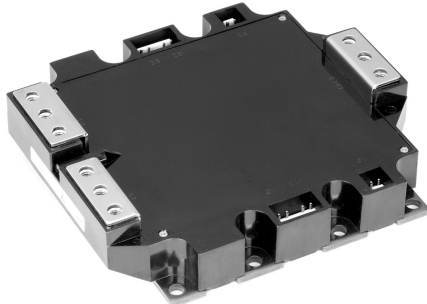


< IGBT MODULES >

CM1400DUC-24S

HIGH POWER SWITCHING USE
INSULATED TYPE



Dual switch (Half-Bridge)

Collector current I_C **1 4 0 0 A**
 Collector-emitter voltage V_{CES} **1 2 0 0 V**
 Maximum junction temperature T_{jmax} **1 7 5 °C**

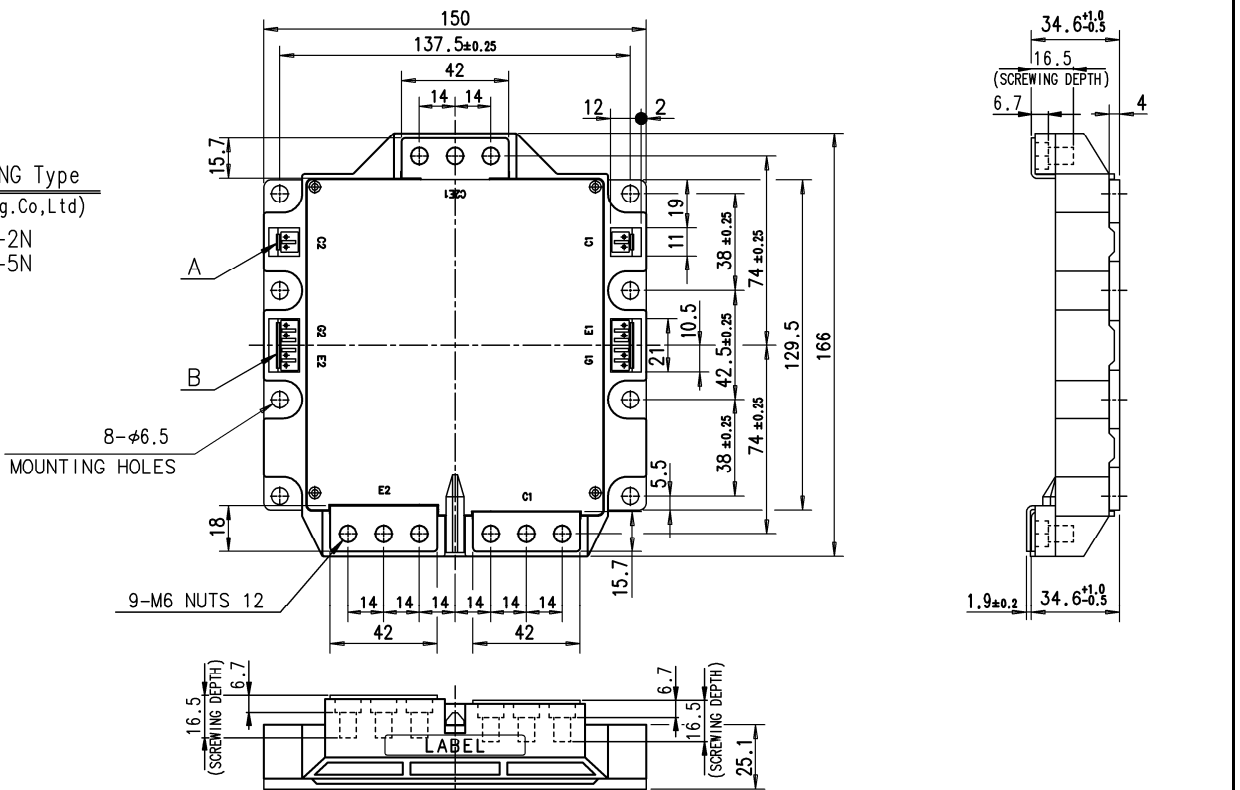
- Flat base Type
- Copper base plate (non-plating)
- RoHS Directive compliant
- UL Recognized under UL1557, File E323585

APPLICATION

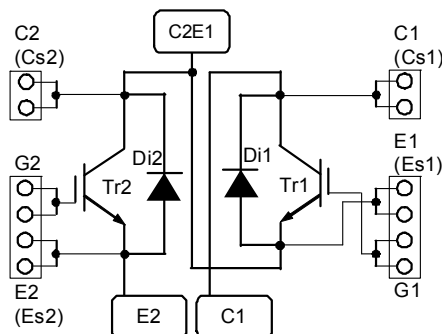
Wind power, Photovoltaic (Solar) power, AC Motor Control, Motion/Servo Control, Power supply, etc.

