

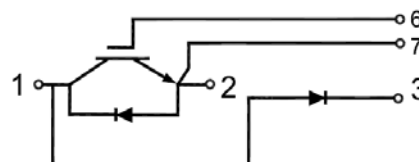
SYMT150CU120T2VH-M

IGBT Module Preliminary Data



Features:

- Field Stop Trench Gate IGBT
- 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:

- Welding
- HEV Inverter
- Industrial Motor Drives
- UPS

IGBT, Inverter

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

V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current	$T_C = 100^\circ\text{C}$	150	A
		$T_C = 25^\circ\text{C}$	300	A
I_{CM}	Repetitive Peak Collector Current	$T_J = 175^\circ\text{C}$	300	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	$T_C = 25^\circ\text{C}$ $T_{Jmax}=175^\circ\text{C}$	1085	W

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

Static Characteristics

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=4\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.9	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=150\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.70	2.00	V
			$T_J=125^{\circ}\text{C}$	1.90		V
			$T_J=150^{\circ}\text{C}$	2.00		
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	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			400	nA
C_{ies}	Input Capacitance	$V_{CE}= 25\text{V}$, $V_{GE}= 0\text{V}$, $f=1\text{MHz}$		10.13		nF
C_{oes}	Out Capacitance			1.01		nF
C_{res}	Reverse Transfer Capacitance			0.77		nF

Switching Characteristics

$t_{d(ON)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=150A,$ $R_{Gon}=4.7\Omega, V_{GE}= \pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		258		ns
			$T_J=125^{\circ}C$		258		
			$T_J=150^{\circ}C$		260		
t_r	Rise Time		$T_J=25^{\circ}C$		85		ns
			$T_J=125^{\circ}C$		89		
			$T_J=150^{\circ}C$		89		
$t_{d(OFF)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		265		ns
			$T_J=125^{\circ}C$		277		
			$T_J=150^{\circ}C$		284		
t_f	Fall Time	$T_J=25^{\circ}C$		205		ns	
		$T_J=125^{\circ}C$		376			
		$T_J=150^{\circ}C$		428			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=150A,$ $R_{Gon}=4.7\Omega, V_{GE}= \pm 15V,$ $di/dt=1550A/\mu s$ ($T_J=150^{\circ}C$) Inductive Load	$T_J=25^{\circ}C$		12.5		mJ
		$T_J=125^{\circ}C$		15.7			
		$T_J=150^{\circ}C$		17.5			

E_{off}	Turn-off Switching Loss	$V_{CC}=600V, I_C=150A,$ $R_{Goff}=4.7\Omega, V_{GE}=\pm 15V,$ $du/dt=4106V/\mu s$ ($T_J=150^\circ C$) Inductive Load	$T_J=25^\circ C$		10.3		mJ
			$T_J=125^\circ C$		15.8		
			$T_J=150^\circ C$		17.4		
Q_g	Total Gate Charge	$V_{GE}=+15V \dots -15V$	$T_J=25^\circ C$		0.71		μC
RBSOA	$I_C=300A, V_{CC}=1050V, V_p=1200V, R_{Goff}=4.7\Omega, V_{GE}=+15V$ to 0V, $T_J=150^\circ C$			Trapezoid			
SC Data	$V_{CC}=600V, R_{Gon}=4.7\Omega, R_{Goff}=4.7\Omega, t_p=10\mu s, V_{GE}=+/-15V, T_J=125^\circ C$				680		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(per leg)				0.138		$^\circ C/W$

Diode, Freewheel

Maximum Rated Values of FWD ($T_C=25^\circ C$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	150	A
I_{FM}	Diode Maximum Forward Current	300	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V _{FM}	Forward Voltage	I _F =150A	T _J =25℃		1.50		V
			T _J =125℃		1.50		
			T _J =150℃		1.50		
t _{rr}	Reverse Recovery Time	I _F =150A, -diF/dt=1670A/μs(T _J =150℃), V _R =600V, V _{GE} =-15V	T _J =25℃		371		ns
			T _J =125℃		562		
			T _J =150℃		625		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		127		A
			T _J =125℃		142		
			T _J =150℃		145		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		22.6		μC
			T _J =125℃		34.6		
			T _J =150℃		39.4		

