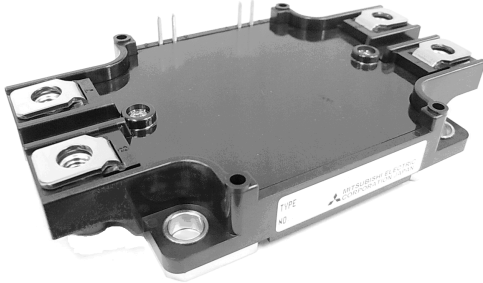


< IGBT MODULES >

CM150EXS-24S

HIGH POWER SWITCHING USE
INSULATED TYPE



Single switch

Collector current I_C **150 A**
 Collector-emitter voltage V_{CES} **1200 V**
 Maximum junction temperature T_{jmax} **175 °C**

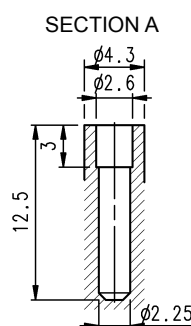
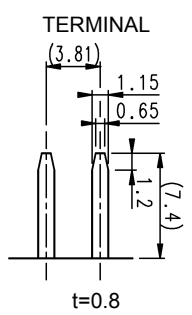
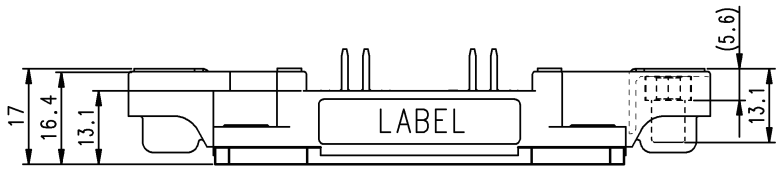
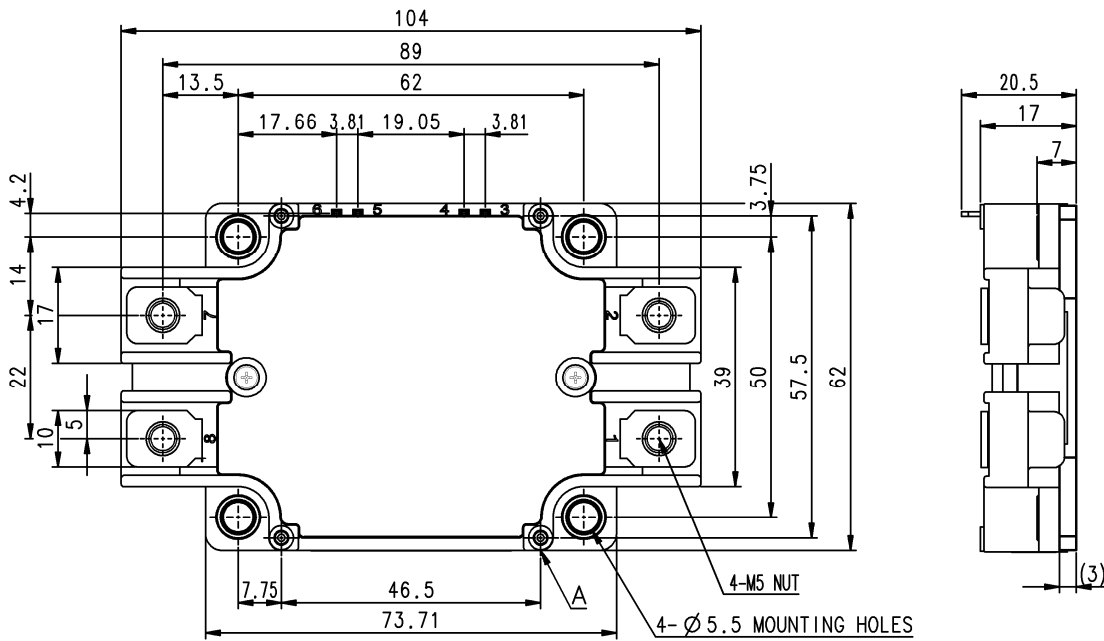
- Flat base Type
- Copper base plate (non-plating)
- Tin plating pin terminals
- RoHS Directive compliant
- Recognized under UL1557, File E323585

