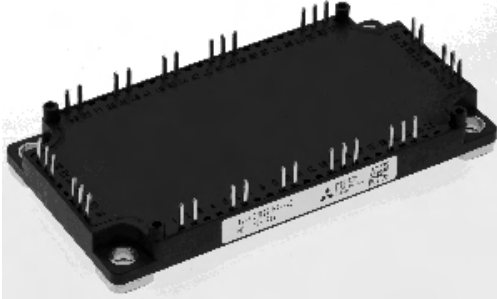


< IGBT MODULES >

# CM50MXA-24S

HIGH POWER SWITCHING USE  
INSULATED TYPE



**CIB (Converter+Inverter+Chopper Brake)**

Collector current  $I_C$  ..... **50 A**  
 Collector-emitter voltage  $V_{CES}$  ..... **1200 V**  
 Maximum junction temperature  $T_{jmax}$  ..... **175 °C**

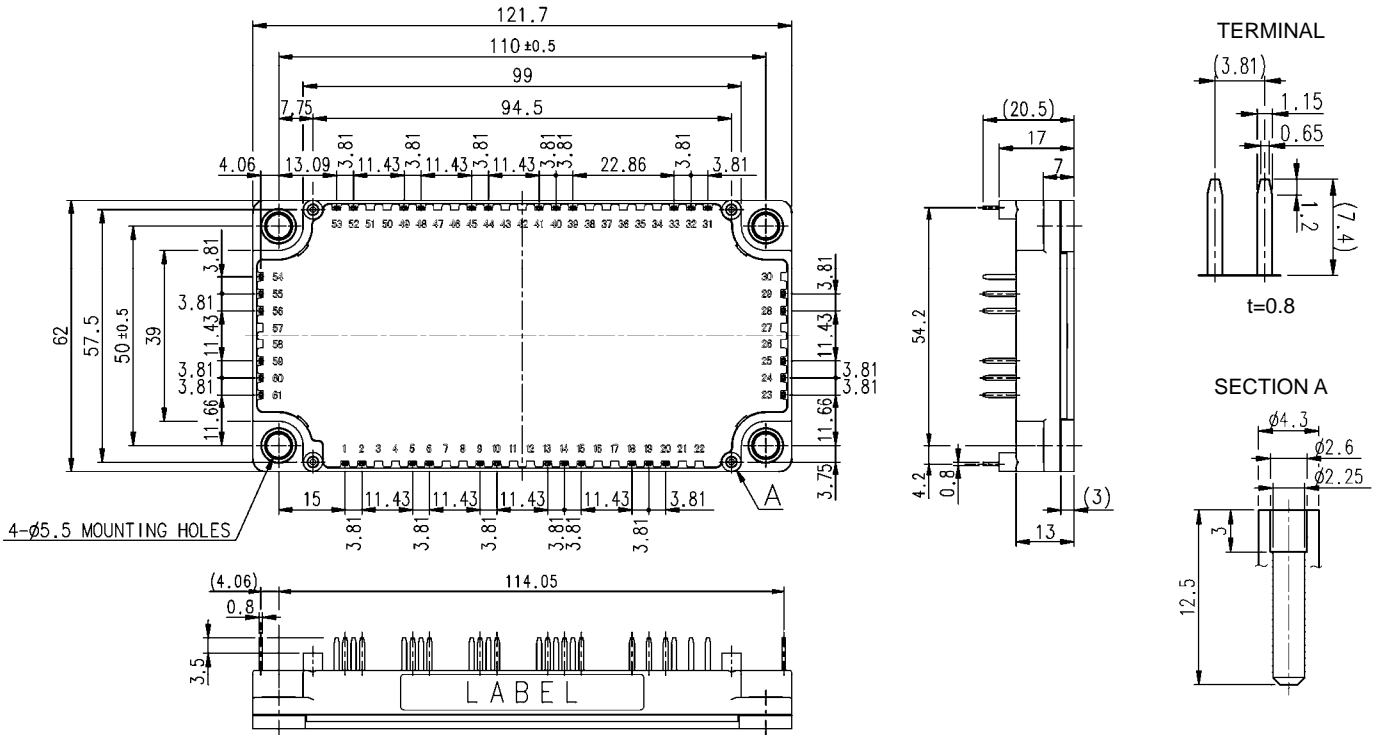
- Flat base Type
- Copper base plate
- Tin plating pin terminals
- RoHS Directive compliant
- Recognized under UL1557, File E323585

## APPLICATION

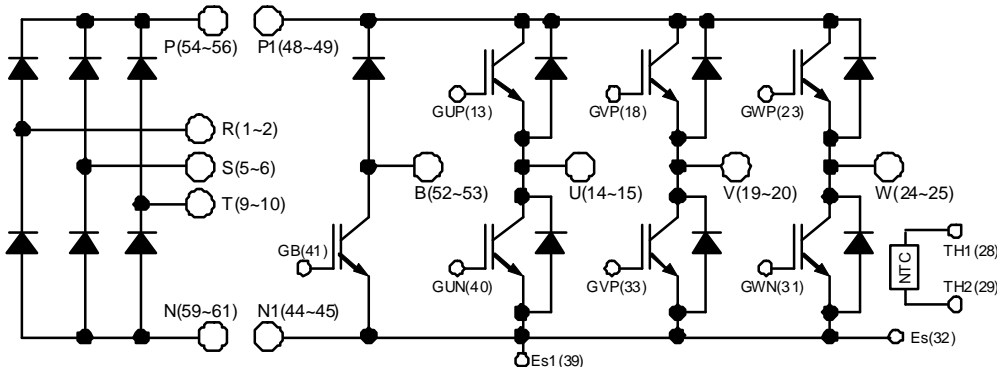
AC Motor Control, Motion/Servo Control, Power supply, etc.

## OUTLINE DRAWING & INTERNAL CONNECTION

Dimension in mm



### INTERNAL CONNECTION



Caution: Each (two or three) pin terminal of P/N/P1/N1/U/V/W/B/R/S/T is connected in the module, but should use all each three pins for the external wiring.

Tolerance otherwise specified

Division of Dimension	Tolerance
0.5 to 3	±0.2
over 3 to 6	±0.3
over 6 to 30	±0.5
over 30 to 120	±0.8
over 120 to 400	±1.2

The tolerance of size between terminals is assumed to be ±0.4.

< IGBT MODULES >

CM50MXA-24S

HIGH POWER SWITCHING USE  
INSULATED TYPE

ABSOLUTE MAXIMUM RATINGS (T<sub>j</sub>=25 °C, unless otherwise specified)

INVERTER PART IGBT/DIODE

Symbol	Item	Conditions	Rating	Unit
V <sub>CES</sub>	Collector-emitter voltage	G-E short-circuited	1200	V
V <sub>GES</sub>	Gate-emitter voltage	C-E short-circuited	± 20	V
I <sub>C</sub>	Collector current	DC, T <sub>C</sub> =125 °C (Note2, 4)	50	A
I <sub>CRM</sub>		Pulse, Repetitive (Note3)	100	
P <sub>tot</sub>	Total power dissipation	T <sub>C</sub> =25 °C (Note2, 4)	425	W
I <sub>E</sub> (Note1)	Emitter current	(Note2)	50	A
I <sub>ERM</sub> (Note1)		Pulse, Repetitive (Note3)	100	
T <sub>jm ax</sub>	Maximum junction temperature	Instantaneous event (overload)	175	°C

BRAKE PART IGBT/DIODE

Symbol	Item	Conditions	Rating	Unit
V <sub>CES</sub>	Collector-emitter voltage	G-E short-circuited	1200	V
V <sub>GES</sub>	Gate-emitter voltage	C-E short-circuited	± 20	V
I <sub>C</sub>	Collector current	DC, T <sub>C</sub> =125 °C (Note2, 4)	35	A
I <sub>CRM</sub>		Pulse, Repetitive (Note3)	70	
P <sub>tot</sub>	Total power dissipation	T <sub>C</sub> =25 °C (Note2, 4)	355	W
V <sub>R RM</sub>	Repetitive peak reverse voltage	G-E short-circuited	1200	V
I <sub>F</sub>	Forward current	(Note2)	35	A
I <sub>FRM</sub>		Pulse, Repetitive (Note3)	70	
T <sub>jm ax</sub>	Maximum junction temperature	Instantaneous event (overload)	175	°C

CONVERTER PART DIODE

Symbol	Item	Conditions	Rating	Unit
V <sub>R RM</sub>	Repetitive peak reverse voltage	-	1600	V
E <sub>a</sub>	Recommended AC input voltage	RMS	440	V
I <sub>O</sub>	DC output current	3-phase full wave rectifying, T <sub>C</sub> =125 °C (Note4)	50	A
I <sub>FSM</sub>	Surge forward current	The sine half wave 1 cycle peak value, f=60 Hz, non-repetitive	500	A
I <sup>2</sup> t	Current square time	Value for one cycle of surge current	1040	A <sup>2</sup> s
T <sub>jm ax</sub>	Maximum junction temperature	Instantaneous event (overload)	150	°C

