GT300BB120P4H

IGBT Module

Preliminary Data

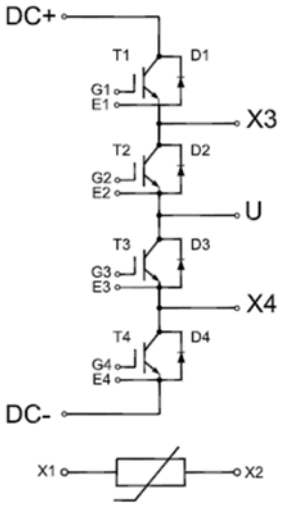
Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated >10μs
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested(2×Ic)
- Lead Free, Compliant with RoHS Requirement

Applications:

- 3-Level-Applications
- Solar Applications

Circuit Diagram



IGBT, Buck Switch (T1, T4)

Maximum Rated Values (T_C=25℃unless otherwise specified)

Symbol	Description		Values	Units
V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C=100℃	300	A
		T_C=25℃	600	A
I_{CM}	Peak Collector Current Repetitive	t_p=1ms	600	A
P_D	Maximum Power Dissipation (per IGBT)	T_C=25℃ T_{Jmax}=175℃	3000	W

Electrical Characteristics of IGBT (T_C=25℃unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=3.8mA, V_{CE}=V_{GE}		5.0	5.7	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=300A, V_{GE}=15V	T_J=25℃		1.65	2.10	V
			T_J=125℃		2.00		V
			T_J=150℃		2.10		V
I_{CES}	Collector-Emitter Leakage Current	V_{GE}=0V, V_{CE}=V_{CES}, T_J=25℃				1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=±20V, V_{CE}=0V, T_J=25℃				±200	nA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=100kHz			34.39		nF
C_{oes}	Output Capacitance				4.57		nF
C_{res}	Reverse Transfer Capacitance				2.21		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=300A, R_{Gon}=0.33Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		259		ns
			T_J=125℃		278		
			T_J=150℃		290		
t_r	Rise Time		T_J=25℃		125		ns
			T_J=125℃		134		
			T_J=150℃		136		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=300A, R_{Goff}=0.33Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		230		ns
			T_J=125℃		236		
			T_J=150℃		236		
t_f	Fall Time		T_J=25℃		170		ns
			T_J=125℃		223		
			T_J=150℃		232		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=300A, R_{Gon}=0.33Ω, V_{GE}=±15V, di/dt=2261A/μs (T_J=150℃), Inductive Load	T_J=25℃		8.1		mJ
			T_J=125℃		14.1		
			T_J=150℃		16.9		

E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=300A, R_{Goff}=0.33Ω, V_{GE}=±15V, du/dt=6675V/μs (T_J=150℃), Inductive Load	T_J=25℃		23.5		mJ
			T_J=125℃		30.5		
			T_J=150℃		32.4		
Q_g	Total Gate Charge		T_J=25℃		8.73		μC
$R_{G(int)}$	Internal Gate Resistor		T_J=25℃		1.83		Ω
SCSOA	V_{CC}=600V, V_{GE}=±15V,t_P=10μs, T_J=150℃, R_G=15Ω				1320		A
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per IGBT)					0.05	℃/W

Buck Diode (D2, D3)

Maximum Rated Values(T_C=25℃unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1200	V
I_F	Continuous Forward Current	T_C=100℃	300	A
I_{FM}	Maximum Forward Current	t_p=1ms	600	A

Electrical Characteristics of Diode (T_C=25℃unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=300A	T_J=25℃		1.65		V
			T_J=125℃		1.80		
			T_J=150℃		1.80		
t_{rr}	Reverse Recovery Time	I_F=300A, -diF/dt=1950A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		138		ns
			T_J=125℃		182		
			T_J=150℃		212		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		408		A
			T_J=125℃		465		
			T_J=150℃		477		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		31.8		μC
			T_J=125℃		46.2		
			T_J=150℃		52.5		

E_{rec}	Reverse Recovery Energy	I_F=300A, -diF/dt=1950A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		15.0		mJ
			T_J=125℃		20.0		
			T_J=150℃		22.8		
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per Diode)					0.08	℃/W

IGBT, Boost Switch (T2, T3)

Maximum Rated Values(T_C=25℃unless otherwise specified)

Symbol	Description		Values	Units
V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C=100℃	300	A
		T_C=25℃	600	A
I_{CM}	Peak Collector Current Repetitive	t_P=1ms	600	A
P_D	Maximum Power Dissipation (per IGBT)	T_C=25℃ T_{Jmax}=175℃	3000	W

Electrical Characteristics of IGBT (T_C=25℃unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=3.8mA, V_{CE}=V_{GE}		5.0	5.7	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=300A, V_{GE}=15V	T_J=25℃		1.65	2.10	V
			T_J=125℃		2.00		V
			T_J=150℃		2.10		V
I_{CES}	Collector-Emitter Leakage Current	V_{GE}=0V, V_{CE}=V_{CES}, T_J=25℃				1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=±20V, V_{CE}=0V, T_J=25℃				±200	nA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=100kHz			34.39		nF
C_{oes}	Output Capacitance				4.57		nF
C_{res}	Reverse Transfer Capacitance				2.21		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=300A, R_{Gon}=0.33Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		259		ns
			T_J=125℃		278		
			T_J=150℃		290		
t_r	Rise Time		T_J=25℃		125		ns
			T_J=125℃		134		
			T_J=150℃		136		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=300A, R_{Goff}=0.33Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		230		ns
			T_J=125℃		236		
			T_J=150℃		236		
t_f	Fall Time		T_J=25℃		170		ns
			T_J=125℃		223		
			T_J=150℃		232		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=300A, R_{Gon}=0.33Ω, V_{GE}=±15V, di/dt=2261A/μs (T_J=150℃), Inductive Load	T_J=25℃		8.1		mJ
			T_J=125℃		14.1		
			T_J=150℃		16.9		
E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=300A, R_{Goff}=0.33Ω, V_{GE}=±15V, du/dt=6675V/μs (T_J=150℃), Inductive Load	T_J=25℃		23.5		mJ
			T_J=125℃		30.5		
			T_J=150℃		32.4		
Q_g	Total Gate Charge		T_J=25℃		8.73		μC
R_g	Internal Gate Resistor		T_J=25℃		1.83		Ω
SCSOA	V_{CC}=600V, V_{GE}=±15V,t_P=10μs, T_J=150℃, R_G=15Ω				1320		A
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per IGBT)					0.05	℃/W

Boost Diode (D1, D4)