APPLICATION

Brake

OUTLINE DRAWING & INTERNAL CONNECTION

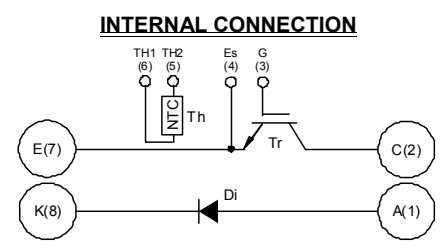
Dimension in mm



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 >

CM150EXS-24S

HIGH POWER SWITCHING USE
INSULATED TYPE

ABSOLUTE MAXIMUM RATINGS (T_j=25 °C, unless otherwise specified)

IGBT

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	± 20	V
I _C	Collector current	DC, T _C =120 °C (Note1, 3)	150	A
I _{CRM}		Pulse, Repetitive (Note2)	300	
P _{tot}	Total power dissipation	T _C =25 °C (Note1, 3)	1150	W

DIODE

Symbol	Item	Conditions	Rating	Unit
V _{RRM}	Repetitive peak reverse voltage	-	1200	V
I _F	Forward current	(Note1)	150	A
I _{FRM}		Pulse, Repetitive (Note2)	300	

MODULE

Symbol	Item	Conditions	Rating	Unit
V _{isol}	Isolation voltage	Terminals to base plate, RMS, f=60 Hz, AC 1 min	4000	V
T _{jmax}	Maximum junction temperature	Instantaneous event (overload)	175	°C
T _{Cmax}	Maximum case temperature	(Note3)	125	
T _{jop}	Operating junction temperature	Continuous operation (under switching)	-40 ~ +150	°C
T _{stg}	Storage temperature	-	-40 ~ +125	

ELECTRICAL CHARACTERISTICS (T_j=25 °C, unless otherwise specified)

IGBT

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
I _{CES}	Collector-emitter cut-off current	V _{CE} =V _{CES} , G-E short-circuited	-	-	1.0	mA	
I _{GES}	Gate-emitter leakage current	V _{GE} =V _{GES} , C-E short-circuited	-	-	0.5	µA	
V _{GE(th)}	Gate-emitter threshold voltage	I _C =15 mA, V _{CE} =10 V	5.4	6.0	6.6	V	
V _{CEsat}	Collector-emitter saturation voltage	I _C =150 A (Note4), V _{GE} =15 V, (Terminal)	T _j =25 °C	-	1.80	2.25	V
			T _j =125 °C	-	2.00	-	
			T _j =150 °C	-	2.05	-	
		I _C =150 A (Note4), V _{GE} =15 V, (Chip)	T _j =25 °C	-	1.70	2.15	V
			T _j =125 °C	-	1.90	-	
			T _j =150 °C	-	1.95	-	
C _{ies}	Input capacitance	V _{CE} =10 V, G-E short-circuited	-	-	15	nF	
C _{oes}	Output capacitance		-	-	3.0		
C _{res}	Reverse transfer capacitance		-	-	0.25		
Q _G	Gate charge	V _{CC} =600 V, I _C =150 A, V _{GE} =15 V	-	350	-	nC	
t _{d(on)}	Turn-on delay time	V _{CC} =600 V, I _C =150 A, V _{GE} =±15 V, R _G =0 Ω, Inductive load	-	-	800	ns	
t _r	Rise time		-	-	200		
t _{d(off)}	Turn-off delay time		-	-	600		
t _f	Fall time		-	-	300		
E _{on}	Turn-on switching energy per pulse	V _{CC} =600 V, I _C =150 A, V _{GE} =±15 V, R _G =0 Ω, T _j =150 °C, Inductive load	-	24.2	-	mJ	
E _{off}	Turn-off switching energy per pulse		-	16	-		
R _{CC'+EE'}	Internal lead resistance	Main terminals-chip, per element, T _C =25 °C (Note3)	-	-	2.0	mΩ	
r _g	Internal gate resistance	-	-	13	-	Ω	

< IGBT MODULES >

CM150EXS-24S

HIGH POWER SWITCHING USE
INSULATED TYPE

ELECTRICAL CHARACTERISTICS (cont.; $T_j=25\text{ }^\circ\text{C}$, unless otherwise specified)

