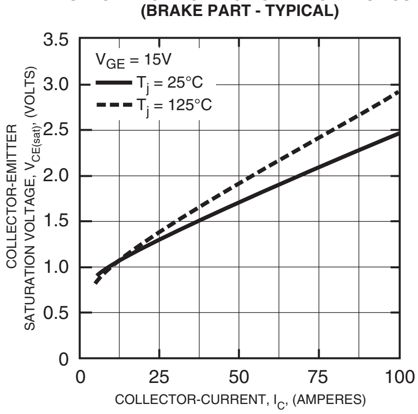
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (INVERTER PART - TYPICAL)



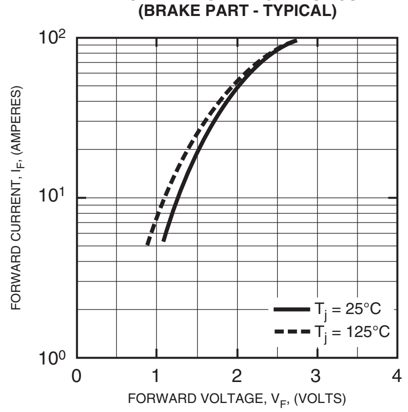
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (CONVERTER PART - TYPICAL)



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



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



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (BRAKE PART - TYPICAL)