Maximum Rated Values(T_C=25℃unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1200	V
I_F	Continuous Forward Current	T_C=100℃	300	A
I_{FM}	Maximum Forward Current	t_p=1ms	600	A

Electrical Characteristics of Diode (T_C=25℃unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=300A	T_J=25℃		1.65		V
			T_J=125℃		1.80		
			T_J=150℃		1.80		
t_{rr}	Reverse Recovery Time	I_F=300A, -diF/dt=1950A/μs(T_J=150℃), V_{rr}=600V, V_{GE}=-15V	T_J=25℃		138		ns
			T_J=125℃		182		
			T_J=150℃		212		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		408		A
			T_J=125℃		465		
			T_J=150℃		477		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		31.8		μC
			T_J=125℃		46.2		
			T_J=150℃		52.5		
E_{rec}	Reverse Recovery Energy		T_J=25℃		15.0		mJ
			T_J=125℃		20.0		
			T_J=150℃		22.8		
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per Diode)					0.08	℃/W

Internal NTC-Thermistor Characteristics

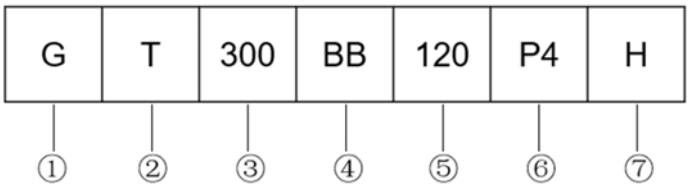
Symbol	Conditions	Min.	Max.	Units
R_{25}	T_C=25℃	5		kΩ
△R/R	T_C=100℃,R_{100}=465Ω		±5	%
P_{25}	T_C=25℃	10		mW
$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$	3380		K
$B_{25/80}$	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$	3440		K
$B_{25/100}$	$R_2=R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$	3545		K

Module

Symbol	Description		Min.	Typ.	Max.	Units
V_{ISO}	Isolation Voltage(All Terminals Shorted)	AC, 50Hz, 30s		4500		V
d_{creep}	Creepage Distance: Terminal to Heatsink			11.2		mm
	Creepage Distance: Terminal to Terminal			6.8		
d_{clear}	Clearance: Terminal to Heatsink			9.4		mm
	Clearance: Terminal to Terminal			5.5		
L_{SCE}	Stray Inductance Module			12		nH
T_J	Maximum Junction Temperature				175	℃
T_{JOP}	Maximum Operating Junction Temperature Range		-40		+150	℃
T_{stg}	Storage Temperature		-40		+150	℃
CTI	Comparative Tracking Index		400			
$R_{\theta CS}$	Case-to-Sink Thermally (Conductive Grease Applied)				0.02	℃/W
T	Mounting Screw:M5		2.5		4.0	N·m
G	Weight			162		g

Ordering Information Table

Device code



① - IGBT Module
② - Trench, Low Switching Losses IGBT
③ - Rated Current (300=300A)
④ - Circuit Configuration (Buck-Boost)
⑤ - Rated Voltage (120=1200V)
⑥ - Package Type
⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

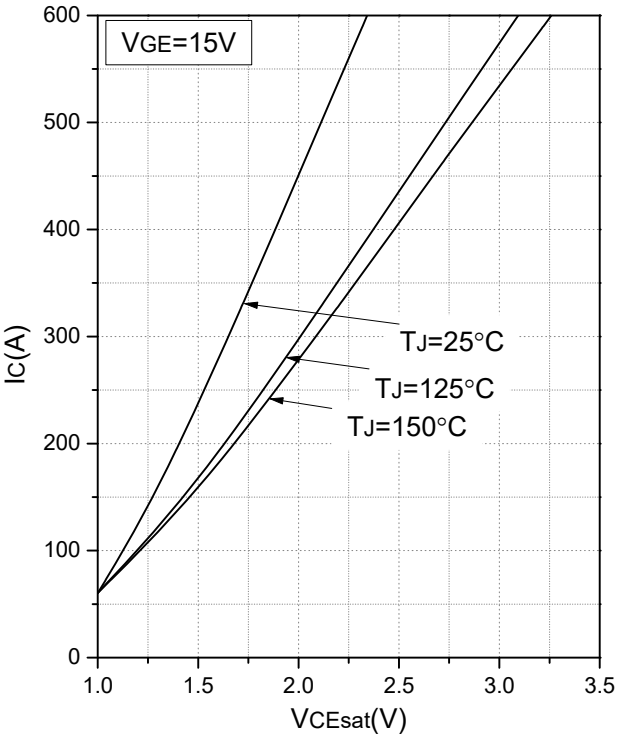


Fig.1 Typical Saturation Voltage Characteristics
(Buck Switch(T1,T4))

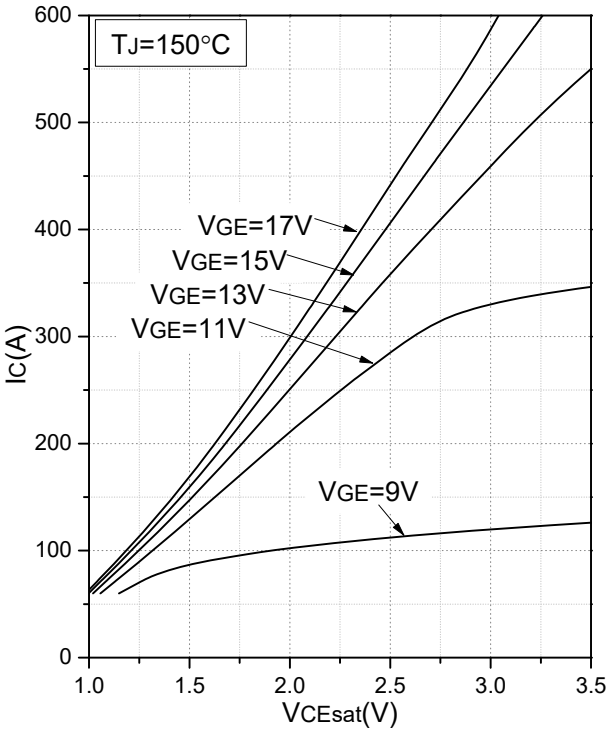


Fig.2 Typical Output Characteristics
(Buck Switch(T1,T4))