DIODE PART

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
I_{RRM}	Reverse current	$V_R=V_{RRM}$	-	-	1.0	mA	
V_F	Forward voltage	$I_F=150\text{ A}$ ^(Note4) , (Terminal)	$T_j=25\text{ }^\circ\text{C}$	-	1.8	2.25	V
			$T_j=125\text{ }^\circ\text{C}$	-	1.8	-	
			$T_j=150\text{ }^\circ\text{C}$	-	1.8	-	
		$I_F=150\text{ A}$ ^(Note4) , (Chip)	$T_j=25\text{ }^\circ\text{C}$	-	1.7	2.15	V
			$T_j=125\text{ }^\circ\text{C}$	-	1.7	-	
			$T_j=150\text{ }^\circ\text{C}$	-	1.7	-	
t_{rr}	Reverse recovery time	$V_{CC}=600\text{ V}$, $I_F=150\text{ A}$, $V_{GE}=\pm 15\text{ V}$, $R_G=0\text{ }\Omega$, Inductive load	-	-	300	ns	
Q_{rr}	Reverse recovery charge		-	8.0	-	μC	
E_{rr}	Reverse recovery energy per pulse	$V_{CC}=600\text{ V}$, $I_F=150\text{ A}$, $V_{GE}=\pm 15\text{ V}$, $R_G=0\text{ }\Omega$, $T_j=150\text{ }^\circ\text{C}$, Inductive load	-	12.2	-	mJ	

NTC THERMISTOR PART

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R_{25}	Zero-power resistance	$T_C=25\text{ }^\circ\text{C}$ ^(Note3)	4.85	5.00	5.15	k Ω
$\Delta R/R$	Deviation of resistance	$R_{100}=493\text{ }\Omega$, $T_C=100\text{ }^\circ\text{C}$ ^(Note3)	-7.3	-	+7.8	%
$B_{(25/50)}$	B-constant	Approximate by equation ^(Note5)	-	3375	-	K
P_{25}	Power dissipation	$T_C=25\text{ }^\circ\text{C}$ ^(Note3)	-	-	10	mW

THERMAL RESISTANCE CHARACTERISTICS

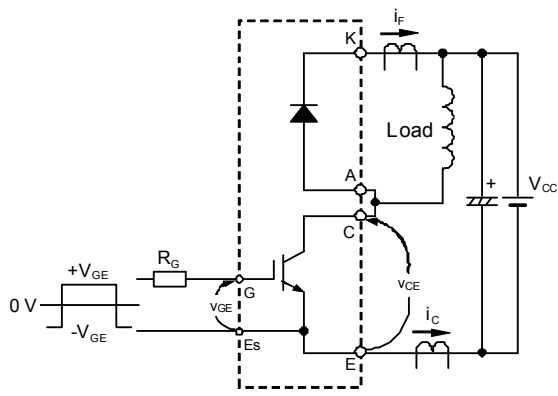
Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
$R_{th(j-c)Q}$	Thermal resistance	Junction to case, IGBT ^(Note3)	-	-	0.13	K/W
$R_{th(j-c)D}$		Junction to case, DIODE ^(Note3)	-	-	0.23	
$R_{th(c-s)}$	Contact thermal resistance	Case to heat sink, per 1 module, Thermal grease applied ^(Note3, 6)	-	25	-	K/kW

MECHANICAL CHARACTERISTICS

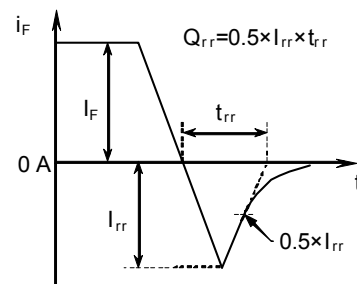
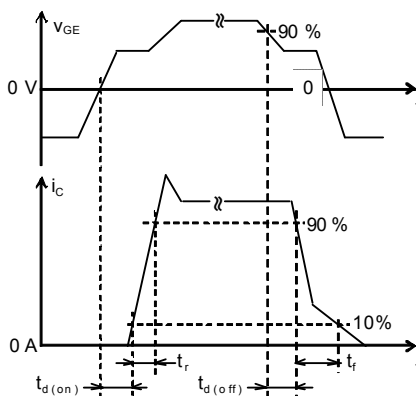
Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
M_t	Mounting torque	Main terminals M 5 screw	2.5	3.0	3.5	N·m
M_s	Mounting torque	Mounting to heat sink M 5 screw	2.5	3.0	3.5	N·m
d_s	Creepage distance	Terminal to terminal	20.6	-	-	mm
		Terminal to base plate	17	-	-	
d_a	Clearance	Terminal to terminal	12	-	-	mm
		Terminal to base plate	10.6	-	-	
m	mass	-	210	-	g	
e_c	Flatness of base plate	On the centerline X, Y ^(Note7)	-100	-	+100	μm

