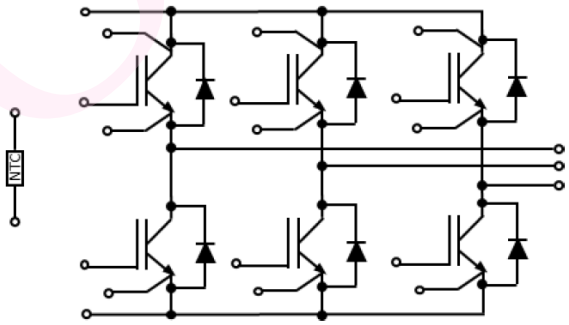
MS KM400AC07BT
Technical Information
IGBT Power Module

Key Parameters

V_{CES}	= 650V
I_C	= 400A

Features
- Low $V_{ce(sat)}$
- Fast switching
- High ruggedness
- High short circuit capability

Applications
- Inverter for motor drive
- Water pumps
- Wind turbines



Equivalent Circuit Schematic

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Absolute Maximum Ratings: IGBT, Inverter

Symbol	Characteristic	Value	Unit
V_{CES}	Collector-Emitter Voltage	650	V
I_{CDC}	Continuous DC Collector Current	400	A
I_{CRM}	Peak Collector Current	800	A
V_{GES}	Gate-Emitter Voltage	±20	V
$P_{D(max)}$	Total Power Dissipation (T_c=25°C, T_j =175°C)	1650	W

IGBT Characteristics

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
BV_{CES}	Collector-Emitter breakdown Voltage	V_{GE}=0V, I_C =250μA,T_{vj}=25°C	650			V
I_{CES}	Collector-Emitter leakage Current	V_{CE}=650V,V_{GE}=0V, T_{vj}=25°C			5.0	mA
I_{GES}	Gate-Emitter leakage Current	V_{CE}=0V,V_{GE}=±20V, T_{vj}=25°C			±500	ηA
$V_{GE(th)}$	Gate-emitter Threshold Voltage	V_{GE}=V_{CE}, I_C =4mAA,T_{vj}=25°C	5.0	5.9	6.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	Ic=400A,V_{GE}=15V, T_{vj}=25°C		1.5	1.8	V
		Ic=400A,V_{GE}=15V, T_{vj}=150°C		1.75		V
Q_G	Gate Charge	V_{CC}=300V, V_{GE}=0/15V, I_C=400A T_{vj} =25°C		2.45		μC
C_{iss}	Input Capacitance	V_{CE}=25V, V_{GE} =0V, f=1MHz, T_{vj}=25°C		33		ηF
C_{oss}	Output Capacitance			1.5		ηF
$t_{d(on)}$	Turn-on Delay Time	I_C =400A V_{CE} = 300 V V_{GE} = ±15V R_G = 1.8Ω T_{vj}=25°C , L_{load} =0.82mH Energy loss include tail and diode reverse recovery		89		ηs
t_r	Rise Time			99		ηs
$t_{d(off)}$	Turn-off Delay Time			220		ηs
t_f	Fall Time			79		ηs
E_{on}	Energy Dissipation During Turn-on Time			5.5		mJ
E_{off}	Energy Dissipation During Turn-off Time			9.8		mJ
$t_{d(on)}$	Turn-on Delay Time	I_C =400A V_{CE} = 300 V V_{GE} = ±15V R_G = 1.8Ω T_{vj}=150°C , L_{load} =0.82mH Energy loss include tail and diode reverse recovery		108		ηs
t_r	Rise Time			100		ηs
$t_{d(off)}$	Turn-off Delay Time			250		ηs
t_f	Fall Time			130		ηs
E_{on}	Energy Dissipation During Turn-on Time			8.5		mJ
E_{off}	Energy Dissipation During Turn-off Time			12.8		mJ
T_{SC}	Short circuit withstand time	V_{GE}=15V, Tv_j=150°C,V_{cc}≤360V,	10			μs

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Absolute Maximum Ratings: Diode, Inverter