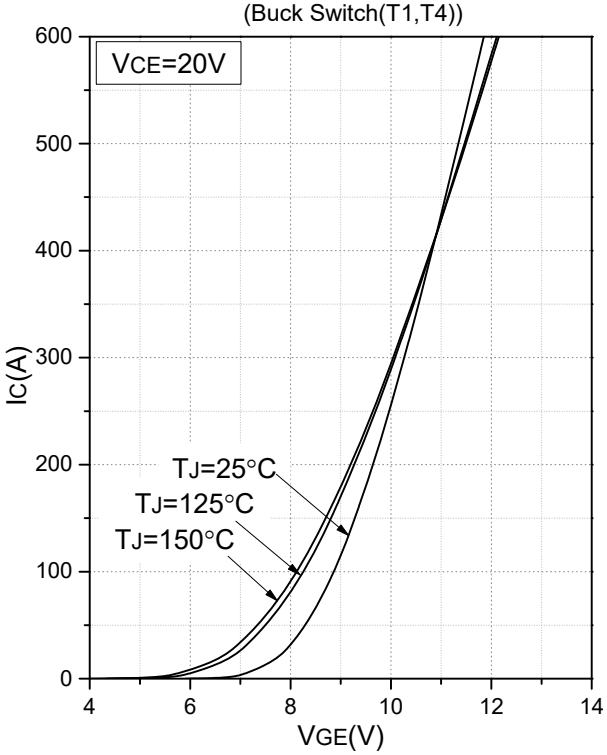


Fig.3 Transfer Characteristic
(Buck Switch(T1,T4))

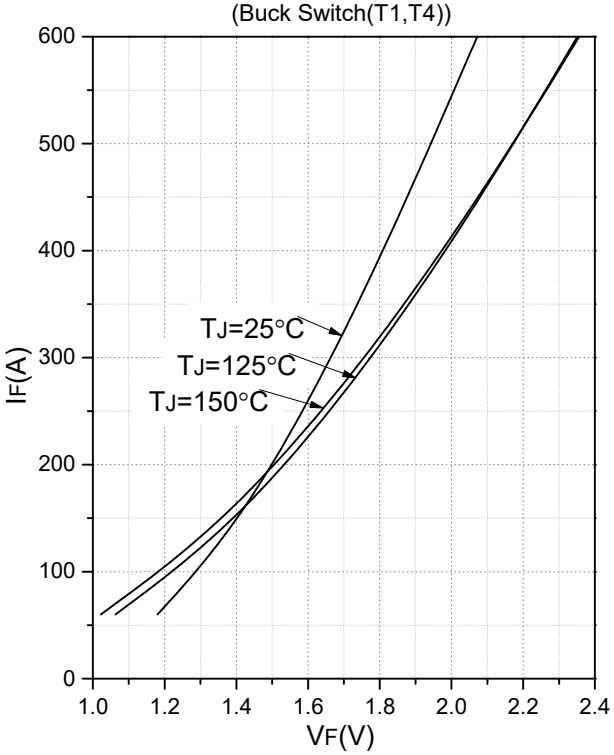


Fig.4 Forward Characteristics of Diode
(Buck Diode(D2,D3))

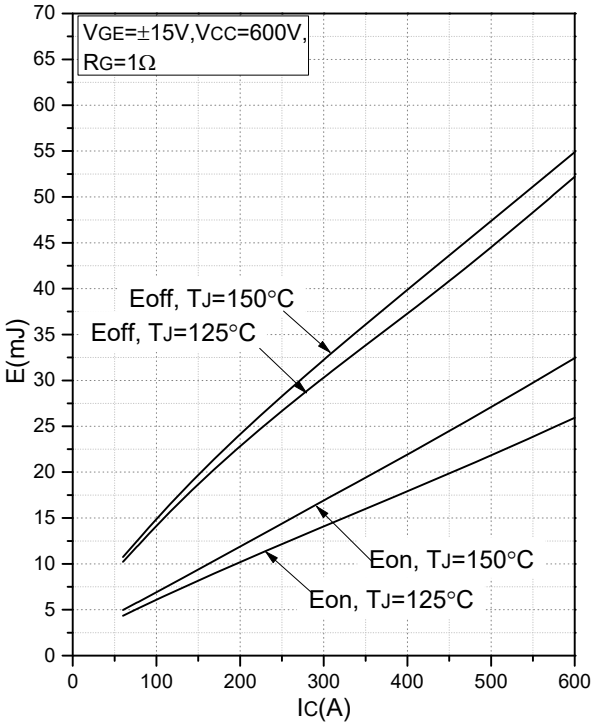


Fig.5 Typical Switching Loss vs. Collector Current
(Buck Switch(T1,T4))

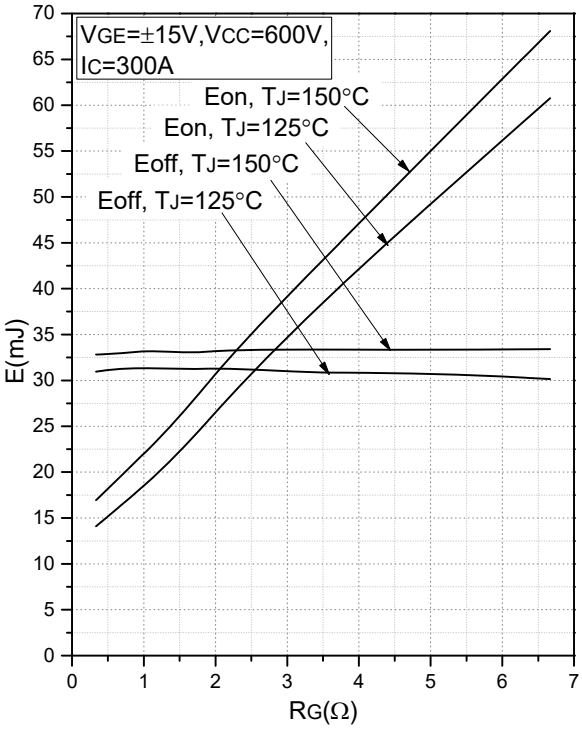


Fig.6 Typical Switching Loss vs. Gate Resistance
(Buck Switch(T1,T4))

