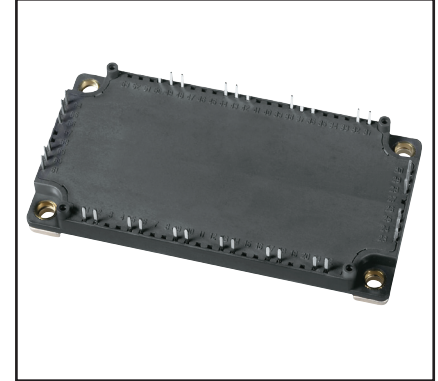
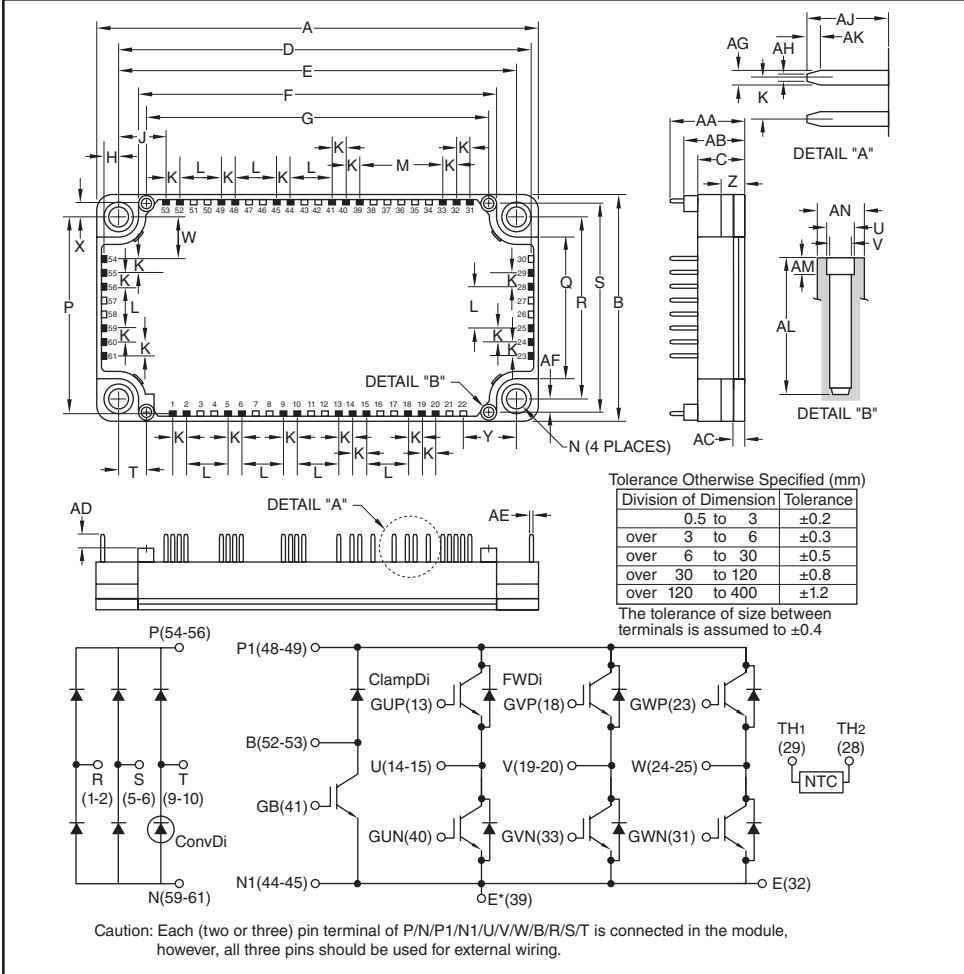


### NX-Series CIB Module (3Ø Converter + 3Ø Inverter + Brake) 50 Amperes/1200 Volts



#### 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. 6th 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. CM50MXA-24S is a 1200V ( $V_{CES}$ ), 50 Ampere CIB Power Module.

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

#### Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.79	121.7
B	2.44	62.0
C	0.51	13.0
D	4.49	114.05
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	0.9	22.86
N	0.22 Dia.	5.5 Dia.
P	2.13	54.2
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	0.102 Dia.	2.6 Dia.

Dimensions	Inches	Millimeters
V	0.088 Dia.	2.25 Dia.
W	0.46	11.66
X	0.16	4.2
Y	0.59	15.0
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	0.05	1.2
AL	0.49	12.5
AM	0.12	3.0
AN	0.17 Dia.	4.3 Dia.

**CM50MXA-24S**  
**NX-Series CIB Module**  
**(3Ø Converter + 3Ø Inverter + Brake)**  
**50 Amperes/1200 Volts**

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

**Inverter Part IGBT/FWDi**

Characteristics	Symbol	Rating	Units
Collector-Emitter Voltage ( $V_{GE} = 0V$ )	$V_{CES}$	1200	Volts
Gate-Emitter Voltage ( $V_{CE} = 0V$ )	$V_{GES}$	$\pm 20$	Volts
Collector Current (DC, $T_C = 125^\circ\text{C}$ )*2,*4	$I_C$	50	Amperes
Collector Current (Pulse, Repetitive)*3	$I_{CRM}$	100	Amperes
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )*2,*4	$P_{tot}$	425	Watts
Emitter Current*2	$I_E^{*1}$	50	Amperes
Emitter Current (Pulse, Repetitive)*3	$I_{ERM}^{*1}$	100	Amperes
Maximum Junction Temperature, Instantaneous Event (Overload)	$T_{j(max)}$	175	$^\circ\text{C}$

**Brake Part IGBT/ClampDi**

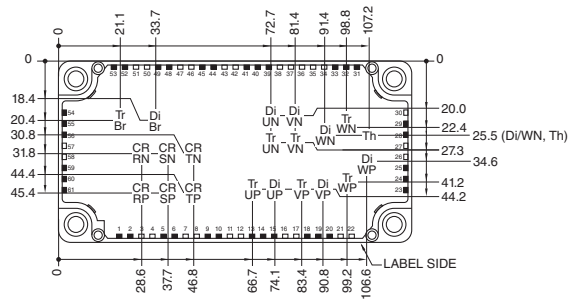
Characteristics	Symbol	Rating	Units
Collector-Emitter Voltage ( $V_{GE} = 0V$ )	$V_{CES}$	1200	Volts
Gate-Emitter Voltage ( $V_{CE} = 0V$ )	$V_{GES}$	$\pm 20$	Volts
Collector Current (DC, $T_C = 125^\circ\text{C}$ )*2,*4	$I_C$	35	Amperes
Collector Current (Pulse, Repetitive)*3	$I_{CRM}$	70	Amperes
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )*2,*4	$P_{tot}$	355	Watts
Repetitive Peak Reverse Voltage ( $V_{GE} = 0V$ )	$V_{RRM}$	1200	Volts
Forward Current*2	$I_F^{*1}$	35	Amperes
Forward Current (Pulse, Repetitive)*3	$I_{FRM}^{*1}$	70	Amperes
Maximum Junction Temperature, Instantaneous Event (Overload)	$T_{j(max)}$	175	$^\circ\text{C}$

\*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.



Each mark points to the center position of each chip.

Tr\*P / Tr\*N / TrBr (\* = U/V/W): IGBT  
 Di\*P / Di\*N (\* = U/V/W): FWDi  
 DiBr: Clamp Di  
 CR\*P / CR\*N (\* = R/S/T): Conv Di  
 Th: NTC Thermistor



**CM50MXA-24S**  
**NX-Series CIB Module**  
**(3Ø Converter + 3Ø Inverter + Brake)**  
**50 Amperes/1200 Volts**

**Absolute Maximum Ratings, T<sub>j</sub> = 25°C unless otherwise specified**

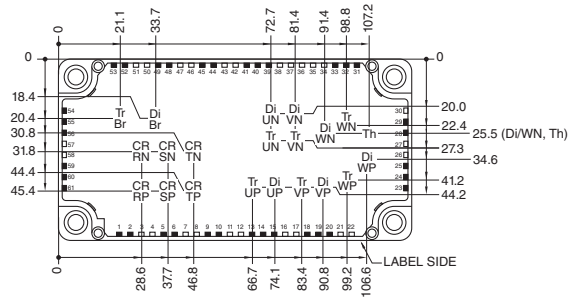
**Converter Part ConvDi**

Characteristics	Symbol	Rating	Units
Repetitive Peak Reverse Voltage (V <sub>GE</sub> = 0V)	V <sub>RRM</sub>	1600	Volts
Recommended AC Input Voltage (RMS)	E <sub>a</sub>	480	Volts
DC Output Current (3-Phase Full Wave Rectifying, T <sub>C</sub> = 125°C) <sup>*4</sup>	I <sub>O</sub>	50	Amperes
Surge Forward Current (Sine Half Wave 1 Cycle Peak Value, f = 60Hz, Non-repetative)	I <sub>FSM</sub>	500	Amperes
Current Square Time (Value for One Cycle of Surge Current)	I <sup>2</sup> t	1040	A <sup>2</sup> s
Maximum Junction Temperature, Instantaneous Event (Overload)	T <sub>j(max)</sub>	150	°C

