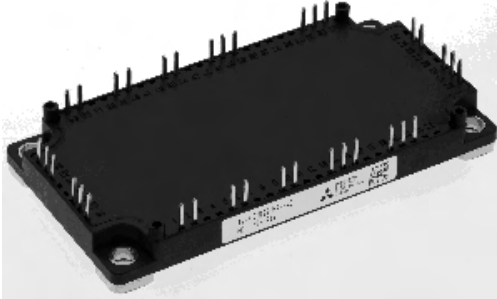


< IGBT MODULES >

# CM35MXA-24S

HIGH POWER SWITCHING USE  
INSULATED TYPE



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

Collector current  $I_C$  ..... **35 A**  
 Collector-emitter voltage  $V_{CES}$  ..... **1200 V**  
 Maximum junction temperature  $T_{jmax}$  ..... **175 °C**

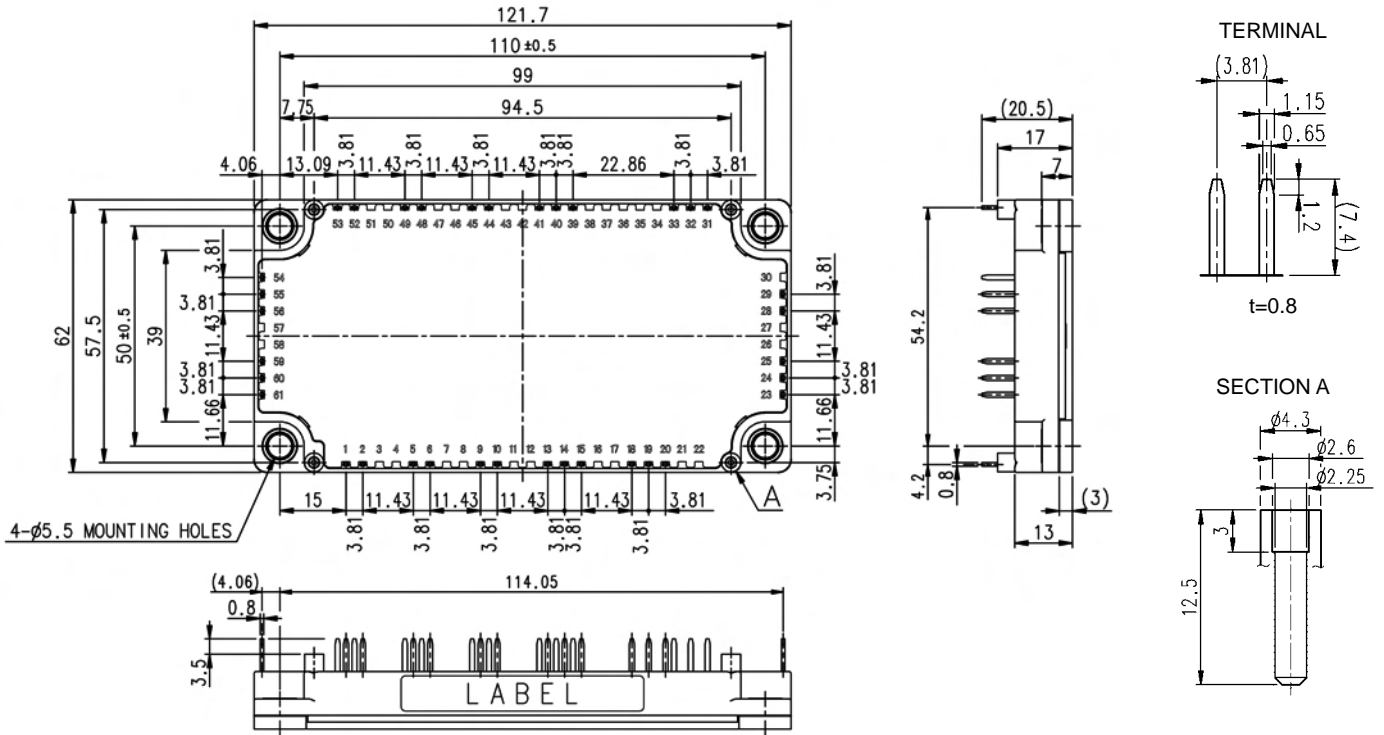
- Flat base Type
- Copper base plate
- Tin plating pin terminals
- RoHS Directive compliant
- Recognized under UL1557, File E323585

## APPLICATION

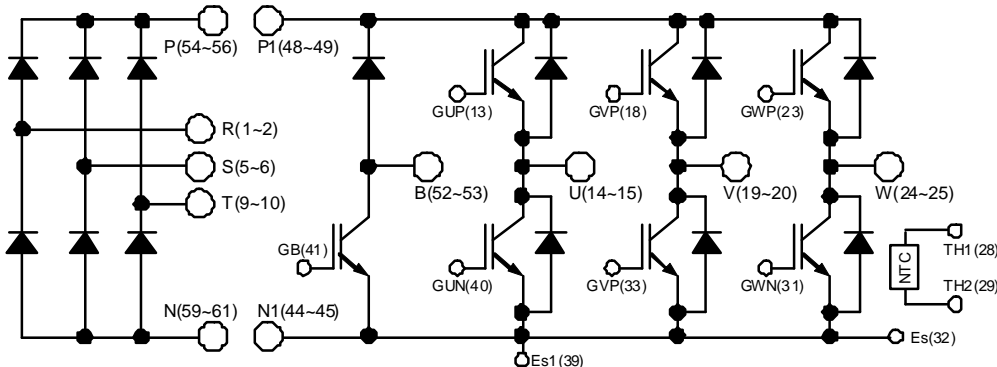
AC Motor Control, Motion/Servo Control, Power supply, etc.

## 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 >

CM35MXA-24S

HIGH POWER SWITCHING USE  
INSULATED TYPE

ABSOLUTE MAXIMUM RATINGS ( $T_j=25\text{ }^\circ\text{C}$ , unless otherwise specified)

INVERTER PART IGBT/DIODE

Symbol	Item	Conditions	Rating	Unit
$V_{CES}$	Collector-emitter voltage	G-E short-circuited	1200	V
$V_{GES}$	Gate-emitter voltage	C-E short-circuited	$\pm 20$	V
$I_C$	Collector current	DC, $T_C=125\text{ }^\circ\text{C}$ (Note2, 4)	35	A
$I_{CRM}$		Pulse, Repetitive (Note3)	70	
$P_{tot}$	Total power dissipation	$T_C=25\text{ }^\circ\text{C}$ (Note2, 4)	355	W
$I_E$ (Note1)	Emitter current	(Note2)	35	A
$I_{ERM}$ (Note1)		Pulse, Repetitive (Note3)	70	
$T_{jmax}$	Maximum junction temperature	Instantaneous event (overload)	175	$^\circ\text{C}$

BRAKE PART IGBT/DIODE

Symbol	Item	Conditions	Rating	Unit
$V_{CES}$	Collector-emitter voltage	G-E short-circuited	1200	V
$V_{GES}$	Gate-emitter voltage	C-E short-circuited	$\pm 20$	V
$I_C$	Collector current	DC, $T_C=125\text{ }^\circ\text{C}$ (Note2, 4)	35	A
$I_{CRM}$		Pulse, Repetitive (Note3)	70	
$P_{tot}$	Total power dissipation	$T_C=25\text{ }^\circ\text{C}$ (Note2, 4)	355	W
$V_{RRM}$	Repetitive peak reverse voltage	G-E short-circuited	1200	V
$I_F$	Forward current	(Note2)	35	A
$I_{FRM}$		Pulse, Repetitive (Note3)	70	
$T_{jmax}$	Maximum junction temperature	Instantaneous event (overload)	175	$^\circ\text{C}$