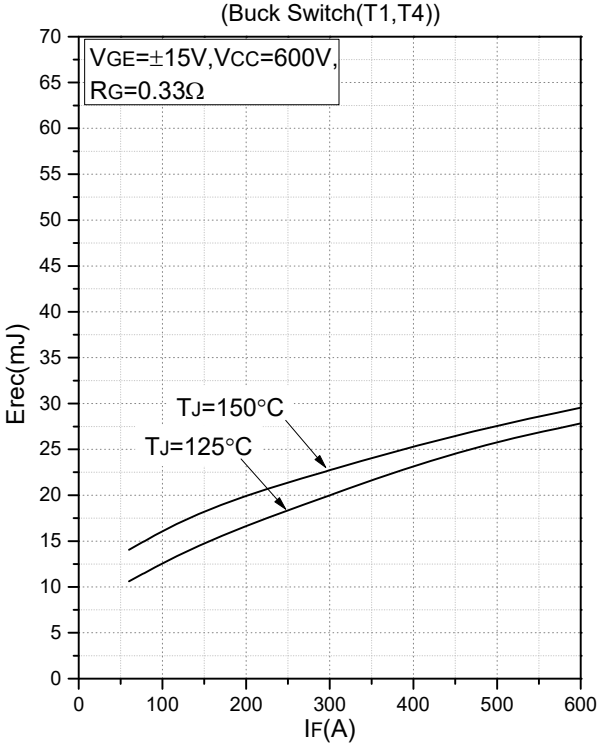


Fig.7 Typical Switching Loss vs. Forward Current
(Buck Diode(D2,D3))

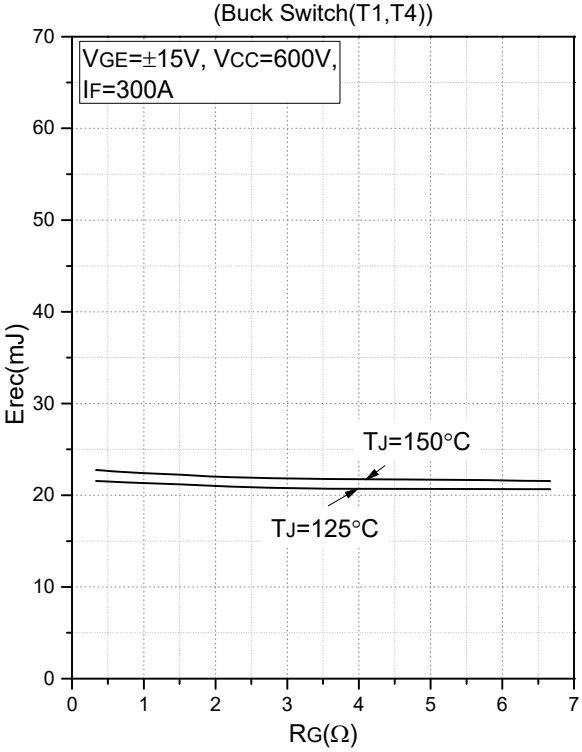


Fig.8 Typical Switching Loss vs. Gate Resistance
(Buck Diode(D2,D3))

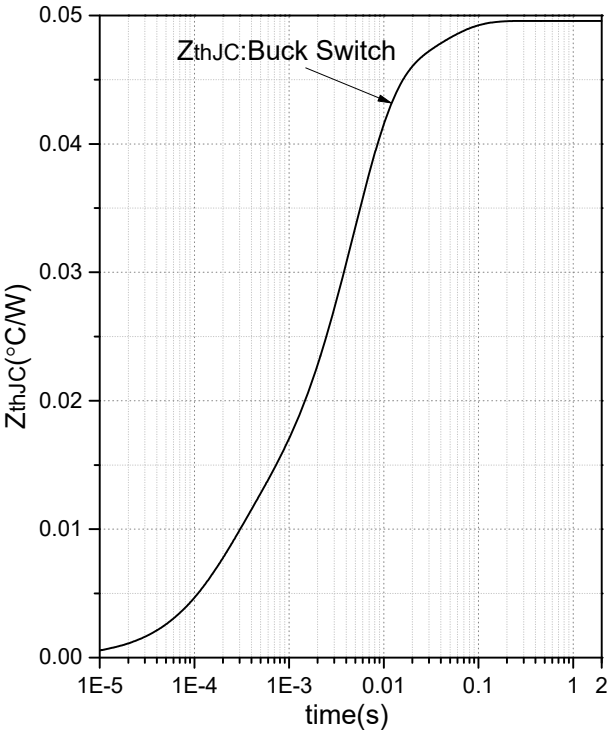


Fig.9Transient Thermal Impedance
(Buck Switch(T1,T4))

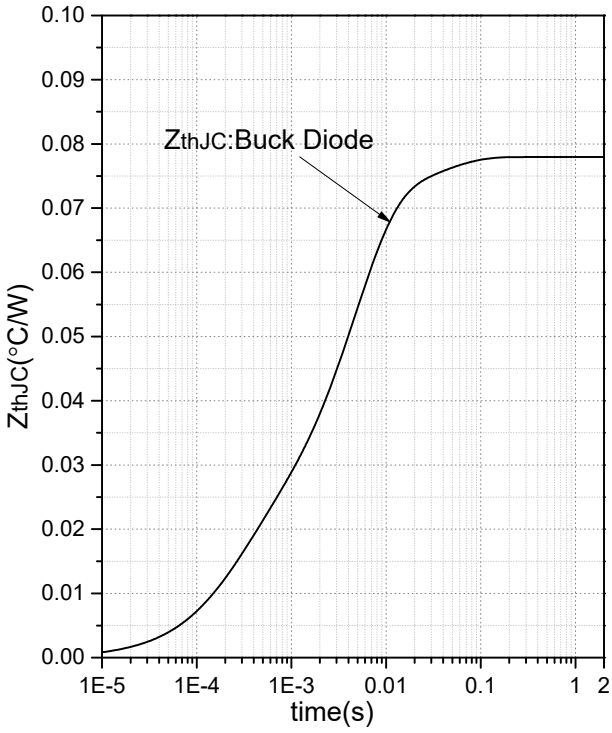


Fig.10 Transient Thermal Impedance
(Buck Diode(D2,D3))

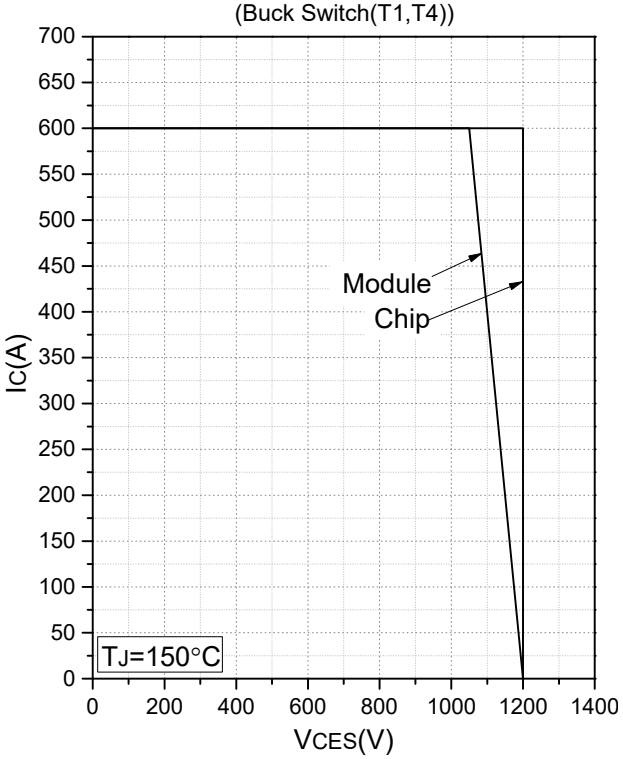


Fig.11 Reverse Bias Safe Operation Area
(Buck Switch(T1,T4))