**Module**

Characteristics	Symbol	Rating	Units
Isolation Voltage (Terminals to Baseplate, RMS, f = 60Hz, AC 1 minute)	V <sub>ISO</sub>	2500	Volts
Maximum Case Temperature <sup>*4</sup>	T <sub>C(max)</sub>	125	°C
Operating Junction Temperature, Continuous Operation (Under Switching)	T <sub>j(op)</sub>	-40 to +150	°C
Storage Temperature	T <sub>stg</sub>	-40 to +125	°C

<sup>\*4</sup> Case temperature (T<sub>C</sub>) and heatsink temperature (T<sub>S</sub>) 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.



Each mark points to the center position of each chip.

Tr\*P / Tr\*N / Tr\*Br (\* = U/V/W): IGBT      Di\*P / Di\*N (\* = U/V/W): FWDI  
 Di\*Br: Clamp Di                                  CR\*P / CR\*N (\* = R/S/T): Conv Di  
 Th: NTC Thermistor

**CM50MXA-24S**  
**NX-Series CIB Module**  
**(3Ø Converter + 3Ø Inverter + Brake)**  
 50 Amperes/1200 Volts

**Electrical Characteristics, T<sub>j</sub> = 25°C unless otherwise specified**

**Inverter Part IGBT/FWDi**

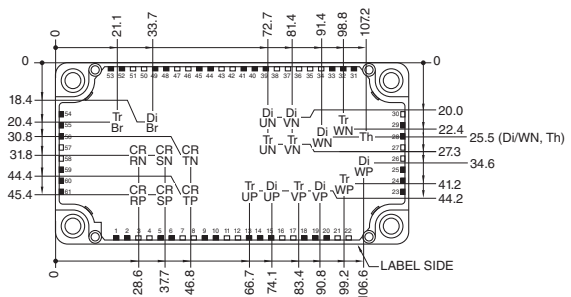
Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Emitter Cutoff Current	I <sub>CES</sub>	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V	—	—	1.0	mA
Gate-Emitter Leakage Current	I <sub>GES</sub>	V <sub>GE</sub> = V <sub>GES</sub> , V <sub>CE</sub> = 0V	—	—	0.5	µA
Gate-Emitter Threshold Voltage	V <sub>GE(th)</sub>	I <sub>C</sub> = 5mA, V <sub>CE</sub> = 10V	5.4	6.0	6.6	Volts
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub> (Terminal)	I <sub>C</sub> = 50A, V <sub>GE</sub> = 15V, T <sub>j</sub> = 25°C*6	—	1.80	2.25	Volts
		I <sub>C</sub> = 50A, V <sub>GE</sub> = 15V, T <sub>j</sub> = 125°C*6	—	2.00	—	Volts
		I <sub>C</sub> = 50A, V <sub>GE</sub> = 15V, T <sub>j</sub> = 150°C*6	—	2.05	—	Volts
Collector-Emitter Saturation Voltage	V <sub>CE(sat)</sub> (Chip)	I <sub>C</sub> = 50A, V <sub>GE</sub> = 15V, T <sub>j</sub> = 25°C*6	—	1.70	2.15	Volts
		I <sub>C</sub> = 50A, V <sub>GE</sub> = 15V, T <sub>j</sub> = 125°C*6	—	1.90	—	Volts
		I <sub>C</sub> = 50A, V <sub>GE</sub> = 15V, T <sub>j</sub> = 150°C*6	—	1.95	—	Volts
Input Capacitance	C <sub>ies</sub>		—	—	5.0	nF
Output Capacitance	C <sub>oes</sub>	V <sub>CE</sub> = 10V, V <sub>GE</sub> = 0V	—	—	1.0	nF
Reverse Transfer Capacitance	C <sub>res</sub>		—	—	0.08	nF
Gate Charge	Q <sub>G</sub>	V <sub>CC</sub> = 600V, I <sub>C</sub> = 50A, V <sub>GE</sub> = 15V	—	117	—	nC
Turn-on Delay Time	t <sub>d(on)</sub>		—	—	300	ns
Rise Time	t <sub>r</sub>	V <sub>CC</sub> = 600V, I <sub>C</sub> = 50A, V <sub>GE</sub> = ±15V,	—	—	200	ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 13Ω, Inductive Load	—	—	600	ns
Fall Time	t <sub>f</sub>		—	—	300	ns
Emitter-Collector Voltage	V <sub>EC</sub> *1 (Terminal)	I <sub>E</sub> = 50A, V <sub>GE</sub> = 0V, T <sub>j</sub> = 25°C*6	—	1.80	2.25	Volts
		I <sub>E</sub> = 50A, V <sub>GE</sub> = 0V, T <sub>j</sub> = 125°C*6	—	1.80	—	Volts
		I <sub>E</sub> = 50A, V <sub>GE</sub> = 0V, T <sub>j</sub> = 150°C*6	—	1.80	—	Volts
Emitter-Collector Voltage	V <sub>EC</sub> *1 (Chip)	I <sub>E</sub> = 50A, V <sub>GE</sub> = 0V, T <sub>j</sub> = 25°C*6	—	1.70	2.15	Volts
		I <sub>E</sub> = 50A, V <sub>GE</sub> = 0V, T <sub>j</sub> = 125°C*6	—	1.70	—	Volts
		I <sub>E</sub> = 50A, V <sub>GE</sub> = 0V, T <sub>j</sub> = 150°C*6	—	1.70	—	Volts
Reverse Recovery Time	t <sub>rr</sub> *1	V <sub>CC</sub> = 600V, I <sub>E</sub> = 50A, V <sub>GE</sub> = ±15V	—	—	300	ns
Reverse Recovery Charge	Q <sub>rr</sub> *1	R <sub>G</sub> = 13Ω, Inductive Load	—	2.7	—	µC
Turn-on Switching Energy per Pulse	E <sub>on</sub>	V <sub>CC</sub> = 600V, I <sub>C</sub> = I <sub>E</sub> = 50A,	—	5.5	—	mJ
Turn-off Switching Energy per Pulse	E <sub>off</sub>	V <sub>GE</sub> = ±15V, R <sub>G</sub> = 13Ω,	—	5.3	—	mJ
Reverse Recovery Energy per Pulse	E <sub>rr</sub> *1	T <sub>j</sub> = 150°C, Inductive Load	—	4.5	—	mJ
Internal Lead Resistance	R <sub>CC</sub> * + EE'	Main Terminals-Chip, Per Switch, T <sub>C</sub> = 25°C*4	—	—	5.0	mΩ
Internal Gate Resistance	r <sub>g</sub>	Per Switch	—	0	—	Ω

\*1 Represent ratings and characteristics of the anti-parallel, emitter-to-collector free wheeling diode (FWDi).

\*4 Case temperature (T<sub>C</sub>) and heatsink temperature (T<sub>S</sub>) 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 Pulse width and repetition rate should be such as to cause negligible temperature rise.



Each mark points to the center position of each chip.