Symbol	Characteristic	Value	Unit
V_{RRM}	Repetitive peak reverse voltage	650	V
I_F	Continuous DC forward current	400	A
I_{FRM}	Repetitive peak forward current	800	A

Diode Characteristics

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_F	Forward Voltage	I_F=400A,T_{vj}=25°C		1.6	1.9	V
		I_F=400A,T_{vj}=150°C		1.4		V
Q_{rr}	Recovered Charge	I_F =400 A V_R=300V -di$_F$/dt =2260A/µs T_{vj}=25°C		16.6		µC
I_{rrm}	Peak Reverse Recovery Current			117		A
E_{rr}	Reverse Recovery Energy			3.1		mJ

Module Characteristics

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_{isol}	Isolation voltage	t=1min,f=50Hz	2500			V
T_{jmax}	Maximum Junction Temperature				175	°C
$T_{vj\ op}$	Operating Junction Temperature		-40		150	°C
T_{stg}	Storage Temperature		-40		125	°C
$R_{CC'+EE'}$	Module lead resistance terminal to chip			1.0		mΩ
L_{SCE}	Stray Inductance, Module			30		nH
$R_{\theta jc}$	Junction-to Case	per IGBT-inverter		0.09		°C/W
		per Diode-inverter		0.17		°C/W
$R_{\theta cs}$	Case to Sink	per IGBT-inverter		0.08		°C/W
		per Diode-inverter		0.085		°C/W
M_t	Module Electrodes Torque	Recommended(M5)	3.0		6.0	N·m
M_s	Module-to-Sink Torque	Recommended(M6)	3.0		6.0	N·m
G	Weight of Module			485		g

