

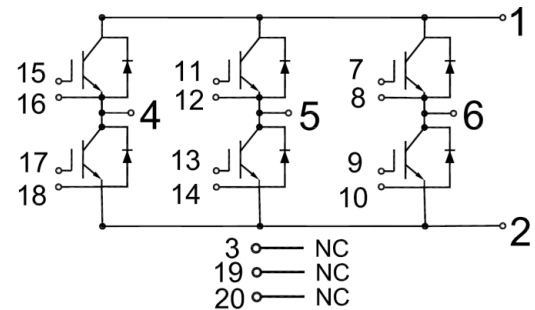


GK35FF60A1H-C

IGBT Module

Features:

- Non Punch Through (NPT) Technology
- Short Circuit Rated $>10\mu\text{s}$
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested($2\times I_c$)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement



Applications:

- Industrial Inverters
- Servo Applications

IGBT, Inverter

Maximum Rated Values ($T_c=25^\circ\text{C}$ unless otherwise specified)

V_{CES}	Collector-Emitter Blocking Voltage		600	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_c	Continuous Collector Current	$T_c=80^\circ\text{C}$	35	A
		$T_c=25^\circ\text{C}$	60	A
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	70	A
P_D	Maximum Power Dissipation per IGBT	$T_c=25^\circ\text{C}$ $T_{Jmax}=150^\circ\text{C}$	230	W



Electrical Characteristics of IGBT ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1\text{mA}$, $V_{CE}=V_{GE}$	4.3	4.8	5.3	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=35\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	2.00		V
			$T_J=125^{\circ}\text{C}$	2.30		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$, $V_{CE}=V_{CES}$, $T_J=25^{\circ}\text{C}$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			200	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		1.96		nF
C_{oes}	Output Capacitance			0.95		nF
C_{res}	Reverse Transfer Capacitance			0.26		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=300V, I_c=35A,$ $R_{Gon}=15\Omega,$ $V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		28		ns
			$T_J=125^{\circ}C$		33		
t_r	Rise Time		$T_J=25^{\circ}C$		34		ns
			$T_J=125^{\circ}C$		35		
$t_{d(off)}$	Turn-off Delay Time	$V_{CC}=300V, I_c=35A,$ $R_{Goff}=15\Omega,$ $V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		165		ns
			$T_J=125^{\circ}C$		168		
t_f	Fall Time		$T_J=25^{\circ}C$		102		ns
			$T_J=125^{\circ}C$		162		
E_{on}	Turn-on Switching Loss	$V_{CC}=300V, I_c=35A,$ $R_{Gon}=15\Omega, V_{GE}=\pm 15V,$ $di/dt=790A/\mu s$ ($T_J=125^{\circ}C$) Inductive Load	$T_J=25^{\circ}C$		0.29		mJ
			$T_J=125^{\circ}C$		0.47		
E_{off}	Turn-off Switching Loss	$V_{CC}=300V, I_c=35A,$ $R_{Goff}=15\Omega, V_{GE}=\pm 15V,$ $du/dt=3760V/\mu s$ ($T_J=125^{\circ}C$) Inductive Load	$T_J=25^{\circ}C$		0.44		mJ
			$T_J=125^{\circ}C$		0.65		
Q_g	Total Gate Charge	$V_{GE}=+15V \dots -15V$	$T_J=25^{\circ}C$		443		nC
$R_{G(int)}$	Internal Gate Resistance		$T_J=25^{\circ}C$		0		Ω
RBSOA	$I_c=70A, V_{CC}=480V, V_p=600V, R_G=15\Omega, V_{GE}=+15V$ to 0V, $T_J=150^{\circ}C$			Trapezoid			
SCSOA	$V_{CC}=300V, V_{GE}=15V, T_J=125^{\circ}C$			10			μs
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per IGBT)					0.54	$^{\circ}C/W$



FWD, Inverter

Maximum Rated Values ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^{\circ}\text{C}$	600	V
I_F	Diode Continuous Forward Current		35	A
I_{FM}	Diode Maximum Forward Current	$t_p=1\text{ms}$	70	A

Electrical Characteristics of FWD ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

