Revision B	
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Checked by	
Approved by	T.Ito
Date	9-Sep-'10

PRELIMINARY

CM1800DY-34S

HIGH POWER SWITCHING USE
INSULATED TYPE

Notice: This is not a final specification. Some parametric limits are subject to change.

1800A/1700V

Dual (Half-Bridge)

- Using New IGBT and FWDi -

- I_C ……………………….. 1800 A
- V_{CES} ……………….…..…. 1700 V

- Flat base Type
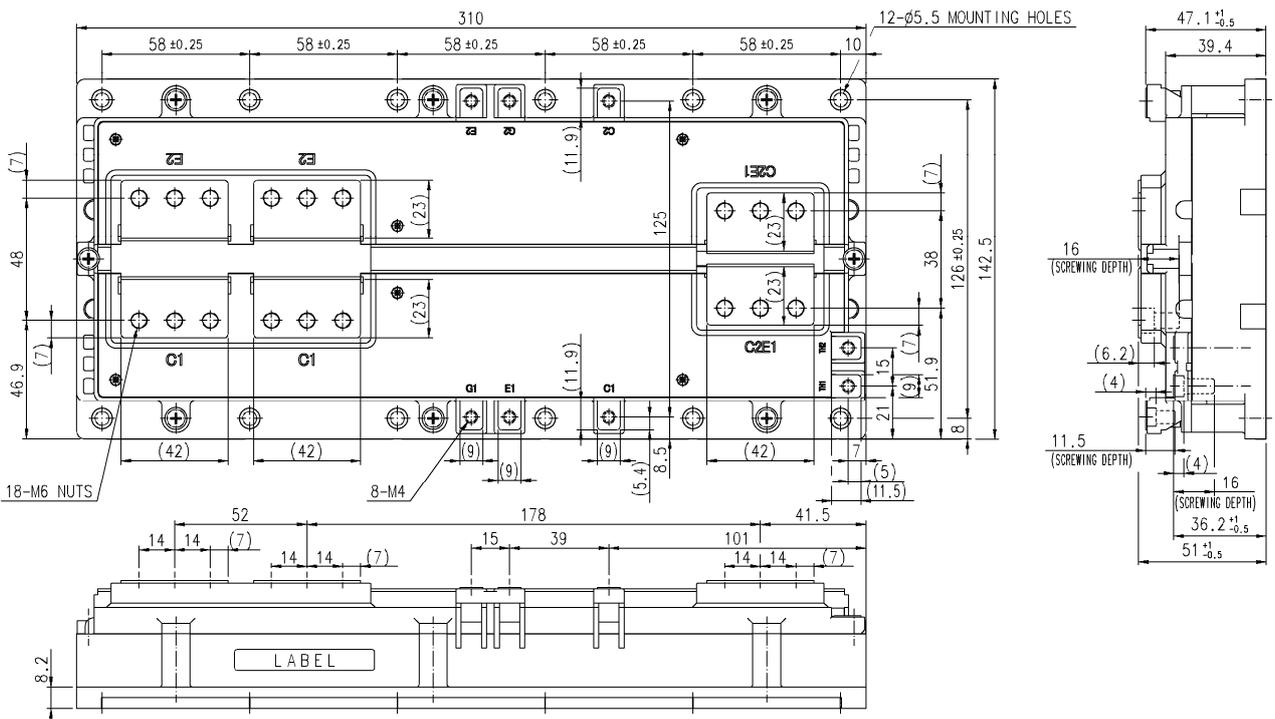 Alminium base plate
- RoHS Directive compliant
- UL under application

APPLICATION

Wind power, AC Motor Control, Power supply, etc.
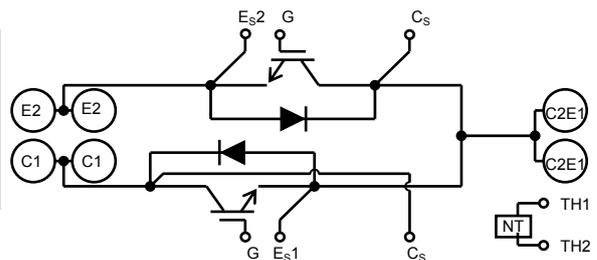
OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimension in mm

A B

18-M6 NUTS

8-M4

CIRCUIT DIAGRAM

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

Note: Main terminal pair should be connected together in case of the current through it.