MODULE

Symbol	Item	Conditions	Rating	Unit
V <sub>isol</sub>	Isolation voltage	Terminals to base plate, RMS, f=60 Hz, AC 1 min	2500	V
T <sub>C max</sub>	Maximum case temperature	(Note4)	125	°C
T <sub>j op</sub>	Operating junction temperature	Continuous operation (under switching)	-40 ~ +150	°C
T <sub>stg</sub>	Storage temperature	-	-40 ~ +125	

MECHANICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
M <sub>s</sub>	Mounting torque	Mounting to heat sink M 5 screw	2.5	3.0	3.5	N·m
d <sub>s</sub>	Creepage distance	Terminal to terminal	6.47	-	-	mm
		Terminal to base plate	14.27	-	-	
d <sub>a</sub>	Clearance	Terminal to terminal	6.47	-	-	mm
		Terminal to base plate	12.33	-	-	
m	mass	-	-	300	-	g
e <sub>c</sub>	Flatness of base plate	On the centerline X, Y (Note5)	±0	-	+100	µm

< IGBT MODULES >

CM50MXA-24S

HIGH POWER SWITCHING USE  
INSULATED TYPE

ELECTRICAL CHARACTERISTICS (T<sub>j</sub>=25 °C, unless otherwise specified)

INVERTER PART IGBT/DIODE

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
I <sub>CES</sub>	Collector-emitter cut-off current	V <sub>CE</sub> =V <sub>CES</sub> , G-E short-circuited	-	-	1.0	mA	
I <sub>GES</sub>	Gate-emitter leakage current	V <sub>GE</sub> =V <sub>GES</sub> , C-E short-circuited	-	-	0.5	μA	
V <sub>GE(th)</sub>	Gate-emitter threshold voltage	I <sub>C</sub> =5 mA, V <sub>CE</sub> =10 V	5.4	6.0	6.6	V	
V <sub>CEsat</sub>	Collector-emitter saturation voltage	I <sub>C</sub> =50 A <sup>(Note6)</sup> , V <sub>GE</sub> =15 V, (Terminal)	T <sub>j</sub> =25 °C	-	1.80	2.25	V
			T <sub>j</sub> =125 °C	-	2.00	-	
			T <sub>j</sub> =150 °C	-	2.05	-	
		I <sub>C</sub> =50 A <sup>(Note6)</sup> , V <sub>GE</sub> =15 V, (Chip)	T <sub>j</sub> =25 °C	-	1.70	2.15	V
			T <sub>j</sub> =125 °C	-	1.90	-	
			T <sub>j</sub> =150 °C	-	1.95	-	
C <sub>ies</sub>	Input capacitance	V <sub>CE</sub> =10 V, G-E short-circuited	-	-	5.0	nF	
C <sub>oes</sub>	Output capacitance		-	-	1.0		
C <sub>res</sub>	Reverse transfer capacitance		-	-	0.08		
Q <sub>G</sub>	Gate charge	V <sub>CC</sub> =600 V, I <sub>C</sub> =50 A, V <sub>GE</sub> =15 V	-	117	-	nC	
t <sub>d(on)</sub>	Turn-on delay time	V <sub>CC</sub> =600 V, I <sub>C</sub> =50 A, V <sub>GE</sub> =±15 V, R <sub>G</sub> =13 Ω, Inductive load	-	-	300	ns	
t <sub>r</sub>	Rise time		-	-	200		
t <sub>d(off)</sub>	Turn-off delay time		-	-	600		
t <sub>f</sub>	Fall time		-	-	300		
V <sub>EC</sub> <sup>(Note1)</sup>	Emitter-collector voltage	I <sub>E</sub> =50 A <sup>(Note6)</sup> , G-E short-circuited, (Terminal)	T <sub>j</sub> =25 °C	-	1.80	2.25	V
			T <sub>j</sub> =125 °C	-	1.80	-	
			T <sub>j</sub> =150 °C	-	1.80	-	
		I <sub>E</sub> =50 A <sup>(Note6)</sup> , G-E short-circuited, (Chip)	T <sub>j</sub> =25 °C	-	1.70	2.15	V
			T <sub>j</sub> =125 °C	-	1.70	-	
			T <sub>j</sub> =150 °C	-	1.70	-	
t <sub>rr</sub> <sup>(Note1)</sup>	Reverse recovery time	V <sub>CC</sub> =600 V, I <sub>E</sub> =50 A, V <sub>GE</sub> =±15 V, R <sub>G</sub> =13 Ω, Inductive load	-	-	300	ns	
Q <sub>rr</sub> <sup>(Note1)</sup>	Reverse recovery charge	R <sub>G</sub> =13 Ω, Inductive load	-	2.7	-	μC	
E <sub>on</sub>	Turn-on switching energy per pulse	V <sub>CC</sub> =600 V, I <sub>C</sub> =I <sub>E</sub> =50 A, V <sub>GE</sub> =±15 V, R <sub>G</sub> =13 Ω, T <sub>j</sub> =150 °C, Inductive load	-	5.5	-	mJ	
E <sub>off</sub>	Turn-off switching energy per pulse	-	-	5.3	-		
E <sub>rr</sub> <sup>(Note1)</sup>	Reverse recovery energy per pulse	-	-	4.5	-		
R <sub>CC+EE'</sub>	Internal lead resistance	Main terminals-chip, per switch, T <sub>C</sub> =25 °C <sup>(Note4)</sup>	-	-	5.0	mΩ	
r <sub>g</sub>	Internal gate resistance	Per switch	-	0	-	Ω	

BRAKE PART IGBT/DIODE

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
I <sub>CES</sub>	Collector-emitter cut-off current	V <sub>CE</sub> =V <sub>CES</sub> , G-E short-circuited	-	-	1.0	mA	
I <sub>GES</sub>	Gate-emitter leakage current	V <sub>GE</sub> =V <sub>GES</sub> , C-E short-circuited	-	-	0.5	μA	
V <sub>GE(th)</sub>	Gate-emitter threshold voltage	I <sub>C</sub> =3.5 mA, V <sub>CE</sub> =10 V	5.4	6.0	6.6	V	
V <sub>CEsat</sub>	Collector-emitter saturation voltage	I <sub>C</sub> =35 A <sup>(Note6)</sup> , V <sub>GE</sub> =15 V, (Terminal)	T <sub>j</sub> =25 °C	-	1.80	2.25	V
			T <sub>j</sub> =125 °C	-	2.00	-	
			T <sub>j</sub> =150 °C	-	2.05	-	
		I <sub>C</sub> =35 A <sup>(Note6)</sup> , V <sub>GE</sub> =15 V, (Chip)	T <sub>j</sub> =25 °C	-	1.70	2.15	V
			T <sub>j</sub> =125 °C	-	1.90	-	
			T <sub>j</sub> =150 °C	-	1.95	-	
C <sub>ies</sub>	Input capacitance	V <sub>CE</sub> =10 V, G-E short-circuited	-	-	3.5	nF	
C <sub>oes</sub>	Output capacitance		-	-	0.7		
C <sub>res</sub>	Reverse transfer capacitance		-	-	0.06		
Q <sub>G</sub>	Gate charge	V <sub>CC</sub> =600 V, I <sub>C</sub> =35 A, V <sub>GE</sub> =15 V	-	82	-	nC	

< IGBT MODULES >

CM50MXA-24S

HIGH POWER SWITCHING USE  
INSULATED TYPE

ELECTRICAL CHARACTERISTICS (cont.; T<sub>j</sub>=25 °C, unless otherwise specified)

BRAKE PART IGBT/DIODE

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
t <sub>d(on)</sub>	Turn-on delay time	V <sub>CC</sub> =600 V, I <sub>C</sub> =35 A, V <sub>GE</sub> =±15 V, R <sub>G</sub> =18 Ω, Inductive load	-	-	300	ns	
t <sub>r</sub>	Rise time		-	-	200		
t <sub>d(off)</sub>	Turn-off delay time		-	-	600		
t <sub>f</sub>	Fall time		-	-	300		
I <sub>RRM</sub>	Reverse current	V <sub>R</sub> =V <sub>RRM</sub> , G-E short-circuited	-	-	1.0	mA	
V <sub>F</sub>	Forward voltage	I <sub>F</sub> =35 A <sup>(Note6)</sup> , G-E short-circuited, (Terminal)	T <sub>j</sub> =25 °C	-	1.80	2.25	V
			T <sub>j</sub> =125 °C	-	1.80	-	
			T <sub>j</sub> =150 °C	-	1.80	-	
		I <sub>F</sub> =35 A <sup>(Note6)</sup> , G-E short-circuited, (Chip)	T <sub>j</sub> =25 °C	-	1.70	2.15	V
			T <sub>j</sub> =125 °C	-	1.70	-	
			T <sub>j</sub> =150 °C	-	1.70	-	
t <sub>rr</sub>	Reverse recovery time	V <sub>CC</sub> =600 V, I <sub>F</sub> =35 A, V <sub>GE</sub> =±15 V, R <sub>G</sub> =18 Ω, Inductive load	-	-	300	ns	
Q <sub>rr</sub>	Reverse recovery charge	R <sub>G</sub> =18 Ω, Inductive load	-	1.9	-	μC	
E <sub>on</sub>	Turn-on switching energy per pulse	V <sub>CC</sub> =600 V, I <sub>C</sub> =I <sub>F</sub> =35 A,	-	4.2	-	mJ	
E <sub>off</sub>	Turn-off switching energy per pulse	V <sub>GE</sub> =±15 V, R <sub>G</sub> =18 Ω, T <sub>j</sub> =150 °C,	-	3.7	-		
E <sub>rr</sub>	Reverse recovery energy per pulse	Inductive load	-	3.5	-		
r <sub>g</sub>	Internal gate resistance	-	-	0	-	Ω	