E _{rec}	Reverse Recovery Energy	I _F =150A, -diF/dt=1670A/μs(T _J =150°C), V _R =600V, V _{GE} =-15V	T _J =25°C		9.7		mJ
			T _J =125°C		15.2		
			T _J =150°C		17.6		
R _{θJC}	Diode Thermal Resistance: Junction-To-Case (per leg)				0.213		°C/W

Diode, Inverse

Maximum Rated Values of Inverse Diode (T_C = 25°C unless otherwise specified)

V _{RRM}	Repetitive Peak Reverse Voltage	1200	V
I _F	Diode Continuous Forward Current	100	A
I _{FM}	Peak FWD Current Repetitive	200	A

Electrical Characteristics of Inverse Diode (T_C=25°C unless otherwise specified)

Symbol	Description	Conditions		Min	Typ	Max	Unit
V _{FM}	Forward Voltage	I _F =100A	T _J =25℃		1.70		V
			T _J =125℃		1.80		
			T _J =150℃		1.80		
t _{rr}	Reverse Recovery Time	I _F =100A, -diF/dt =1911A/μs(T _J =150℃), V _R =600V, V _{GE} =-15V	T _J =25℃		260		ns
			T _J =125℃		396		
			T _J =150℃		454		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		92		A
			T _J =125℃		104		
			T _J =150℃		105		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		10.2		μC
			T _J =125℃		16.8		
			T _J =150℃		19.2		
E _{rec}	Reverse Recovery Energy	I _F =100A, -diF/dt =1911A/μs(T _J =150℃), V _R =600V, V _{GE} =-15V	T _J =25℃		4.83		mJ
		T _J =125℃		7.92			
		T _J =150℃		9.13			



$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case		0.34		$^{\circ}\text{C/W}$
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Module

Symbol	Description		Min	Typ	Max	Unit
V_{iso}	Isolation Voltage (All Terminals Shorted)	$f = 50\text{Hz}, 1\text{minute}$	2500			V
T_J	Maximum Junction Temperature				175	$^{\circ}\text{C}$
T_{JOP}	Maximum Operating Junction Temperature Range		-40		+150	$^{\circ}\text{C}$
T_{stg}	Storage Temperature		-40		+125	$^{\circ}\text{C}$
CTI	Comparative Tracking Index		200			V
$R_{\theta CS}$	Case-To-Sink Thermally (Conductive Grease Applied)			0.03		$^{\circ}\text{C/W}$
T	Power Terminals Screw:M6		3.0		5.0	N·m
T	Mounting Screw:M6		4.0		6.0	N·m
G	Weight			300		g