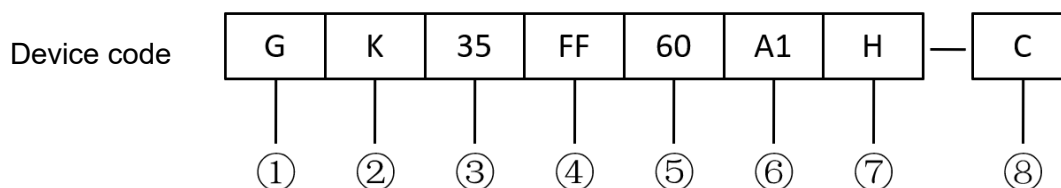
Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =35A	T _J =25°C		1.90		V
			T _J =125°C		1.70		
t _{rr}	Reverse Recovery Time	I _F =35A, -diF/dt=912A/μs(T _J =125°C), V _{rr} =300V, V _{GE} =-15V	T _J =25°C		72		ns
			T _J =125°C		96		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C	34.4		A	
			T _J =125°C	28.7			
Q _{rr}	Reverse Recovery Charge		T _J =25°C	0.84		μC	
			T _J =125°C	1.54			
E _{rec}	Reverse Recovery Energy		T _J =25°C	0.15		mJ	
			T _J =125°C	0.29			
R _{θJC}	Thermal Resistance: Junction-to-Case (Per Diode)					1.41	°C/W



Module

Symbol	Description	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage(All Terminals Shorted)	f=50Hz, 1minute		2500	V
T _J	Maximum Junction Temperature			150	°C
T _{JOP}	Maximum Operating Junction Temperature Range	-40		+125	°C
T _{stg}	Storage Temperature	-40		+125	°C
R _{θCS}	Case-To-Sink (Conductive Grease Applied)			0.06	°C/W
M	Mounting Screw:M3	0.75		1.20	N·m
G	Weight		30		g

Ordering Information Table



- ① - IGBT Module
- ② - NPT, Standard IGBT
- ③ - Rated Current (35=35A)
- ④ - Circuit Configuration (Full Bridge)
- ⑤ - Rated Voltage (60=600V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)
- ⑧ - Internal Code