CONVERTER PART DIODE

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
I <sub>RRM</sub>	Reverse current	V <sub>R</sub> =V <sub>RRM</sub> , T <sub>j</sub> =150 °C	-	-	6.0	mA
V <sub>F</sub> (Terminal)	Forward voltage	I <sub>F</sub> =50 A <sup>(Note6)</sup>	-	1.2	1.6	V

NTC THERMISTOR PART

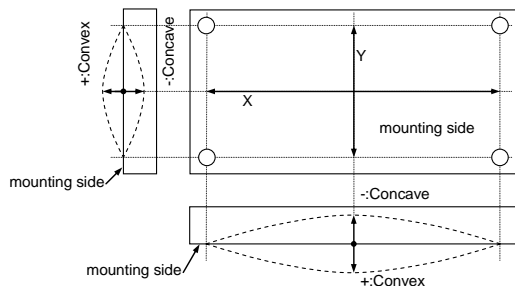
Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R <sub>25</sub>	Zero-power resistance	T <sub>C</sub> =25 °C <sup>(Note4)</sup>	4.85	5.00	5.15	kΩ
ΔR/R	Deviation of resistance	R <sub>100</sub> =493 Ω, T <sub>C</sub> =100 °C <sup>(Note4)</sup>	-7.3	-	+7.8	%
B <sub>(25/50)</sub>	B-constant	Approximate by equation <sup>(Note7)</sup>	-	3375	-	K
P <sub>25</sub>	Power dissipation	T <sub>C</sub> =25 °C <sup>(Note4)</sup>	-	-	10	mW

THERMAL RESISTANCE CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R <sub>th(j-c)Q</sub>	Thermal resistance <sup>(Note4)</sup>	Junction to case, per Inverter IGBT	-	-	0.35	K/W
R <sub>th(j-c)D</sub>		Junction to case, per Inverter DIODE	-	-	0.63	
R <sub>th(j-c)Q</sub>		Junction to case, per Brake IGBT	-	-	0.42	K/W
R <sub>th(j-c)D</sub>		Junction to case, per Brake DIODE	-	-	0.69	
R <sub>th(j-c)D</sub>		Junction to case, per Converter DIODE	-	-	0.33	K/W
R <sub>th(c-s)</sub>		Contact thermal resistance <sup>(Note4)</sup>	Case to heat sink, per 1 module, Thermal grease applied <sup>(Note8)</sup>	-	15	-

< IGBT MODULES >  
**CM50MXA-24S**  
**HIGH POWER SWITCHING USE**  
**INSULATED TYPE**

- Note1. Represent ratings and characteristics of the anti-parallel, emitter-collector free wheeling diode (FWDi).
- Junction temperature ( $T_j$ ) should not increase beyond  $T_{jmax}$  rating.
  - Pulse width and repetition rate should be such that the device junction temperature ( $T_j$ ) dose not exceed  $T_{jmax}$  rating.
  - Case temperature ( $T_c$ ) and heat sink temperature ( $T_s$ ) are defined on the each surface (mounting side) of base plate and heat sink just under the chips. Refer to the figure of chip location.
  - The base plate (mounting side) flatness measurement points (X, Y) are as follows of the following figure.



- Pulse width and repetition rate should be such as to cause negligible temperature rise. Refer to the figure of test circuit.

$$7. B_{(25/50)} = \ln\left(\frac{R_{25}}{R_{50}}\right) / \left(\frac{1}{T_{25}} - \frac{1}{T_{50}}\right),$$

$R_{25}$ : resistance at absolute temperature  $T_{25}$  [K];  $T_{25}=25 [^{\circ}\text{C}]+273.15=298.15$  [K]

$R_{50}$ : resistance at absolute temperature  $T_{50}$  [K];  $T_{50}=50 [^{\circ}\text{C}]+273.15=323.15$  [K]

- Typical value is measured by using thermally conductive grease of  $\lambda=0.9$  W/(m·K).
- Use the following screws when mounting the printed circuit board (PCB) on the stand offs.  
 "φ2.6×10 or φ2.6×12 self tapping screw"  
 The length of the screw depends on the thickness (t1.6~t2.0) of the PCB.

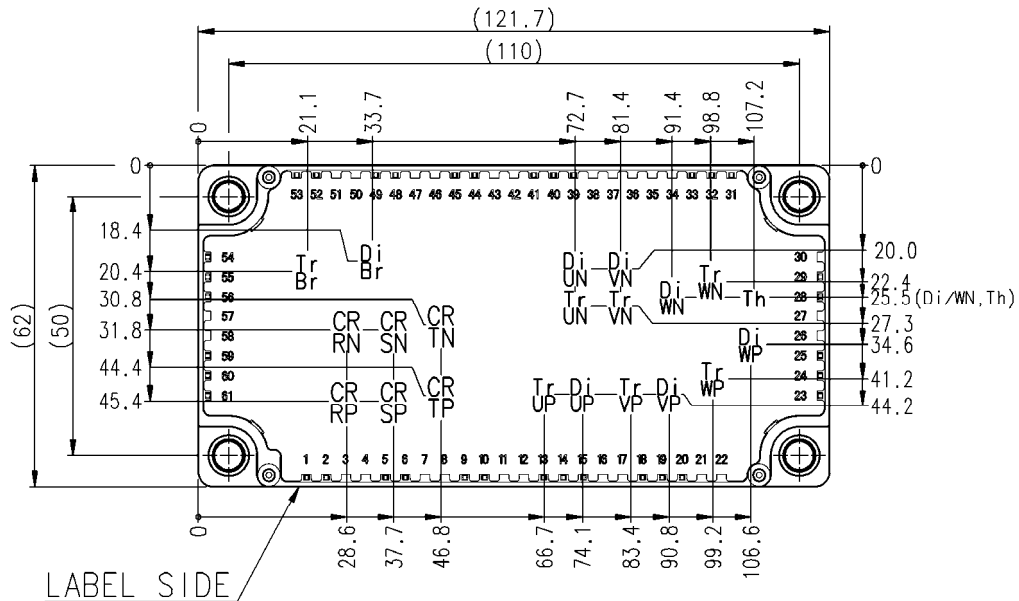
**RECOMMENDED OPERATING CONDITIONS**

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
$V_{CC}$	(DC) Supply voltage	Applied across P-N/P1-N1 terminals	-	600	850	V	
$V_{GEon}$	Gate (-emitter drive) voltage	Applied across GB-Es/ G*P-*/G*N-Es(*=U, V, W) terminals	13.5	15.0	16.5	V	
$R_G$	External gate resistance	Per switch	Inverter IGBT	13	-	130	Ω
			Brake IGBT	18	-	180	

< IGBT MODULES >  
**CM50MXA-24S**  
 HIGH POWER SWITCHING USE  
 INSULATED TYPE

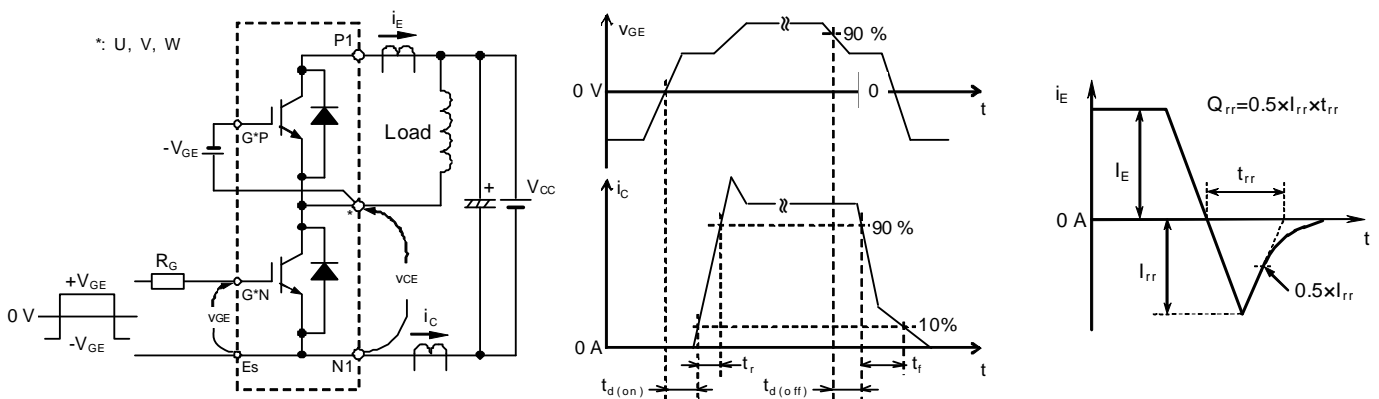
CHIP LOCATION (Top view)

