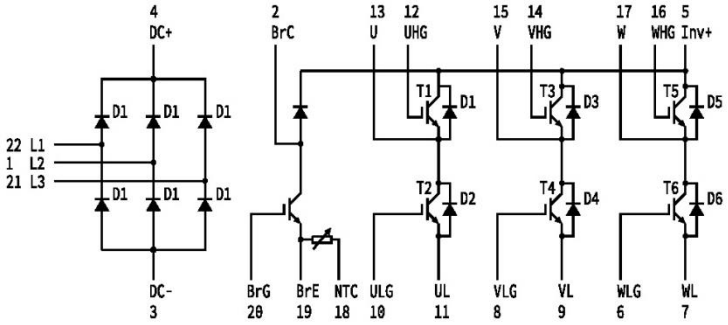
GT15PI120C6H

IGBT Module

Features：

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



Applications：

- Industrial Inverters

IGBT, Inverter

Maximum Rated Values (T_C=25℃ 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℃,	15	A
		T_C = 25℃	30	A
I_{CM}	Repetitive Peak Collector Current	T_J = 175℃	30	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C = 25℃ T_{Jmax}=175℃	165	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=1mA, V_{CE}=V_{GE}		5.0	5.7	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=15A, V_{GE}=15V	T_J=25℃		1.85	2.10	V
			T_J=125℃		2.20		V
			T_J=150℃		2.30		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℃				100	nA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=100kHz			0.96		nF
C_{oes}	Output Capacitance				0.12		nF
C_{res}	Reverse Transfer Capacitance				0.04		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=15A, R_{Gon}=36Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		70		ns
			T_J=125℃		72		
			T_J=150℃		72		
t_r	Rise Time		T_J=25℃		34		ns
			T_J=125℃		40		
			T_J=150℃		40		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=15A, R_{Goff}=36Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		118		ns
			T_J=125℃		136		
			T_J=150℃		136		
t_f	Fall Time		T_J=25℃		330		ns
			T_J=125℃		407		
			T_J=150℃		410		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=15A, R_{Gon}=36Ω, V_{GE}=±15V, di/dt=300A/μs (T_J=150℃) Inductive Load	T_J=25℃		1.51		mJ
			T_J=125℃		1.75		
			T_J=150℃		1.79		

E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=15A, R_{Goff}=36Ω, V_{GE}=±15V, du/dt=2150V/μs (T_J=150℃) Inductive Load	T_J=25℃		0.88		mJ
			T_J=125℃		1.17		
			T_J=150℃		1.27		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		85		nC
RBSOA	I_C=30A, V_{CC}=1050V, V_p=1200V, R_G=36Ω, V_{GE}=+15V to 0V, T_J=150℃			Trapezoid			
SCSOA	V_{CC}=600V, V_{GE}=±15V, R_{Gon}=36Ω, R_{Goff}=36Ω, t_p=10us, T_J=125℃				98		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-to-Case(IGBT Part, per leg)					0.92	℃/W

Diode, Inverter

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

V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	15	A
I_{FM}	Diode Maximum Forward Current	30	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F =15A	T_J = 25℃		1.90		V
			T_J = 125℃		2.00		
			T_J = 150℃		2.00		
I_{rr}	Peak Reverse Recovery Current	I_F=15A, -diF/dt =384A/μs, (T_J=125℃) -diF/dt =367A/μs, (T_J=150℃) V_{rr} = 600V, V_{GE} = -15V	T_J = 25℃		8.40		A
			T_J = 125℃		9.10		
			T_J = 150℃		9.70		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		1.34		μC
			T_J = 125℃		2.14		
			T_J = 150℃		2.33		
E_{rec}	Reverse Recovery Energy	I_F=15A, -diF/dt =384A/μs, (T_J=125℃) -diF/dt =367A/μs, (T_J=150℃) V_{rr} = 600V, V_{GE} = -15V	T_J = 25℃		0.37		mJ
			T_J = 125℃		0.70		
			T_J = 150℃		0.80		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case(Diode Part, Per Leg)					1.37	℃/W