< IGBT MODULES >
CM150EXS-24S
 HIGH POWER SWITCHING USE
 INSULATED TYPE

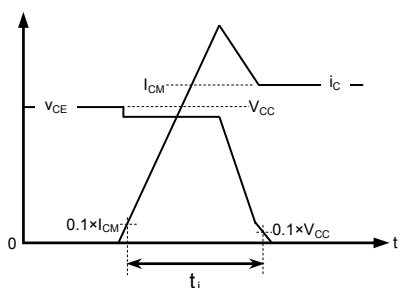
TEST CIRCUIT AND WAVEFORMS



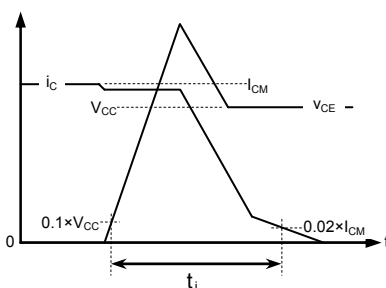
Switching characteristics test circuit and waveforms



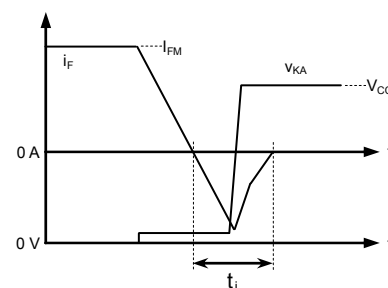
t_{rr} , Q_{rr} test waveform



IGBT Turn-on switching energy

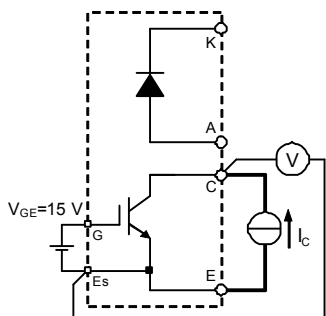


IGBT Turn-off switching energy

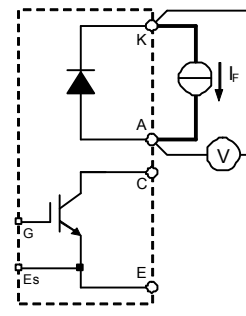


DIODE Reverse recovery energy

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