Dimension in mm, tolerance: ±1 mm



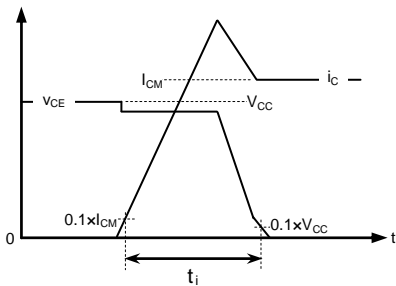
Tr\*P/Tr\*N/Tr\*Br: IGBT, Di\*P/Di\*N: DIODE (\*=U/V/W), Di\*Br: BRAKE DIODE, CR\*P/CR\*N: CONVERTER DIODE (\*=R/S/T), Th: NTC thermistor

TEST CIRCUIT AND WAVEFORMS

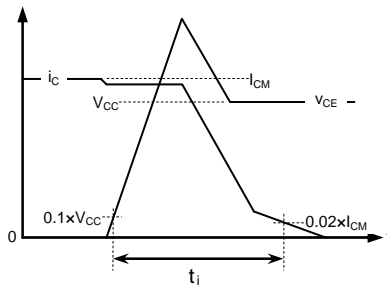


Switching characteristics test circuit and waveforms

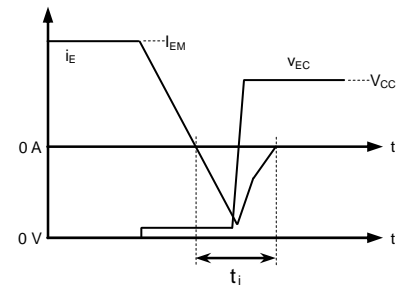
$t_{rr}$ ,  $Q_{rr}$  test waveform



IGBT Turn-on switching energy



IGBT Turn-off switching energy



DIODE Reverse recovery energy

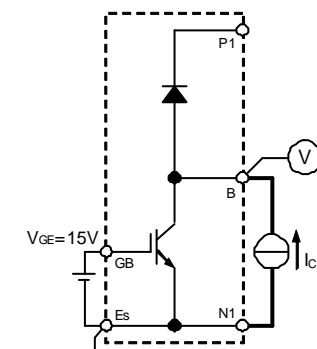
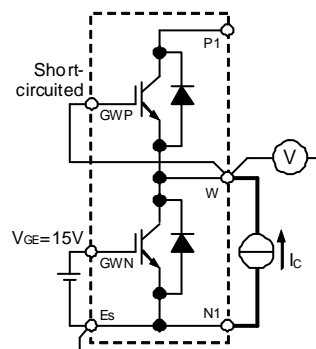
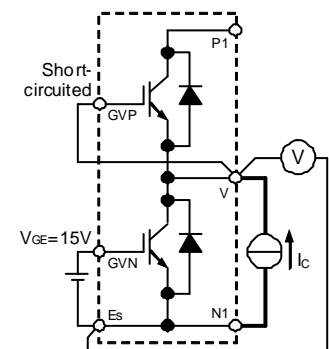
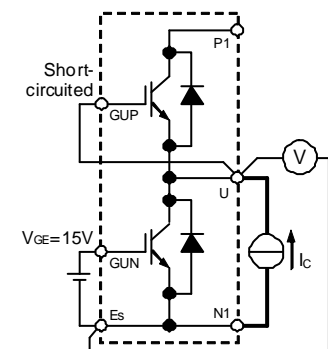
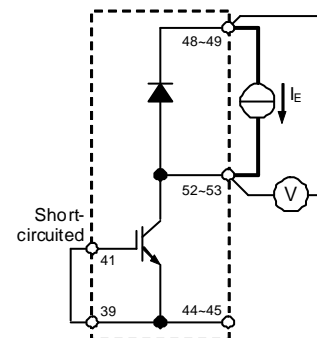
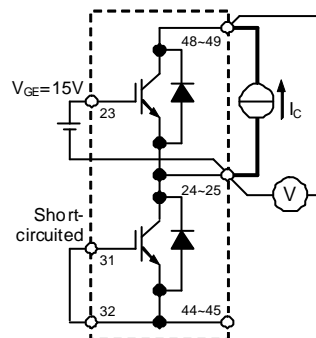
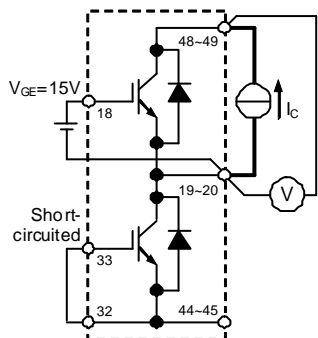
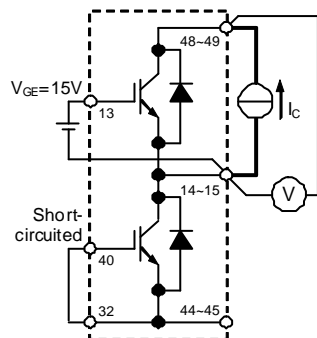
Turn-on / Turn-off switching energy and Reverse recovery energy test waveforms (Integral time instruction drawing)

< IGBT MODULES >

CM50MXA-24S

HIGH POWER SWITCHING USE  
INSULATED TYPE

TEST CIRCUIT



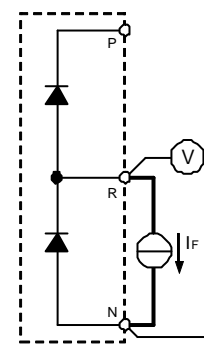
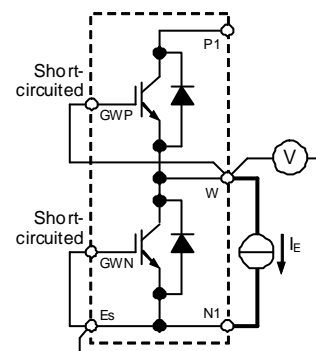
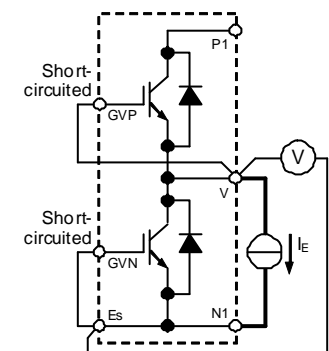
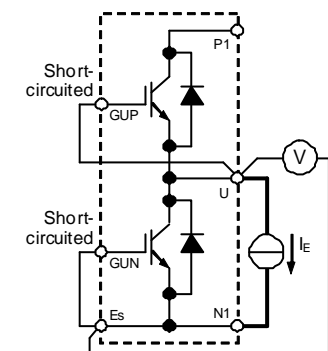
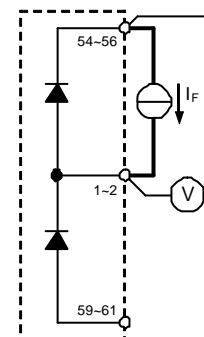
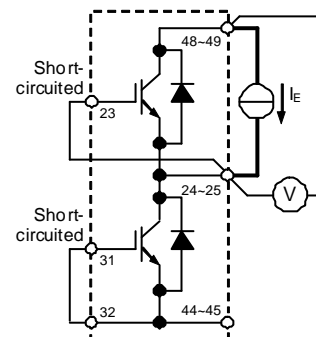
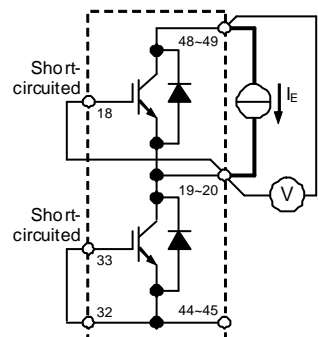
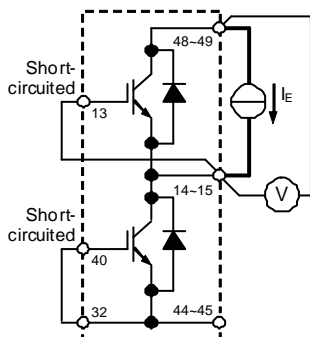
G-E short-circuited  
UP / UN IGBT

G-E short-circuited  
VP / VN IGBT

G-E short-circuited  
WP / WN IGBT

G-E short-circuited  
Brake IGBT / DIODE

$V_{CEsat}$  / BRAKE DIODE  $V_F$  test circuit  $V_{CEsat}$  / ClampDi  $V_F$  test circuit



G-E short-circuited  
UP / UN DIODE

G-E short-circuited  
VP / VN DIODE

G-E short-circuited  
WP / WN DIODE

CONVERTER DIODE (ex. phase-R)

$V_{EC}$  / CONVERTER DIODE  $V_F$  test circuit

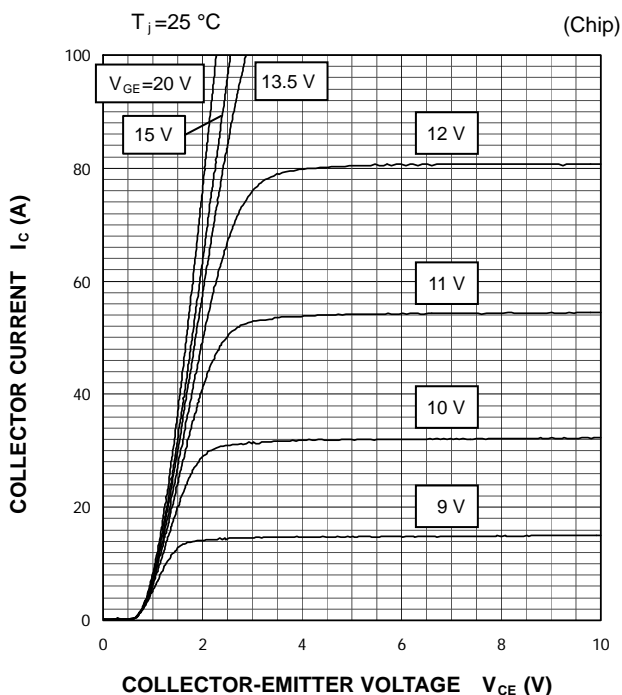
\* In the above test circuit, should use all three main pin terminals (P1/N1/P/N/U/V/W) for connection with the terminals and the current source.