CONVERTER PART DIODE

Symbol	Item	Conditions	Rating	Unit
$V_{RRM}$	Repetitive peak reverse voltage	-	1600	V
$E_a$	Recommended AC input voltage	RMS	440	V
$I_O$	DC output current	3-phase full wave rectifying, $T_C=125\text{ }^\circ\text{C}$ (Note4)	35	A
$I_{FSM}$	Surge forward current	The sine half wave 1 cycle peak value, $f=60\text{ Hz}$ , non-repetitive	350	A
$I^2t$	Current square time	Value for one cycle of surge current	510	$\text{A}^2\text{s}$
$T_{jmax}$	Maximum junction temperature	Instantaneous event (overload)	150	$^\circ\text{C}$

MODULE

Symbol	Item	Conditions	Rating	Unit
$V_{isol}$	Isolation voltage	Terminals to base plate, RMS, $f=60\text{ Hz}$ , AC 1 min	2500	V
$T_{Cmax}$	Maximum case temperature	(Note4)	125	$^\circ\text{C}$
$T_{jop}$	Operating junction temperature	Continuous operation (under switching)	-40 ~ +150	$^\circ\text{C}$
$T_{stg}$	Storage temperature	-	-40 ~ +125	

MECHANICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
$M_s$	Mounting torque	Mounting to heat sink M 5 screw	2.5	3.0	3.5	N·m
$d_s$	Creepage distance	Terminal to terminal	6.47	-	-	mm
		Terminal to base plate	14.27	-	-	
$d_a$	Clearance	Terminal to terminal	6.47	-	-	mm
		Terminal to base plate	12.33	-	-	
$m$	mass	-	-	300	-	g
$e_c$	Flatness of base plate	On the centerline X, Y (Note5)	$\pm 0$	-	+100	$\mu\text{m}$

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CM35MXA-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> =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	
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		
V <sub>EC</sub> <sup>(Note1)</sup>	Emitter-collector voltage	I <sub>E</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>E</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> <sup>(Note1)</sup>	Reverse recovery time	V <sub>CC</sub> =600 V, I <sub>E</sub> =35 A, V <sub>GE</sub> =±15 V, R <sub>G</sub> =18 Ω, Inductive load	-	-	300	ns	
Q <sub>rr</sub> <sup>(Note1)</sup>	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>E</sub> =35 A, V <sub>GE</sub> =±15 V, R <sub>G</sub> =18 Ω, T <sub>j</sub> =150 °C, Inductive load	-	4.2	-	mJ	
E <sub>off</sub>	Turn-off switching energy per pulse	-	-	3.7	-		
E <sub>rr</sub> <sup>(Note1)</sup>	Reverse recovery energy per pulse	-	-	3.5	-		
R <sub>CC+EE'</sub>	Internal lead resistance	Main terminals-chip, per switch, T <sub>C</sub> =25 °C <sup>(Note4)</sup>	-	-	5.7	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 >

CM35MXA-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	-	-	4.0	mA
V <sub>F</sub> (Terminal)	Forward voltage	I <sub>F</sub> =35 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	-	-	0.42	K/W
R <sub>th(j-c)D</sub>		Junction to case, per Inverter DIODE	-	-	0.69	
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	-	-	0.45	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	-	K/kW

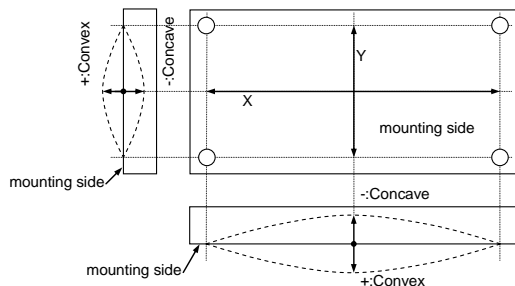
< IGBT MODULES >

CM35MXA-24S

HIGH POWER SWITCHING USE  
INSULATED TYPE

Note1. Represent ratings and characteristics of the anti-parallel, emitter-collector free wheeling diode (DIODE).

2. Junction temperature ( $T_j$ ) should not increase beyond  $T_{jmax}$  rating.
3. Pulse width and repetition rate should be such that the device junction temperature ( $T_j$ ) dose not exceed  $T_{jmax}$  rating.
4. 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.
5. The base plate (mounting side) flatness measurement points (X, Y) are as follows of the following figure.



6. 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]

8. Typical value is measured by using thermally conductive grease of  $\lambda=0.9$  W/(m·K).
9. 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.

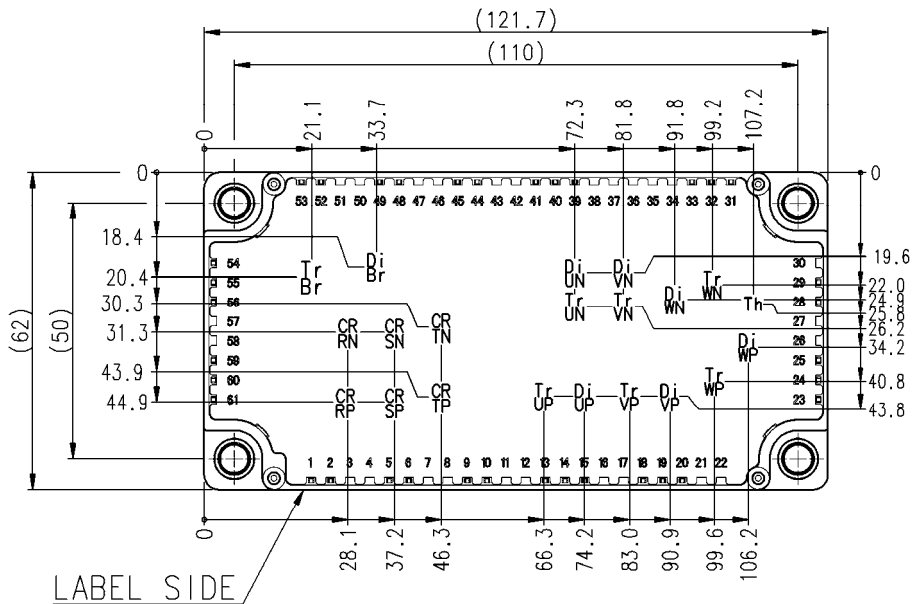
**RECOMMENDED OPERATING CONDITIONS**

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	18	-	180	Ω
			Brake IGBT	18	-	180	