IGBT, Brake-Chopper

Maximum Rated Values (T_C=25℃ 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℃,	15	A
		T_C = 25℃	30	A
I_{CM}	Repetitive Peak Collector Current	T_J = 175℃	30	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C = 25℃ T_{Jmax}=175℃	165	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=1mA, V_{CE}=V_{GE}		5.0	5.7	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=15A, V_{GE}=15V	T_J=25℃		1.85	2.10	V
			T_J=125℃		2.20		V
			T_J=150℃		2.30		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℃				100	nA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=100kHz			0.96		nF
C_{oes}	Output Capacitance				0.12		nF
C_{res}	Reverse Transfer Capacitance				0.04		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V, I_C=15A, R_{Gon}=36Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		70		ns
			T_J=125℃		72		
			T_J=150℃		72		
t_r	Rise Time		T_J=25℃		34		ns
			T_J=125℃		40		
			T_J=150℃		40		

$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V, I_C=15A, R_{Goff}=36Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		118		ns
			T_J=125℃		136		
			T_J=150℃		136		
t_f	Fall Time		T_J=25℃		330		ns
			T_J=125℃		407		
			T_J=150℃		410		
E_{on}	Turn-on Switching Loss	V_{CC}=600V, I_C=15A, R_{Gon}=36Ω, V_{GE}=±15V, di/dt=300A/μs (T_J=150℃) Inductive Load	T_J=25℃		1.51		mJ
			T_J=125℃		1.75		
			T_J=150℃		1.79		
E_{off}	Turn-off Switching Loss	V_{CC}=600V, I_C=15A, R_{Goff}=36Ω, V_{GE}=±15V, du/dt=2150V/μs (T_J=150℃) Inductive Load	T_J=25℃		0.88		mJ
			T_J=125℃		1.17		
			T_J=150℃		1.27		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		85		nC
RBSOA	I_C=30A, V_{CC}=1050V, V_p=1200V, R_G=36Ω, V_{GE}=+15V to 0V, T_J=150℃			Trapezoid			
SCSOA	V_{CC}=600V, V_{GE}=±15V, R_{Gon}=36Ω, R_{Goff}=36Ω, t_p=10us, T_J=125℃				98		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-to-Case(IGBT Part, per leg)					0.92	℃/W

Diode, Brake-Chopper

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

V_{RRM}	Repetitive Peak Reverse Voltage	1200	V
I_F	Diode Continuous Forward Current	15	A
I_{FM}	Diode Maximum Forward Current	30	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F =15A	T_J = 25℃		1.90		V
			T_J = 125℃		2.00		
			T_J = 150℃		2.00		

I_{rr}	Peak Reverse Recovery Current	I_F=15A, -diF/dt =384A/μs, (T_J=125℃) -diF/dt =367A/μs, (T_J=150℃) V_{rr} = 600V, V_{GE} = -15V	T_J = 25℃		8.40		A
			T_J = 125℃		9.10		
			T_J = 150℃		9.70		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		1.34		μC
			T_J = 125℃		2.14		
			T_J = 150℃		2.33		
E_{rec}	Reverse Recovery Energy	I_F=15A, -diF/dt =384A/μs, (T_J=125℃) -diF/dt =367A/μs, (T_J=150℃) V_{rr} = 600V, V_{GE} = -15V	T_J = 25℃		0.37		mJ
			T_J = 125℃		0.70		
			T_J = 150℃		0.80		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case(Diode Part, Per Leg)					1.37	℃/W

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

V_{RRM}	Repetitive Peak Reverse Voltage	T_J =25℃	1800	V
I_{FRMSM}	Maximum RMS Forward Current per Chip	T_J =80℃	20	A
I_{RMSM}	Maximum RMS Current at Rectifier Output	T_J =80℃	30	A
I_{FSM}	Surge Current @t_p=10 ms	T_J =25℃	300	A
		T_J =150℃	250	
I^2t	I^2t - value	T_J =25℃	450	A^2s
		T_J =150℃	300	