OUTLINE DRAWING & INTERNAL CONNECTION

A, B HOUSING Type
(J.S.T.Mfg.Co.,Ltd)
 A : VHR-2N
 B : VHR-5N



INTERNAL CONNECTION



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

< IGBT MODULES >

CM1400DUC-24S

HIGH POWER SWITCHING USE
INSULATED TYPE

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

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 =124 °C (Note2, 4)	1400	A
I _{CRM}		Pulse, Repetitive (Note3)	2800	
P _{tot}	Total power dissipation	T _C =25 °C (Note2, 4)	9375	W
I _E (Note1)	Emitter current	(Note2)	1400	A
I _{ERM} (Note1)		Pulse, Repetitive (Note3)	2800	
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	(Note4)	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)

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	-	-	3.0	µA	
V _{GE(th)}	Gate-emitter threshold voltage	I _C =140 mA, V _{CE} =10 V	5.4	6.0	6.6	V	
V _{CEsat}	Collector-emitter saturation voltage	I _C =1400 A (Note6), V _{GE} =15 V, Terminal=chip	T _j =25 °C	-	1.55	1.90	V
			T _j =125 °C	-	1.75	-	
			T _j =150 °C	-	1.80	-	
C _{ies}	Input capacitance	V _{CE} =10 V, G-E short-circuited	-	-	150	nF	
C _{oes}	Output capacitance		-	-	30		
C _{res}	Reverse transfer capacitance		-	-	2.5		
Q _G	Gate charge	V _{CC} =600 V, I _C =1400 A, V _{GE} =15 V	-	3500	-	nC	
t _{d(on)}	Turn-on delay time	V _{CC} =600 V, I _C =1400 A, V _{GE} =±15 V, R _G =0 Ω, Inductive load	-	-	900	ns	
t _r	Rise time		-	-	250		
t _{d(off)}	Turn-off delay time		-	-	950		
t _f	Fall time		-	-	350		
V _{EC} (Note1)	Emitter-collector voltage	I _E =1400A (Note6), G-E short-circuited, Terminal=chip	T _j =25 °C	-	1.65	2.10	V
			T _j =125 °C	-	1.65	-	
			T _j =150 °C	-	1.65	-	
t _{rr} (Note1)	Reverse recovery time	V _{CC} =600 V, I _E =1400 A, V _{GE} =±15 V, R _G =0 Ω, Inductive load	-	-	450	ns	
Q _{rr} (Note1)	Reverse recovery charge		-	90	-		µC
E _{on}	Turn-on switching energy per pulse	V _{CC} =600 V, I _C =I _E =1400 A, V _{GE} =±15 V, R _G =0 Ω, T _j =150 °C, Inductive load	-	82.2	-	mJ	
E _{off}	Turn-off switching energy per pulse		-	265	-		
E _{rr} (Note1)	Reverse recovery energy per pulse		-	122	-		mJ
R _{CC+EE}	Internal lead resistance	Main terminals-chip, per switch, T _C =25 °C (Note4)	-	0.286	-	mΩ	
r _g	Internal gate resistance	Per switch	-	1.7	-	Ω	

< IGBT MODULES >
CM1400DUC-24S
HIGH POWER SWITCHING USE
INSULATED TYPE

THERMAL RESISTANCE CHARACTERISTICS

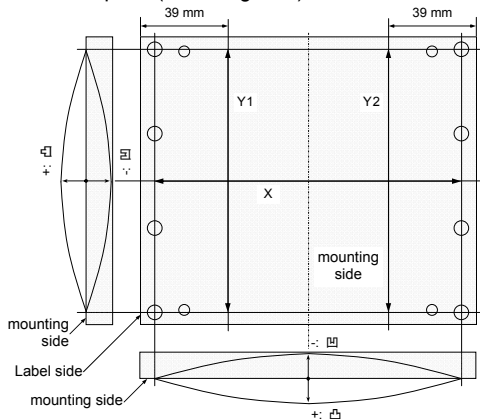
Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
$R_{th(j-c)Q}$	Thermal resistance (Note4)	Junction to case, per Inverter IGBT	-	-	16	K/kW
$R_{th(j-c)D}$		Junction to case, per Inverter FWDi	-	-	26	
$R_{th(c-s)}$	Contact thermal resistance (Note4)	Case to heat sink, per 1/2 module, Thermal grease applied (Note6)	-	12	-	K/kW

MECHANICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
M_t	Mounting torque	Main terminals M 6 screw	3.5	4.0	4.5	N·m
M_s		Mounting to heat sink M 6 screw	3.5	4.0	4.5	
d_s	Creepage distance	Terminal to terminal	24	-	-	mm
		Terminal to base plate	33	-	-	
d_a	Clearance	Terminal to terminal	14	-	-	mm
		Terminal to base plate	33	-	-	
m	Weight	-	-	1450	-	g
e_c	Flatness of base plate	On the centerline X, Y1, Y2 (Note7)	-50	-	+100	μ m

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.
- Pulse width and repetition rate should be such as to cause negligible temperature rise. Refer to the figure of test circuit.
- Typical value is measured by using thermally conductive grease of $\lambda=0.9$ W/(m·K).
- The base plate (mounting side) flatness measurement points (X, Y1, Y2) are as follows of the following figure.