Tr\*P / Tr\*N / TrBr (\* = U/V/W): IGBT      Di\*P / Di\*N (\* = U/V/W): FWDi  
 DiBr: Clamp Di      CR\*P / CR\*N (\* = R/S/T): Conv Di  
 Th: NTC Thermistor

**CM50MXA-24S**  
**NX-Series CIB Module**  
**(3Ø Converter + 3Ø Inverter + Brake)**  
 50 Amperes/1200 Volts

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

#### Brake Part IGBT/ClampDi

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Emitter Cutoff Current	$I_{CES}$	$V_{CE} = V_{CES}, V_{GE} = 0V$	—	—	1.0	mA
Gate-Emitter Leakage Current	$I_{GES}$	$V_{GE} = V_{GES}, V_{CE} = 0V$	—	—	0.5	$\mu\text{A}$
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 3.5\text{mA}, V_{CE} = 10V$	5.4	6.0	6.6	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$ (Terminal)	$I_C = 35A, V_{GE} = 15V, T_j = 25^\circ\text{C}^{*6}$	—	1.80	2.25	Volts
		$I_C = 35A, V_{GE} = 15V, T_j = 125^\circ\text{C}^{*6}$	—	2.00	—	Volts
		$I_C = 35A, V_{GE} = 15V, T_j = 150^\circ\text{C}^{*6}$	—	2.05	—	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$ (Chip)	$I_C = 35A, V_{GE} = 15V, T_j = 25^\circ\text{C}^{*6}$	—	1.70	2.15	Volts
		$I_C = 35A, V_{GE} = 15V, T_j = 125^\circ\text{C}^{*6}$	—	1.90	—	Volts
		$I_C = 35A, V_{GE} = 15V, T_j = 150^\circ\text{C}^{*6}$	—	1.95	—	Volts
Input Capacitance	$C_{ies}$		—	—	3.5	nF
Output Capacitance	$C_{oes}$	$V_{CE} = 10V, V_{GE} = 0V$	—	—	0.7	nF
Reverse Transfer Capacitance	$C_{res}$		—	—	0.06	nF
Gate Charge	$Q_G$	$V_{CC} = 600V, I_C = 35A, V_{GE} = 15V$	—	82	—	nC
Turn-on Delay Time	$t_{d(on)}$		—	—	300	ns
Rise Time	$t_r$	$V_{CC} = 600V, I_C = 35A, V_{GE} = \pm 15V,$	—	—	200	ns
Turn-off Delay Time	$t_{d(off)}$	$R_G = 18\Omega, \text{Inductive Load}$	—	—	600	ns
Fall Time	$t_f$		—	—	300	ns
Forward Voltage	$V_F$ (Terminal)	$I_E = 35A, V_{GE} = 0V, T_j = 25^\circ\text{C}^{*6}$	—	1.80	2.25	Volts
		$I_E = 35A, V_{GE} = 0V, T_j = 125^\circ\text{C}^{*6}$	—	1.80	—	Volts
		$I_E = 35A, V_{GE} = 0V, T_j = 150^\circ\text{C}^{*6}$	—	1.80	—	Volts
Forward Voltage	$V_F$ (Chip)	$I_E = 35A, V_{GE} = 0V, T_j = 25^\circ\text{C}^{*6}$	—	1.70	2.15	Volts
		$I_E = 35A, V_{GE} = 0V, T_j = 125^\circ\text{C}^{*6}$	—	1.70	—	Volts
		$I_E = 35A, V_{GE} = 0V, T_j = 150^\circ\text{C}^{*6}$	—	1.70	—	Volts
Reverse Recovery Time	$t_{rr}$	$V_{CC} = 600V, I_E = 35A, V_{GE} = \pm 15V$	—	—	300	ns
Reverse Recovery Charge	$Q_{rr}$	$R_G = 18\Omega, \text{Inductive Load}$	—	1.9	—	$\mu\text{C}$
Turn-on Switching Energy per Pulse	$E_{on}$	$V_{CC} = 600V, I_C = I_E = 35A,$	—	4.2	—	mJ
Turn-off Switching Energy per Pulse	$E_{off}$	$V_{GE} = \pm 15V, R_G = 18\Omega,$	—	3.7	—	mJ
Reverse Recovery Energy per Pulse	$E_{rr}$	$T_j = 150^\circ\text{C}, \text{Inductive Load}$	—	3.5	—	mJ
Internal Gate Resistance	$r_g$		—	0	—	$\Omega$

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

**CM50MXA-24S**  
**NX-Series CIB Module**  
**(3Ø Converter + 3Ø Inverter + Brake)**  
 50 Amperes/1200 Volts

**Electrical Characteristics, T<sub>j</sub> = 25°C unless otherwise specified (continued)**

**Converter Part ConvDi**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Repetitive Peak Reverse Current	I <sub>RRM</sub>	V <sub>R</sub> = V <sub>RRM</sub> , T <sub>j</sub> = 150°C	—	—	6.0	mA
Forward Voltage	V <sub>F</sub>	I <sub>F</sub> = 50A <sup>6</sup>	—	1.2	1.6	Volts

(Terminal)

**NTC Thermistor Part**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Zero Power Resistance	R <sub>25</sub>	T <sub>C</sub> = 25°C <sup>4</sup>	4.85	5.00	5.15	kΩ
Deviation of Resistance	ΔR/R	T <sub>C</sub> = 100°C <sup>4</sup> , R <sub>100</sub> = 493Ω	-7.3	—	+7.8	%
B Constant	B <sub>(25/50)</sub>	Approximate by Equation <sup>7</sup>	—	3375	—	K
Power Dissipation	P <sub>25</sub>	T <sub>C</sub> = 25°C <sup>4</sup>	—	—	10	mW

**Thermal Resistance Characteristics**

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case <sup>4</sup>	R <sub>th(j-c)Q</sub>	Per Inverter IGBT	—	—	0.35	K/W
Thermal Resistance, Junction to Case <sup>4</sup>	R <sub>th(j-c)D</sub>	Per Inverter FWDi	—	—	0.63	K/W
Thermal Resistance, Junction to Case <sup>4</sup>	R <sub>th(j-c)Q</sub>	Per Brake IGBT	—	—	0.42	K/W
Thermal Resistance, Junction to Case <sup>4</sup>	R <sub>th(j-c)D</sub>	Per Brake ClampDi	—	—	0.69	K/W
Thermal Resistance, Junction to Case <sup>4</sup>	R <sub>th(j-c)D</sub>	Per Converter ConvDi	—	—	0.33	K/W
Contact Thermal Resistance, Case to Heatsink <sup>4</sup>	R <sub>th(c-f)</sub>	Thermal Grease Applied, Per 1 Module <sup>8</sup>	—	15	—	K/kW

<sup>4</sup> Case temperature (T<sub>C</sub>) and heatsink temperature (T<sub>S</sub>) 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.

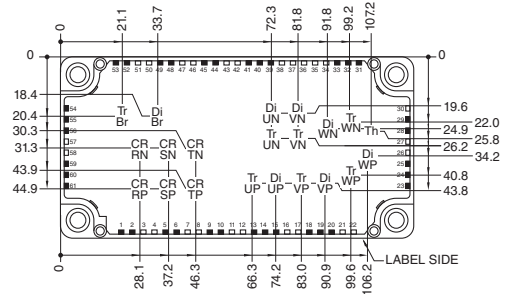
<sup>6</sup> Pulse width and repetition rate should be such as to cause negligible temperature rise.

<sup>7</sup>  $B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}} \cdot \frac{1}{\frac{1}{T_{25}} - \frac{1}{T_{50}}}\right)$

R<sub>25</sub>: Resistance at Absolute Temperature T<sub>25</sub> [K]; T<sub>25</sub> = 25 [°C] + 273.15 = 298.15 [K]

R<sub>50</sub>: Resistance at Absolute Temperature T<sub>50</sub> [K]; T<sub>50</sub> = 50 [°C] + 273.15 = 323.15 [K]

<sup>8</sup> Typical value is measured by using thermally conductive grease of λ = 0.9 [W/(m • K)].



Each mark points to the center position of each chip.