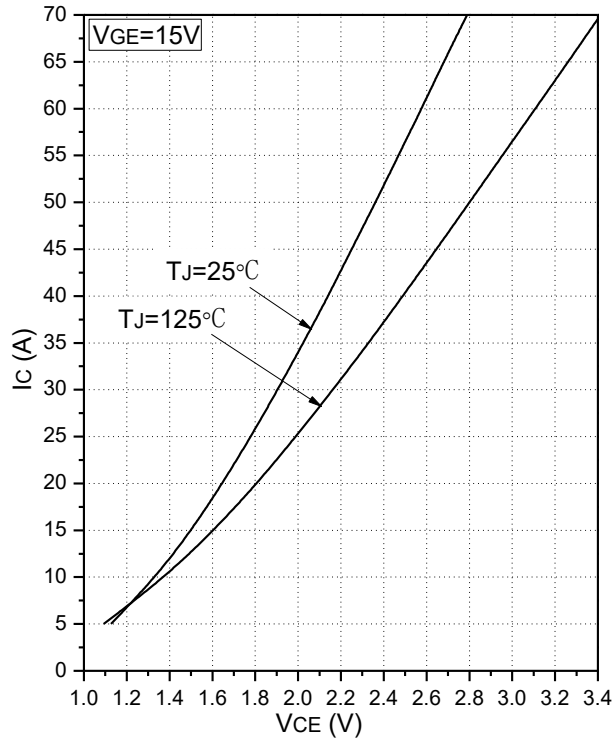


Fig.1 Typical Saturation Voltage Characteristics

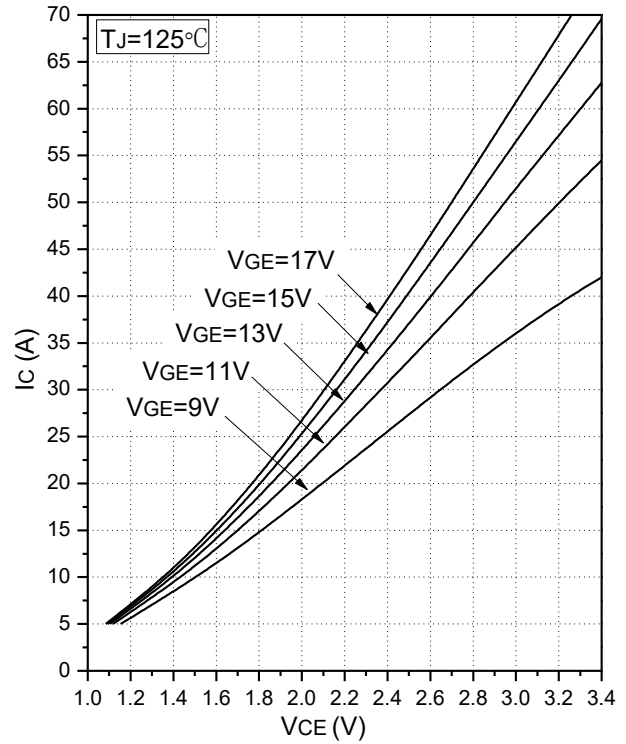