< IGBT MODULES >  
**CM35MXA-24S**  
 HIGH POWER SWITCHING USE  
 INSULATED TYPE

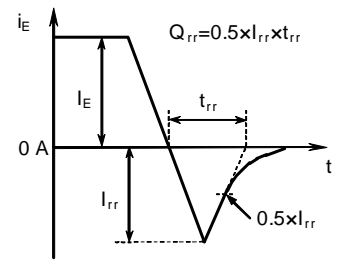
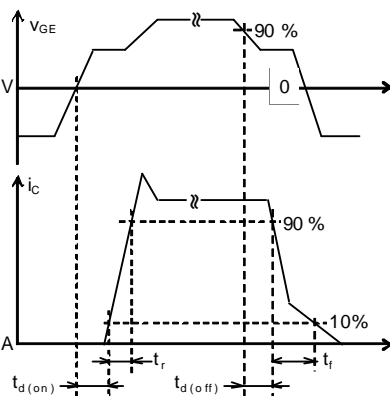
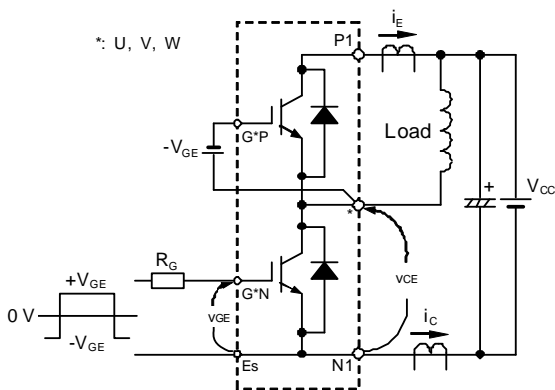
CHIP LOCATION (Top view)

Dimension in mm, tolerance: ±1 mm



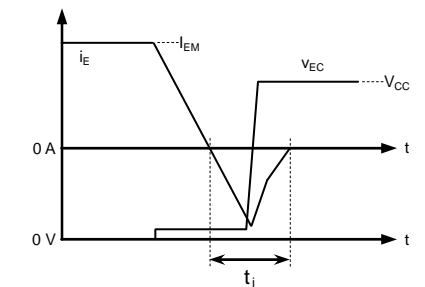
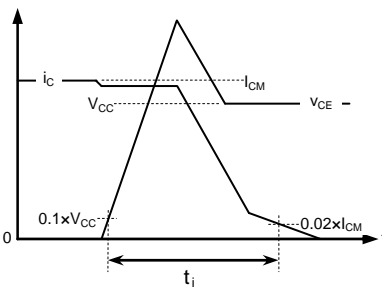
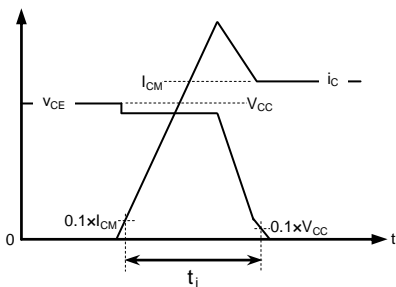
Tr\*P/Tr\*N/Tr\*Br: IGBT, Di\*P/Di\*N: DIODE (\*=U/V/W), Di\*Br: BRAKE DIODE, CR\*P/CR\*N: CONVERTER DIODE (\*=R/S/T), Th: NTC thermistor

**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

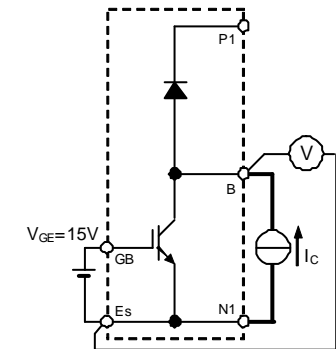
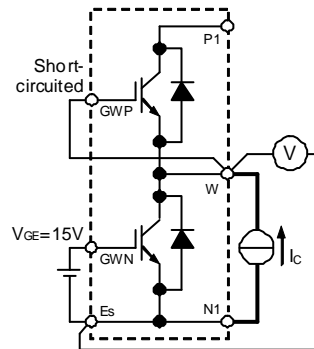
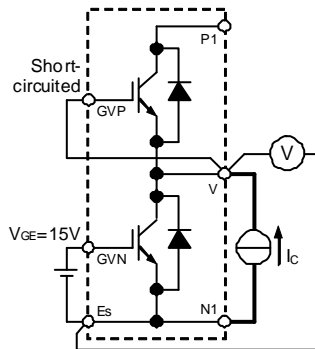
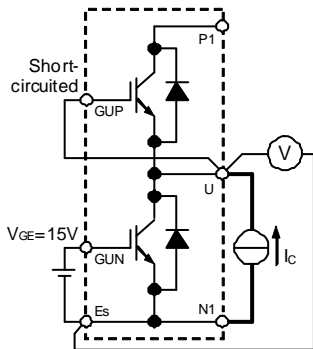
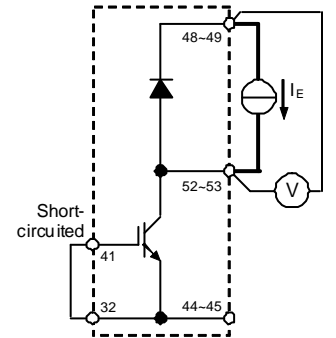
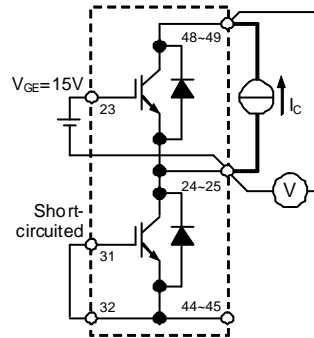
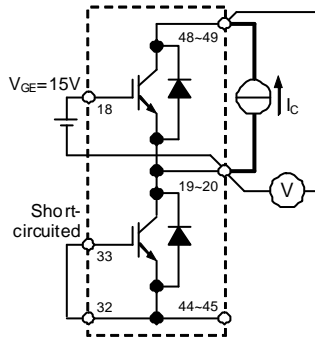
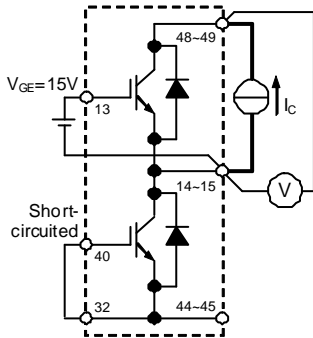
Turn-on / Turn-off switching energy and Reverse recovery energy test waveforms (Integral time instruction drawing)