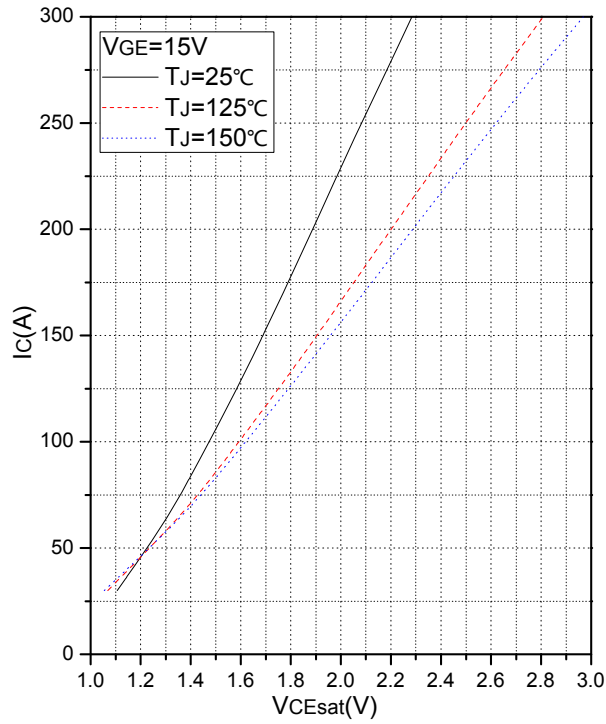


Fig.1 Typical Saturation Voltage Characteristics

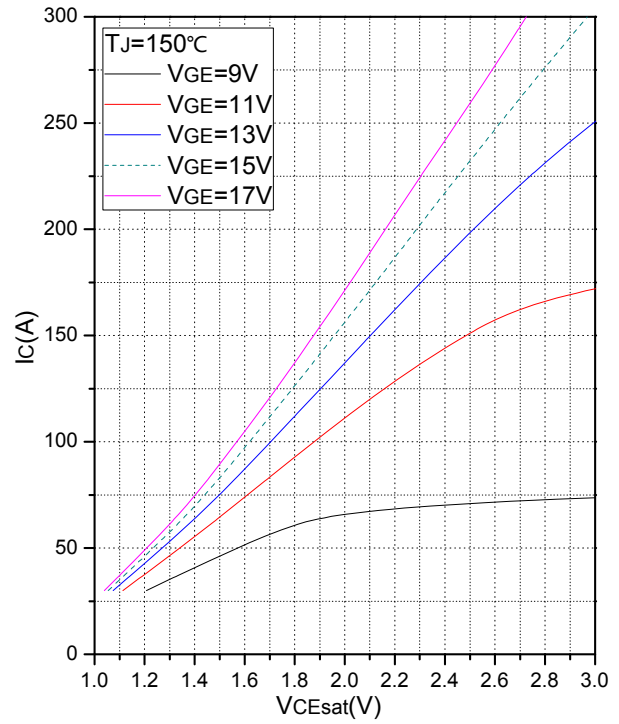


Fig.2 Typical Output Characteristics

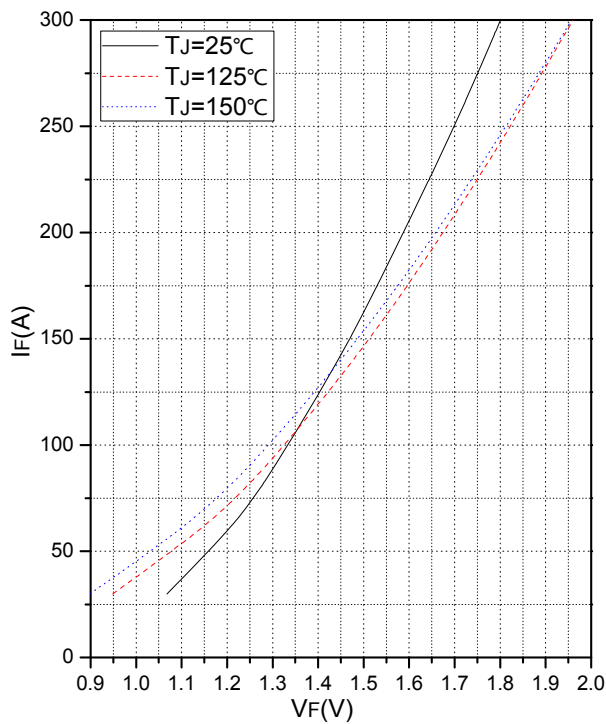


Fig.3 Forward Characteristics of FRD

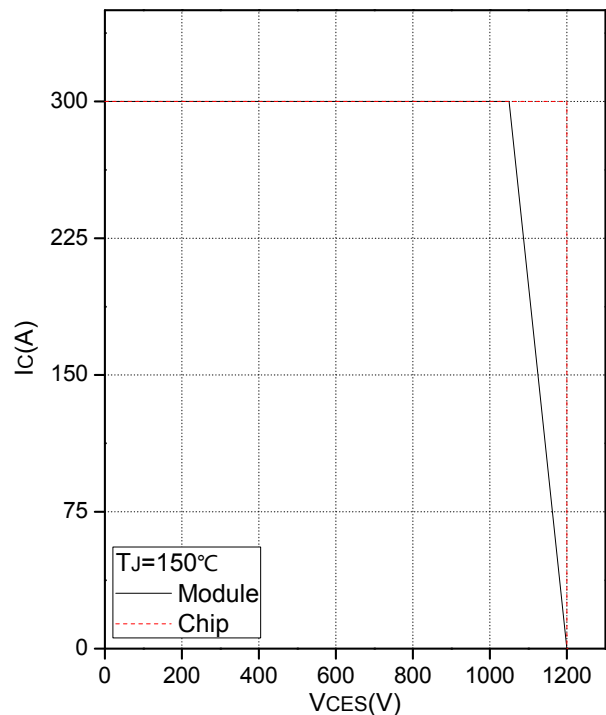


Fig.4 Reverse Bias Safe Operation Area (RBSOA)