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PRELIMINARY

CM1800DY-34S
HIGH POWER SWITCHING USE
INSULATED TYPE

ABSOLUTE MAXIMUM RATINGS (T_j=25 °C, unless otherwise specified)
Inverter IGBT/FWDi part

Symbol	Item	Conditions	Ratings	Unit	
V_{CES}	Collector-emitter voltage	G-E short-circuited	1700	V	B
V_{GES}	Gate-emitter voltage	C-E short-circuited	±20	V	B
I_C	Collector current	DC, T_C=89 °C (Note.2)	1800	A	
I_{CRM}		Pulse (Note.3)	3600		
P_{tot}	Total power dissipation	T_C=25 °C (Note.2, 4)	9350	W	A
I_E (Note.1)	Emitter current	T_C=25 °C (Note.2, 4)	1800	A	
I_{ERM} (Note.1)	(Free wheeling diode forward current)	Pulse (Note.3)	3600		

Module

Symbol	Item	Conditions	Ratings	Unit
T_{jmax}	Maximum junction temperature	-	+175	°C
T_{jop}	Operating junction temperature	-	-40 ~ +150	
T_{stg}	Storage temperature	-	-40 ~ +125	
T_C	Case temperature	-	-40 ~ +125	
V_{isol}	Isolation voltage	Terminals to base plate, f=60 Hz, AC 1 minute	3500	V_{rms}

Note.1: Represent ratings and characteristics of the anti-parallel, emitter-collector free wheeling diode (FWDi).
Note.2: Case temperature (T_C) and heat sink temperature (T_s) are defined on the each surface of base plate and heat sink just under the chips. (Refer to the figure of chip location)
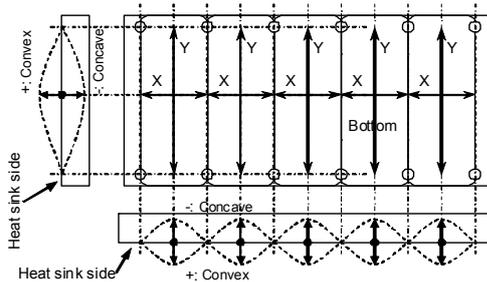Note.3: Pulse width and repetition rate should be such that the device junction temperature (T_j) dose not exceed T_{jmax} rating.
Note.4: Junction temperature (T_j) should not increase beyond T_{jmax} rating.

MECHANICAL CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit	
			Min.	Typ.	Max.		
M_t		Main terminals M 6 screw	3.5	4.0	4.5		A
M_t	Mounting torque	Auxiliary terminals M 4 screw	1.3	1.5	1.7	N·m	
M_s		Mounting M 5 screw	2.5	3.0	3.5		
d_s	Creepage distance	Terminal to terminal	16	-	-	mm	
		Terminal to base plate	25	-	-		A
d_a	Clearance	Terminal to terminal	16	-	-	mm	
		Terminal to base plate	24	-	-		A
m	Weight	-	-	2000	-	g	
e_c	Flatness of base plate	On the centerline X, Y (Note.5)	-50	-	+100	μm	

Note.5: Base plate flatness measurement point is as in the following figure.

A

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ELECTRICAL CHARACTERISTICS (T_j=25 °C, unless otherwise specified)
Inverter IGBT/FWDi part

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit	
I_{CES}	Collector-emitter cut-off current	$V_{CE}=V_{CES}$, V_{GE} short-circuited		-	-	1	mA	A B
I_{GES}	Gate-emitter leakage current	$\pm V_{GE}=V_{GES}$, V_{CE} short-circuited		-	-	5	µA	A B
$V_{GE(th)}$	Gate-emitter threshold voltage	I_C=180 mA, V_{CE}=10 V		5.4	6.0	6.6	V	
V_{CEsat}	Collector-emitter saturation voltage	I_C=1800 A (Note.6),	T_j=25 °C	-	2.30	2.80	V	
		V_{GE}=15 V,	T_j=125 °C	-	2.50	-		
		Terminal	T_j=150 °C	-	2.55	-		
		I_C=1800 A,	T_j=25 °C	-	2.10	2.60	V	
		V_{GE}=15 V,	T_j=125 °C	-	2.30	-		
		Chip	T_j=150 °C	-	2.35	-		
C_{ies}	Input capacitance			-	-	460	nF	B
C_{oes}	Output capacitance	V_{GE} short-circuited, V_{CE}=10 V		-	-	48		
C_{res}	Reverse transfer capacitance			-	-	8		
Q_G	Gate charge	V_{CC}=1000 V, I_C=1800 A, V_{GE}=15 V		-	8400	-	nC	A
$t_{d(on)}$	Turn-on delay time			-	-	1100		
t_r	Rise time	V_{CC}=1000 V, I_C=1800 A, V_{GE}=±15 V,		-	-	200		
$t_{d(off)}$	Turn-off delay time	R_G=0 Ω, Inductive load		-	-	950	ns	
t_f	Fall time			-	-	500		
t_{rr} (Note.1)	Reverse recovery time	V_{CC}=1000 V, I_E=1800 A, V_{GE}=15 V,		-	-	350		
Q_{rr} (Note.1)	Reverse recovery charge	R_G=0 Ω, Inductive load		-	360	-	µC	
E_{on}	Turn-on switching energy	V_{CC}=1000 V, $I_C=I_E$=1800 A,		-	510	-		
E_{off}	Turn-off switching energy	V_{GE}=±15 V, R_G=0 Ω, T_j=150 °C,		-	545	-	mJ	
E_{rr} (Note.1)	Reverse recovery energy	Inductive load, Per pulse		-	490	-		
V_{EC} (Note.1)	Emitter-collector voltage	I_E=1800 A (Note.6),	T_j=25 °C	-	2.1	(2.6)	V	
		V_{GE}=0 V,	T_j=125 °C	-	2.2	-		
		Terminal,	T_j=150 °C	-	2.15	-		
		I_E=1800 A,	T_j=25 °C	-	1.9	(2.4)	V	
		V_{GE}=0 V,	T_j=125 °C	-	2.0	-		
		Chip	T_j=150 °C	-	1.95	-		
$R_{CC'+EE'}$	Internal lead resistance	Main terminals-chip, per switch, T_C=25 °C (Note.2)		-	0.11	-	mΩ	
r_g	Internal gate resistance	Per switch		-	1.1	-	Ω	