< IGBT MODULES >  
**CM50MXA-24S**  
 HIGH POWER SWITCHING USE  
 INSULATED TYPE

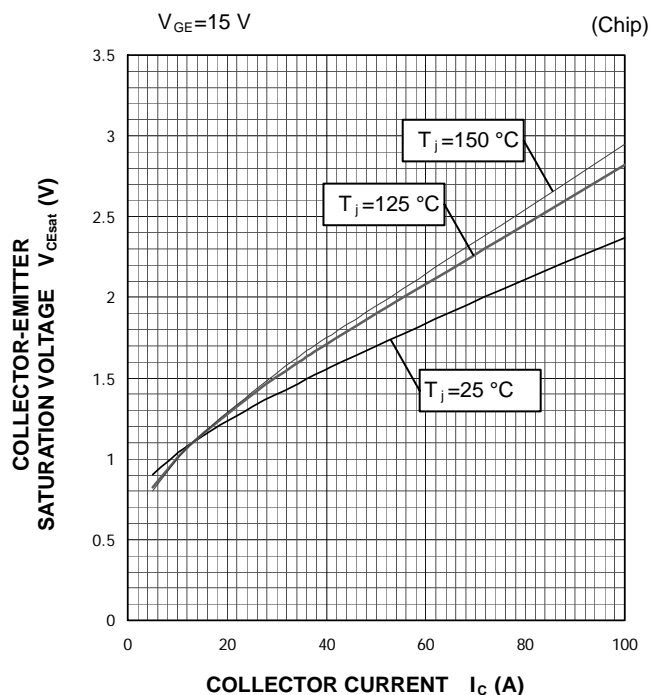
PERFORMANCE CURVES

INVERTER PART

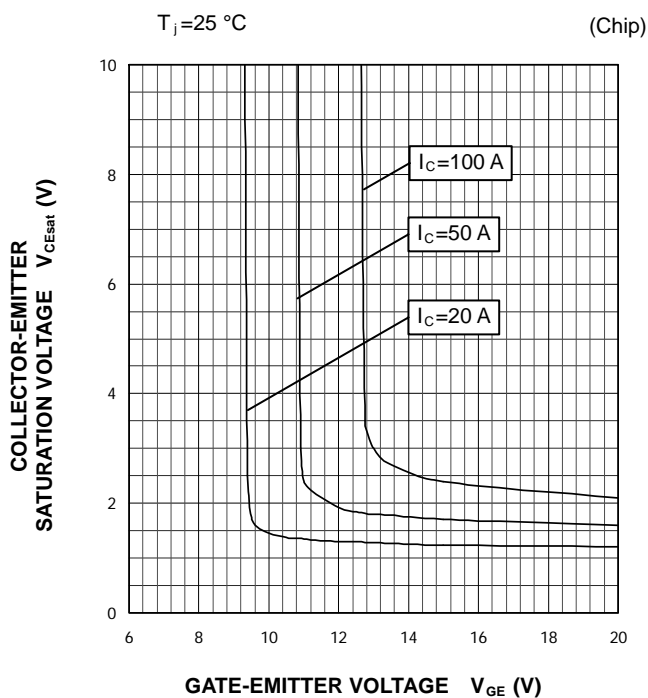
OUTPUT CHARACTERISTICS  
 (TYPICAL)



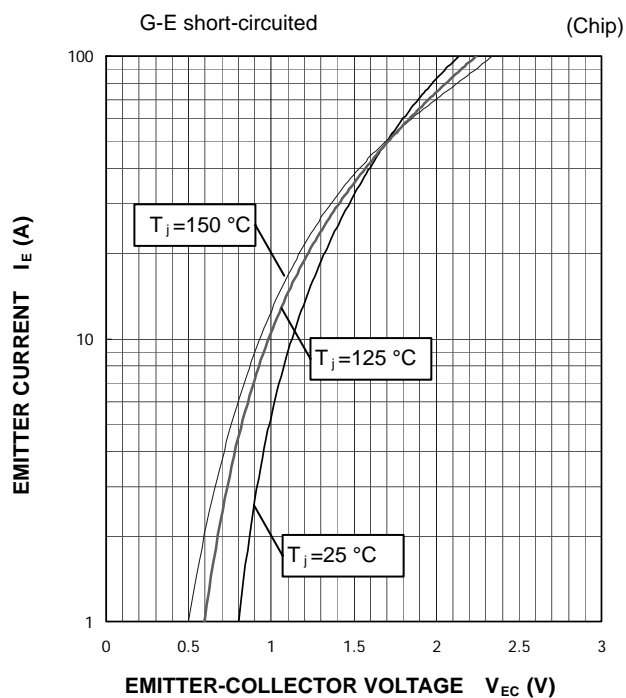
COLLECTOR-EMITTER SATURATION VOLTAGE  
 CHARACTERISTICS  
 (TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE  
 CHARACTERISTICS  
 (TYPICAL)



FREE WHEELING DIODE  
 FORWARD CHARACTERISTICS  
 (TYPICAL)



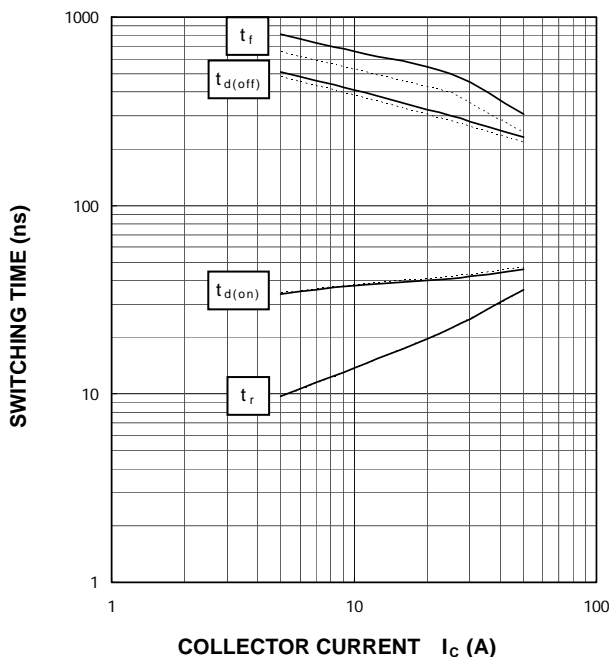


PERFORMANCE CURVES

INVERTER PART

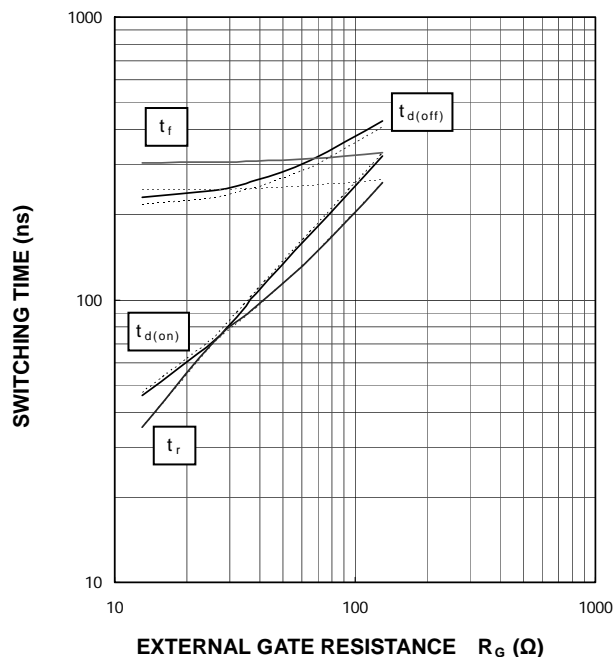
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)

$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $R_G=13\ \Omega$ , INDUCTIVE LOAD  
—:  $T_j=150\text{ }^\circ\text{C}$ , - - - -:  $T_j=125\text{ }^\circ\text{C}$