8. The company name and product names herein are the trademarks and registered trademarks of the respective companies.

< IGBT MODULES >

CM1400DUC-24S

HIGH POWER SWITCHING USE

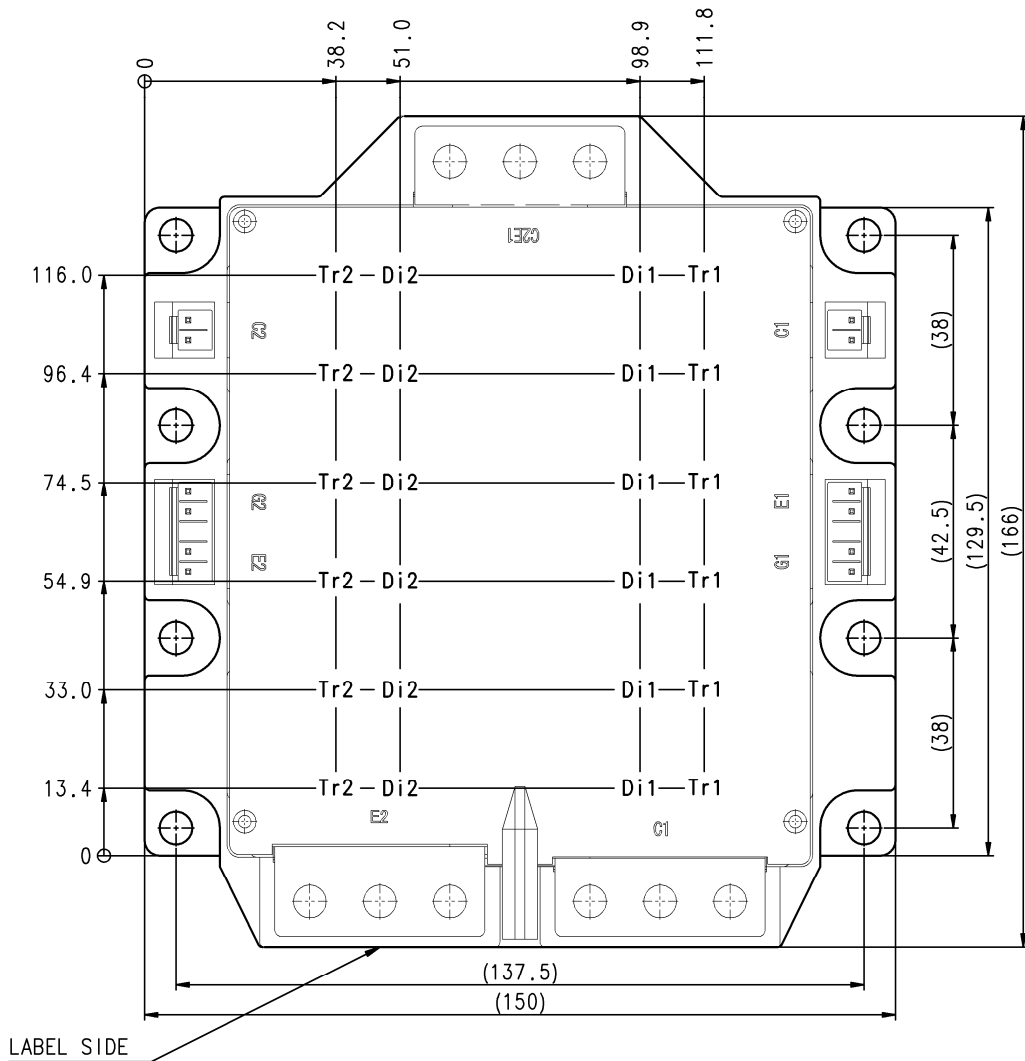
INSULATED TYPE

RECOMMENDED OPERATING CONDITIONS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
V_{CC}	(DC) Supply voltage	Applied across P-N terminals	-	600	850	V
V_{GEon}	Gate (-emitter drive) voltage	Applied across G-Es terminals	13.5	15.0	16.5	V
R_G	External gate resistance	Per switch	0	-	2.2	Ω

CHIP LOCATION (Top view)