NTC thermistor part
A

Symbol	Item	Conditions	Min.	Typ.	Max.	Unit
R_{25}	Zero power resistance	T_C=25 °C (Note.2)	4.85	5.00	5.15	kΩ
ΔR/R	Deviation of resistance	T_C=100 °C, R_{100}=493 Ω	-7.3	-	+7.8	%
$B_{(25/50)}$	B constant	Approximate by equation (Note.7)	-	3375	-	K
P_{25}	Power dissipation	T_C=25 °C (Note.2)	-	-	10	mW

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

Note.2: Case temperature (T_C) and heat sink temperature (T_s) are defined on the each surface of base plate and heat sink just under the chips. (Refer to the figure of chip location)

Note.3: Pulse width and repetition rate should be such that the device junction temperature (T_j) dose not exceed T_{jmax} rating.

Note.4: Junction temperature (T_j) should not increase beyond T_{jmax} rating.

Note.6: Pulse width and repetition rate should be such as to cause negligible temperature rise.
    (Refer to the figure of test circuit)

Note.7: $B_{(25/50)} = \ln(\dfrac{R_{25}}{R_{50}})/(\dfrac{1}{T_{25}} - \dfrac{1}{T_{50}})$

A

R_{25}: resistance at absolute temperature T_{25} [K]; T_{25}=25 [°C]+273.15=298.15 [K]
R_{50}: resistance at absolute temperature T_{50} [K]; T_{50}=50 [°C]+273.15=323.15 [K]

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THERMAL RESISTANCE CHARACTERISTICS

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
$R_{th(j-c)Q}$	Thermal resistance (Note.2)	Junction to case, per Inverter IGBT	-	-	16	K/kW
$R_{th(j-c)R}$		Junction to case, per Inverter FWDi	-	-	27	K/kW
$R_{th(c-s)}$	Contact thermal resistance (Note.2, 9)	Case to heat sink, per 1 module, Thermal grease applied (Note.8)	-	3.1	-	K/kW

Note.2: Case temperature (T_C) and heat sink temperature (T_s) are defined on the each surface of base plate and heat sink just under the chips. (Refer to the figure of chip location)

Note.8: Typical value is measured by using thermally conductive grease of λ=0.9 W/(m·K).

Note.9: When liquid-cooling, actual $R_{th(c-s)}$ should be used by measurement on each heat sink.