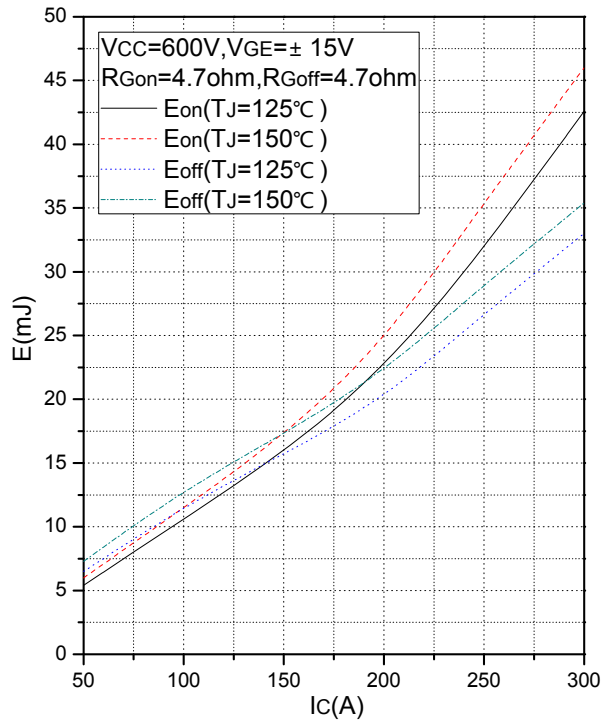


Fig.5 Typical Switching Loss vs. Collector Current

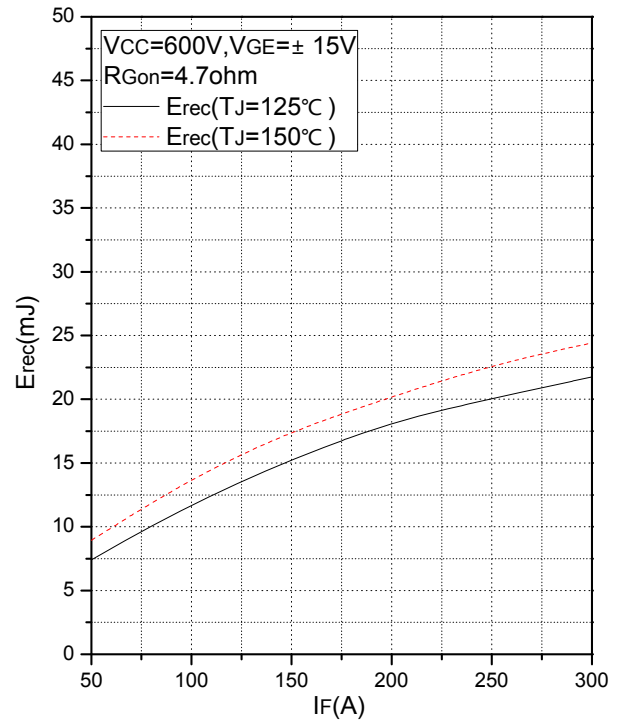


Fig.6 Typical Switching Loss vs. Forward Current

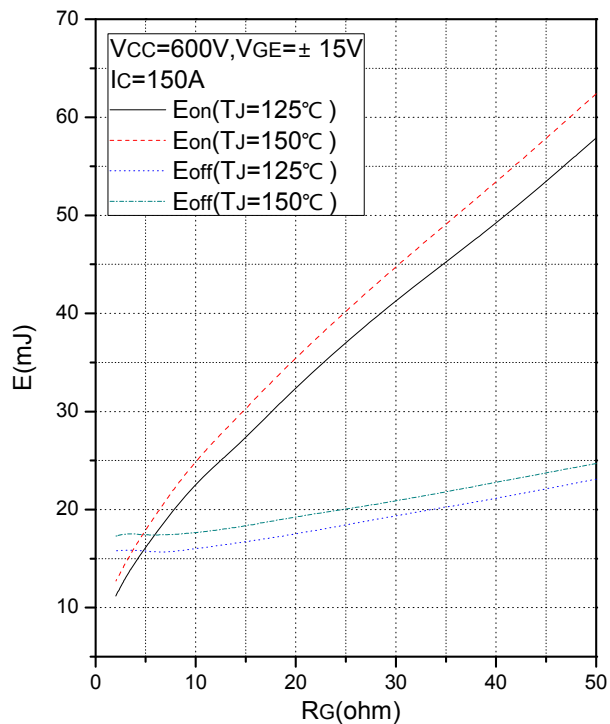