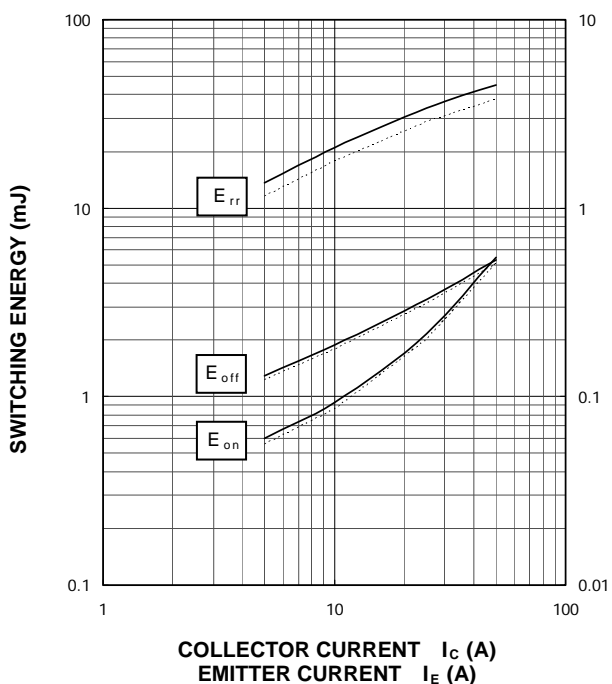
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)

$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $I_C=50\text{ A}$ , INDUCTIVE LOAD  
—:  $T_j=150\text{ }^\circ\text{C}$ , - - - -:  $T_j=125\text{ }^\circ\text{C}$



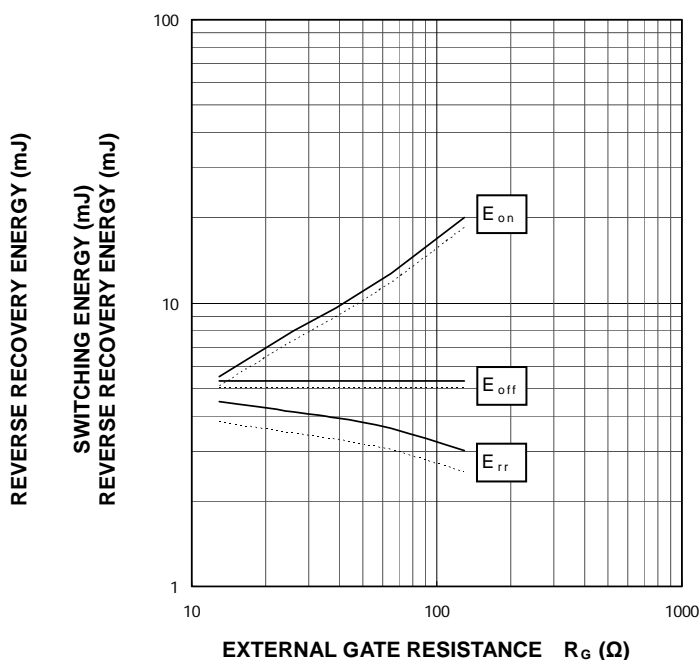
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)

$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $R_G=13\ \Omega$ ,  
INDUCTIVE LOAD, PER PULSE  
—:  $T_j=150\text{ }^\circ\text{C}$ , - - - -:  $T_j=125\text{ }^\circ\text{C}$



HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)

$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $I_C=50\text{ A}$ ,  
INDUCTIVE LOAD, PER PULSE  
—:  $T_j=150\text{ }^\circ\text{C}$ , - - - -:  $T_j=125\text{ }^\circ\text{C}$

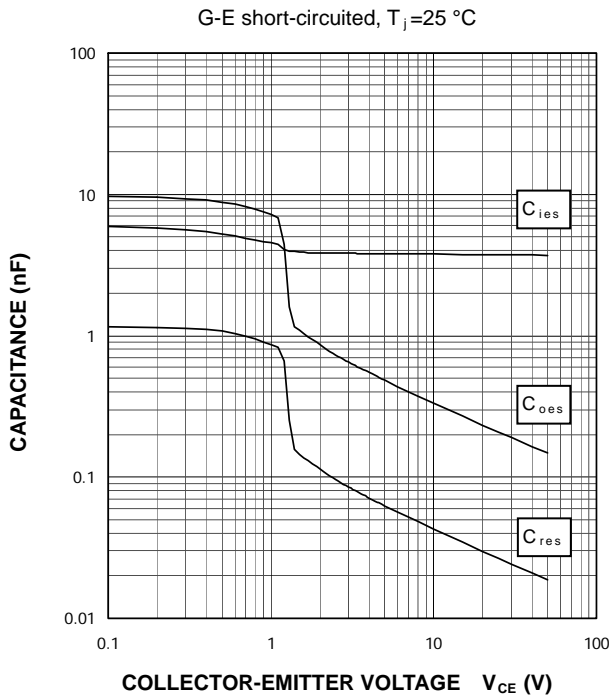


< IGBT MODULES >  
**CM50MXA-24S**  
 HIGH POWER SWITCHING USE  
 INSULATED TYPE

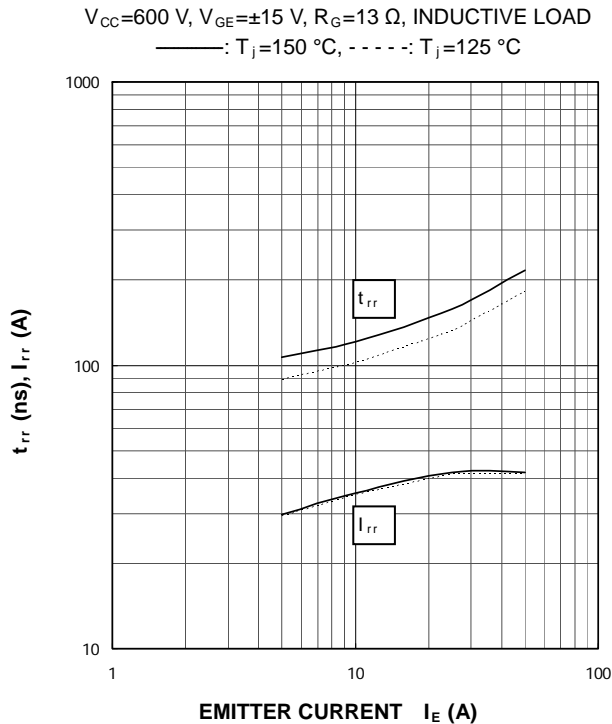
**PERFORMANCE CURVES**

**INVERTER PART**

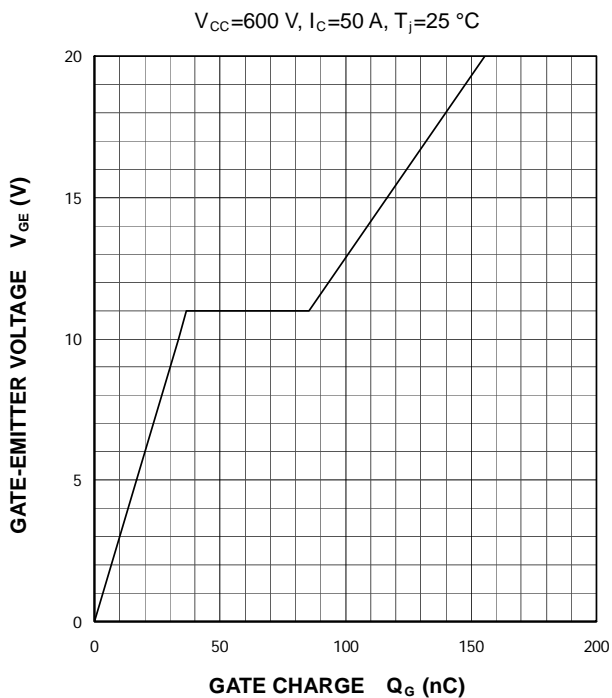
**CAPACITANCE CHARACTERISTICS  
 (TYPICAL)**