Fig.2 Typical Output Characteristics

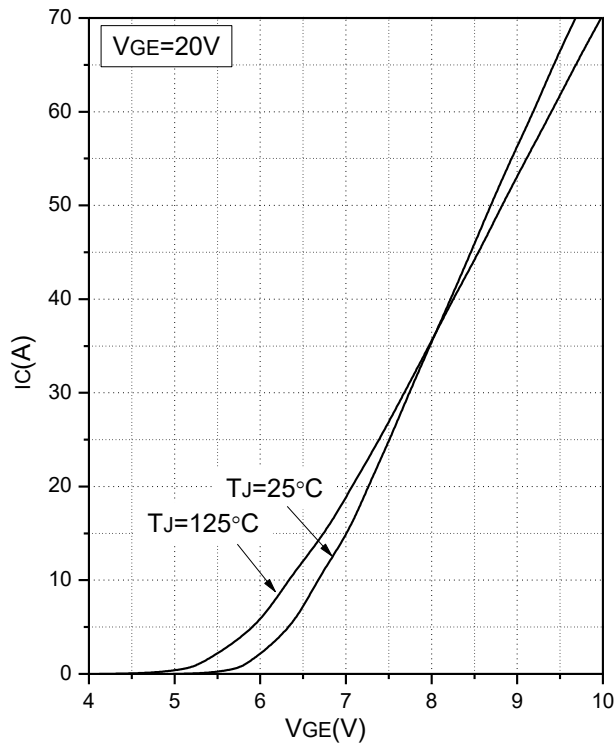


Fig.3 Transfer Characteristic

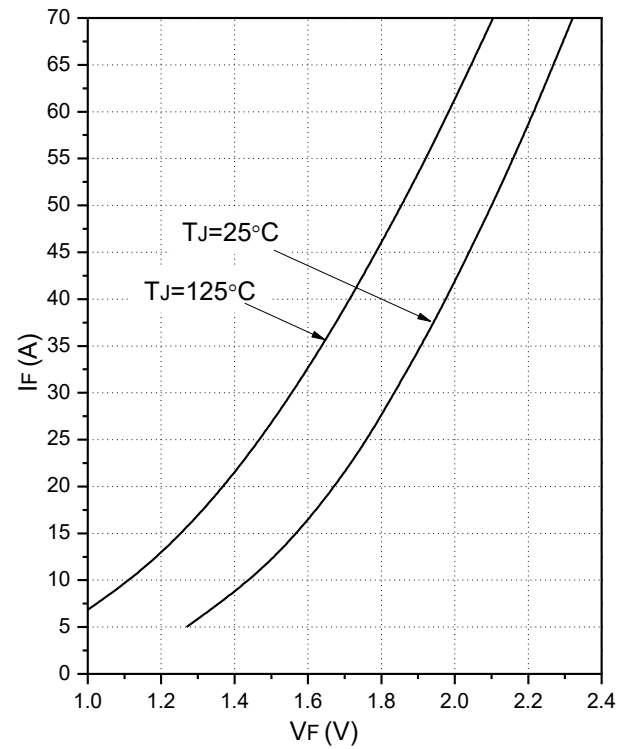