V_{CEsat} test circuit



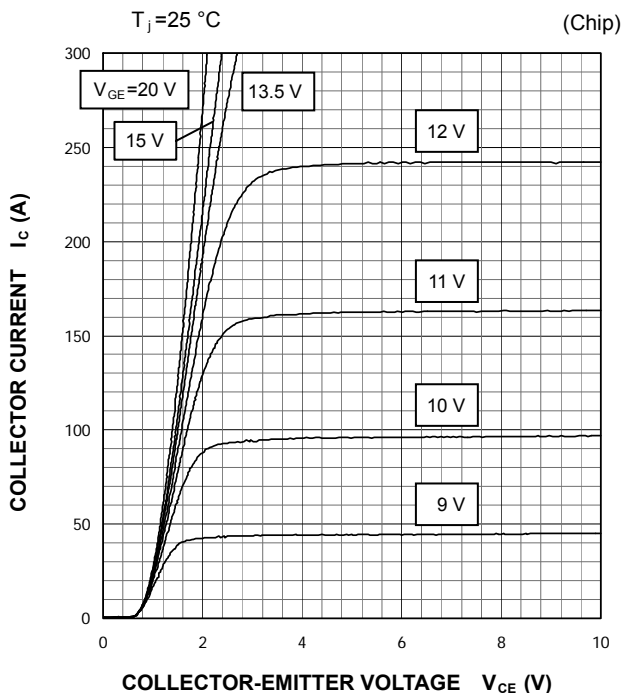
V_F test circuit

< IGBT MODULES >
CM150EXS-24S
 HIGH POWER SWITCHING USE
 INSULATED TYPE

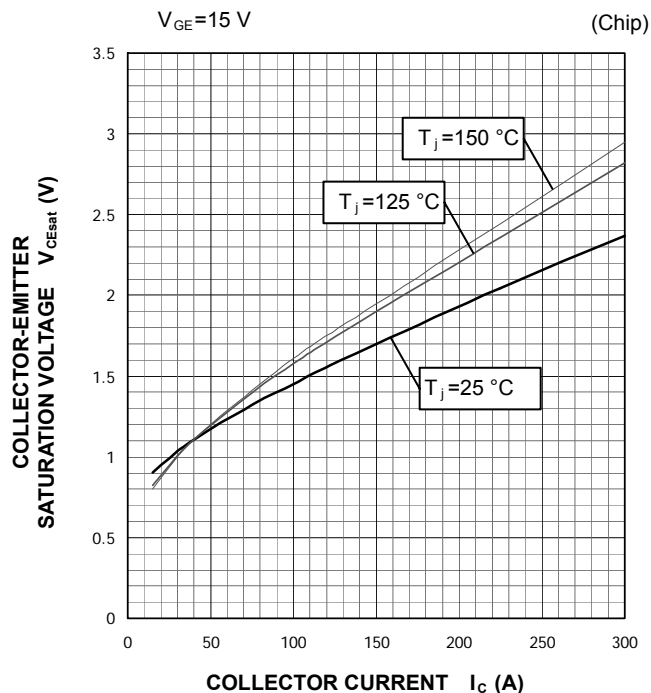
PERFORMANCE CURVES

IGBT/DIODE PART

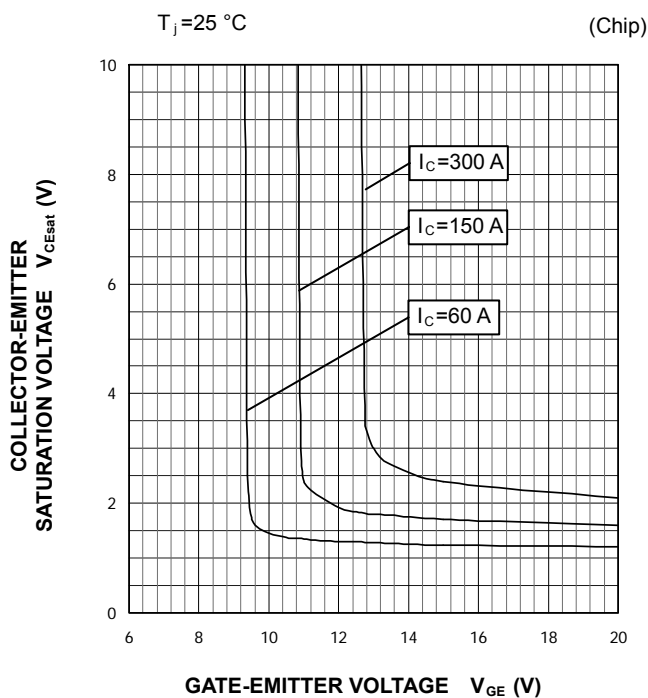
OUTPUT CHARACTERISTICS
 (TYPICAL)



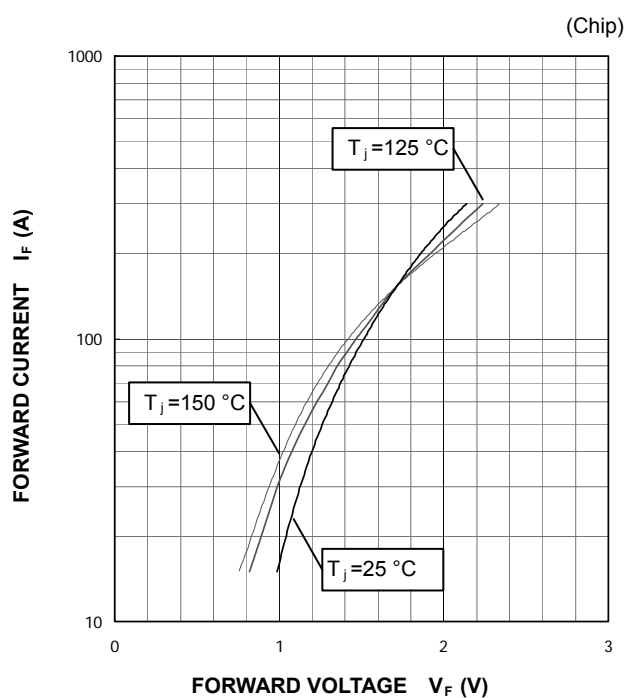
COLLECTOR-EMITTER SATURATION VOLTAGE
 CHARACTERISTICS
 (TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE
 CHARACTERISTICS
 (TYPICAL)



CLAMP DIODE
 FORWARD CHARACTERISTICS
 (TYPICAL)