Tr\*P / Tr\*N / Tr\*Br (\* = U/V/W); IGBT      Di\*P / Di\*N (\* = U/V/W); FWDi  
 Di\*Br: Clamp Di      CR\*P / CR\*N (\* = R/S/T); Conv Di  
 Th: NTC Thermistor

**CM50MXA-24S**  
**NX-Series CIB Module**  
**(3Ø Converter + 3Ø Inverter + Brake)**  
**50 Amperes/1200 Volts**

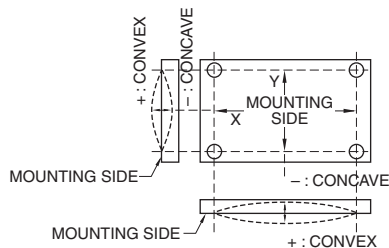
### Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Mounting Torque	$M_s$	Mounting to Heatsink, M5 Screw	22	27	31	in-lb
Creepage Distance	$d_s$	Terminal to Terminal	6.47	—	—	mm
		Terminal to Baseplate	14.27	—	—	mm
Clearance	$d_a$	Terminal to Terminal	6.47	—	—	mm
		Terminal to Baseplate	12.33	—	—	mm
Weight	$m$			300		g
Flatness of Baseplate	$e_c$	On Centerline X, Y <sup>*5</sup>	±0	—	±100	µm

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

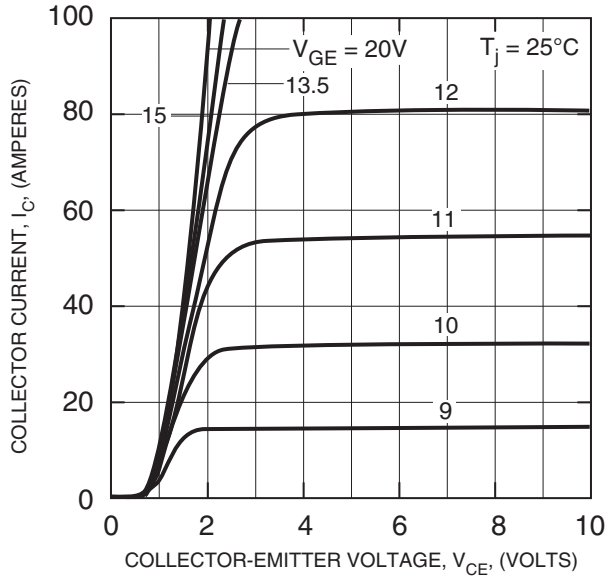
DC Supply Voltage	$V_{CC}$	Applied Across P-N/P1-N1 Terminals	—	600	850	Volts
Gate-Emitter Drive Voltage	$V_{GE(on)}$	Applied Across GB-Es1/ G*P-*/G*N-Es (* = U, V, W) Terminals	13.5	15.0	16.5	Volts
External Gate Resistance	$R_G$	Per Switch Inverter IGBT	13	—	130	Ω
		Per Switch Brake IGBT	18	—	180	Ω

\*5 Baseplate (mounting side) flatness measurement points (X, Y) are shown in the figure below.

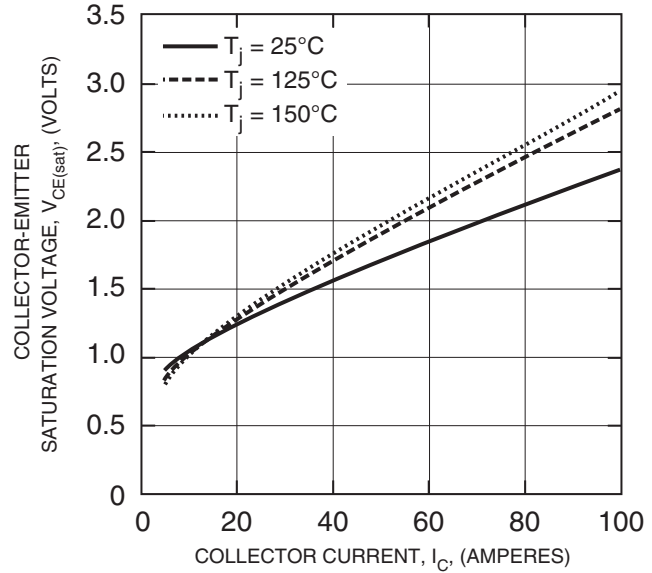


**CM50MXA-24S**  
**NX-Series CIB Module**  
**(3Ø Converter + 3Ø Inverter + Brake)**  
 50 Amperes/1200 Volts

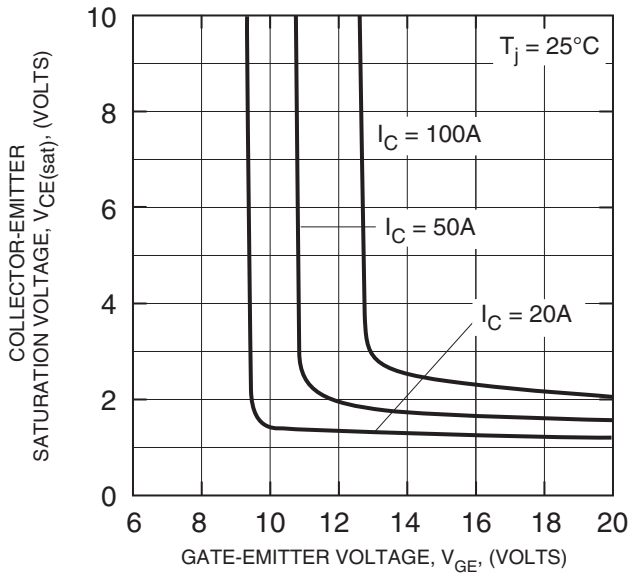
**OUTPUT CHARACTERISTICS  
 (INVERTER PART - TYPICAL)**



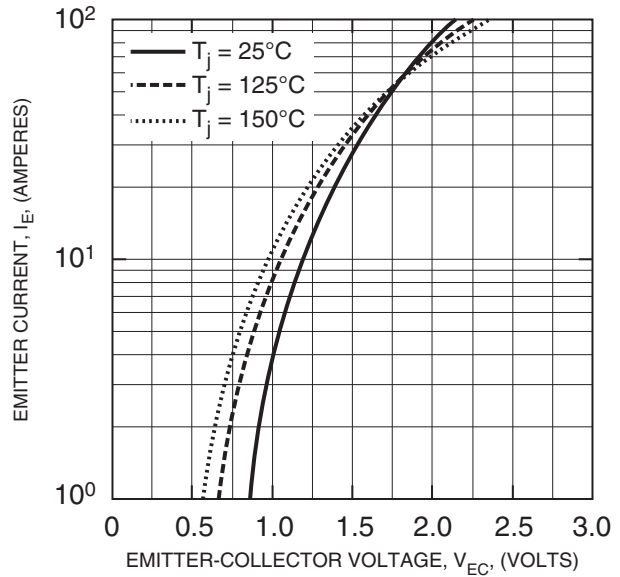
**COLLECTOR-EMITTER  
 SATURATION VOLTAGE CHARACTERISTICS  
 (INVERTER PART - TYPICAL)**