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

V_F	Forward Voltage	I_F = 15 A	T_J =25℃		1.05		V
			T_J =150℃		1.00		
I_R	Reverse Current	V_R=1600V	T_J =25℃			50	uA
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case(Diode Part, Per Leg)					1.11	℃/W

Internal NTC-Thermistor Characteristics

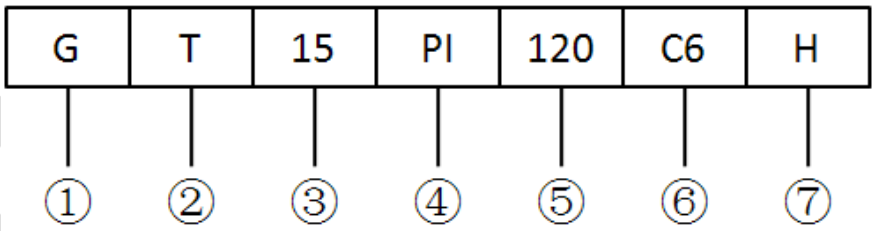
R_{25}	T_C =25℃	22.7		kΩ
△R/R	T_C =100℃，R_{100} =1481Ω		±5	%
P_{25}	T_C =25℃	5		mW
$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$	3950		K
$B_{25/80}$	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$	4000		K

Module

Symbol	Description		Min	Typ	Max	Unit
V_{iso}	Isolation Voltage (All Terminals Shorted)	f = 50Hz, 1minute	2500			V
T_J	Maximum Junction Temperature				175	℃
T_{JOP}	Maximum Operating Junction Temperature Range		-40		+150	℃
T_{stg}	Storage Temperature		-40		+125	℃
CTI	Comparative Tracking Index		200			
$R_{\theta CS}$	Case-To-Sink Thermally (Conductive Grease Applied)				0.13	℃/W
T	Mounting Screw:M4		1.0		1.5	N·m
G	Weight			39		g

Ordering Information Table

Device code



① - IGBT Module
② - Field Stop Trench
③ - Rated Current (15=15A)
④ - Circuit Configuration (Power Integrated)
⑤ - Rated Voltage (120=1200V)
⑥ - Package Type
⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