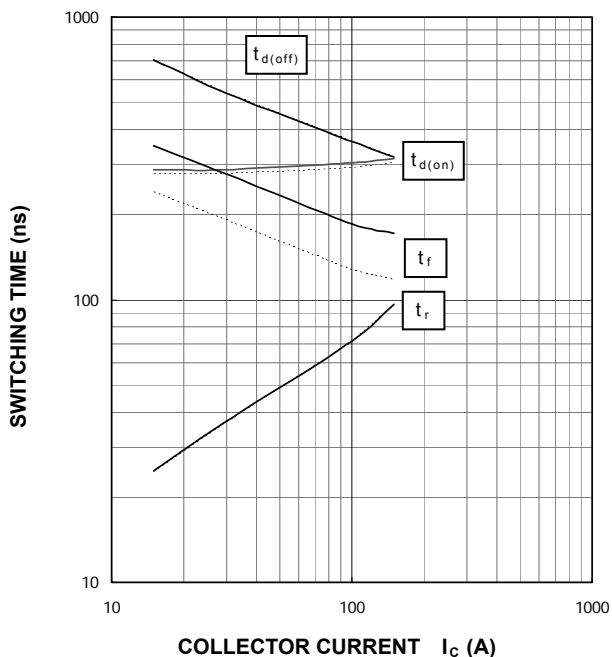


PERFORMANCE CURVES

IGBT/DIODE PART

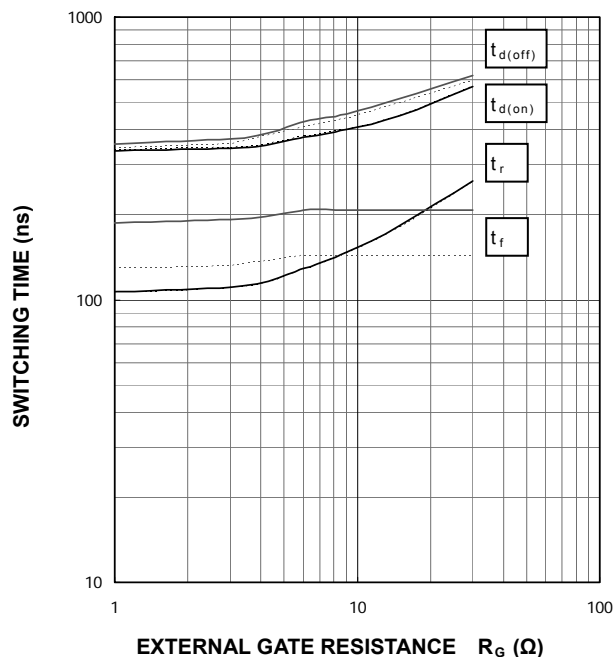
HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

$V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=0\ \Omega$, INDUCTIVE LOAD
——: $T_j=150\text{ }^\circ\text{C}$, - - - -: $T_j=125\text{ }^\circ\text{C}$



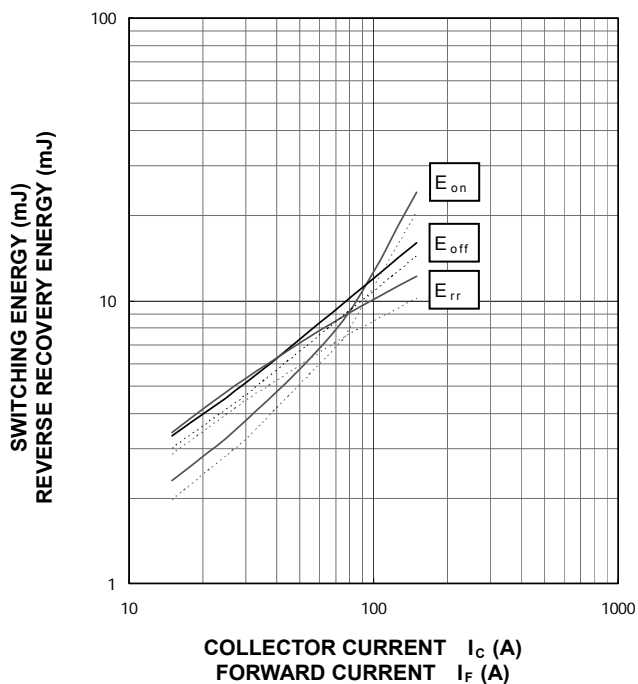
HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

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



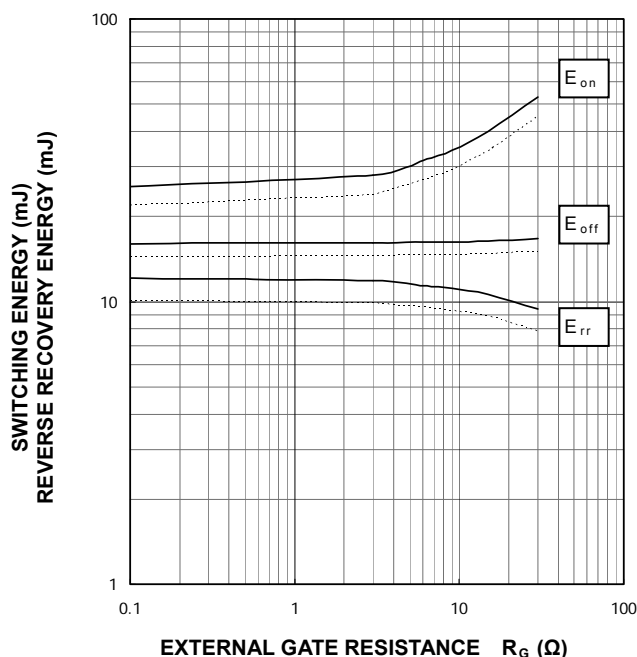
HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