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



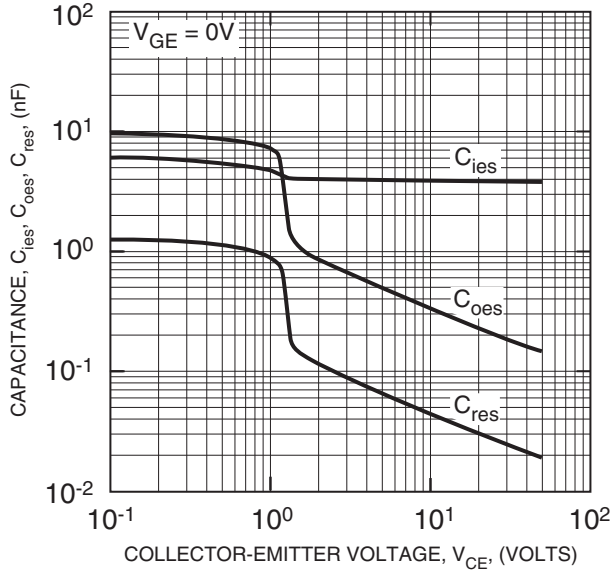
**FREE-WHEEL DIODE  
 FORWARD CHARACTERISTICS  
 (INVERTER PART - TYPICAL)**



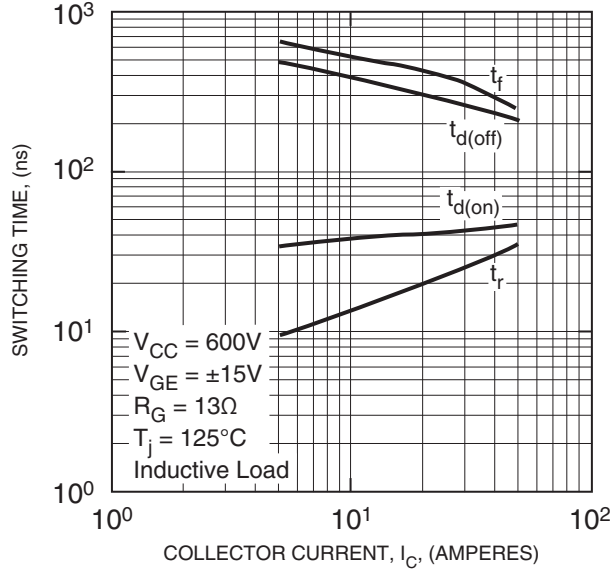


**CM50MXA-24S**  
**NX-Series CIB Module**  
**(3Ø Converter + 3Ø Inverter + Brake)**  
**50 Amperes/1200 Volts**

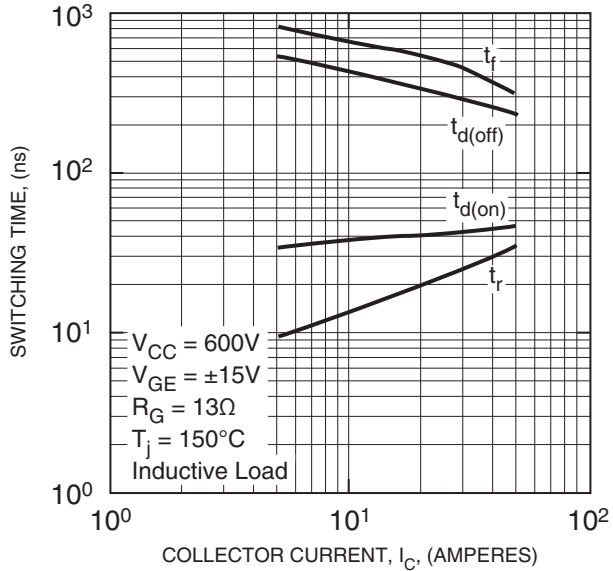
**CAPACITANCE VS.  $V_{CE}$**   
**(INVERTER PART - TYPICAL)**