< IGBT MODULES >

CM35MXA-24S

HIGH POWER SWITCHING USE  
INSULATED TYPE

TEST CIRCUIT



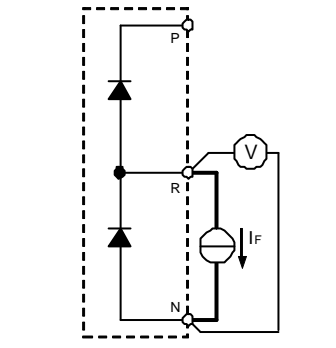
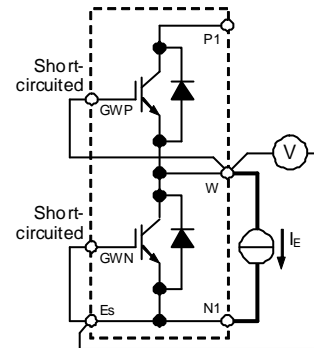
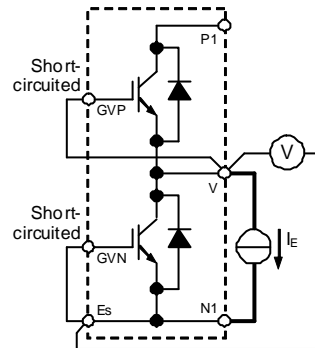
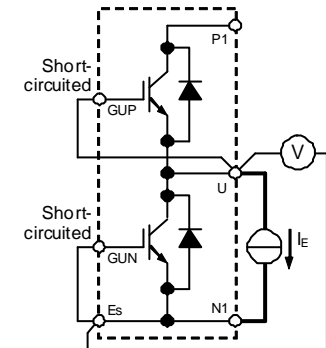
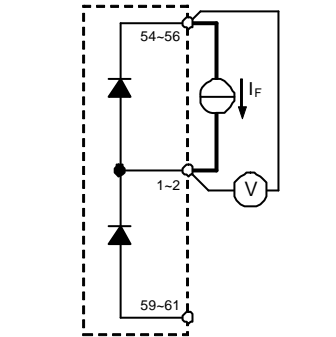
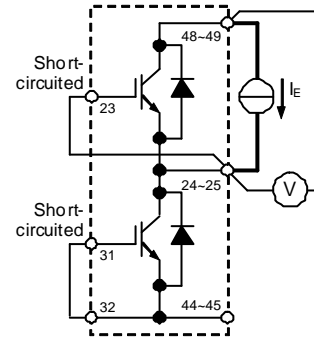
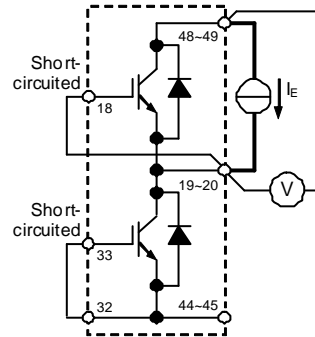
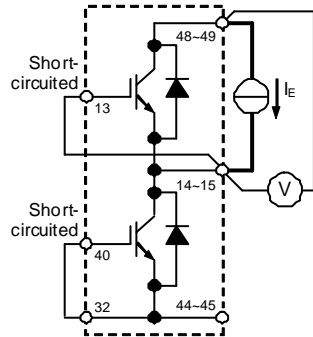
G-E short-circuited  
UP / UN IGBT

G-E short-circuited  
VP / VN IGBT

G-E short-circuited  
WP / WN IGBT

G-E short-circuited  
Brake IGBT / DIODE

**V<sub>CEsat</sub> / BRAKE DIODE V<sub>F</sub> 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)

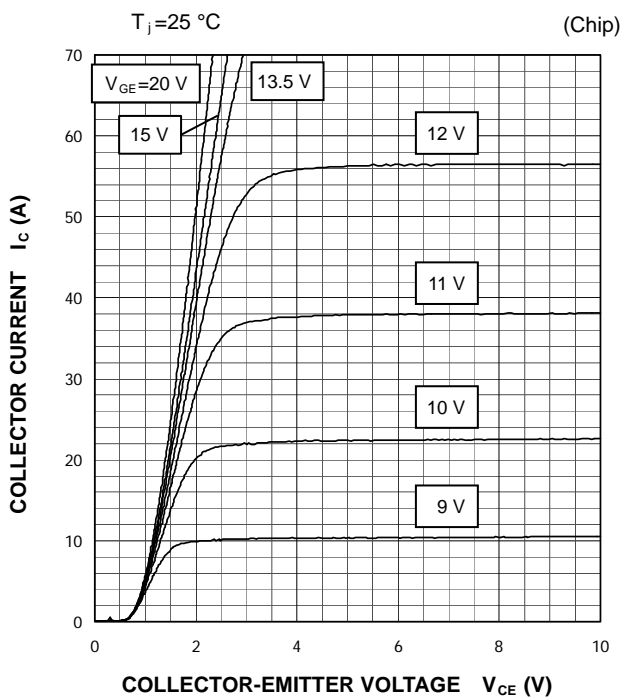
**V<sub>EC</sub> / CONVERTER DIODE V<sub>F</sub> test circuit**

\* 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.

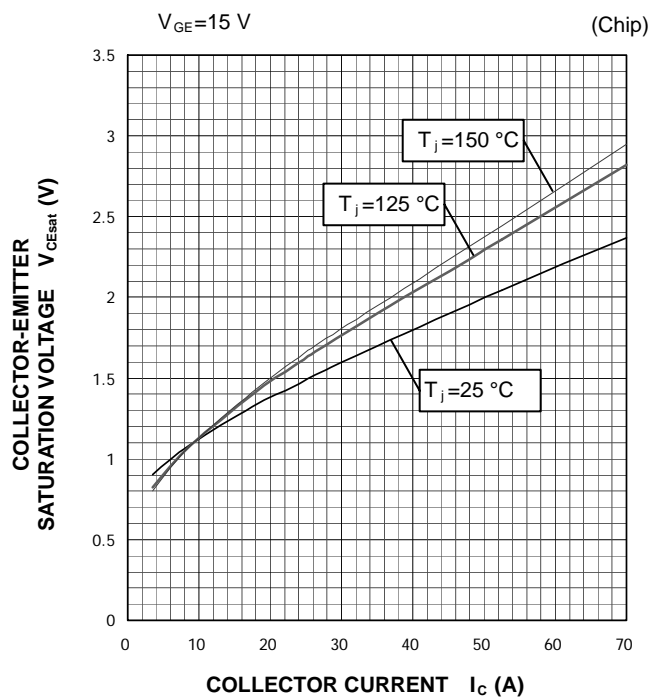
PERFORMANCE CURVES

INVERTER PART

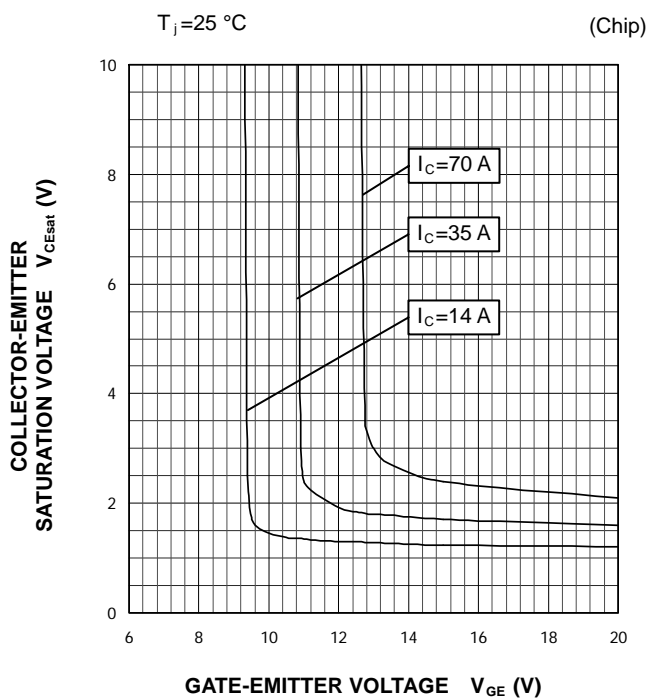
OUTPUT CHARACTERISTICS  
(TYPICAL)