$V_{CC}=600\text{ V}$, $V_{GE}=\pm 15\text{ V}$, $R_G=0\ \Omega$,
INDUCTIVE LOAD, PER PULSE
——: $T_j=150\text{ }^\circ\text{C}$, - - - -: $T_j=125\text{ }^\circ\text{C}$



HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

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



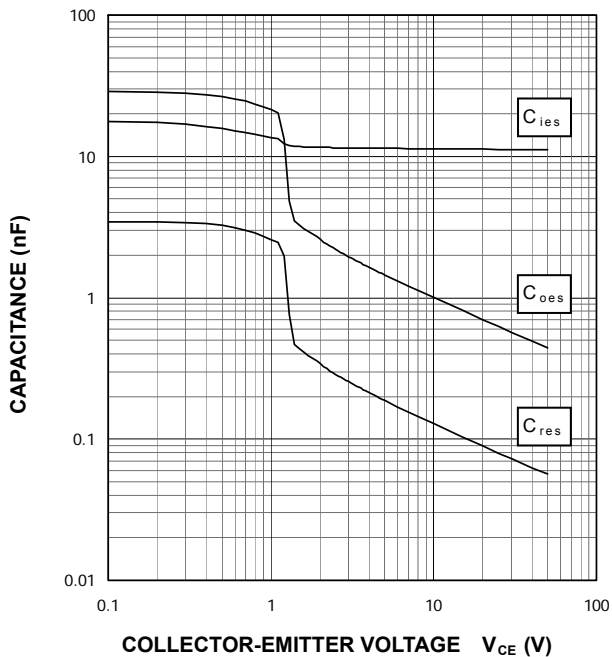
< IGBT MODULES >
CM150EXS-24S
 HIGH POWER SWITCHING USE
 INSULATED TYPE

PERFORMANCE CURVES

IGBT/DIODE PART

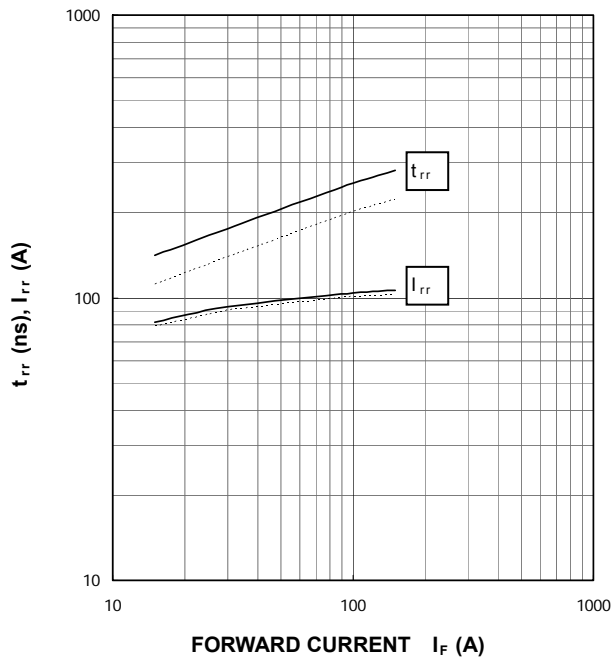
CAPACITANCE CHARACTERISTICS (TYPICAL)