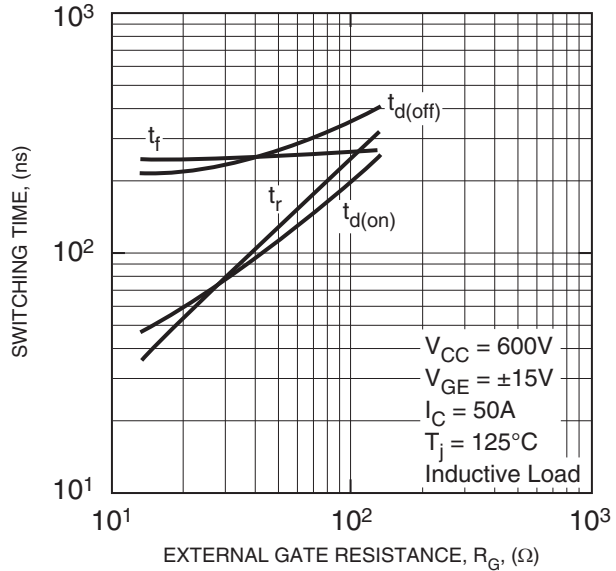
**HALF-BRIDGE**  
**SWITCHING CHARACTERISTICS**  
**(INVERTER PART - TYPICAL)**



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

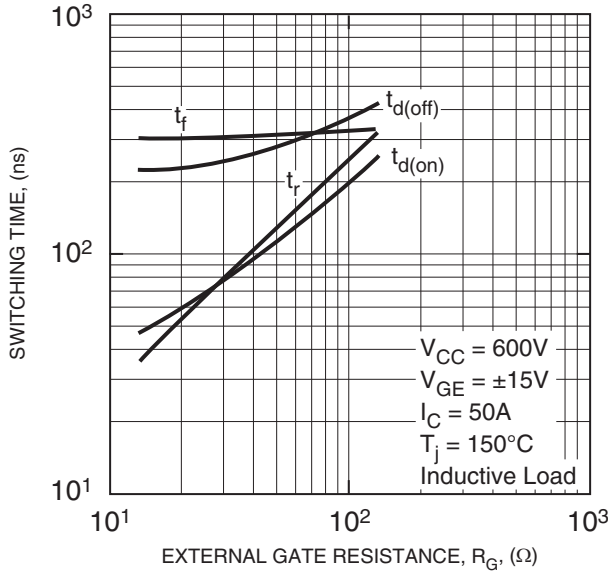


**SWITCHING TIME VS.**  
**GATE RESISTANCE**  
**(INVERTER PART - TYPICAL)**

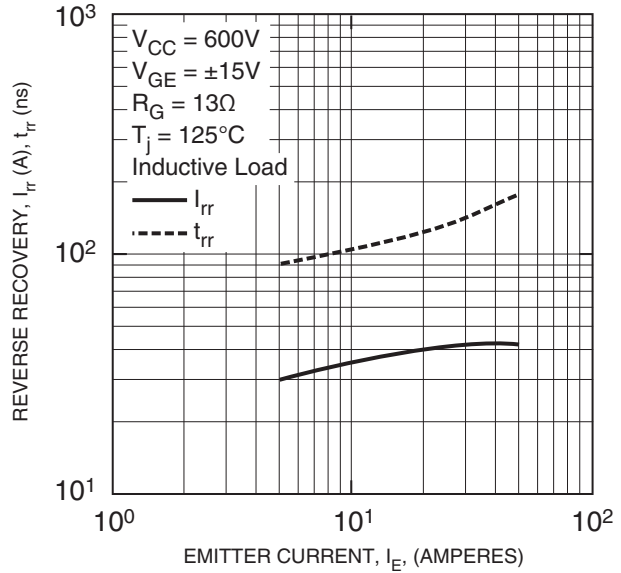


**CM50MXA-24S**  
**NX-Series CIB Module**  
**(3Ø Converter + 3Ø Inverter + Brake)**  
 50 Amperes/1200 Volts

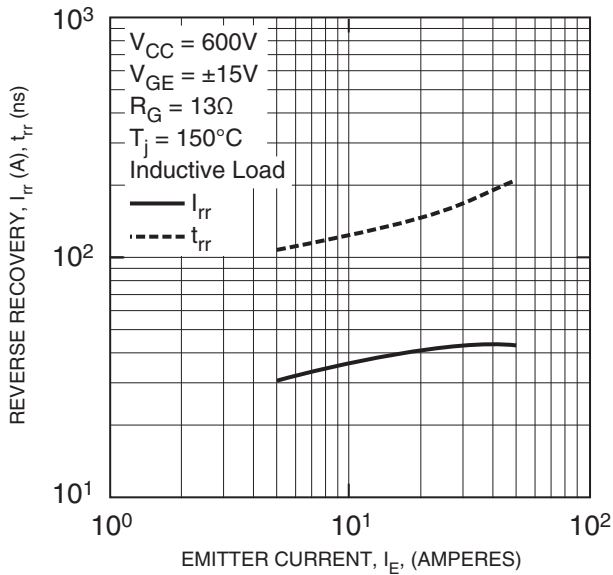
**SWITCHING TIME VS. GATE RESISTANCE (INVERTER PART - TYPICAL)**



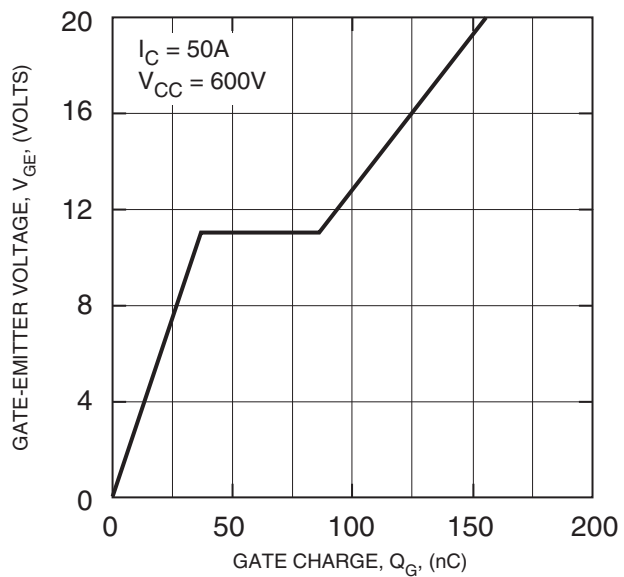
**REVERSE RECOVERY CHARACTERISTICS (INVERTER PART - TYPICAL)**



**REVERSE RECOVERY CHARACTERISTICS (INVERTER PART - TYPICAL)**

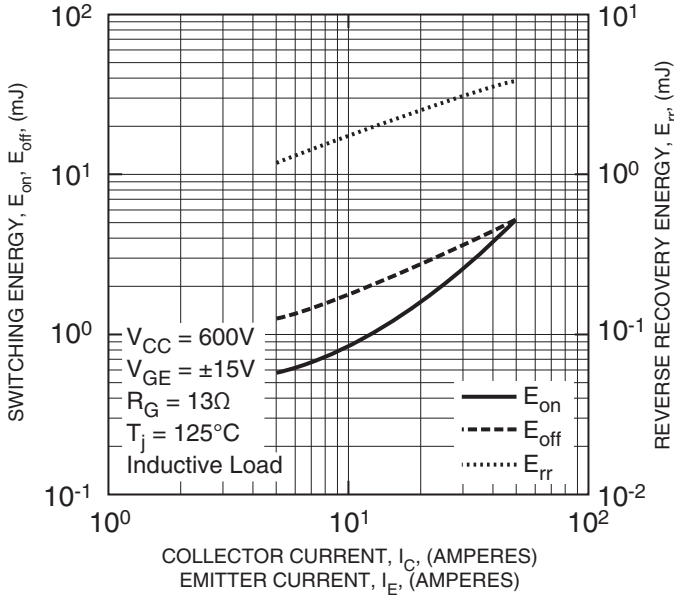


**GATE CHARGE VS. V\_GE (INVERTER PART)**

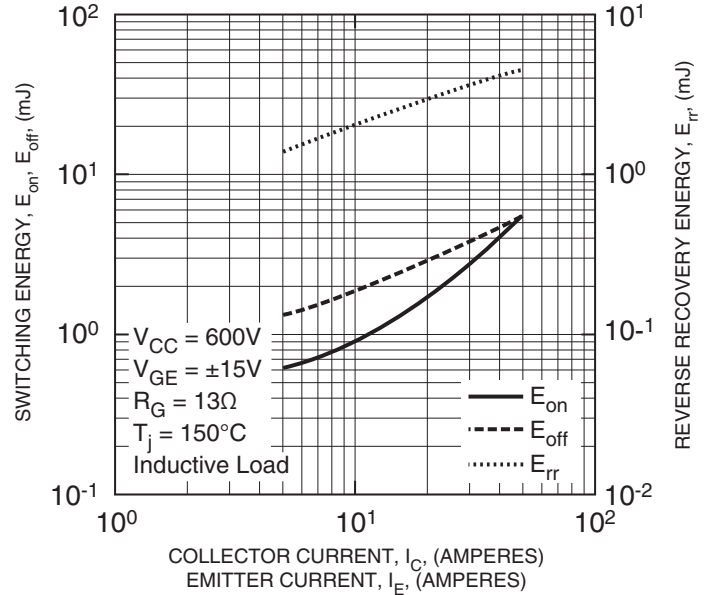