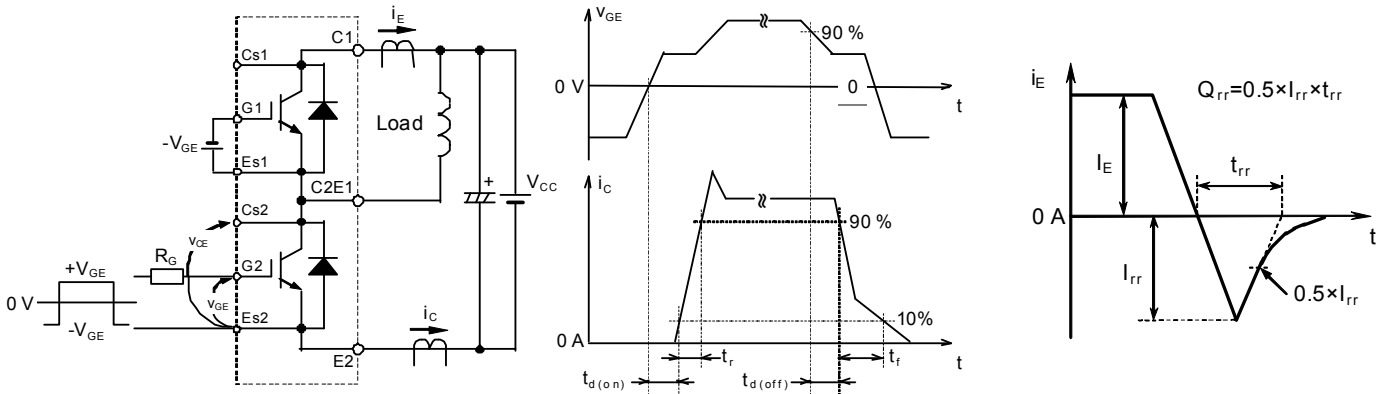
Dimension in mm, tolerance: ± 1 mm



Tr1/Tr2: IGBT, Di1/Di2: FWDi

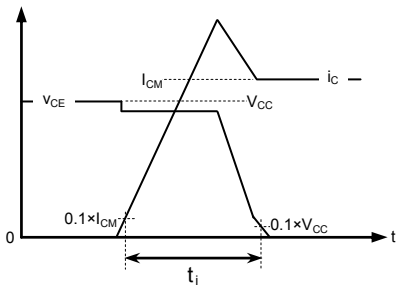
< IGBT MODULES >
CM1400DUC-24S
 HIGH POWER SWITCHING USE
 INSULATED TYPE

TEST CIRCUIT AND WAVEFORMS

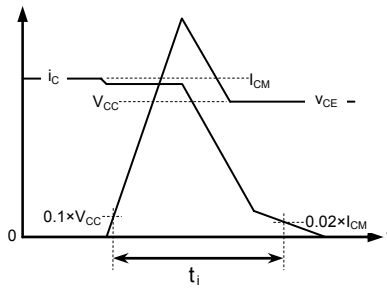


Switching characteristics test circuit and waveforms

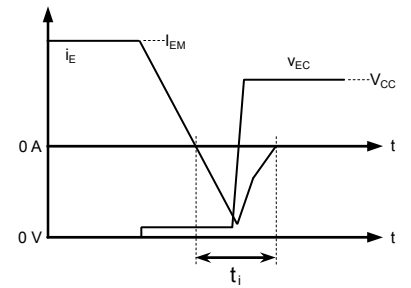
t_{rr} , Q_{rr} test waveform



IGBT Turn-on switching energy