• Typical Electrical Characteristics

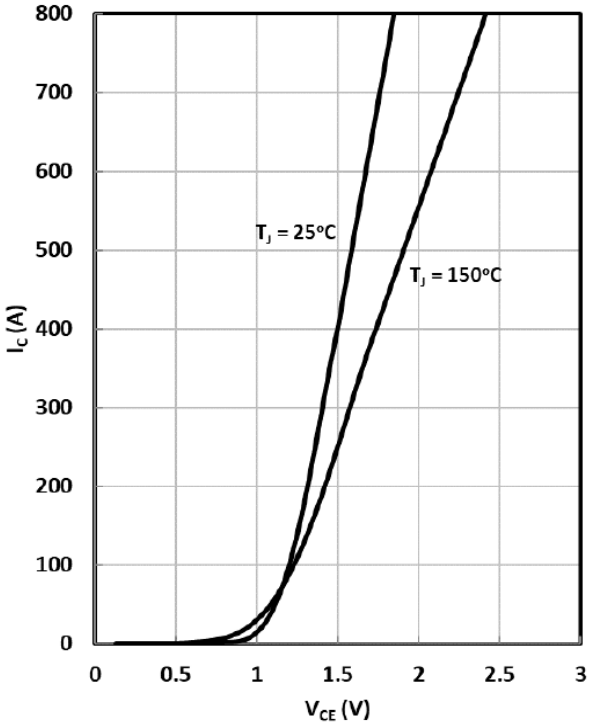

Fig. 1 IGBT (Inverter) Output Characteristics

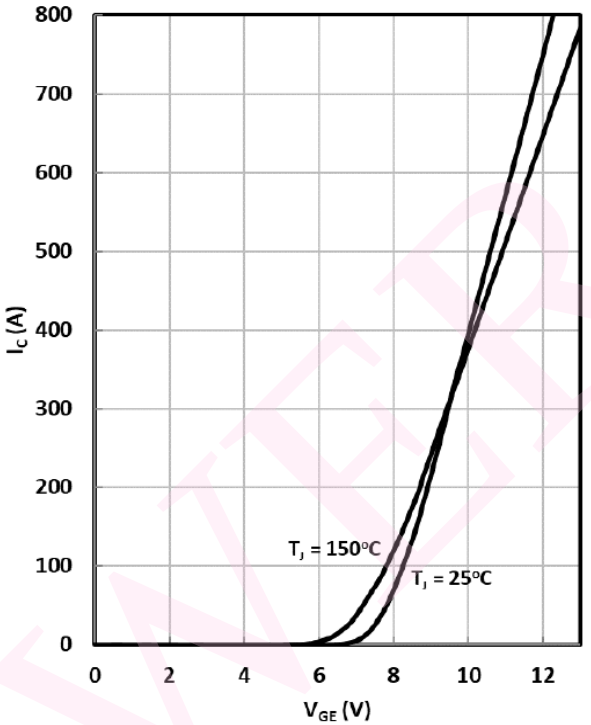

Fig. 2 IGBT (Inverter) Transfer Characteristics

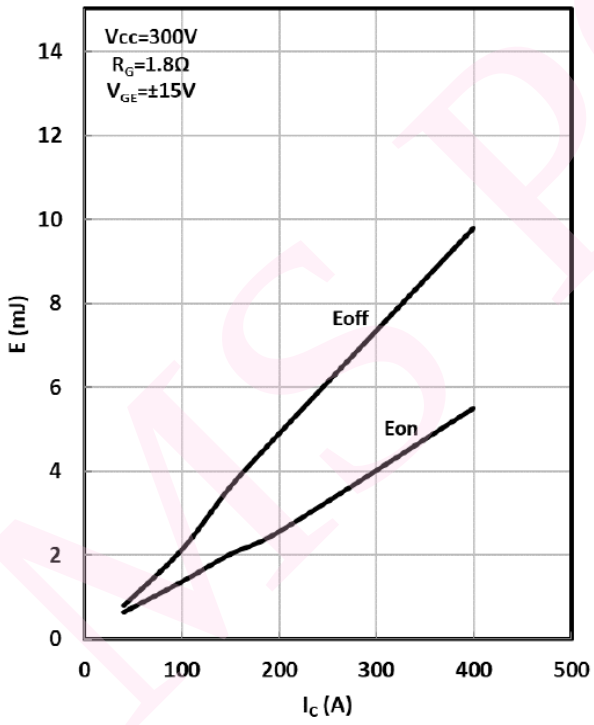

Fig. 3 IGBT (Inverter) Switching Loss vs. Ic