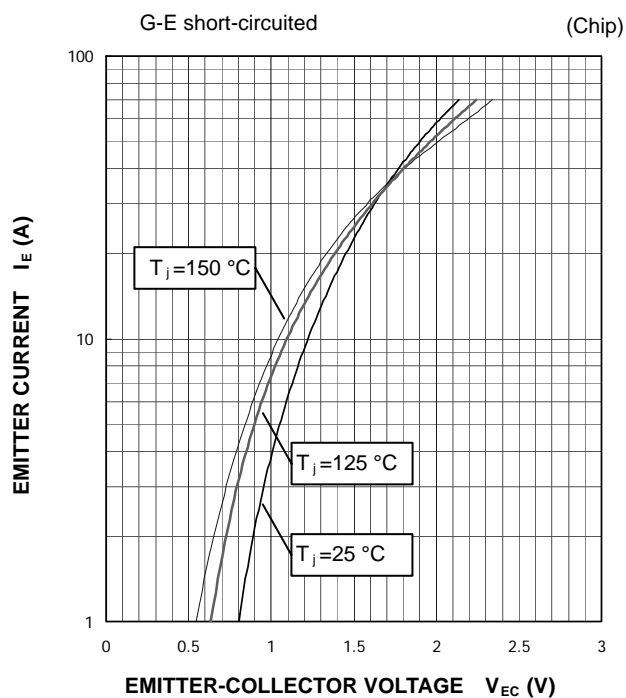
COLLECTOR-EMITTER SATURATION VOLTAGE  
CHARACTERISTICS  
(TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE  
CHARACTERISTICS  
(TYPICAL)



FREE WHEELING DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)



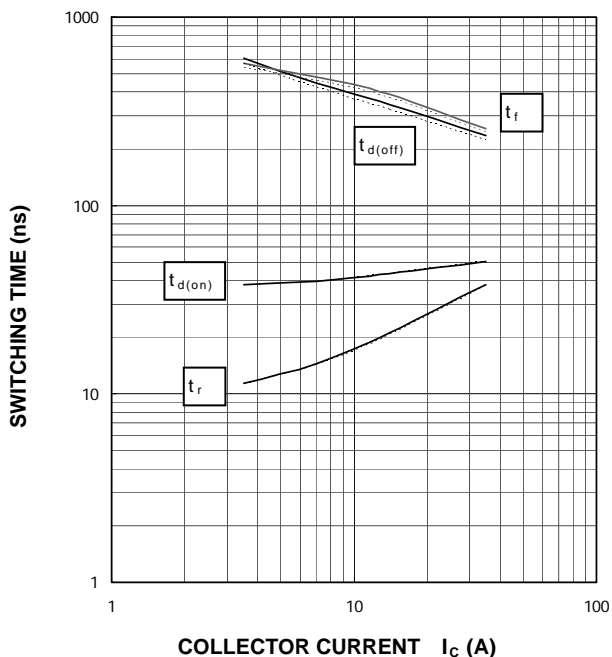


PERFORMANCE CURVES

INVERTER PART

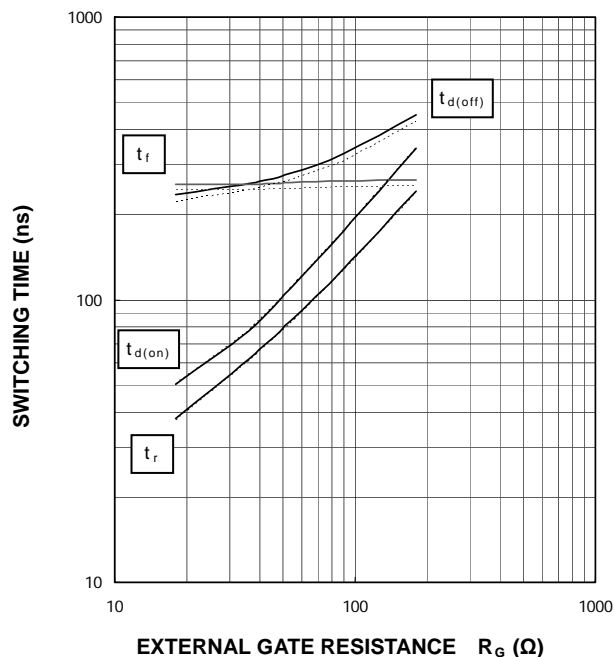
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)

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



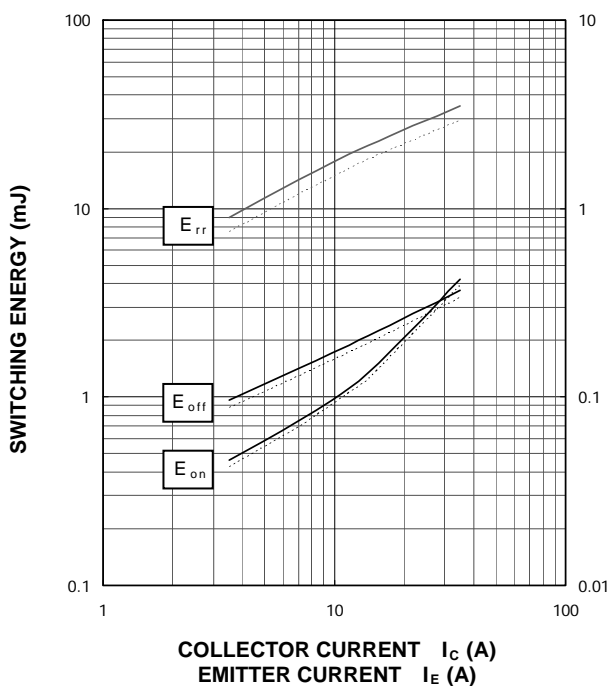
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)

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



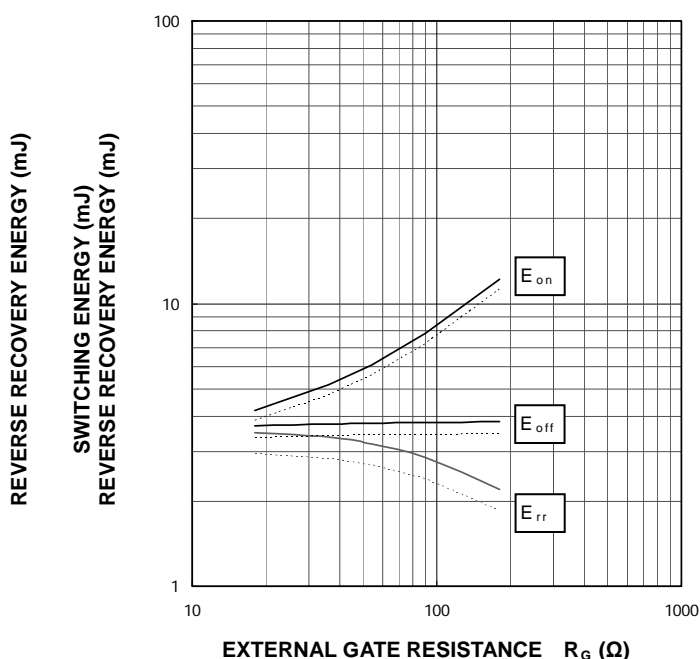
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)

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



HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)