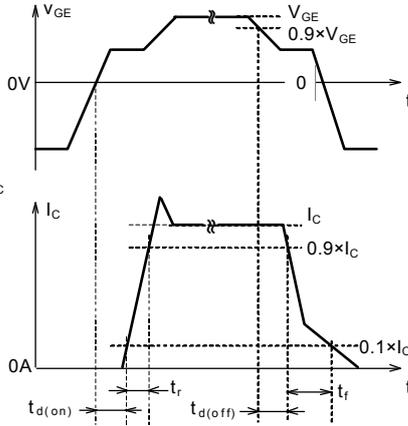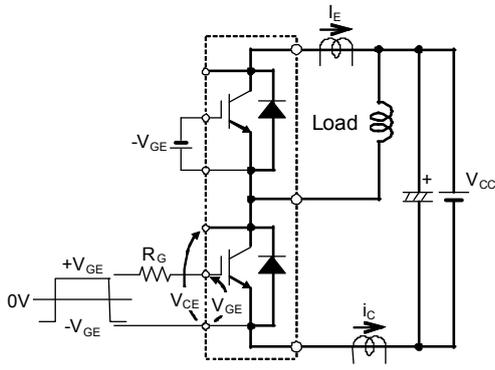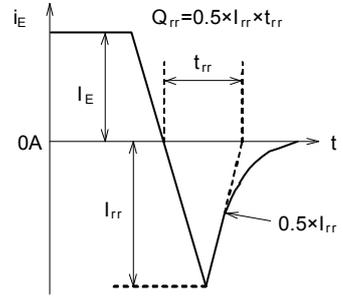## CHIP LOCATION (Top view)

Dimension in mm (tolerance: ±1 mm)
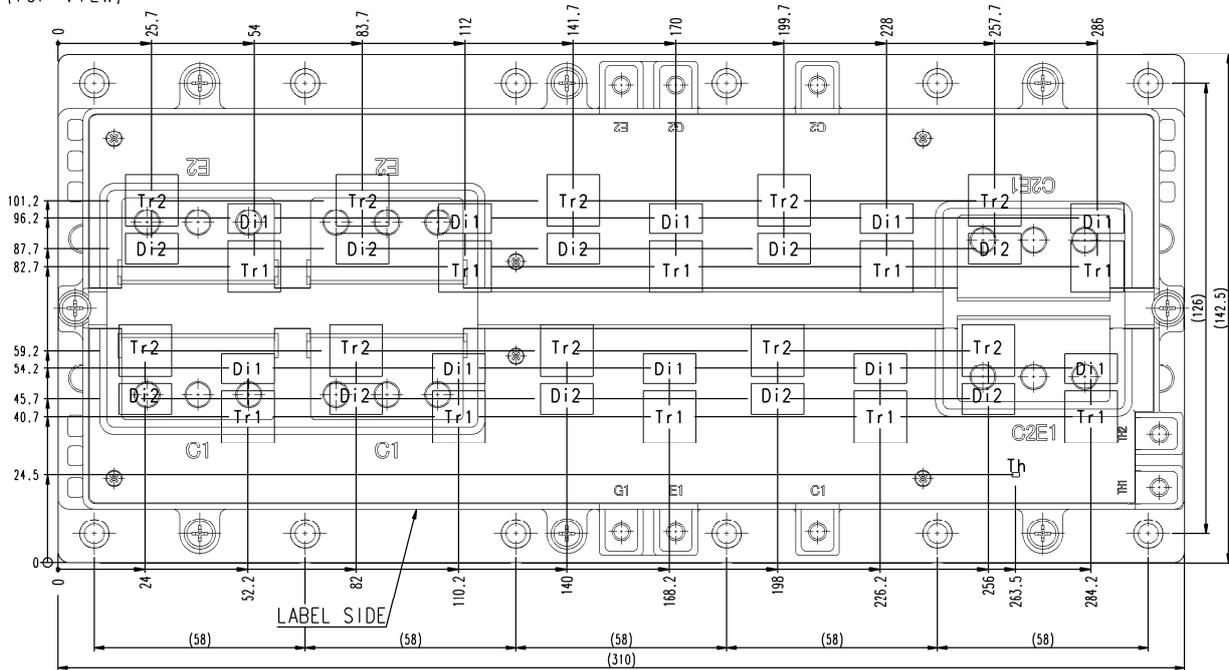
Each mark points the center position of each chip. Tr1/Tr2: IGBT, Di1/Di2: FWDi, Th: Thermistor

APPLICATION NOTE

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HIGH POWER SWITCHING USE
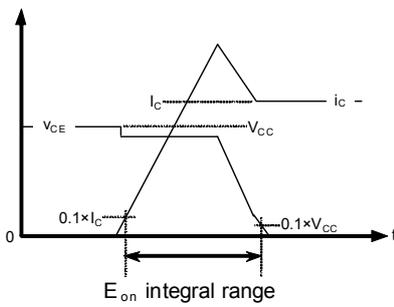**INSULATED TYPE**