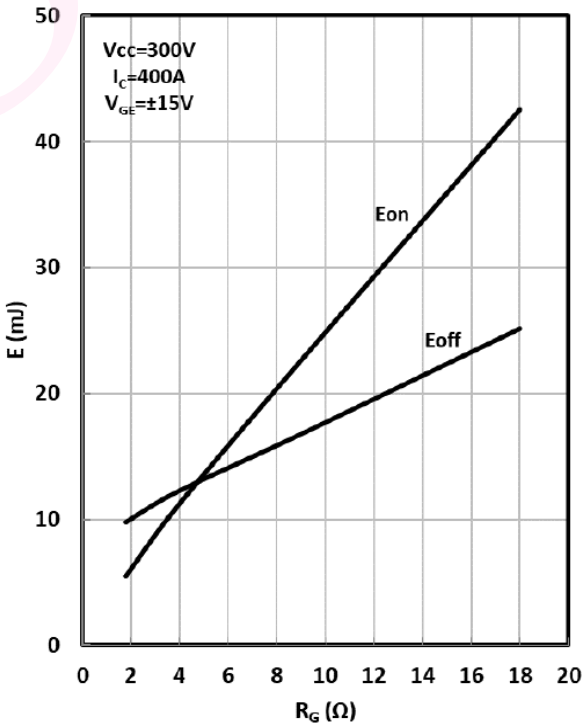

Fig. 4 IGBT (Inverter) Switching Loss vs. Rg

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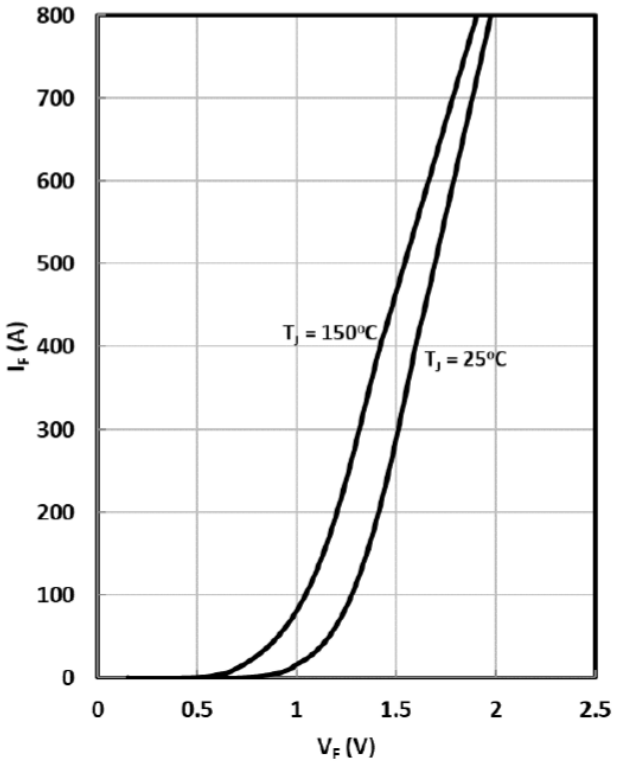


Fig. 5 Diode (Inverter) Forward Characteristics

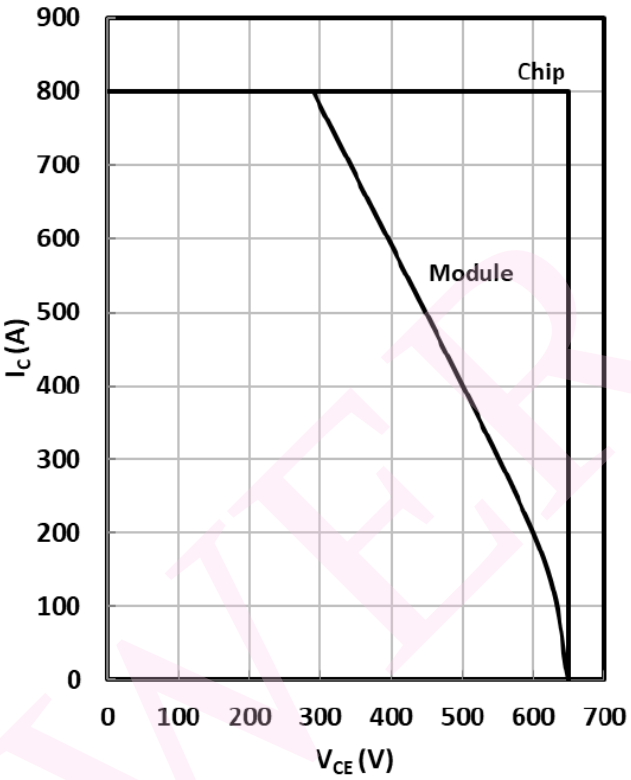
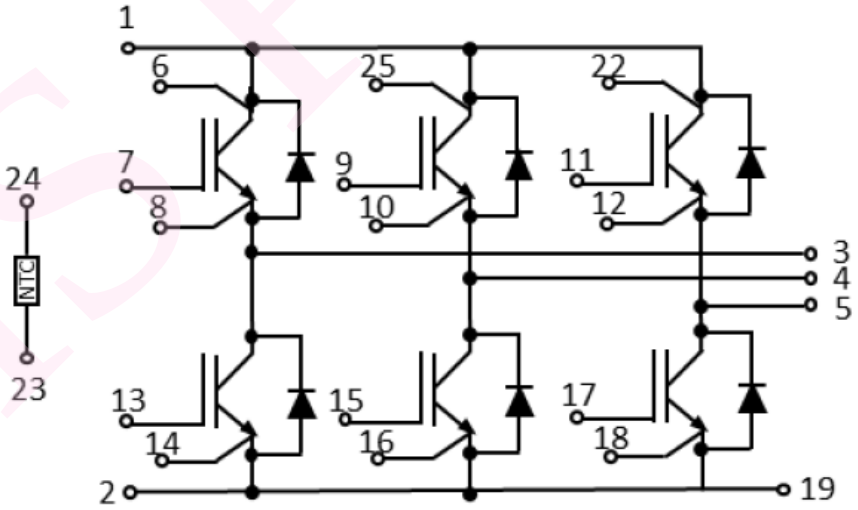