Fig.7 Typical Switching Loss vs. Gate Resistance

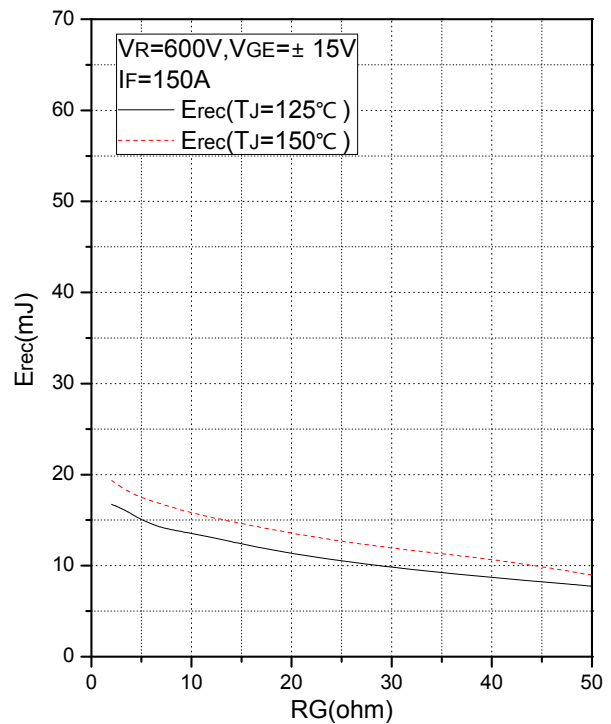


Fig.8 Typical Switching Loss vs. Gate Resistance

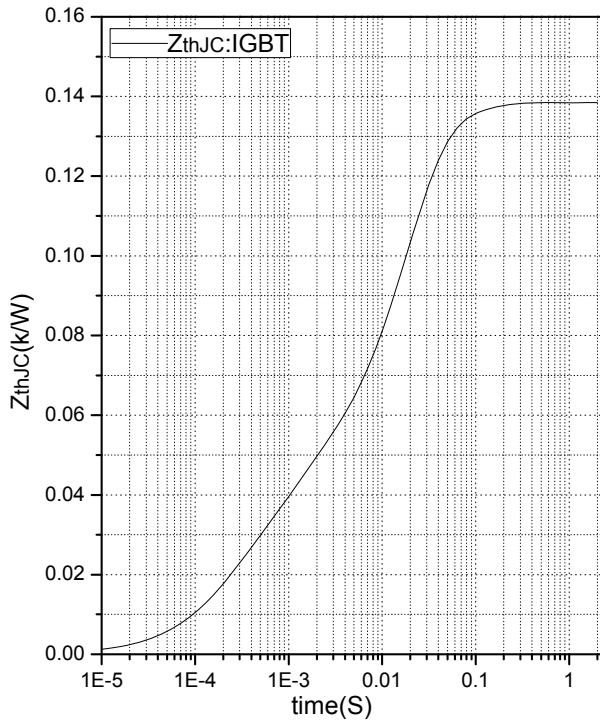


Fig.9 Transient Thermal Impedance (IGBT)