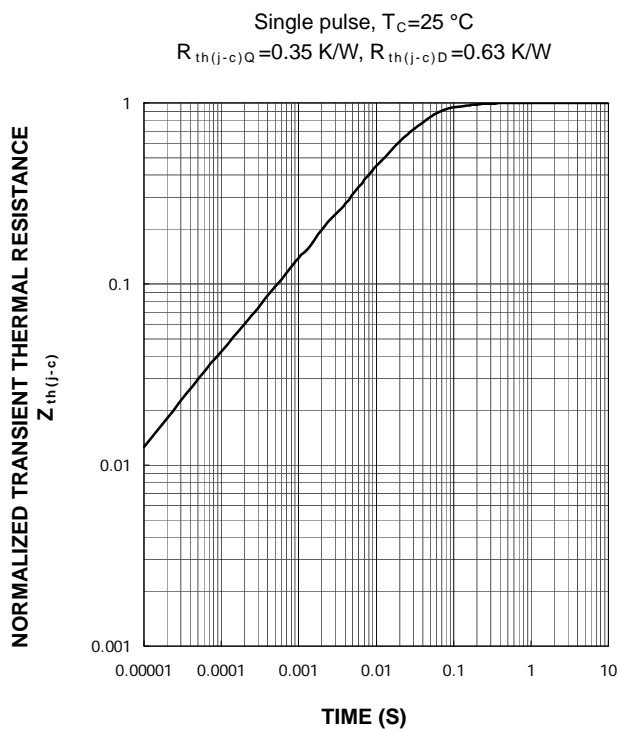
**FREE WHEELING DIODE  
 REVERSE RECOVERY CHARACTERISTICS  
 (TYPICAL)**



**GATE CHARGE CHARACTERISTICS  
 (TYPICAL)**



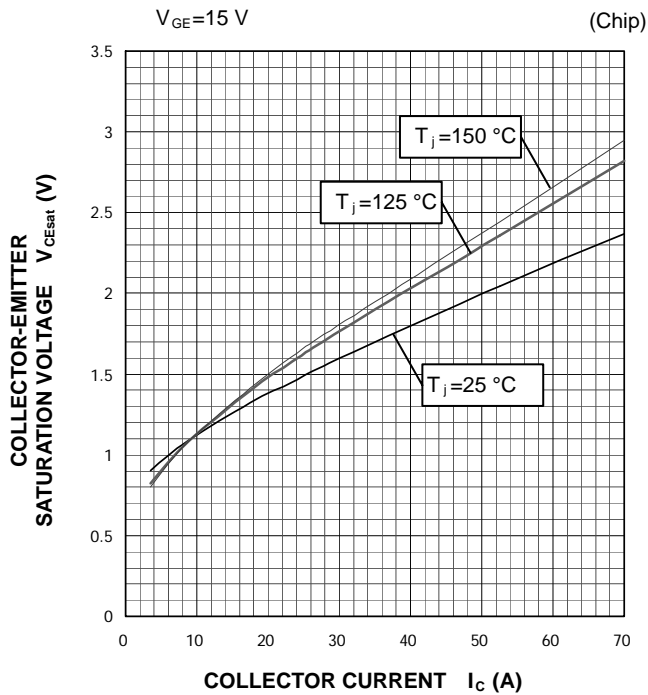
**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS  
 (MAXIMUM)**



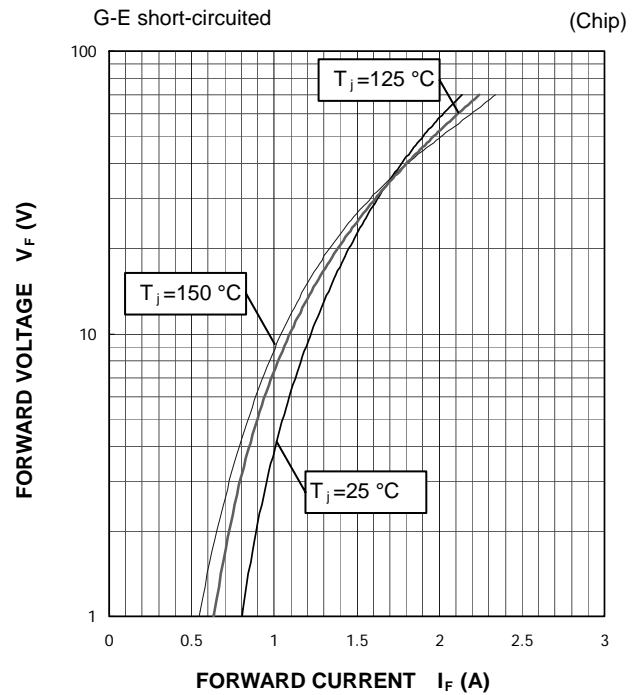
PERFORMANCE CURVES

BRAKE PART

COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)

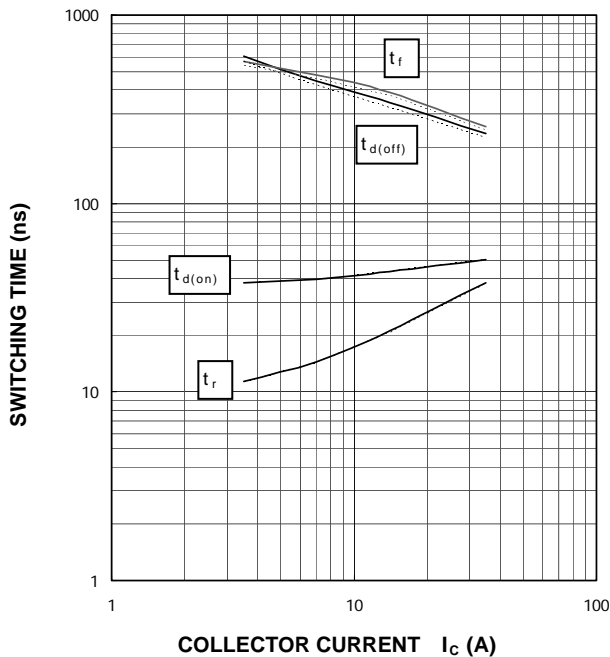


CLAMP DIODE FORWARD CHARACTERISTICS (TYPICAL)



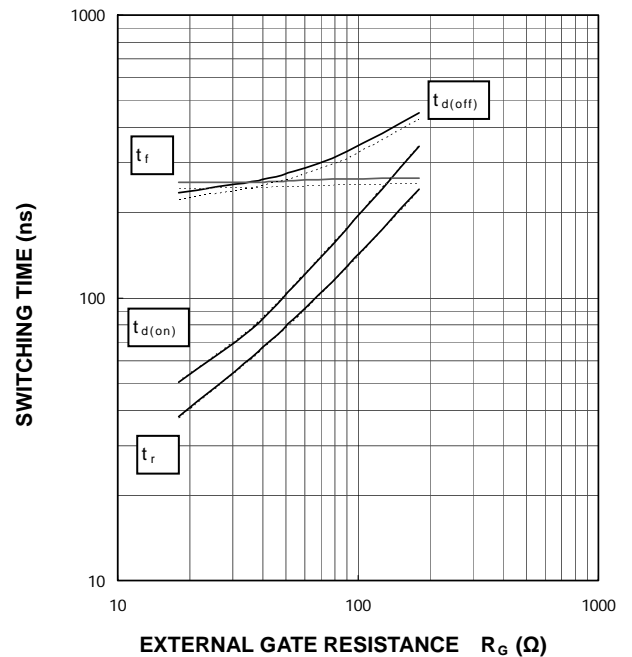
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $R_G=18\ \Omega$ , INDUCTIVE LOAD  
 —:  $T_j=150\text{ }^\circ\text{C}$ , - - - -:  $T_j=125\text{ }^\circ\text{C}$



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)

$V_{CC}=600\text{ V}$ ,  $I_C=35\text{ A}$ ,  $V_{GE}=\pm 15\text{ V}$ , INDUCTIVE LOAD  
 —:  $T_j=150\text{ }^\circ\text{C}$ , - - - -:  $T_j=125\text{ }^\circ\text{C}$

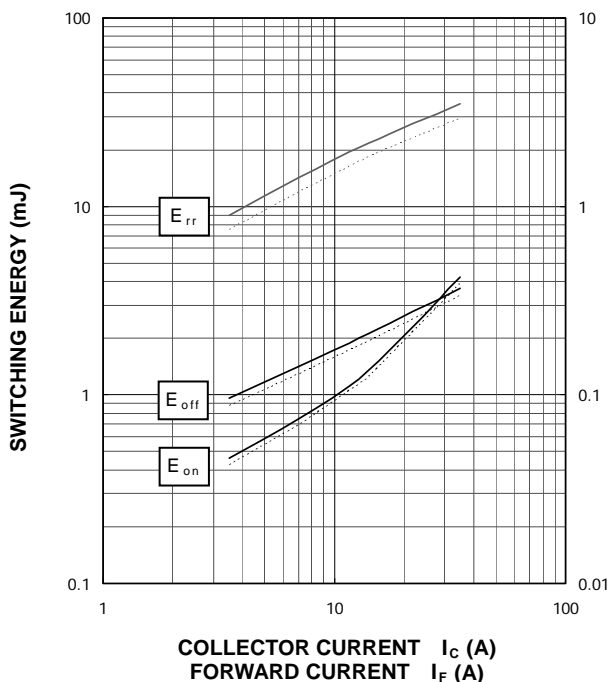


PERFORMANCE CURVES

BRAKE PART

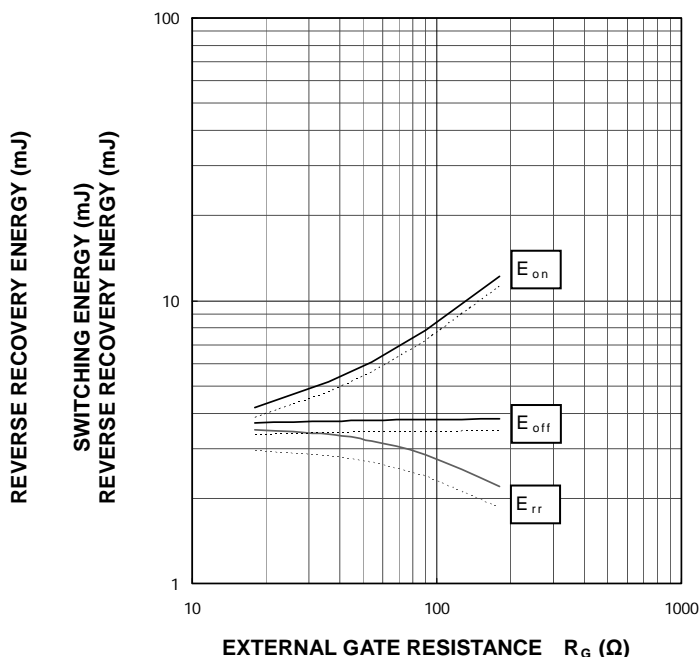
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)