Fig. 6 RBSOA



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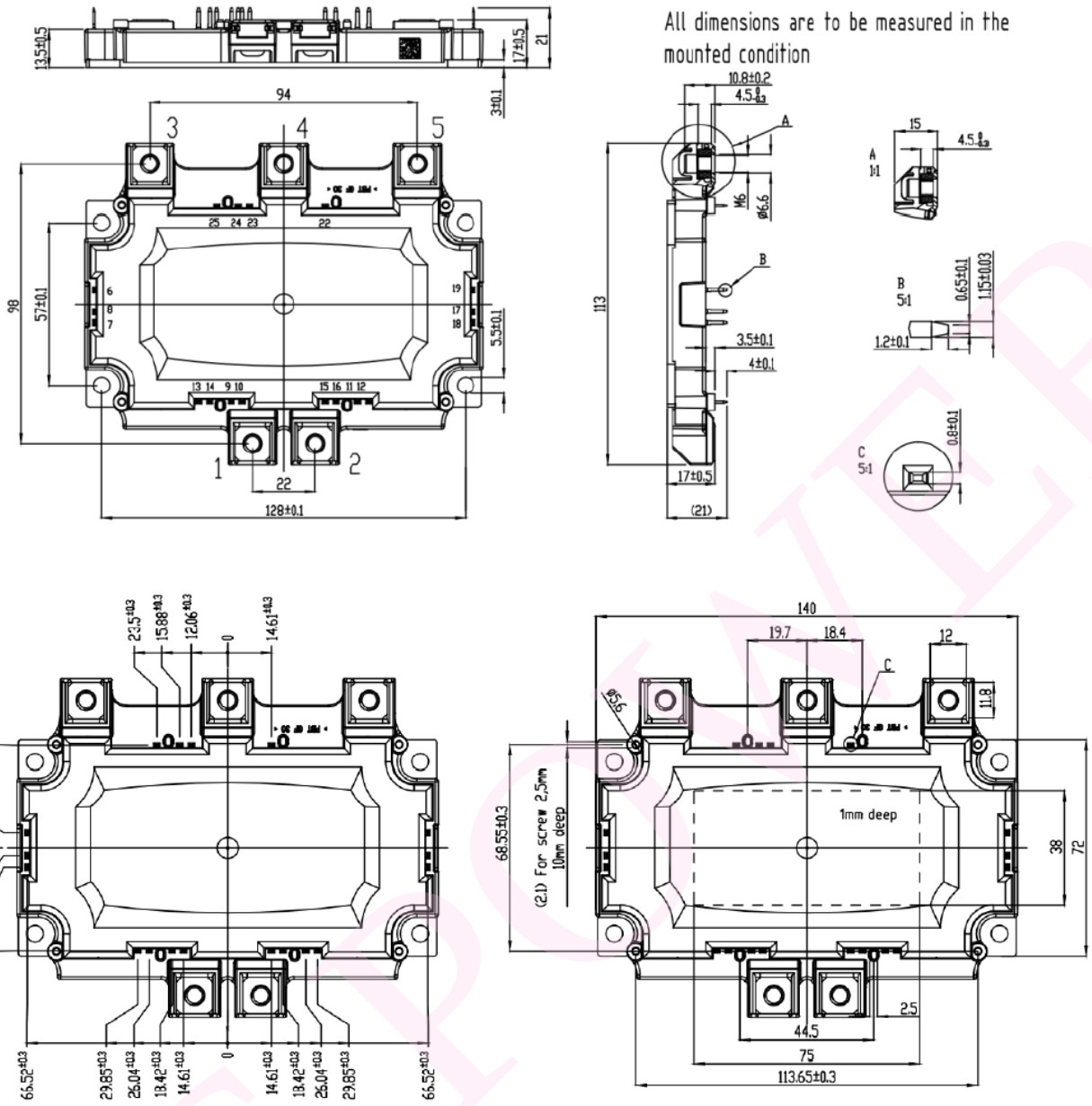

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