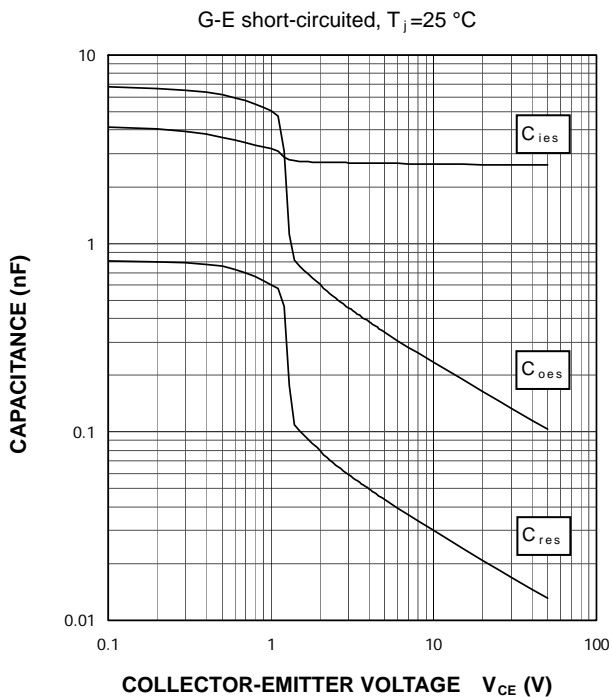
$V_{CC}=600\text{ V}$ ,  $V_{GE}=\pm 15\text{ V}$ ,  $I_C=35\text{ A}$ ,  
INDUCTIVE LOAD, PER PULSE  
—:  $T_j=150\text{ }^\circ\text{C}$ , - - - -:  $T_j=125\text{ }^\circ\text{C}$



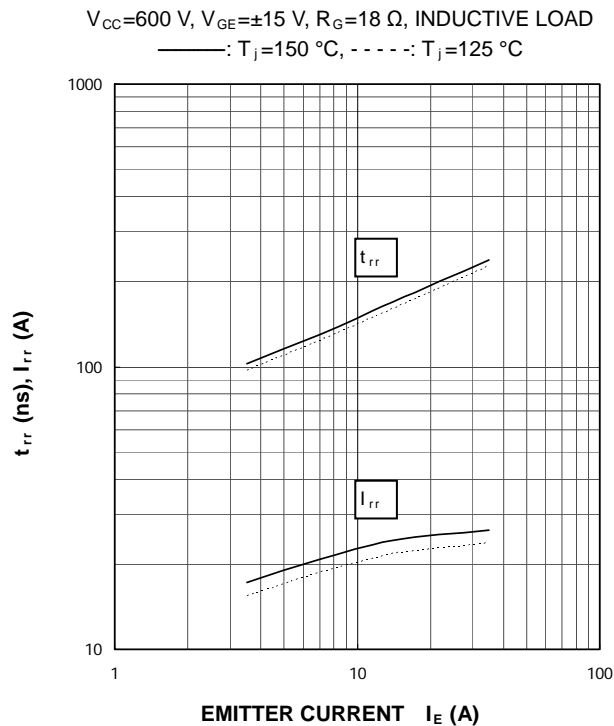
PERFORMANCE CURVES

INVERTER PART

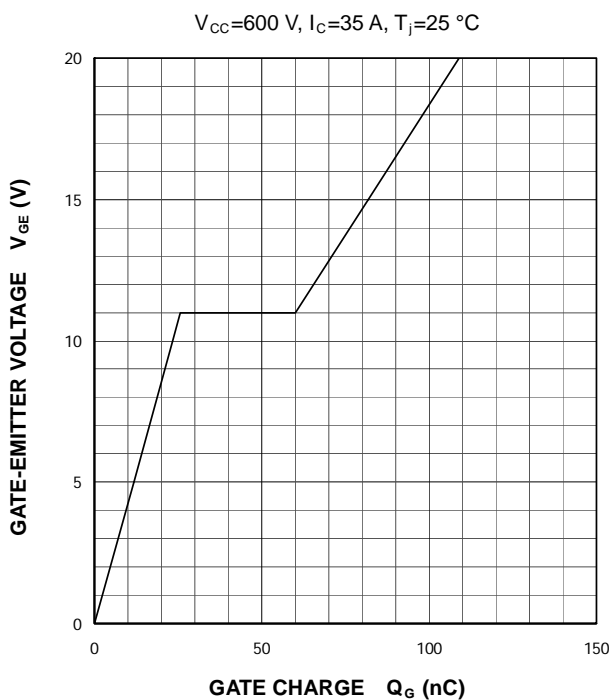
CAPACITANCE CHARACTERISTICS  
(TYPICAL)



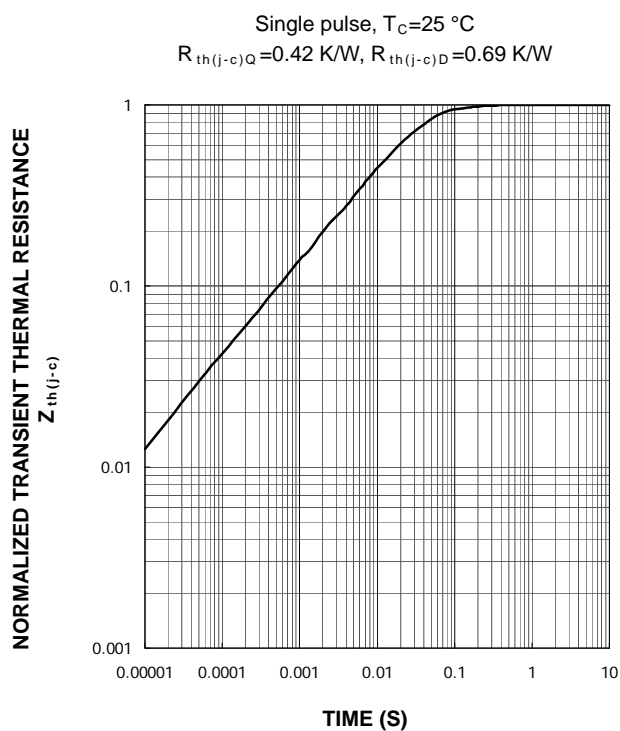
FREE WHEELING DIODE  
REVERSE RECOVERY CHARACTERISTICS  
(TYPICAL)



GATE CHARGE CHARACTERISTICS  
(TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS  
(MAXIMUM)