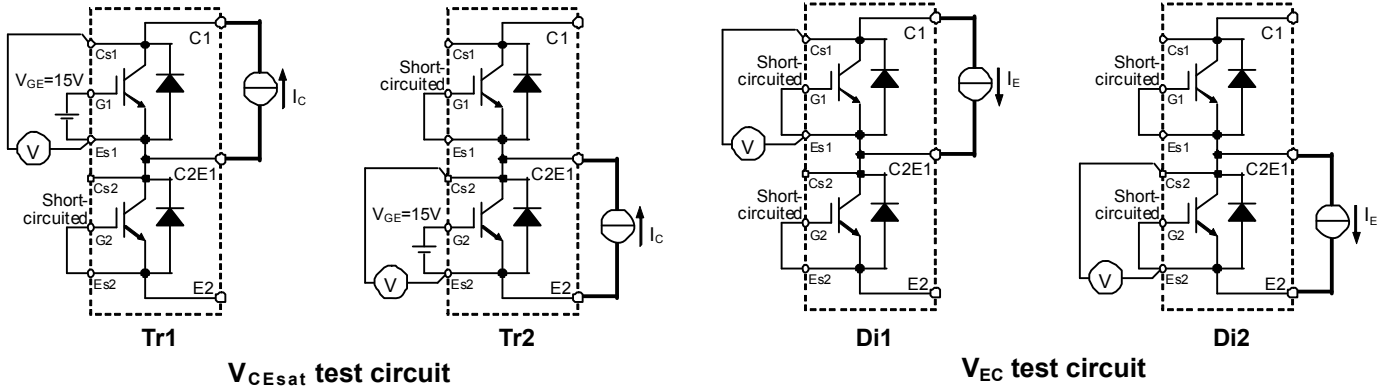
IGBT Turn-off switching energy



FWDi Reverse recovery energy

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

TEST CIRCUIT



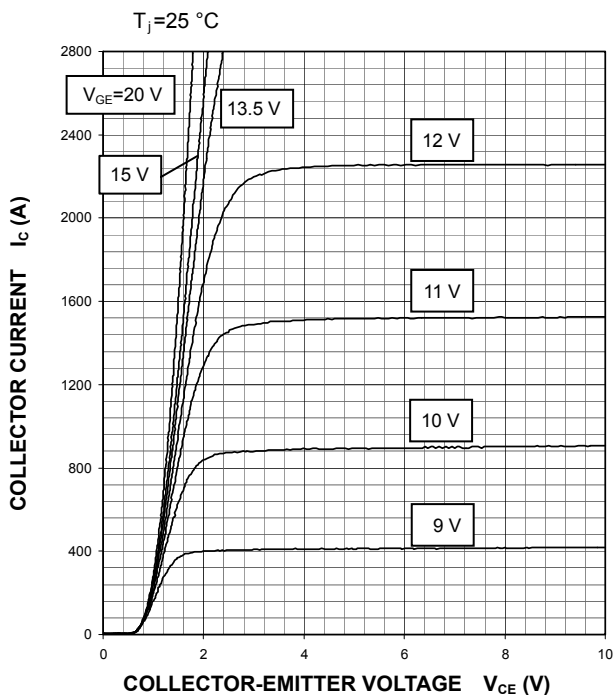
V_{CEsat} test circuit

V_{EC} test circuit

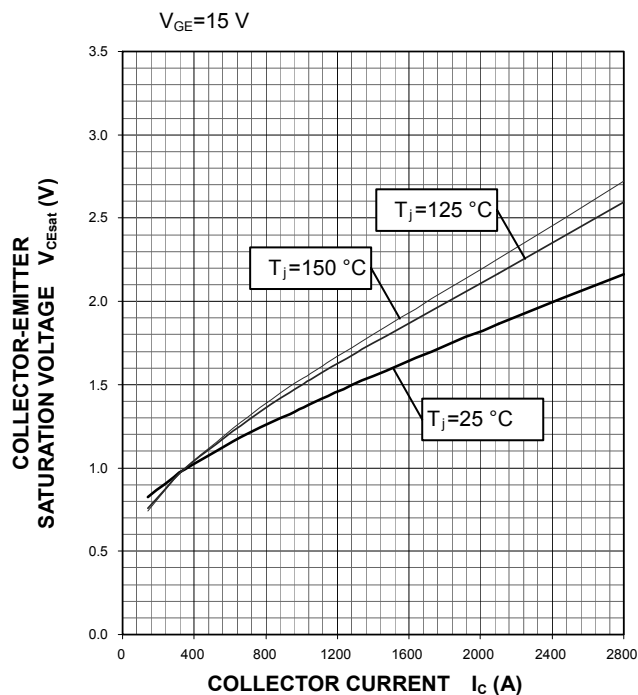
< IGBT MODULES >
CM1400DUC-24S
 HIGH POWER SWITCHING USE
 INSULATED TYPE

PERFORMANCE CURVES

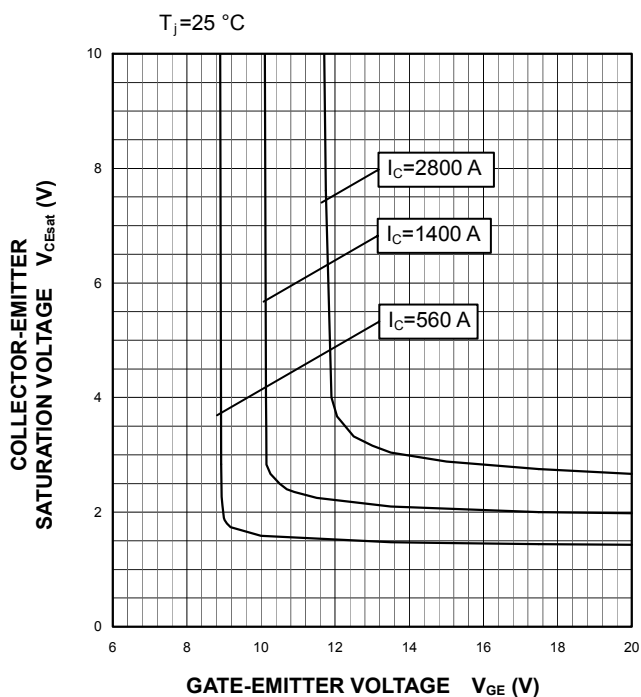
OUTPUT CHARACTERISTICS
 (TYPICAL)