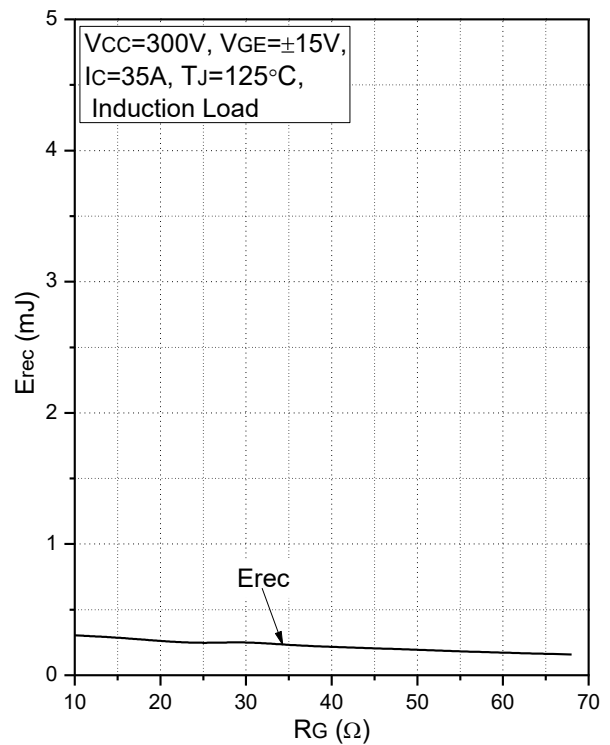
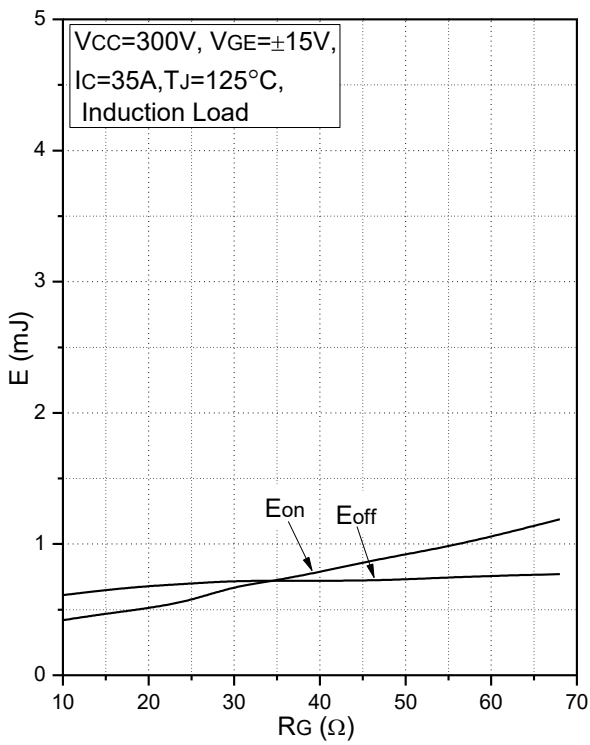
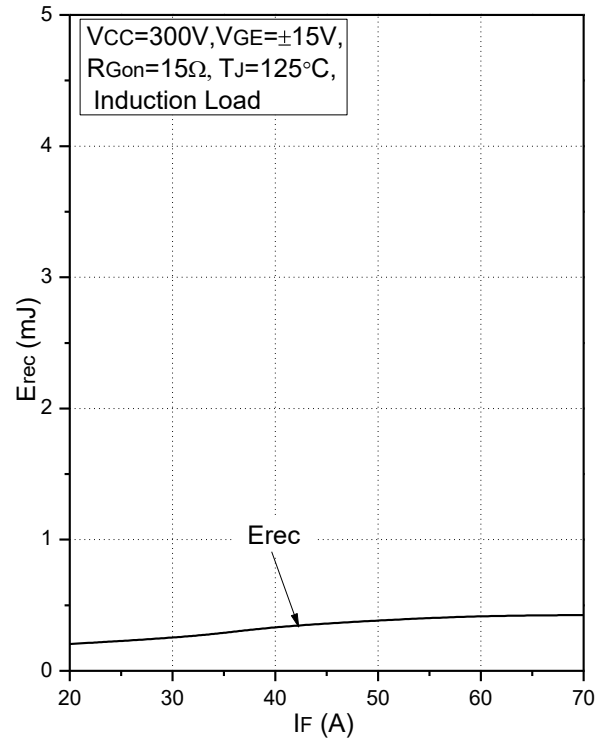
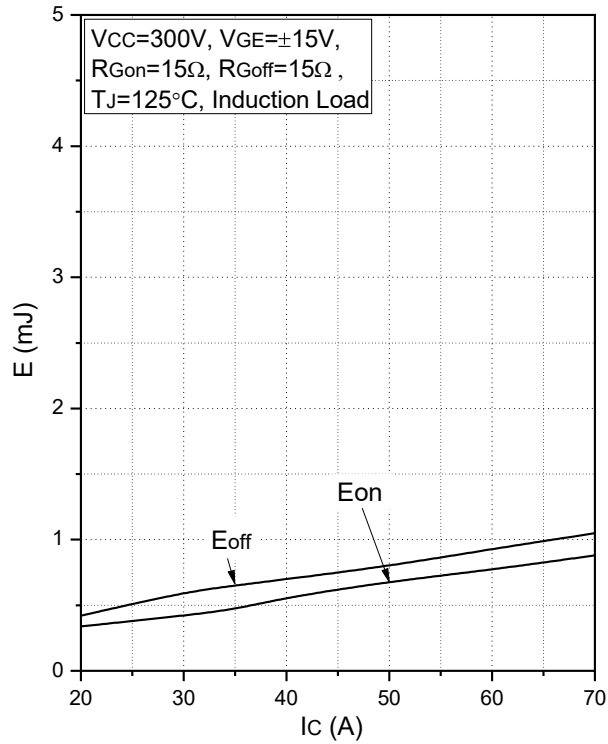