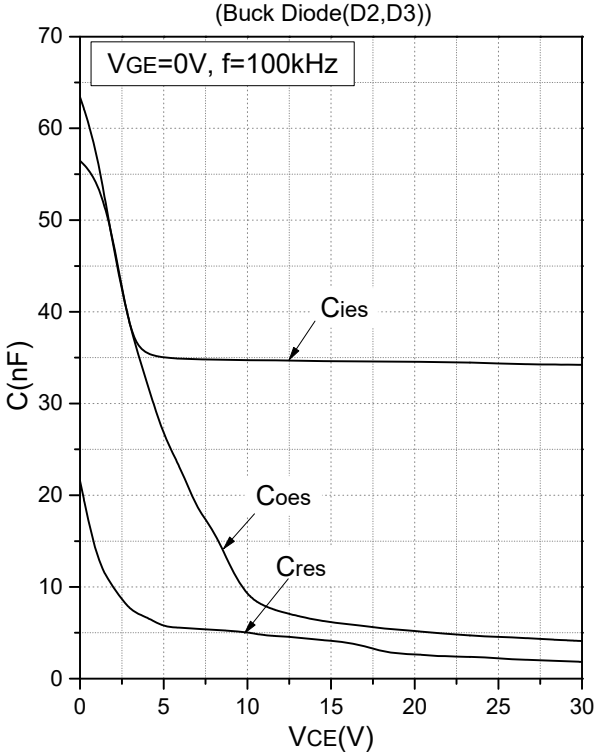


Fig.12 Capacitance Characteristics
(Buck Switch(T1,T4))

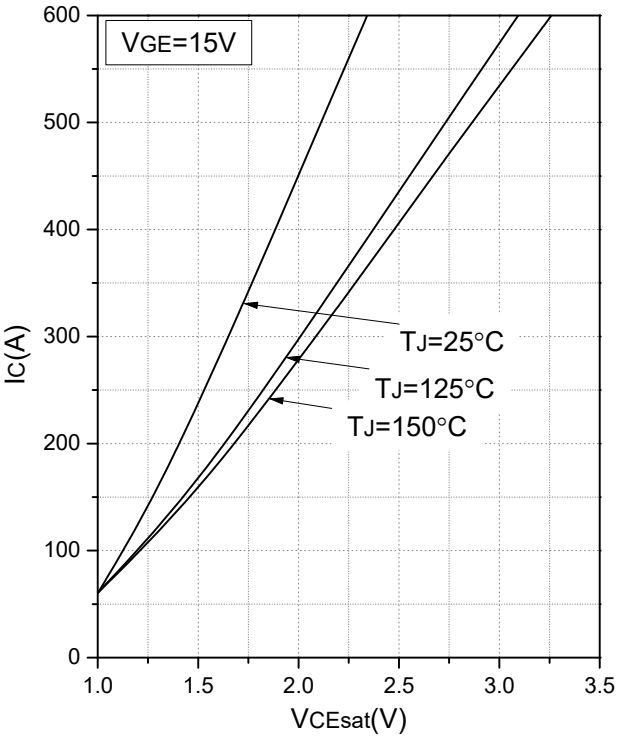


Fig.13 Typical Saturation Voltage Characteristics
(Boost Switch(T2,T3))

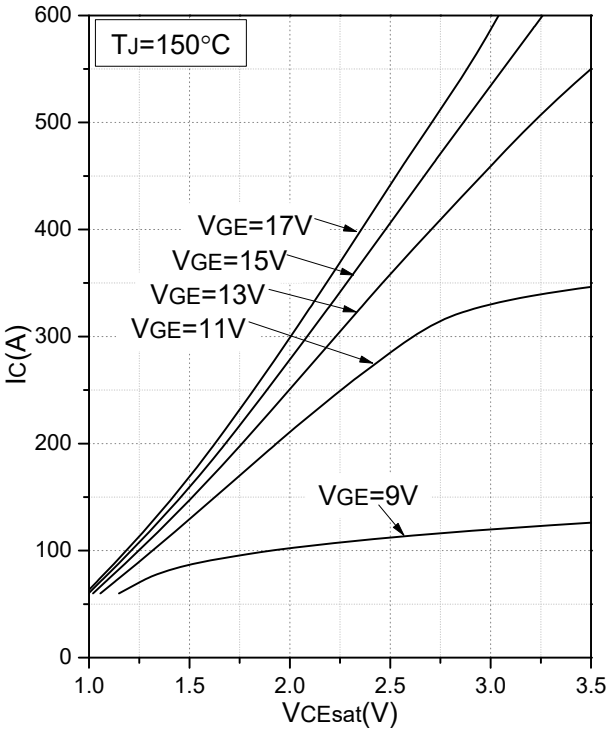


Fig.14 Typical Output Characteristics
(Boost Switch(T2,T3))

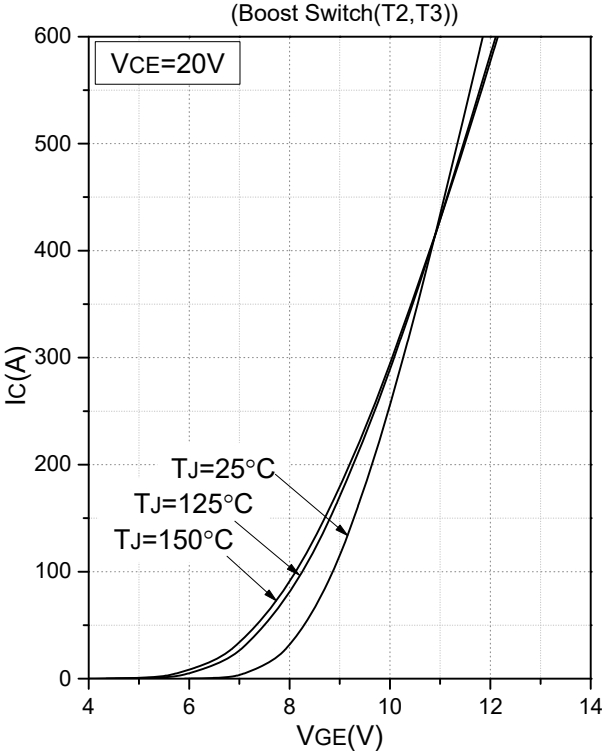


Fig.15 Transfer Characteristic
(Boost Switch(T2,T3))