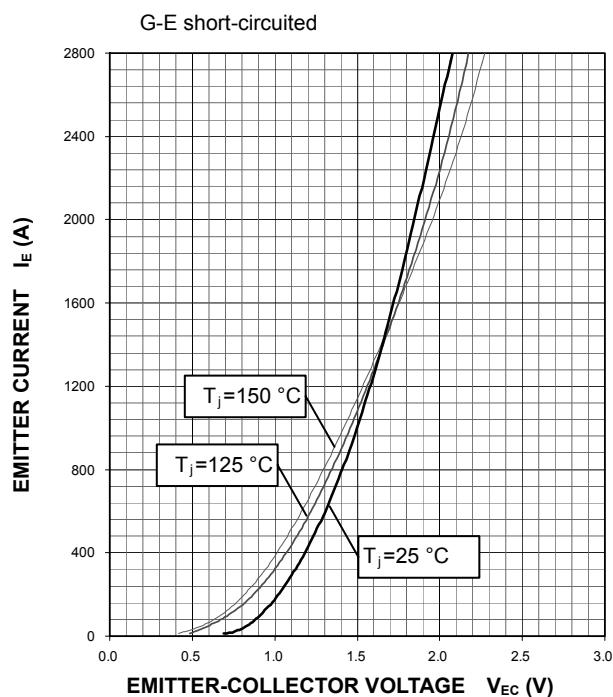
COLLECTOR-EMITTER SATURATION
 VOLTAGE CHARACTERISTICS
 (TYPICAL)



COLLECTOR-EMITTER SATURATION
 VOLTAGE CHARACTERISTICS
 (TYPICAL)



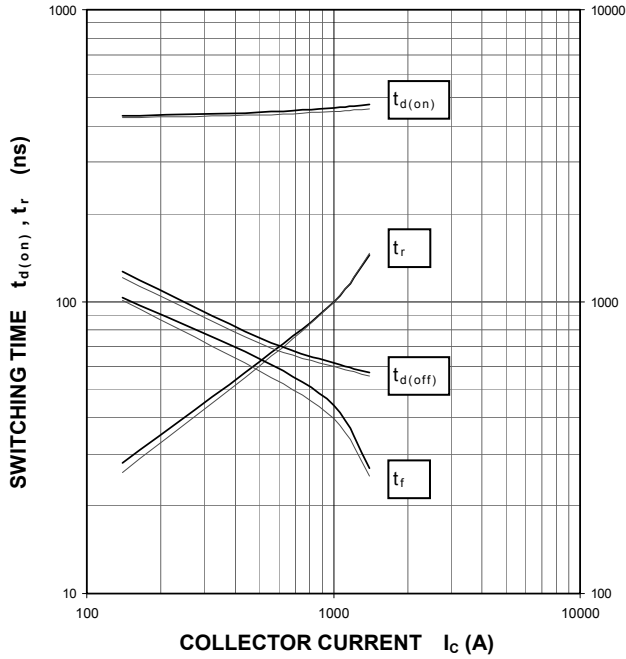
FREE WHEELING DIODE
 FORWARD CHARACTERISTICS
 (TYPICAL)



PERFORMANCE CURVES

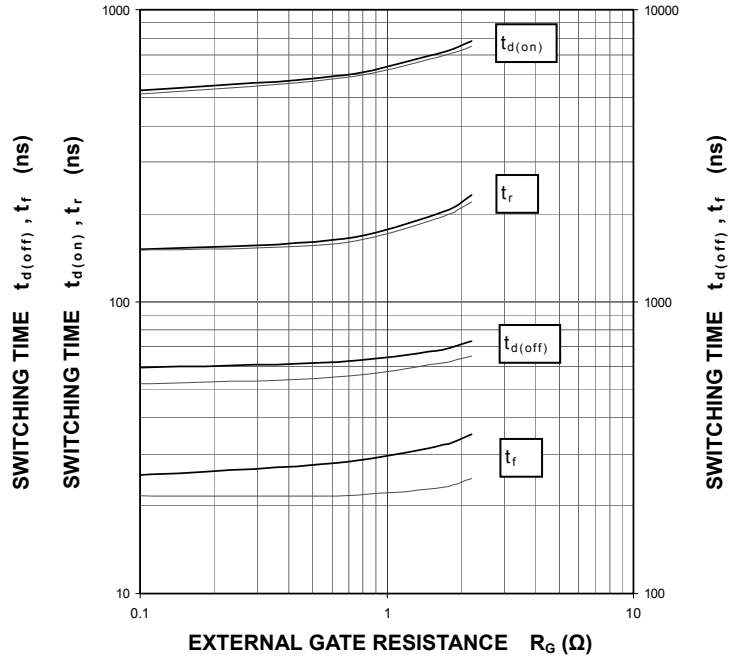
HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