Fig.4 Forward Characteristics of Diode



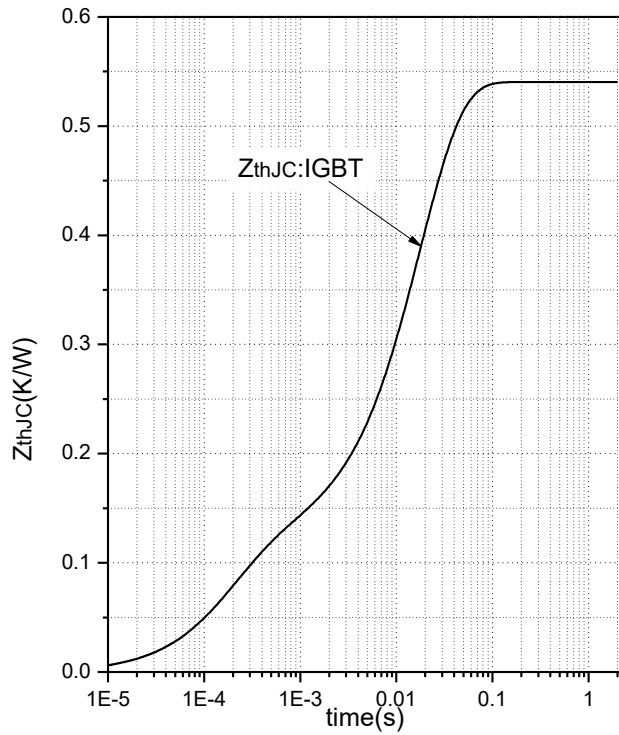


Fig.9 Transient Thermal Impedance of IGBT

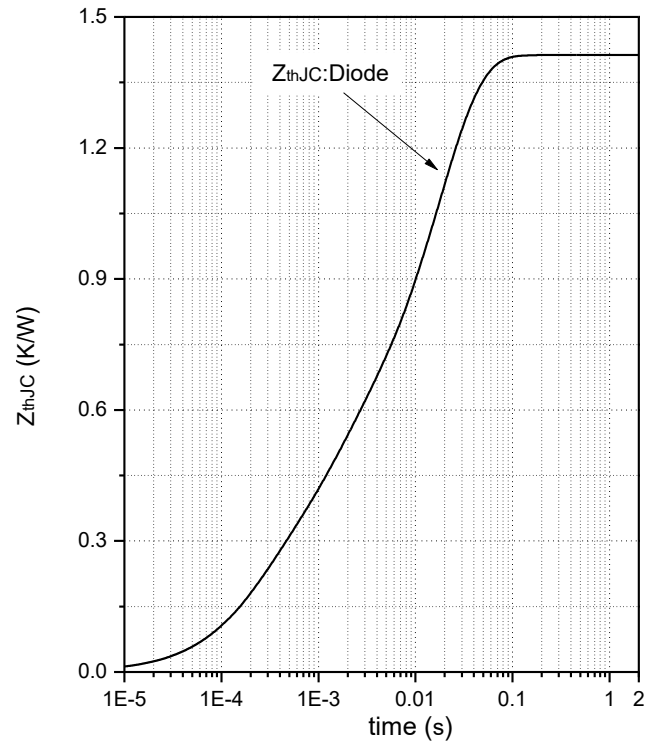


Fig.10 Transient Thermal Impedance of Diode

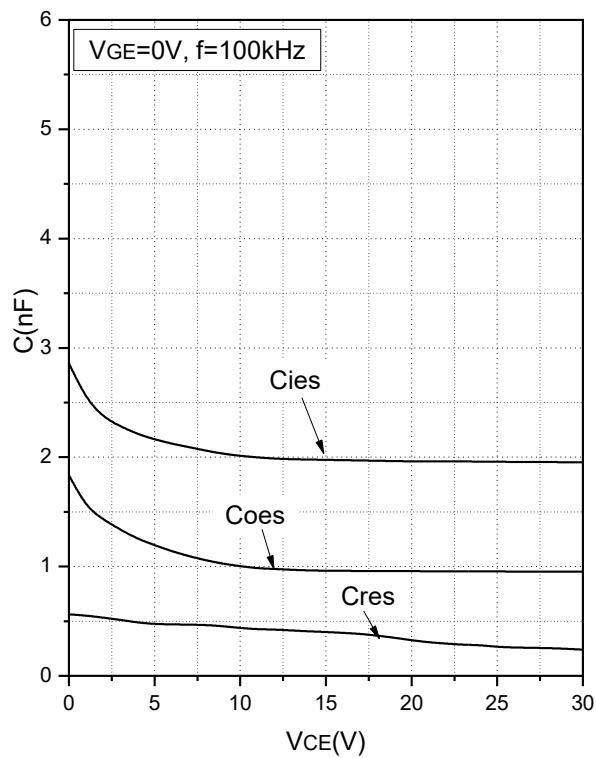


Fig.11 Capacitance Characteristics

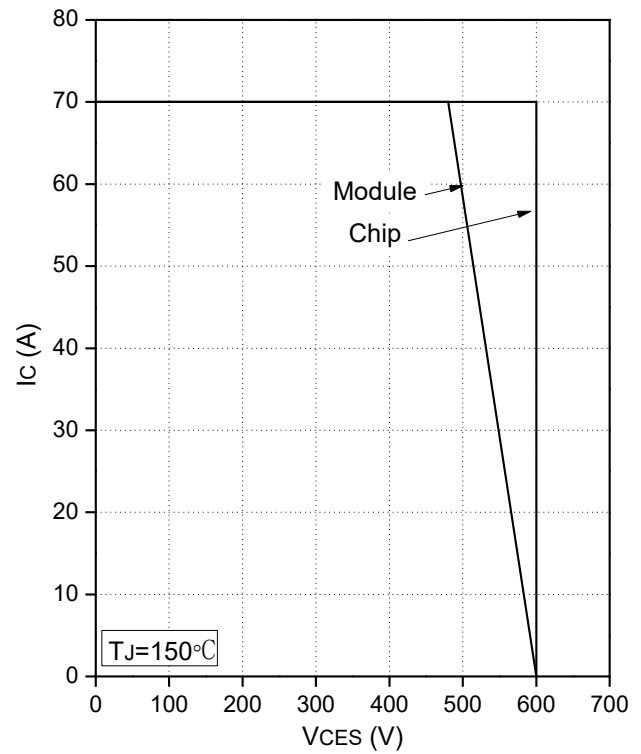
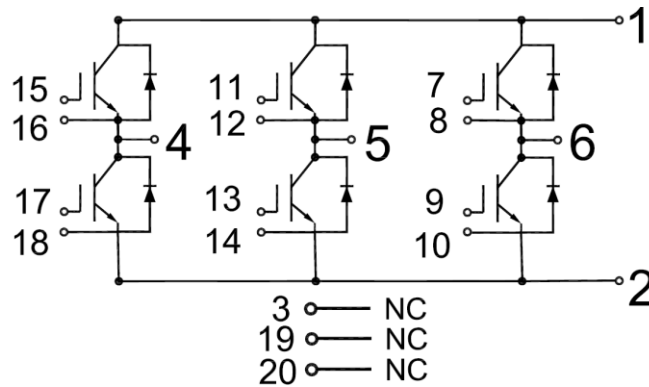