G-E short-circuited, $T_j = 25\text{ }^\circ\text{C}$



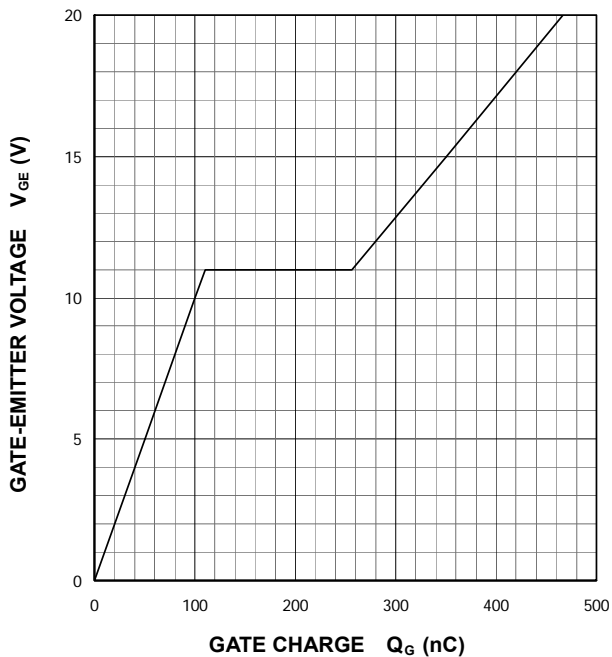
CLAMP DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)

$V_{CC} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_G = 0\text{ }\Omega$, INDUCTIVE LOAD
 —: $T_j = 150\text{ }^\circ\text{C}$, - - - -: $T_j = 125\text{ }^\circ\text{C}$



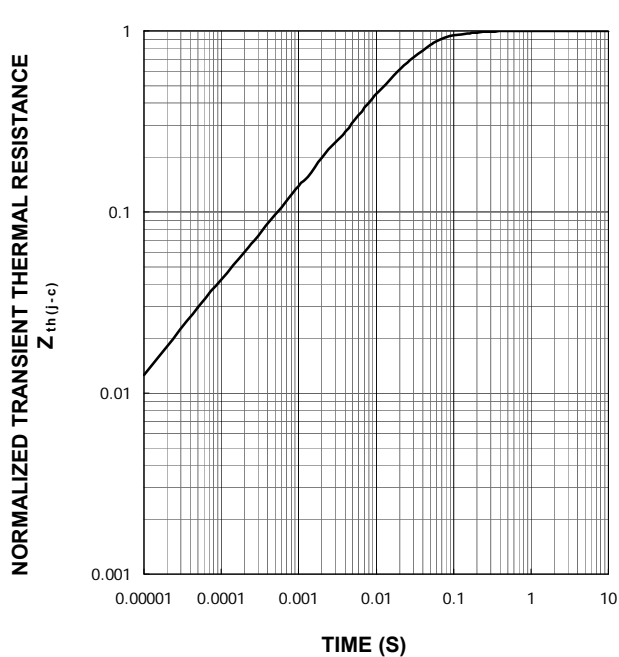
GATE CHARGE CHARACTERISTICS (TYPICAL)

$V_{CC} = 600\text{ V}$, $I_C = 150\text{ A}$, $T_j = 25\text{ }^\circ\text{C}$



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)

Single pulse, $T_C = 25\text{ }^\circ\text{C}$
 $R_{th(j-c)Q} = 0.13\text{ K/W}$, $R_{th(j-c)D} = 0.23\text{ K/W}$

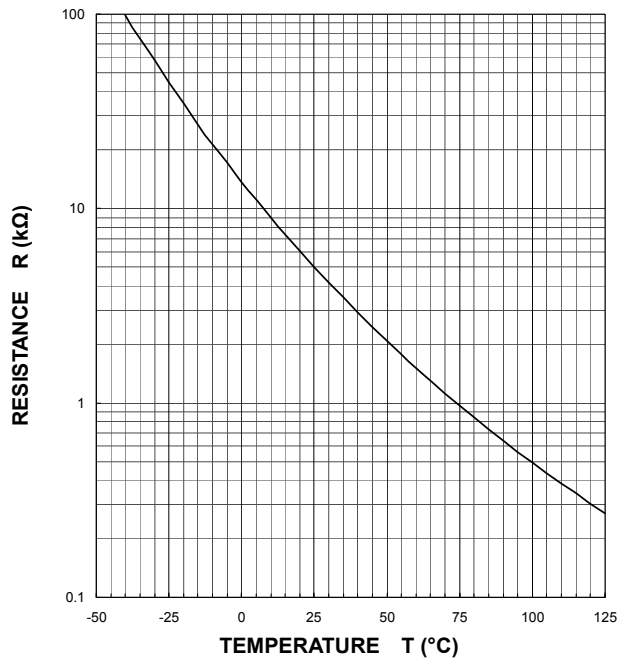


< IGBT MODULES >
CM150EXS-24S
HIGH POWER SWITCHING USE
INSULATED TYPE

PERFORMANCE CURVES

NTC THERMISTOR PART

TEMPERATURE CHARACTERISTICS
(TYPICAL)



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