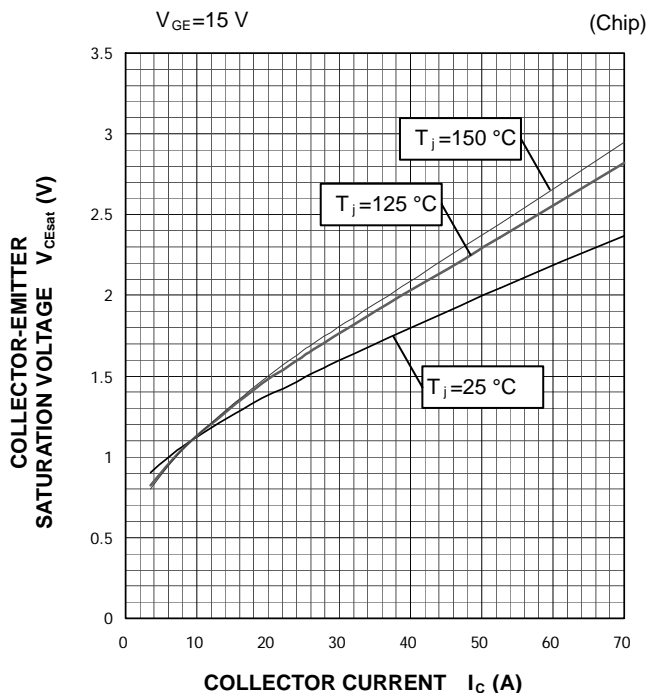


< IGBT MODULES >  
**CM35MXA-24S**  
 HIGH POWER SWITCHING USE  
 INSULATED TYPE

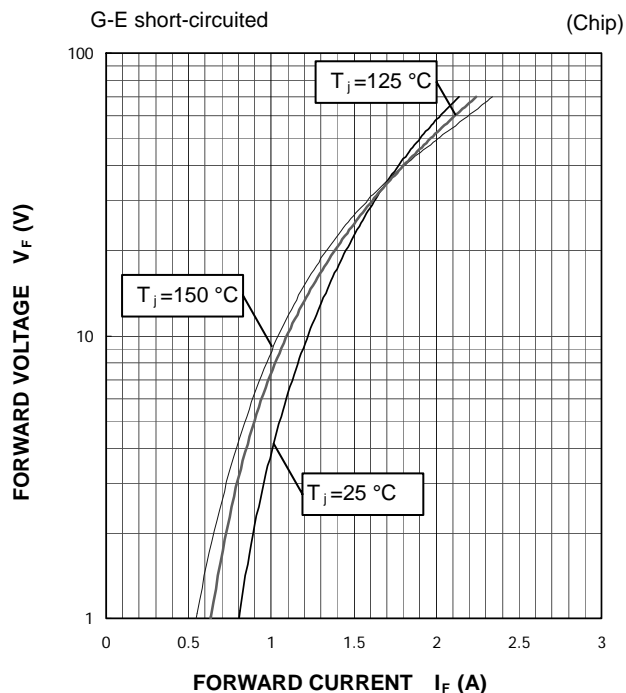
**PERFORMANCE CURVES**

**BRAKE PART**

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

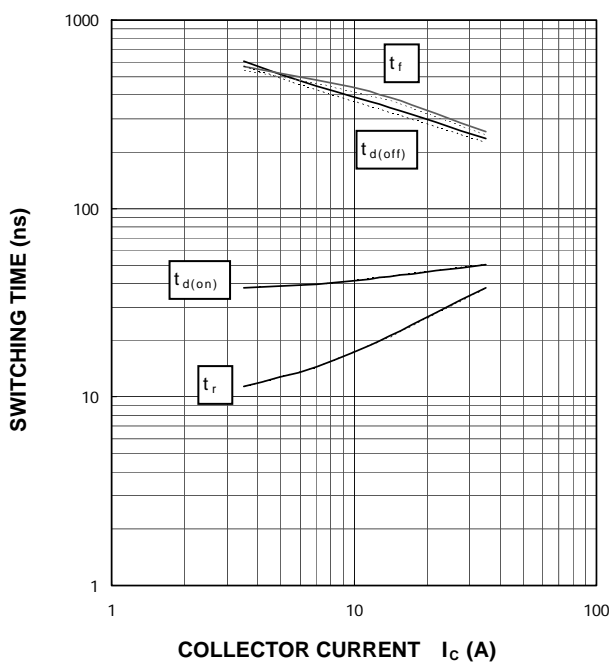


**CLAMP DIODE FORWARD CHARACTERISTICS (TYPICAL)**



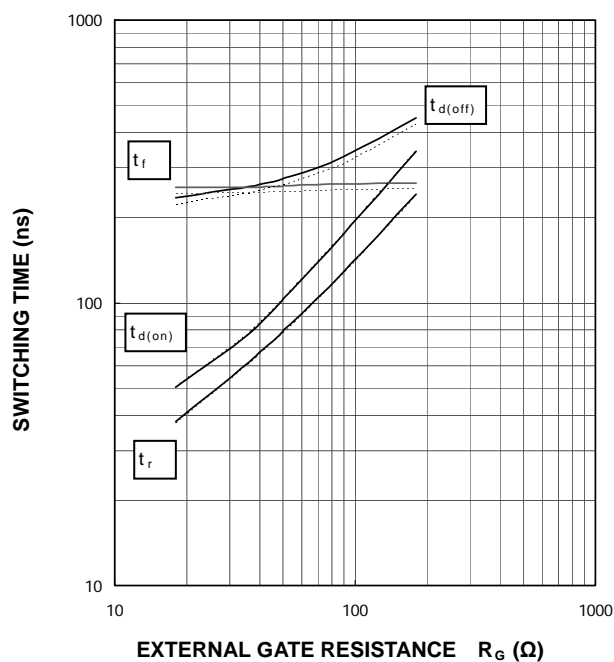
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**

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

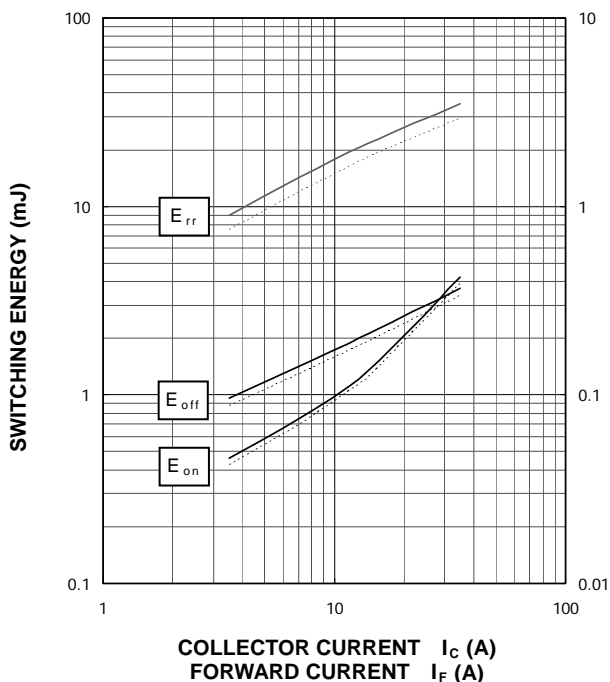


PERFORMANCE CURVES

BRAKE PART

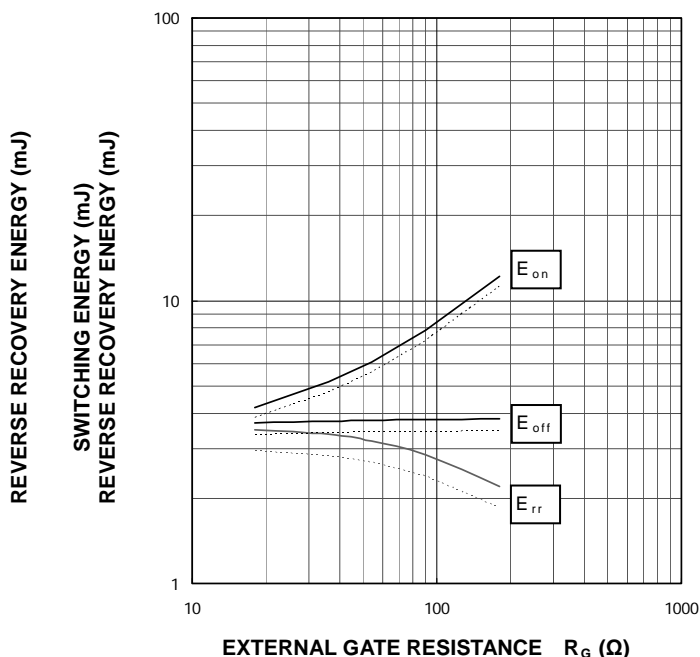
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)