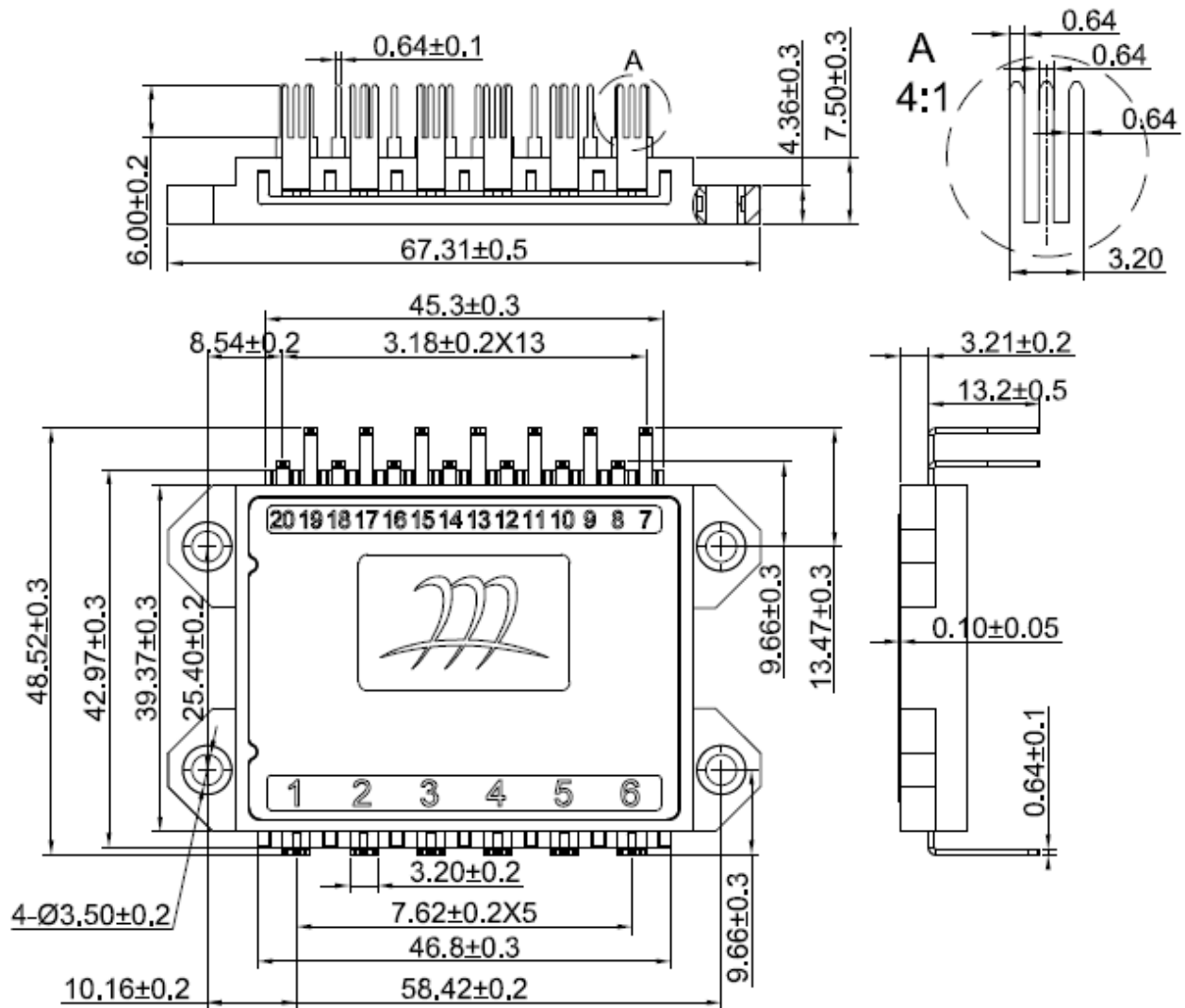
Fig.12 Reverse Bias Safe Operation Area (RBSOA)



Internal Circuit:



Package Outline (Unit: mm):





Revision	Notes
01	Initial Release
02	Updated Internal Circuit and Outline Drawing
03	Updated Internal Circuit
04	Update Electrical Characteristic

Announcements

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