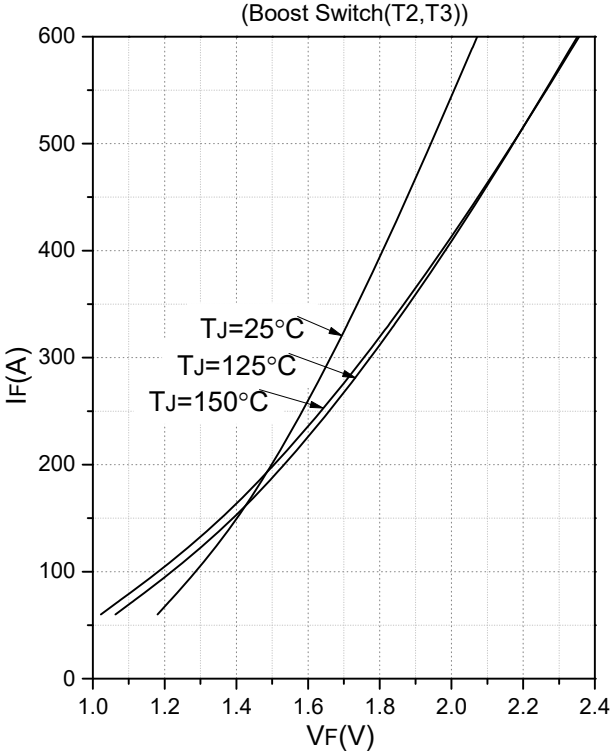


Fig.16 Forward Characteristics of Diode
(Boost Diode(D1,D4))

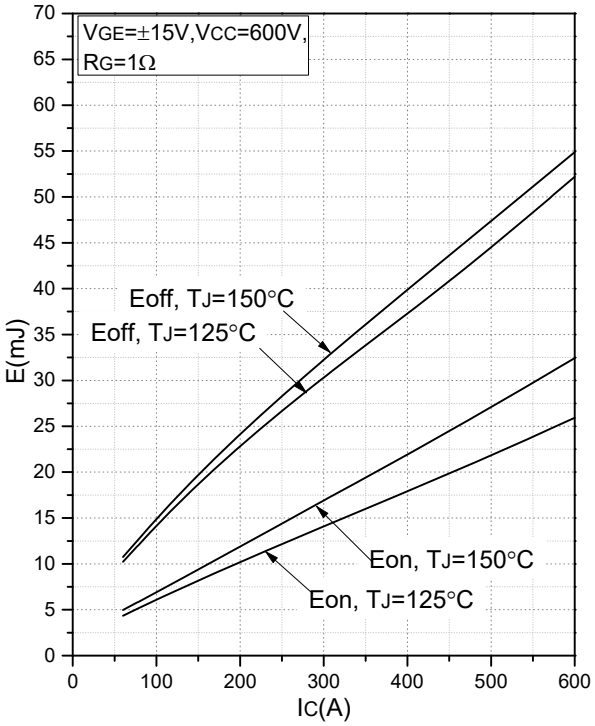


Fig.17 Typical Switching Loss vs. Collector Current
(Boost Switch(T2,T3))

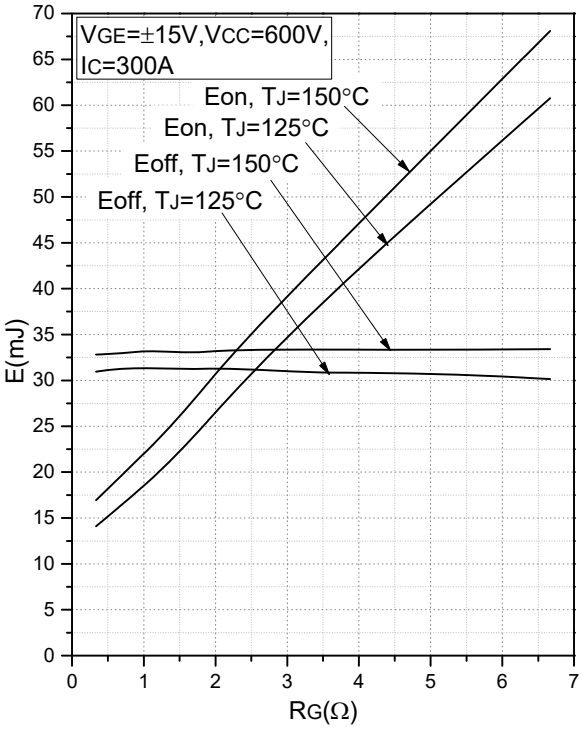


Fig.18 Typical Switching Loss vs. Gate Resistance
(Boost Switch(T2,T3))

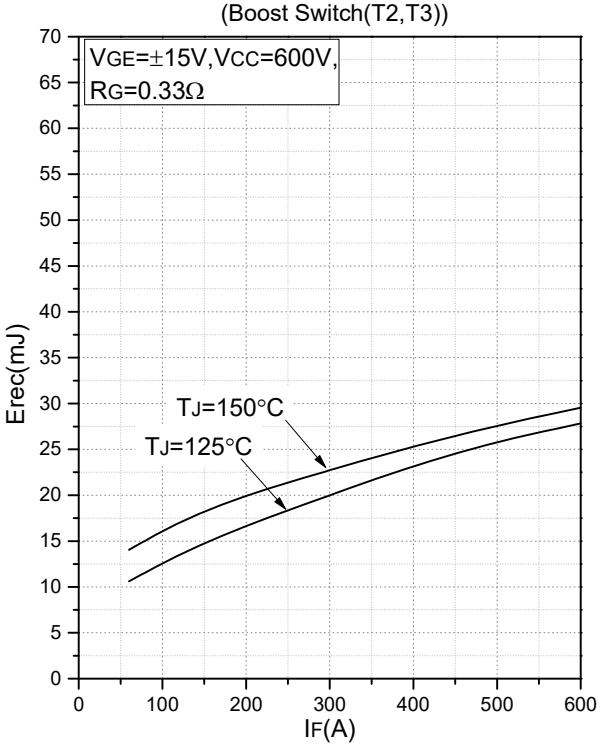


Fig.19 Typical Switching Loss vs. Forward Current
(Boost Diode(D1,D4))