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



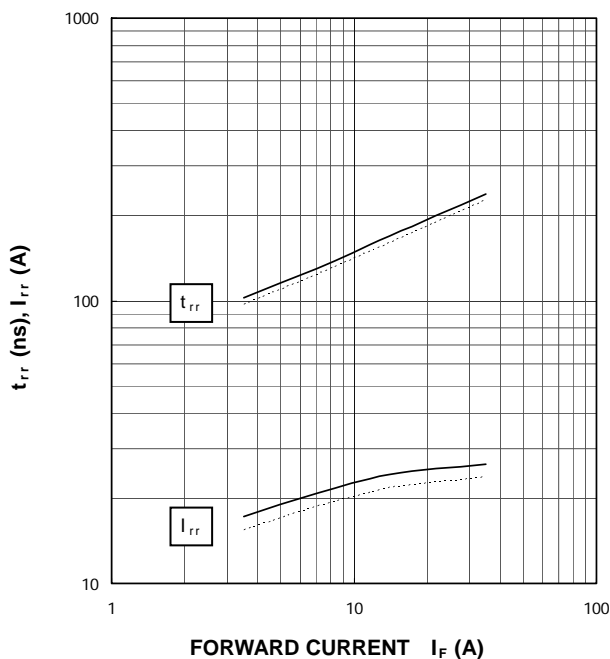
HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)

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



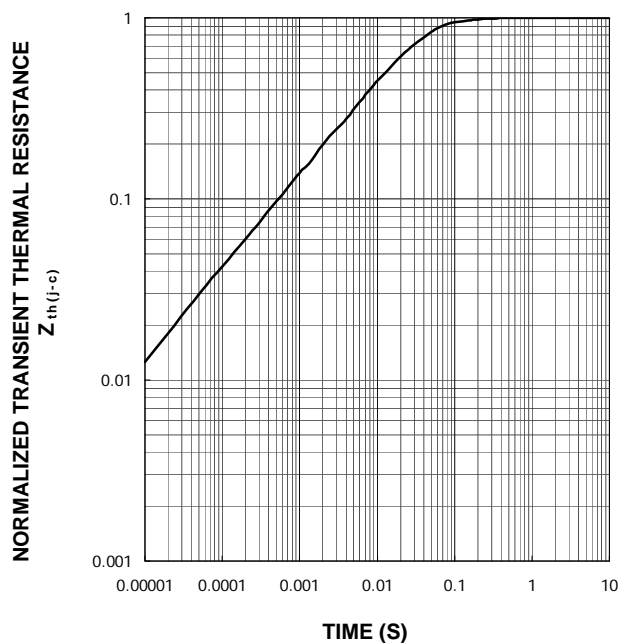
CLAMP DIODE  
REVERSE RECOVERY CHARACTERISTICS  
(TYPICAL)

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



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS  
(MAXIMUM)

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

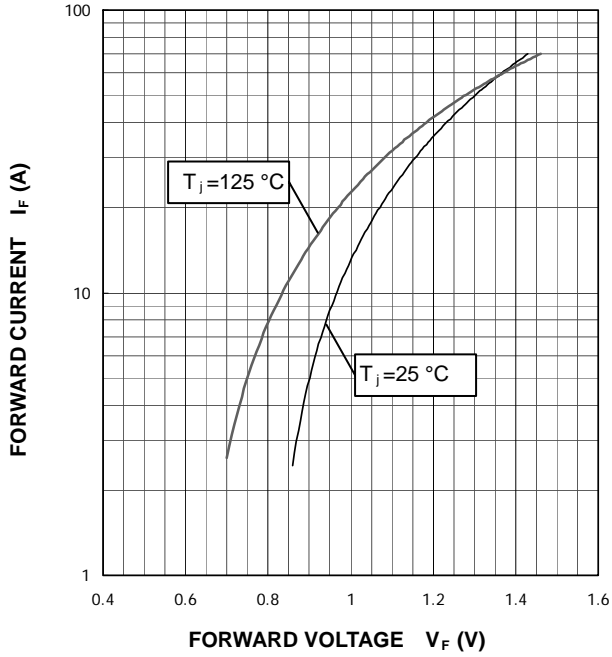


< IGBT MODULES >  
**CM35MXA-24S**  
 HIGH POWER SWITCHING USE  
 INSULATED TYPE

**PERFORMANCE CURVES**

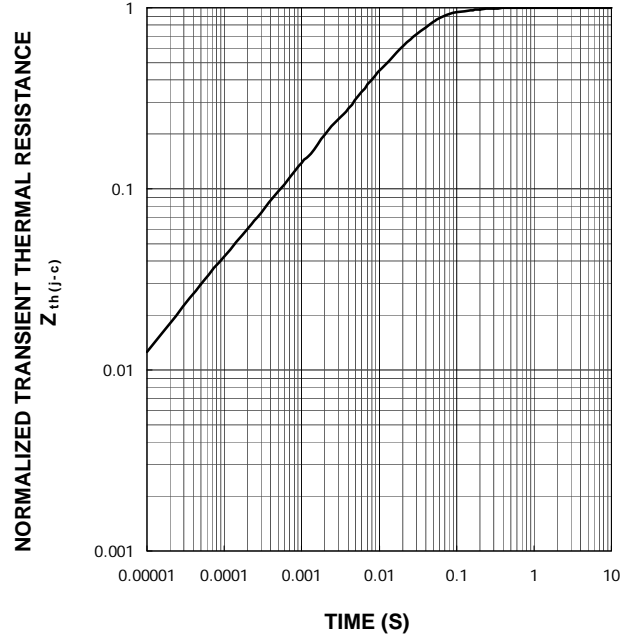
**CONVERTER PART**

**CONVERTER DIODE  
 FORWARD CHARACTERISTICS  
 (TYPICAL)**



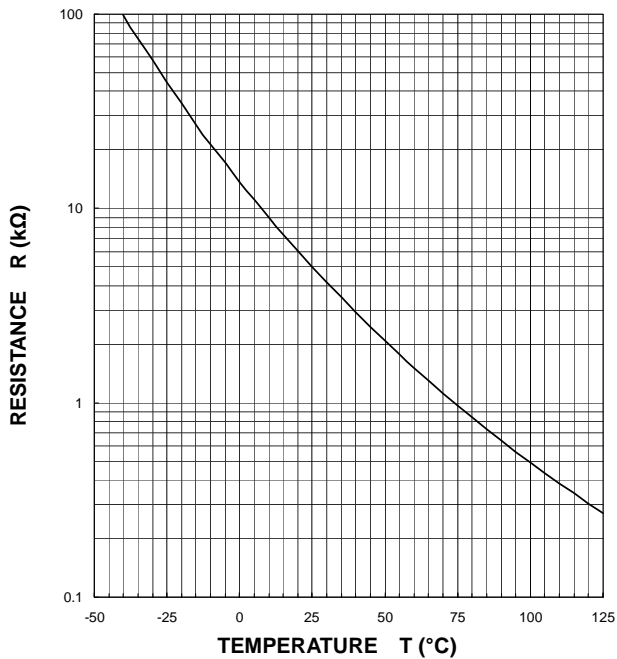
**TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS  
 (MAXIMUM)**

Single pulse,  $T_c = 25\text{ °C}$   
 $R_{th(j-c)D} = 0.45\text{ K/W}$



**NTC thermistor part**

**TEMPERATURE CHARACTERISTICS  
 (TYPICAL)**



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