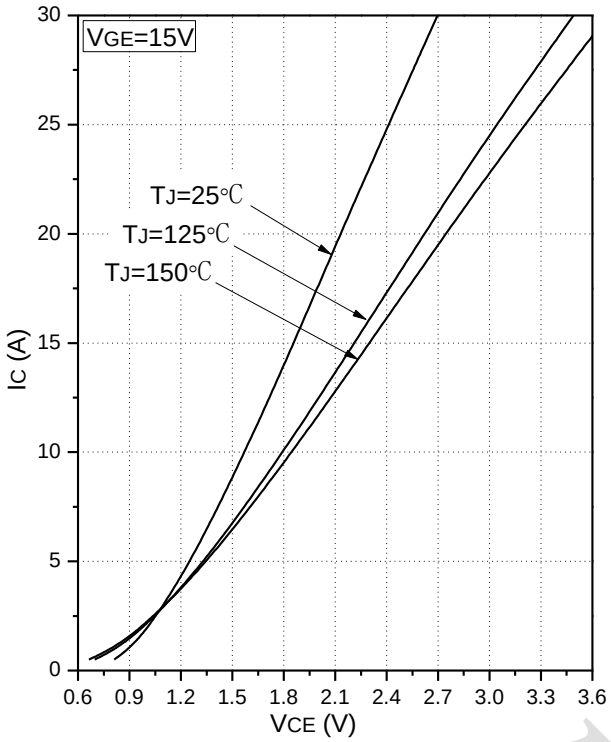


Fig.1 Typical Saturation Voltage Characteristics

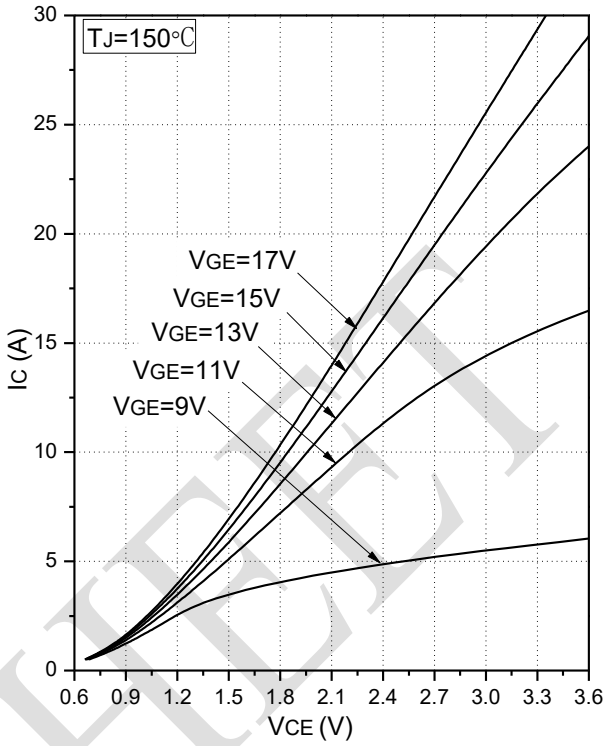


Fig.2 Typical Output Characteristics

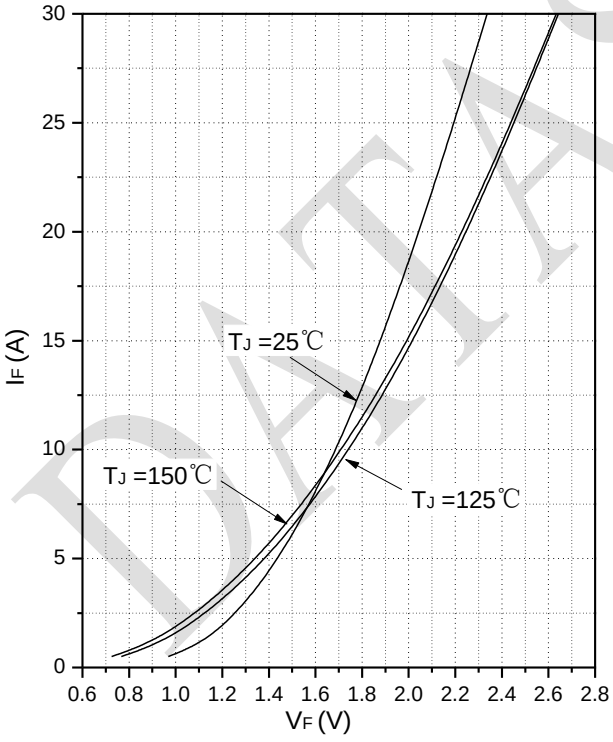


Fig.3 Forward Characteristics of Diode

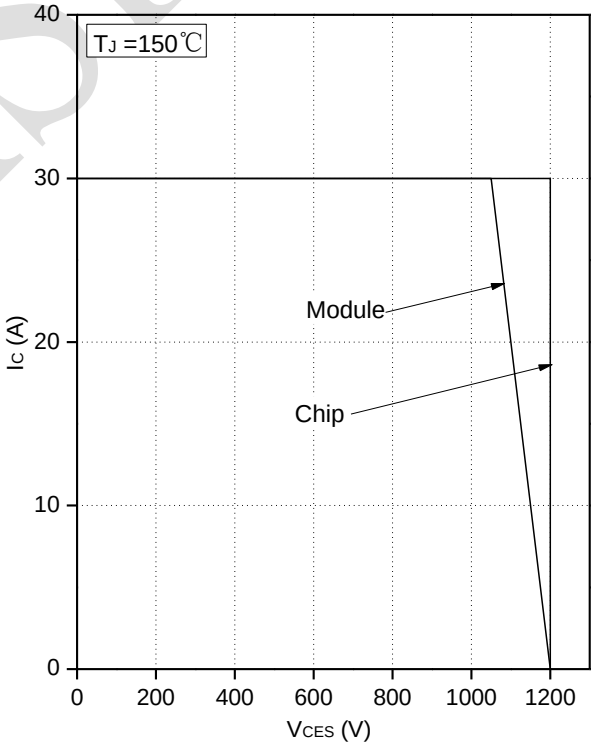


Fig.4 Reverse Bias Safe Operation Area (RBSOA)