$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $R_G=18\ \Omega$ ,  
INDUCTIVE LOAD, PER PULSE  
—:  $T_j=150\text{ }^\circ\text{C}$ , - - - - -:  $T_j=125\text{ }^\circ\text{C}$



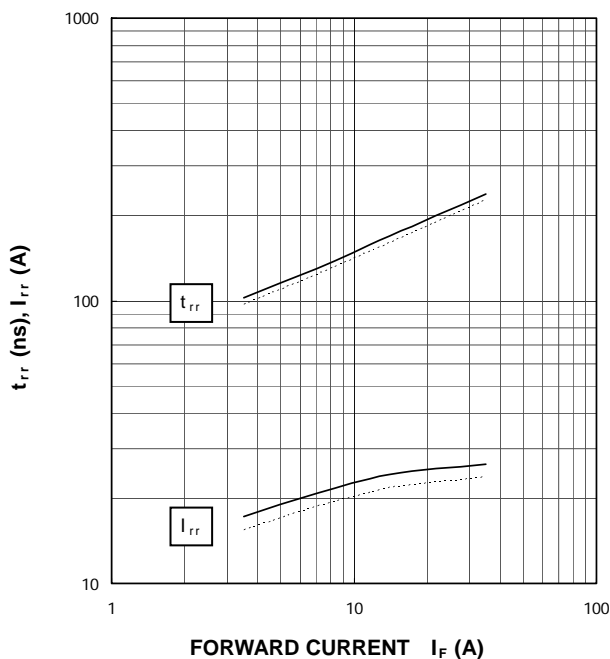
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)

$V_{CC}=600\text{ V}$ ,  $I_C/I_F=35\text{ A}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  
INDUCTIVE LOAD, PER PULSE  
—:  $T_j=150\text{ }^\circ\text{C}$ , - - - - -:  $T_j=125\text{ }^\circ\text{C}$



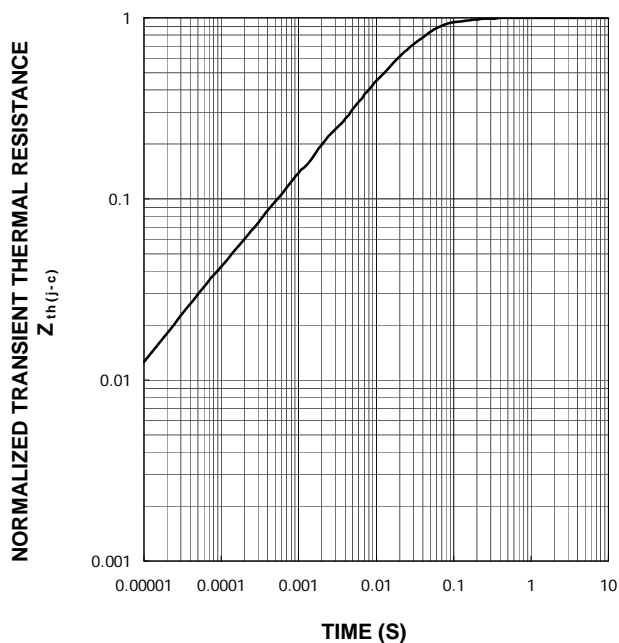
CLAMP DIODE  
REVERSE RECOVERY CHARACTERISTICS  
(TYPICAL)

$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $R_G=18\ \Omega$ , INDUCTIVE LOAD  
—:  $T_j=150\text{ }^\circ\text{C}$ , - - - - -:  $T_j=125\text{ }^\circ\text{C}$



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS  
(MAXIMUM)

Single pulse,  $T_C=25\text{ }^\circ\text{C}$   
 $R_{th(j-c)Q}=0.42\text{ K/W}$ ,  $R_{th(j-c)D}=0.69\text{ K/W}$

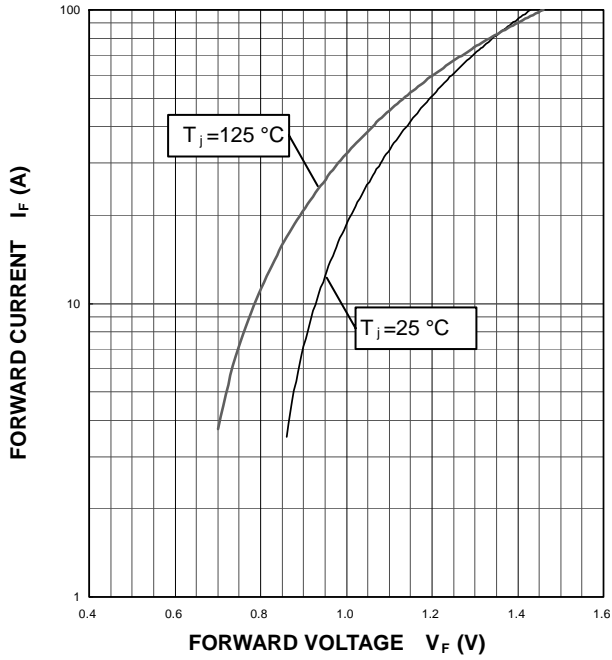


< IGBT MODULES >  
**CM50MXA-24S**  
 HIGH POWER SWITCHING USE  
 INSULATED TYPE

**PERFORMANCE CURVES**

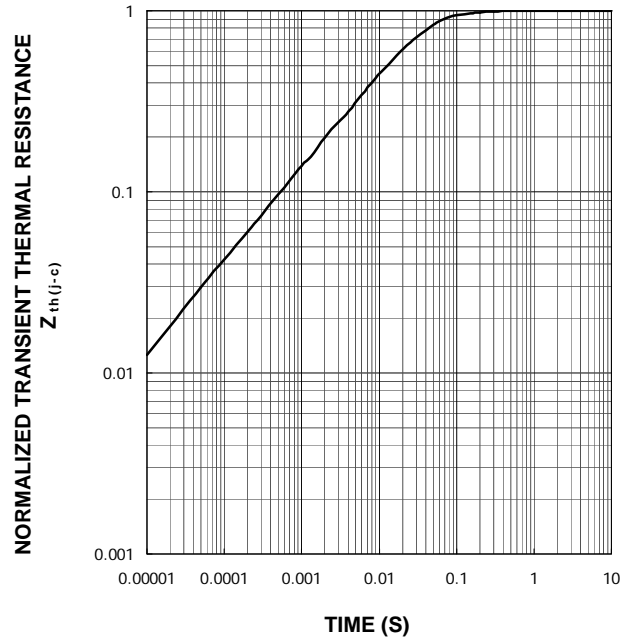
**CONVERTER PART**

**CONVERTER DIODE  
 FORWARD CHARACTERISTICS  
 (TYPICAL)**



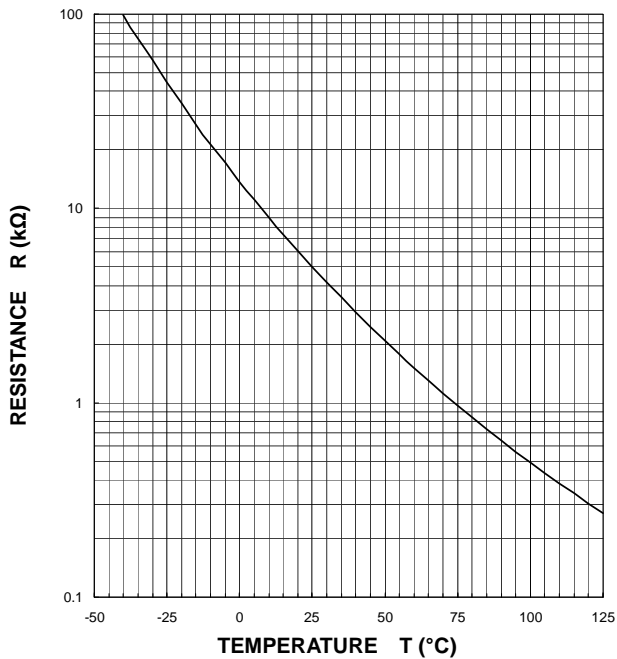
**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS  
 (MAXIMUM)**

Single pulse,  $T_c = 25\text{ °C}$   
 $R_{th(j-c)D} = 0.33\text{ K/W}$



**NTC thermistor part**

**TEMPERATURE CHARACTERISTICS  
 (TYPICAL)**



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