**CM50MXA-24S**  
**NX-Series CIB Module**  
**(3Ø Converter + 3Ø Inverter + Brake)**  
 50 Amperes/1200 Volts

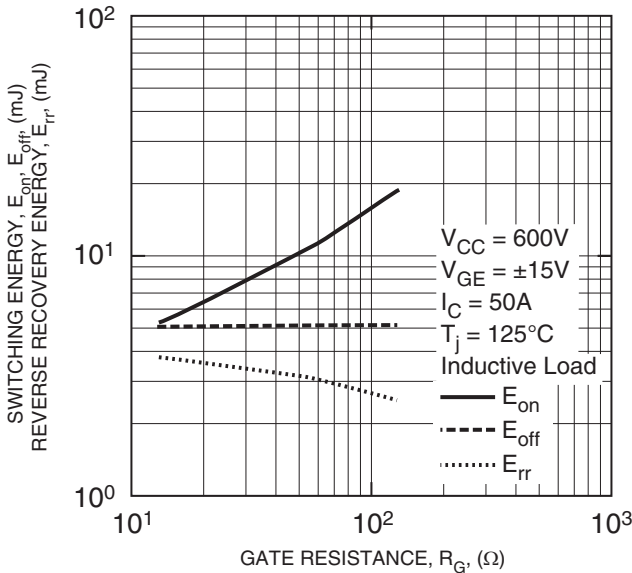
**HALF-BRIDGE SWITCHING CHARACTERISTICS (INVERTER PART - TYPICAL)**



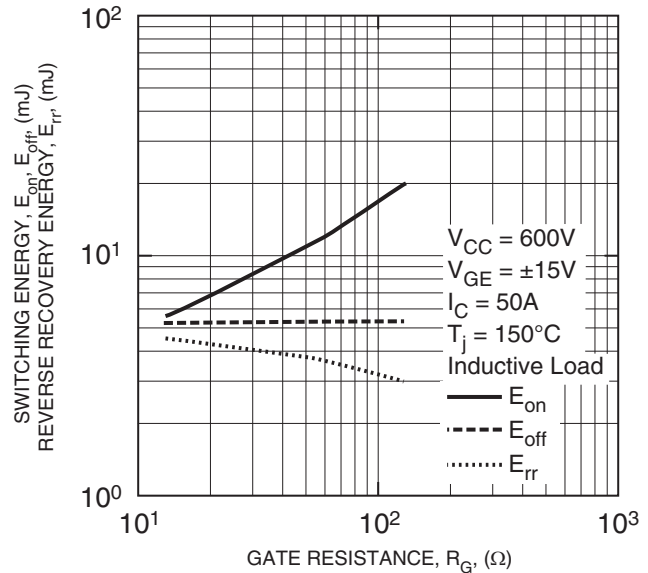
**HALF-BRIDGE SWITCHING CHARACTERISTICS (INVERTER PART - TYPICAL)**



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

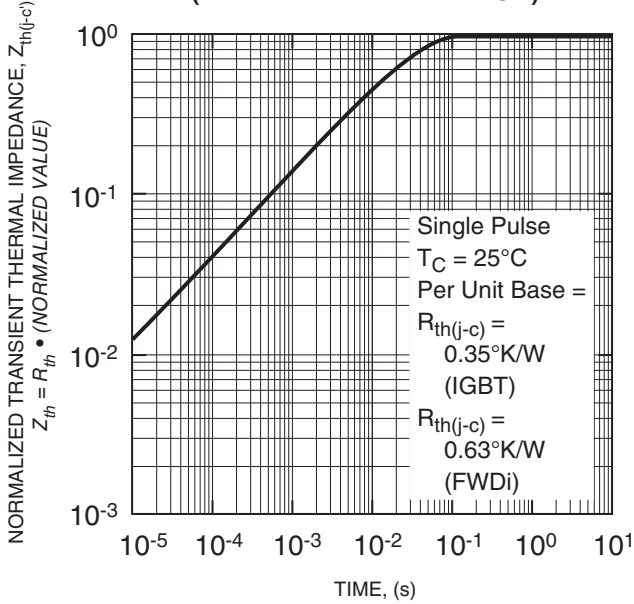


**HALF-BRIDGE SWITCHING CHARACTERISTICS (INVERTER PART - TYPICAL)**

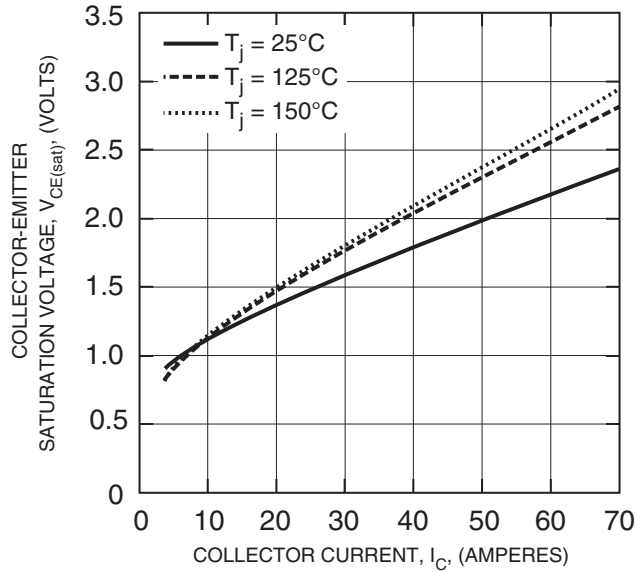


**CM50MXA-24S**  
**NX-Series CIB Module**  
**(3Ø Converter + 3Ø Inverter + Brake)**  
 50 Amperes/1200 Volts

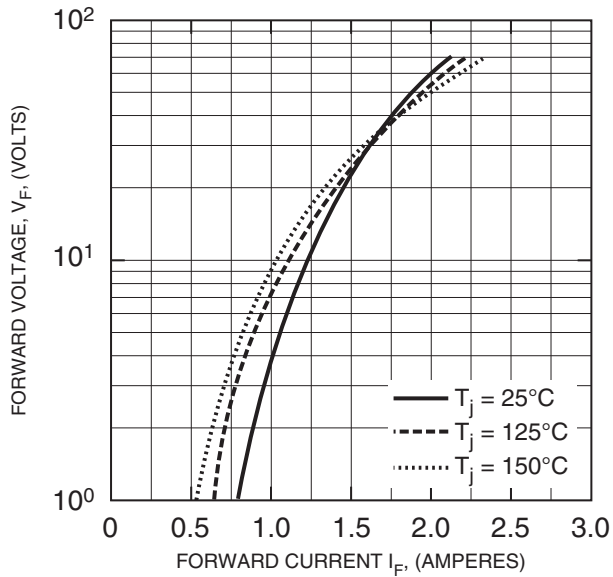
**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (INVERTER PART - MAXIMUM)**