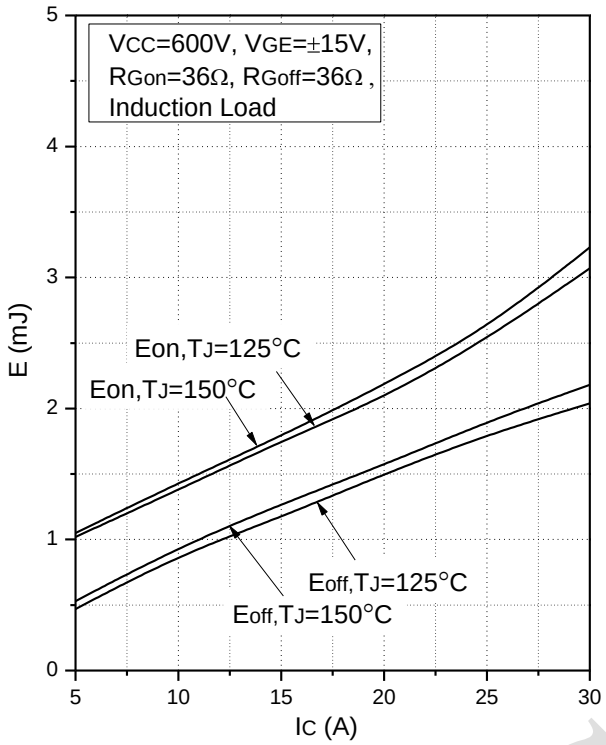


Fig.5 Typical Switching Loss vs. Collector Current

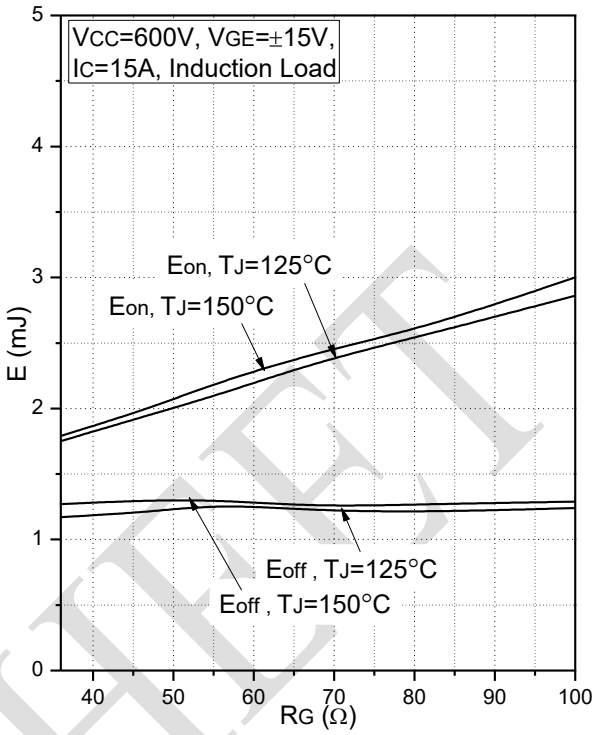


Fig.6 Typical Switching Loss vs. Gate Resistance

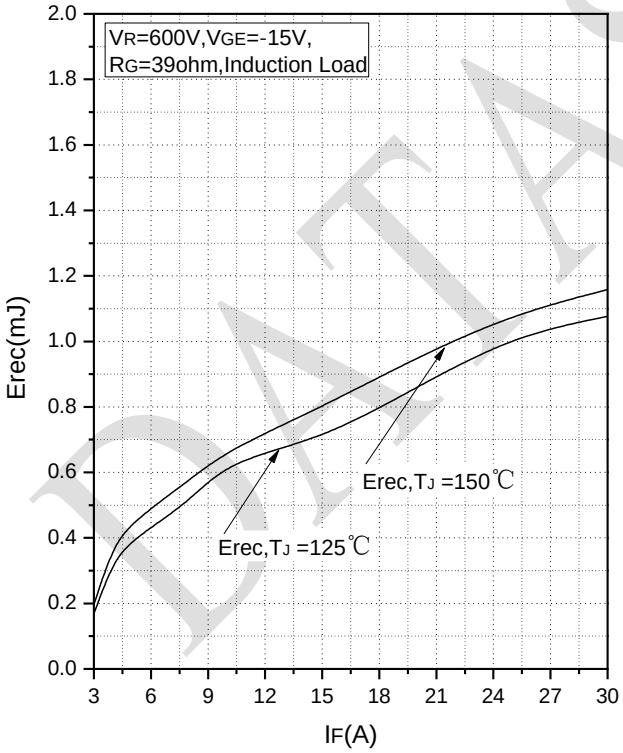