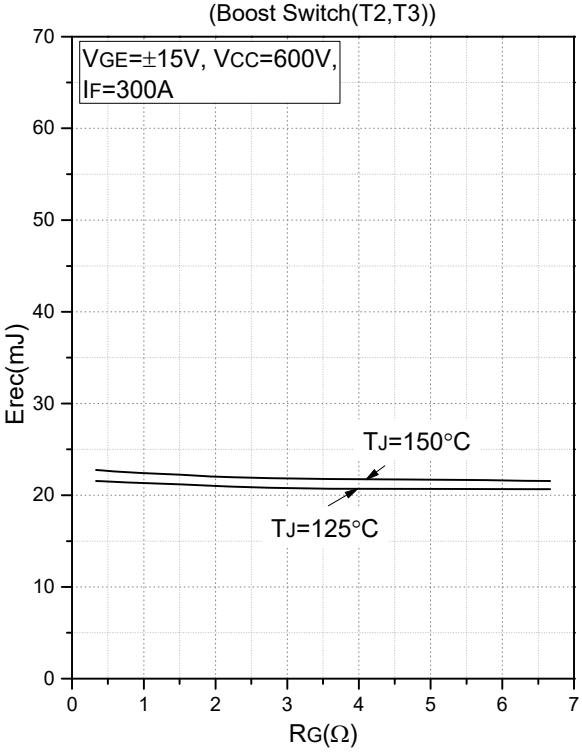


Fig.20 Typical Switching Loss vs. Gate Resistance
(Boost Diode(D1,D4))

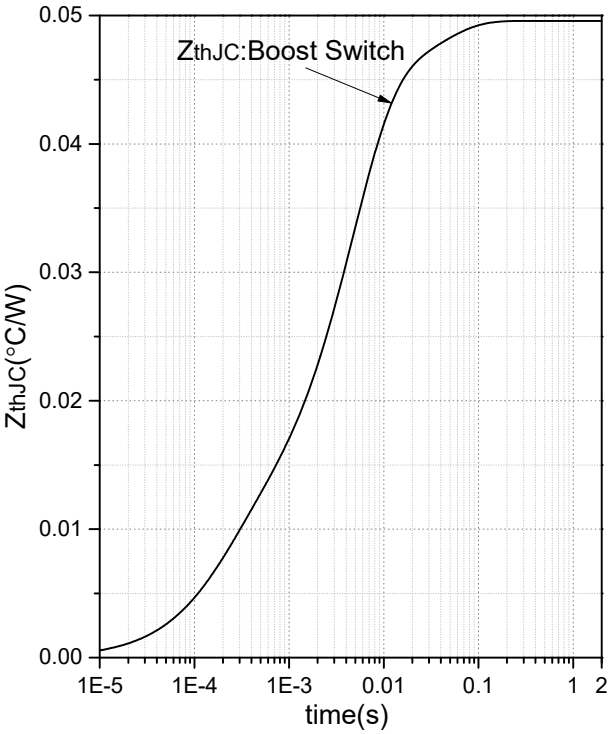


Fig.21 Transient Thermal Impedance
(Boost Switch(T2,T3))

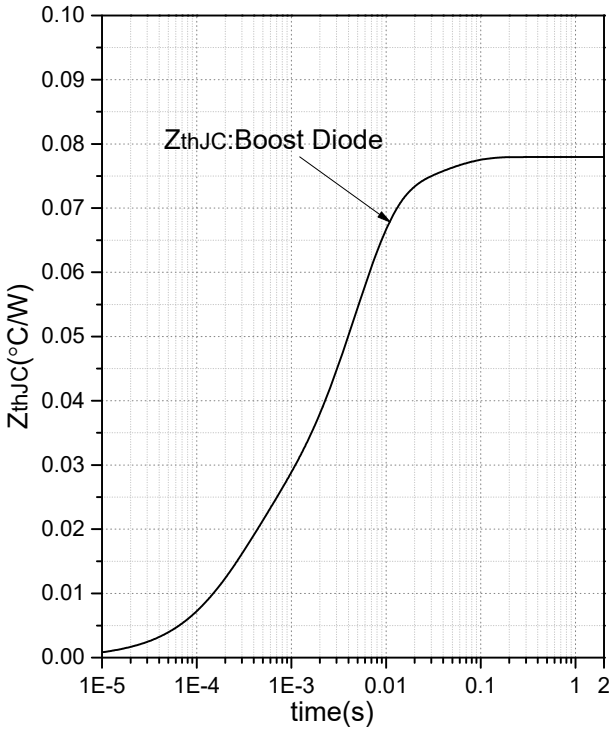


Fig.22 Transient Thermal Impedance
(Boost Diode(D1,D4))

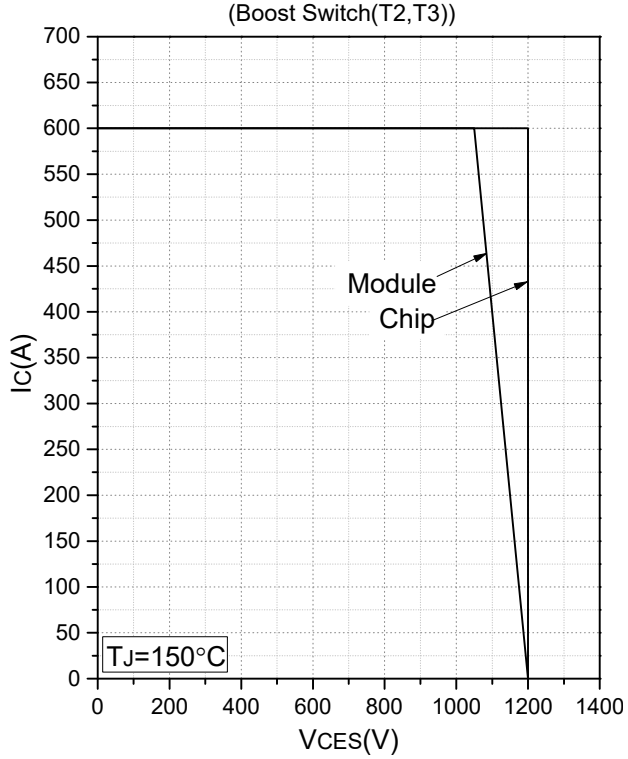


Fig.23 Reverse Bias Safe Operation Area
(Boost Switch(T2,T3))