PRELIMINARY

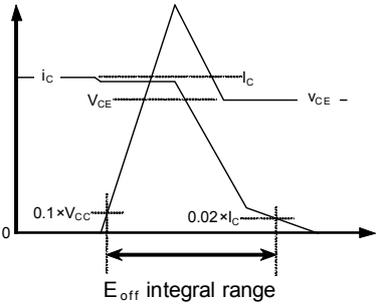## TEST CIRCUIT and WAVEFORMS

Switching time test circuit and waveforms
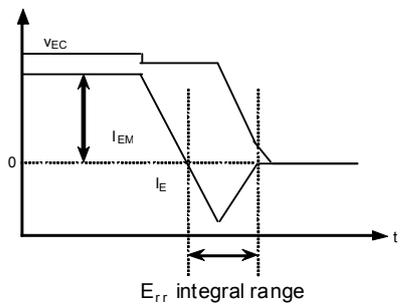
t$_{rr}$, Q$_{rr}$ test waveform

IGBT Turn-on energy

IGBT Turn-off energy

FWDi reverse recovery energy
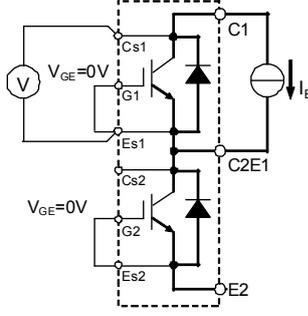
Switching energy (per pulse) test waveforms

Tr1   **Tr2**   **Di1**   **Di2**
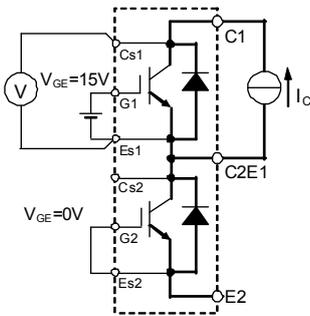
V$_{CEsat}$ test circuit   **V$_{EC}$ test circuit**
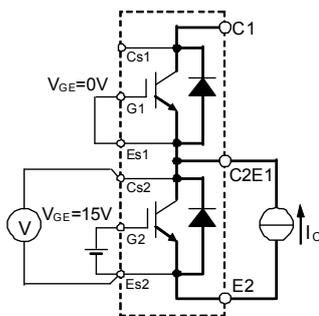
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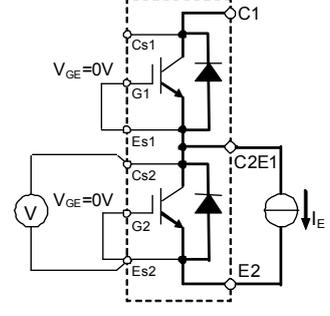
CM1800DY-34S

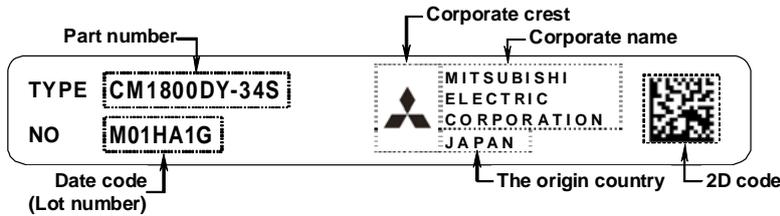**HIGH POWER SWITCHING USE**

INSULATED TYPE

PRELIMINARY

RECOMMENDED OPERATING CONDITIONS (T_a=25 °C, unless otherwise specified)

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
V_{CC}	DC supply voltage	Applied across P-N terminals	-	1000	1200	V
V_{GEon}	Gate-emitter drive voltage	Applied across G-E terminals	13.5	15.0	16.5	
R_G	External gate resistance	-	0	-	2	Ω

LABEL EXAMPLE and 2D CODE SPECIFICATION

Part number — ┌─ Corporate crest
┌─ Corporate name

TYPE CM1800DY-34S   M I T S U B I S H I
                       E L E C T R I C
NO   M01HA1G   C O R P O R A T I O N
                       J A P A N

Date code ┘   └─ The origin country   └─ 2D code
(Lot number)

2D code specification

Item	Specification
Symbology	Data Matrix (ECC200)
Data type	alphanumeric (ASCII) character
Error correction ability	20 ~ 35 %
Symbol size	6.0 mm × 6.0 mm
Cell size	0.25 mm
Code size	24 cell × 24 cell
Data size	32 characters

Data contents

Item	letter size
Part number	20
Space	2
Date code	8
Space	2
total	32

Data contents example("sp" means space, equivalent to ASCII code number 32)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
C	M	1	8	0	0	D	Y	-	3	4	S	sp	sp	sp	sp	sp	sp	sp	sp	sp	sp	M	0	1	H	A	1	G	sp	sp	sp

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APPLICATION NOTE

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MITSUBISHI IGBT MODULES

CM1800DY-34S

HIGH POWER SWITCHING USE

INSULATED TYPE

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