Fig.7 Typical Switching Loss vs. Forward Current

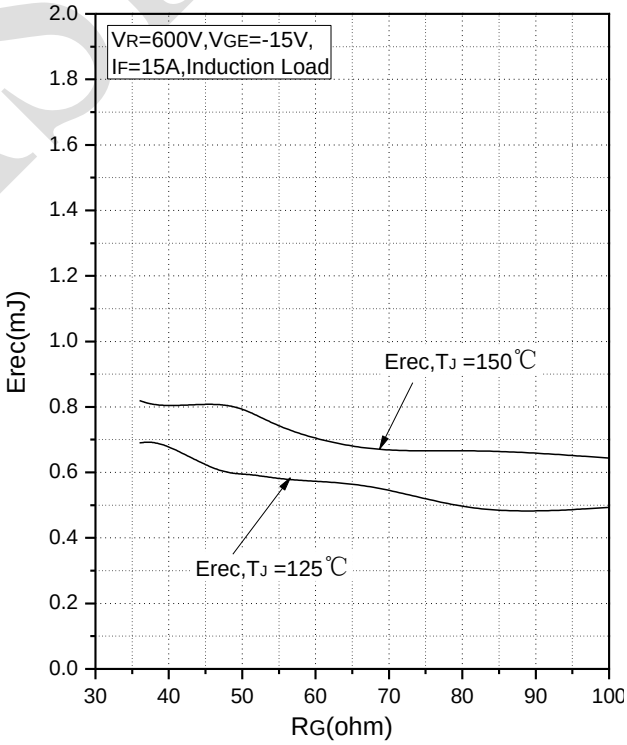


Fig.8 Typical Switching Loss vs. Gate Resistance

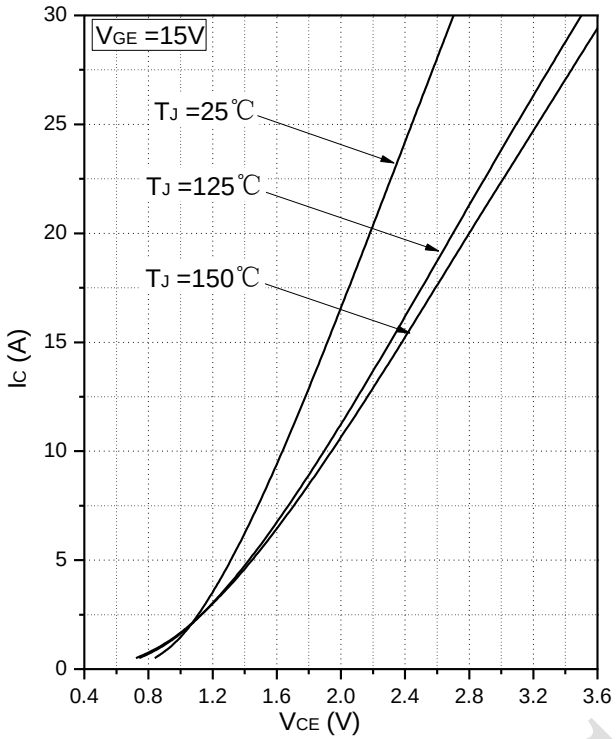


Fig.9 Typical Saturation Voltage Characteristics (Brake-Chopper)