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



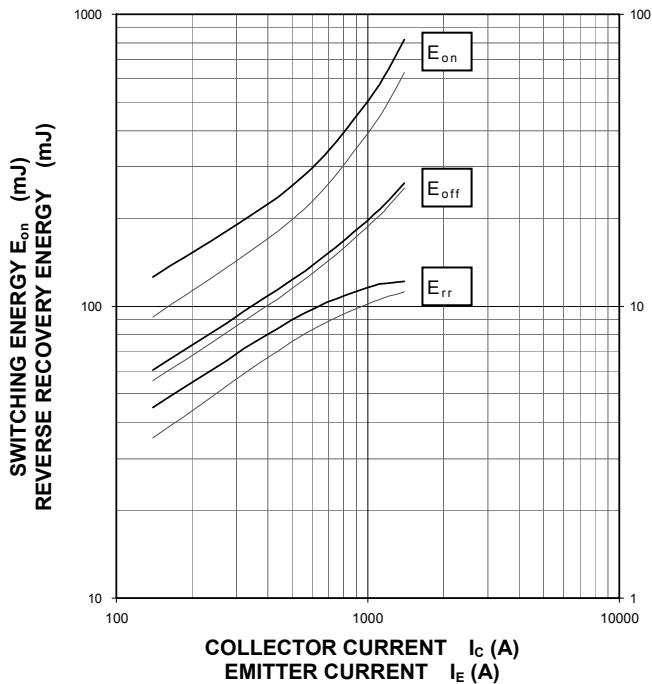
HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

$V_{CC}=600\text{ V}$, $I_c=1400\text{ A}$, $V_{GE}=\pm 15\text{ V}$, INDUCTIVE LOAD
——: $T_j=150\text{ }^\circ\text{C}$, - - - -: $T_j=125\text{ }^\circ\text{C}$



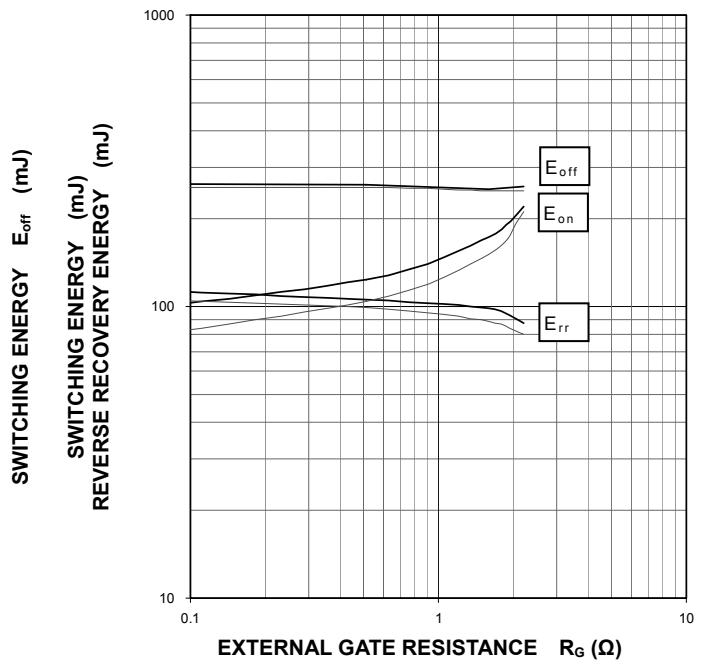
HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

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



HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)

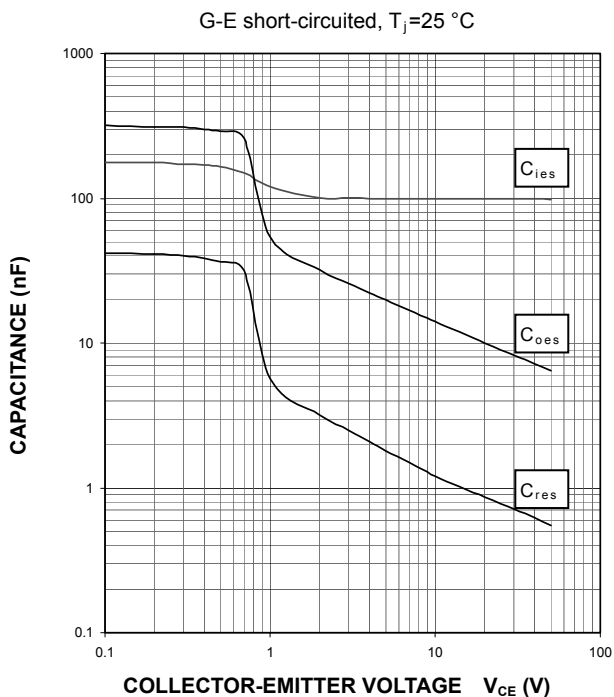
$V_{CC}=600\text{ V}$, $I_c/I_E=1400\text{ A}$, $V_{GE}=\pm 15\text{ V}$,
INDUCTIVE LOAD, PER PULSE
——: $T_j=150\text{ }^\circ\text{C}$, - - - -: $T_j=125\text{ }^\circ\text{C}$