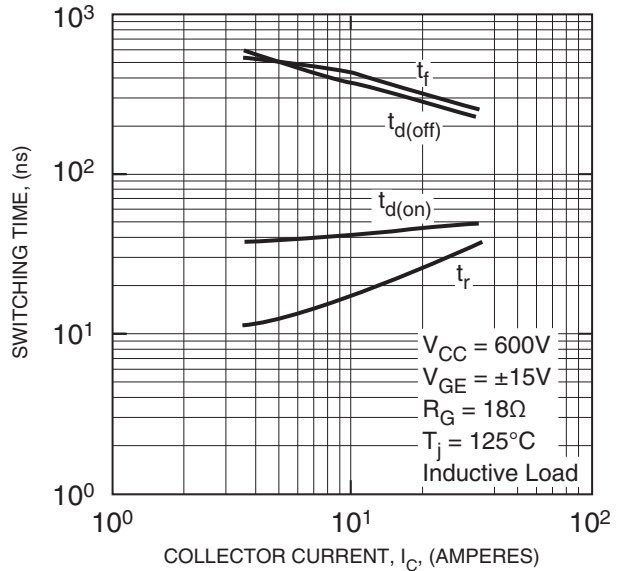
**COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (BRAKE PART - TYPICAL)**



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

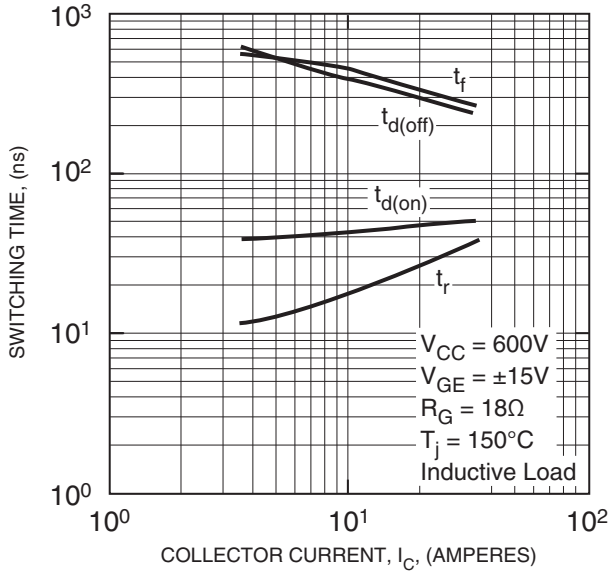


**HALF-BRIDGE SWITCHING CHARACTERISTICS (BRAKE PART - TYPICAL)**

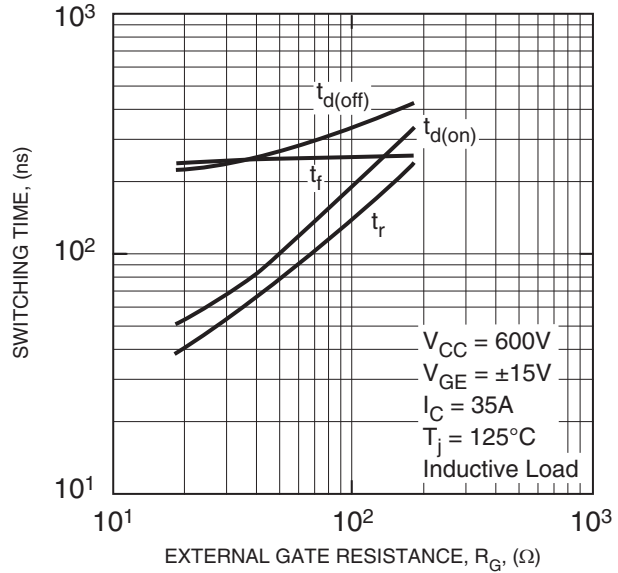


**CM50MXA-24S**  
**NX-Series CIB Module**  
**(3Ø Converter + 3Ø Inverter + Brake)**  
 50 Amperes/1200 Volts

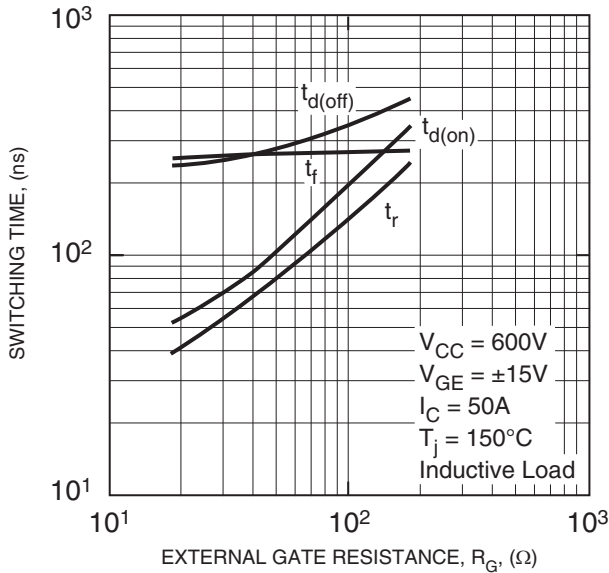
**HALF-BRIDGE SWITCHING CHARACTERISTICS (BRAKE PART - TYPICAL)**



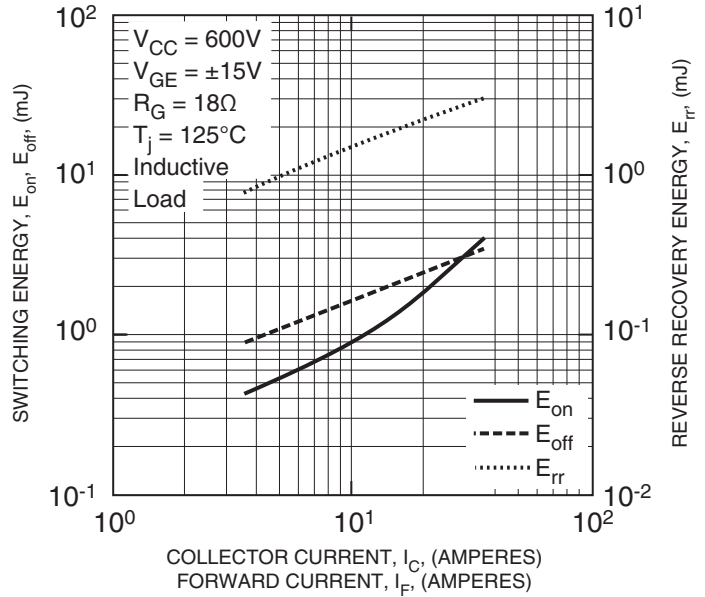
**SWITCHING TIME VS. GATE RESISTANCE (BRAKE - TYPICAL)**



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

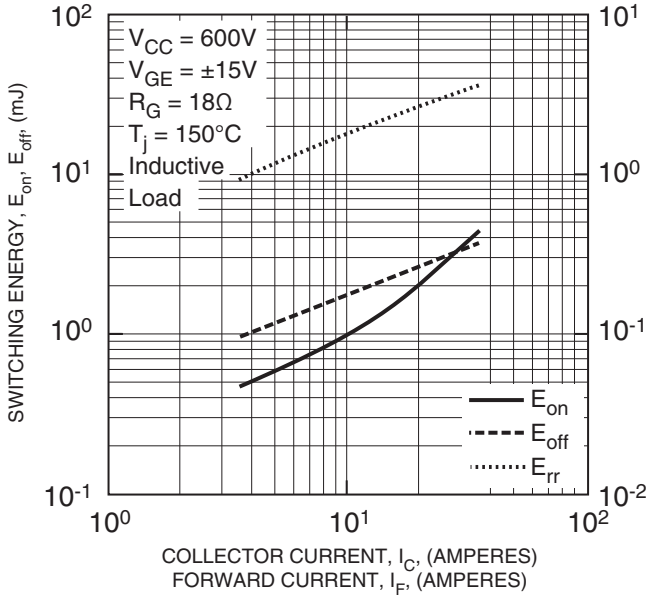


**HALF-BRIDGE SWITCHING CHARACTERISTICS (BRAKE PART - TYPICAL)**

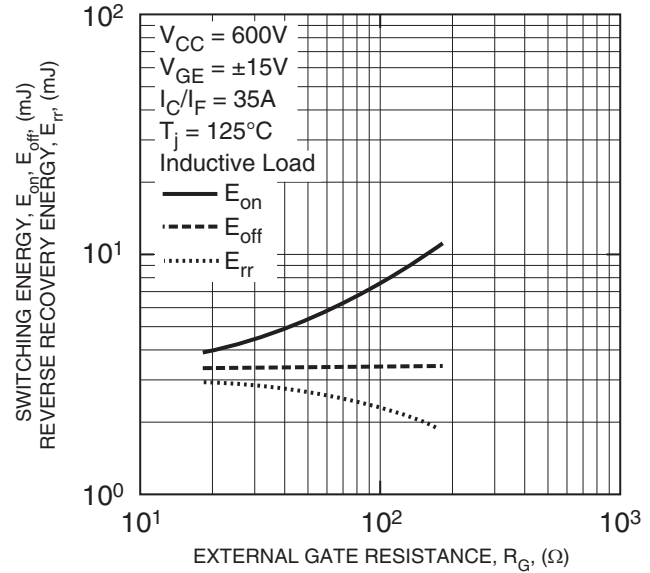


**CM50MXA-24S**  
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 50 Amperes/1200 Volts

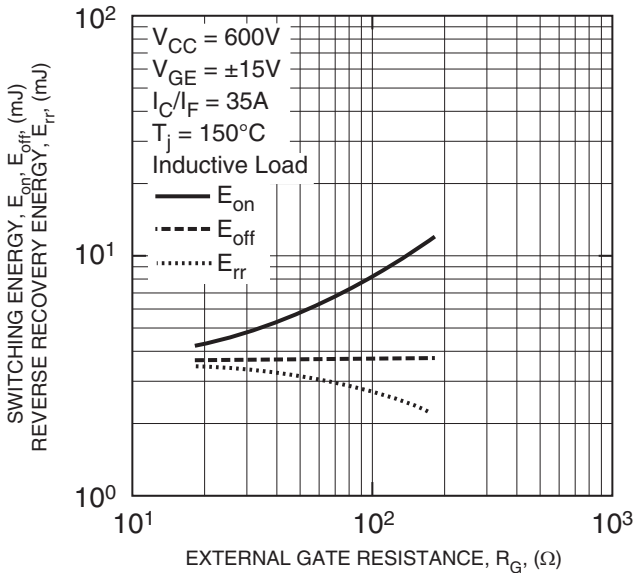
**HALF-BRIDGE SWITCHING CHARACTERISTICS (BRAKE PART - TYPICAL)**



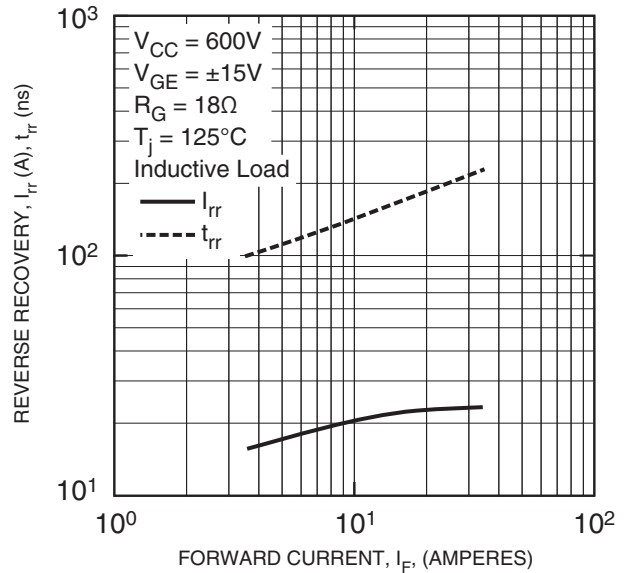
**HALF-BRIDGE SWITCHING CHARACTERISTICS (BRAKE PART - TYPICAL)**



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

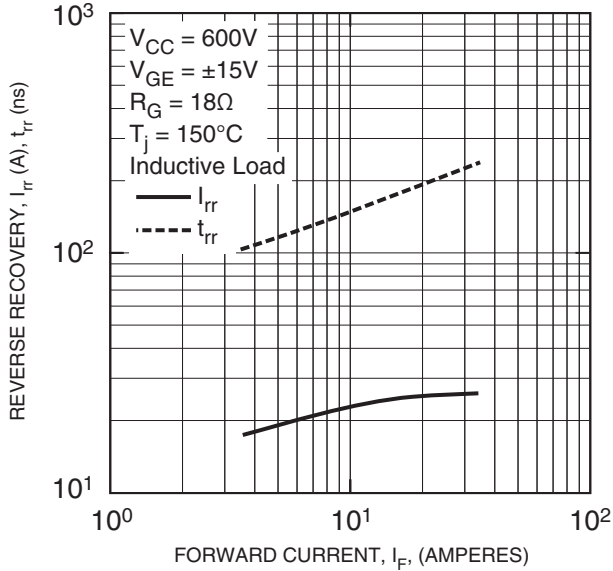


**REVERSE RECOVERY CHARACTERISTICS (BRAKE PART - TYPICAL)**

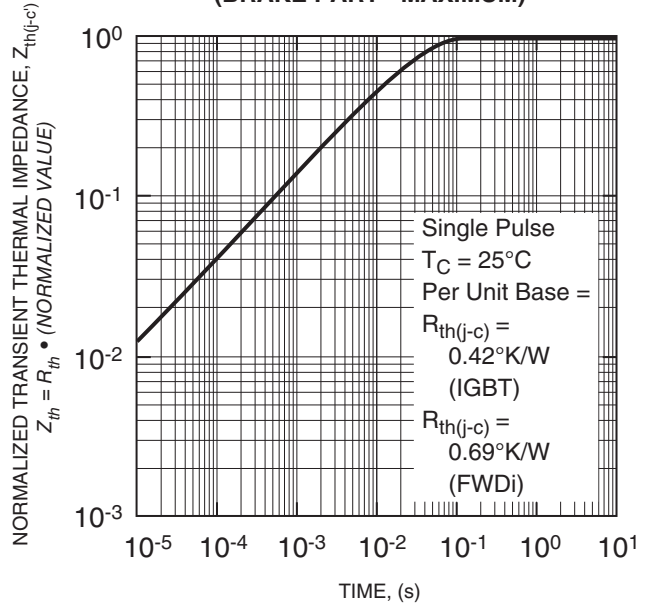


**CM50MXA-24S**  
**NX-Series CIB Module**  
**(3Ø Converter + 3Ø Inverter + Brake)**  
 50 Amperes/1200 Volts

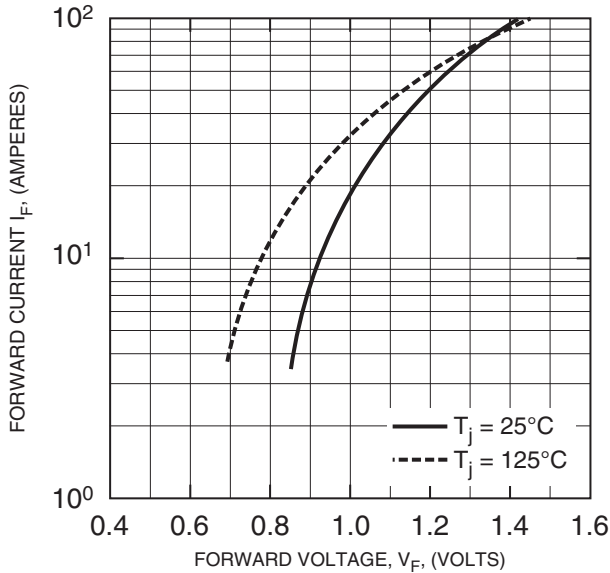
**REVERSE RECOVERY CHARACTERISTICS (BRAKE PART - TYPICAL)**



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (BRAKE PART - MAXIMUM)**



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



**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (CONVERTER PART - MAXIMUM)**