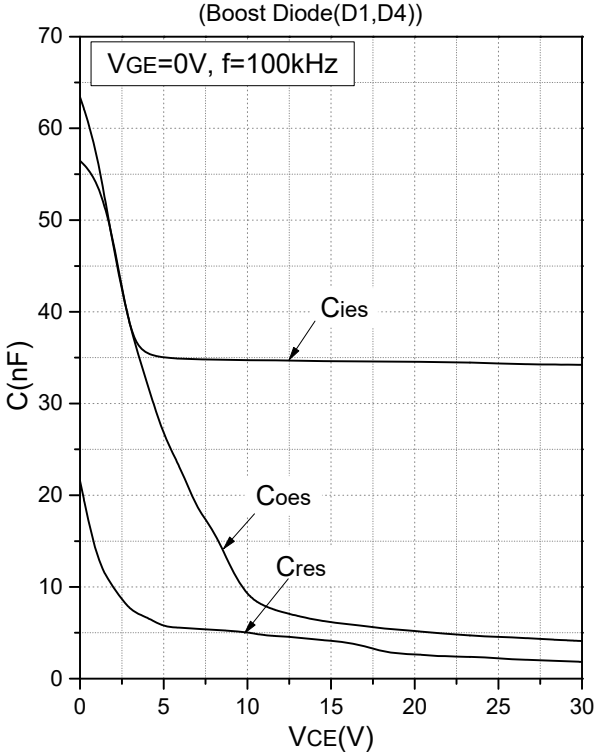


Fig.24Capacitance Characteristics
(Boost Switch(T2,T3))

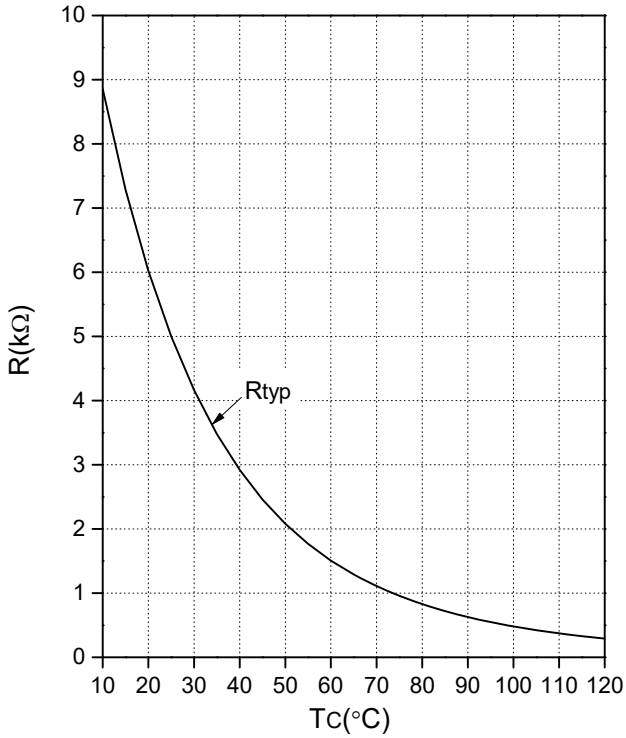
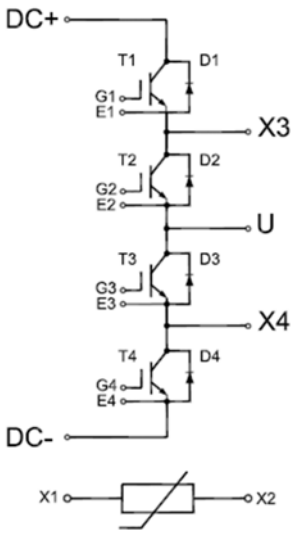
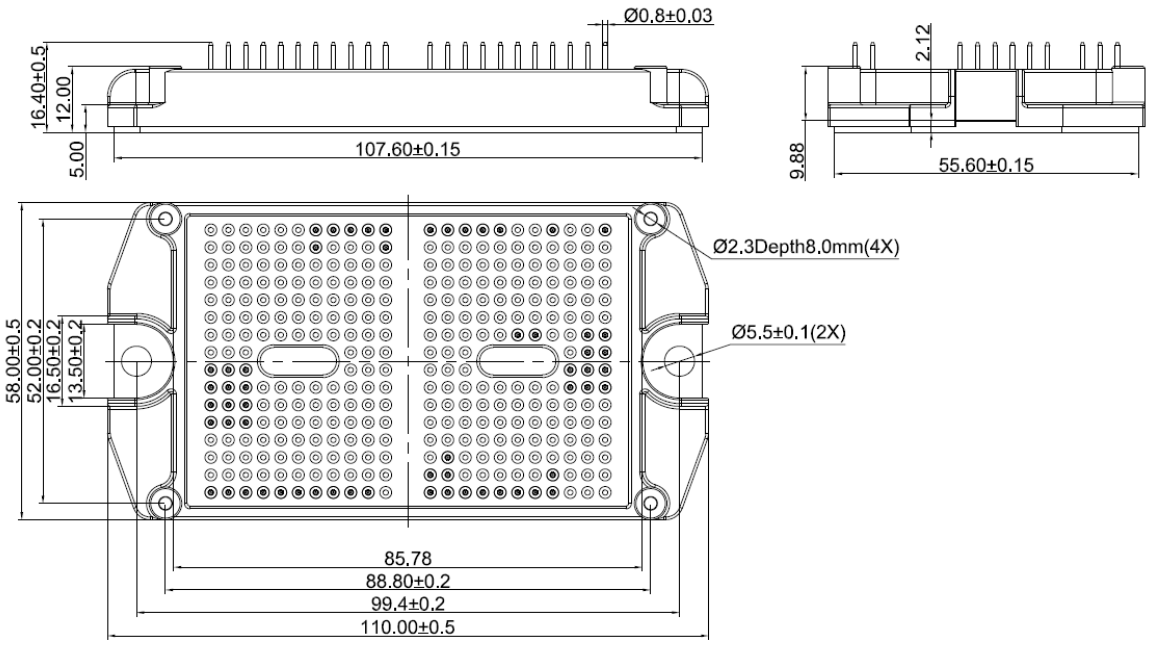


Fig.25 NTC Temperature Characteristics

Internal Circuit:



Package Outline (Unit: mm):



Date	Revision	Notes
09/03/2024	01	Initial Release

Announcements

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The datasheet with “REV.” + “Arabic numerals” is based on engineering data for initial reference purpose only.

The released datasheet would be issued with “REV.” + “alphabet characters”.