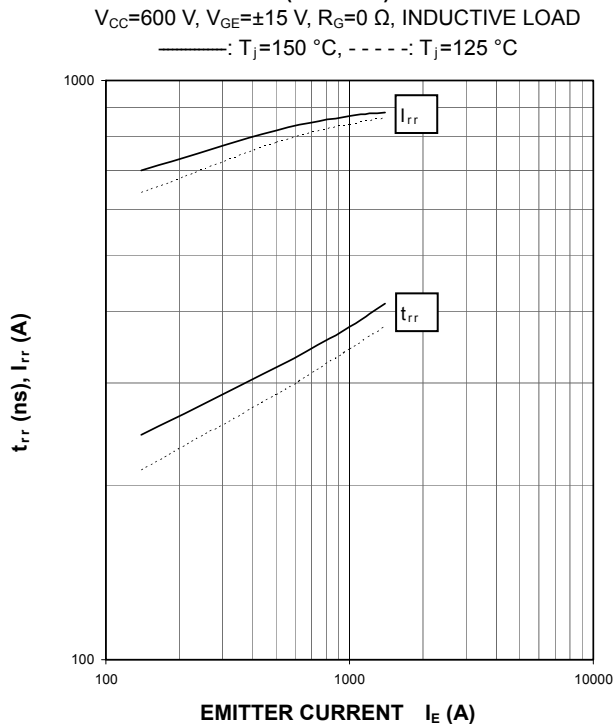
< IGBT MODULES >
CM1400DUC-24S
 HIGH POWER SWITCHING USE
 INSULATED TYPE

PERFORMANCE CURVES

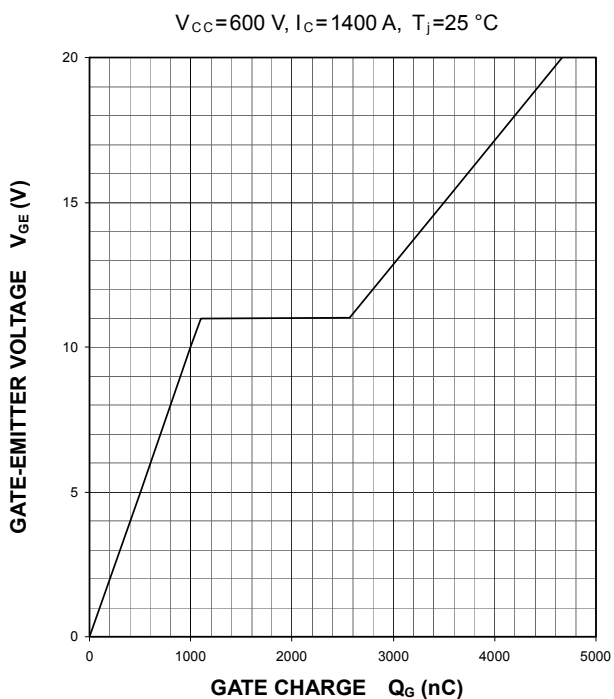
CAPACITANCE CHARACTERISTICS (TYPICAL)



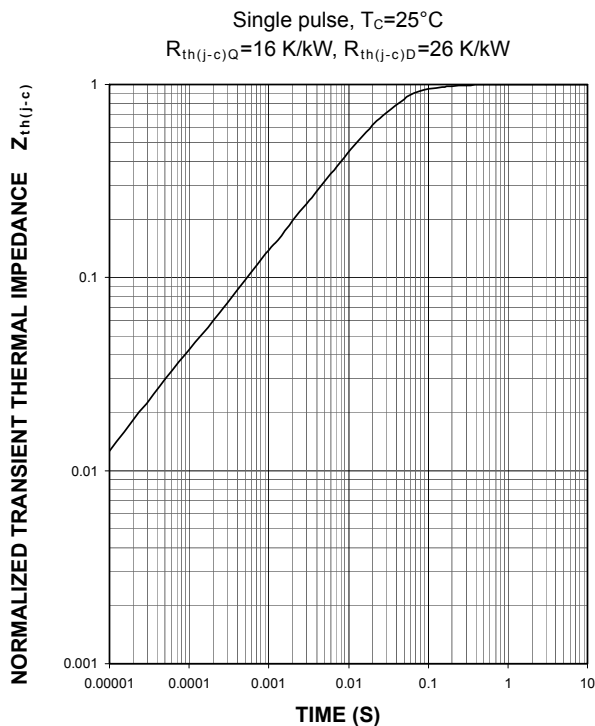
FREE WHEELING DIODE REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE CHARACTERISTICS (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MAXIMUM)



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