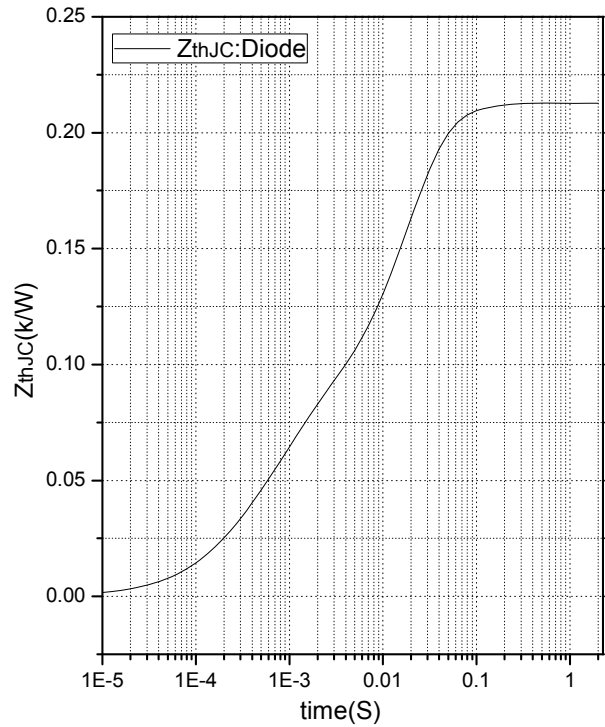


Fig.10 Transient Thermal Impedance (FWD)

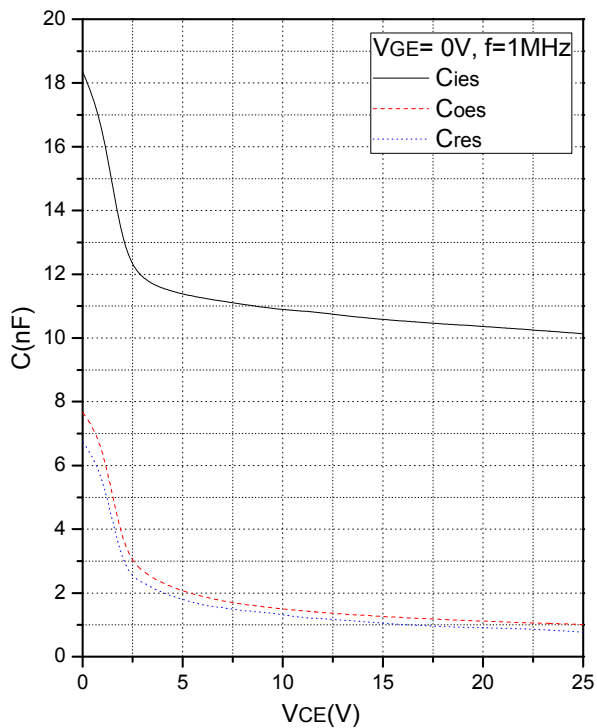


Fig.11 Capacitance Characteristics

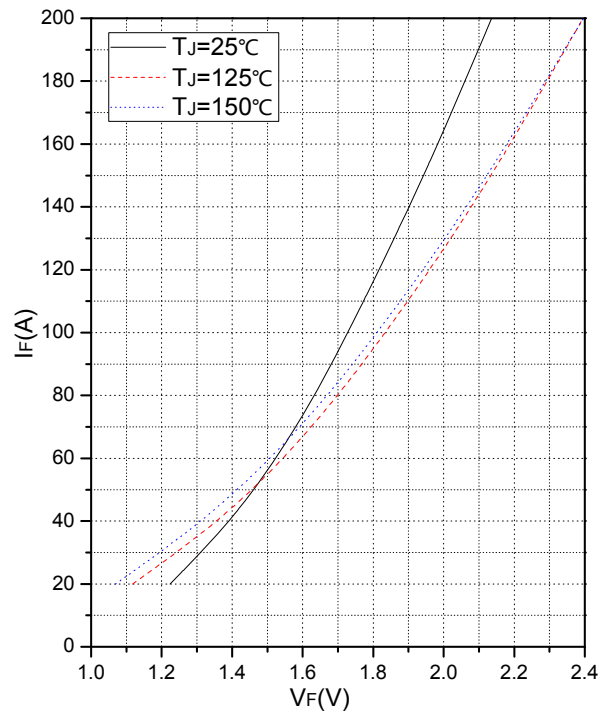
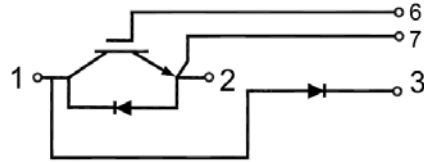


Fig.12 Forward Characteristics of Inverse Diode

Internal Circuit



Package Outline (Unit: mm):