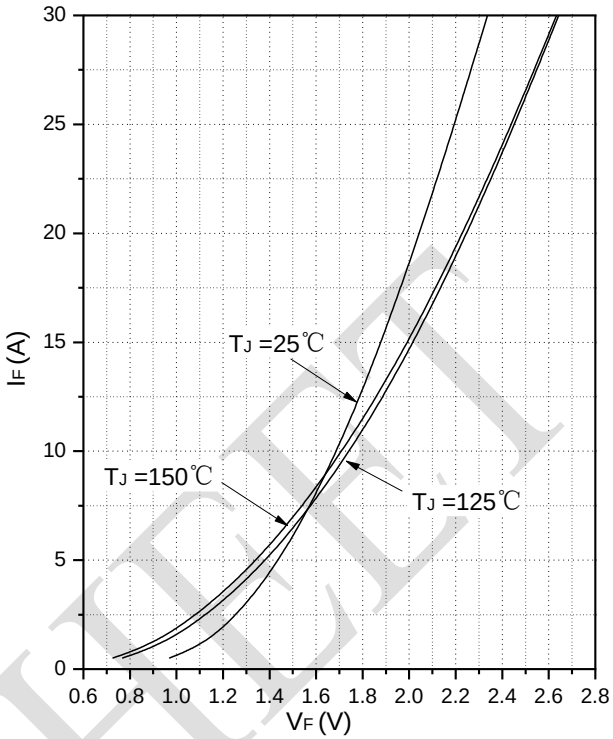


Fig.10 Forward Characteristics of Diode (Brake-Chopper)

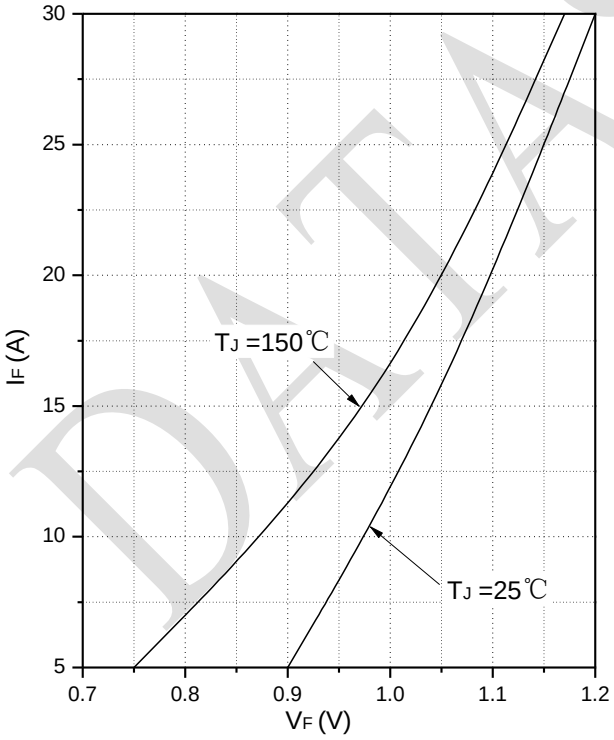


Fig.11 Forward Characteristics of Diode (Rectifier)

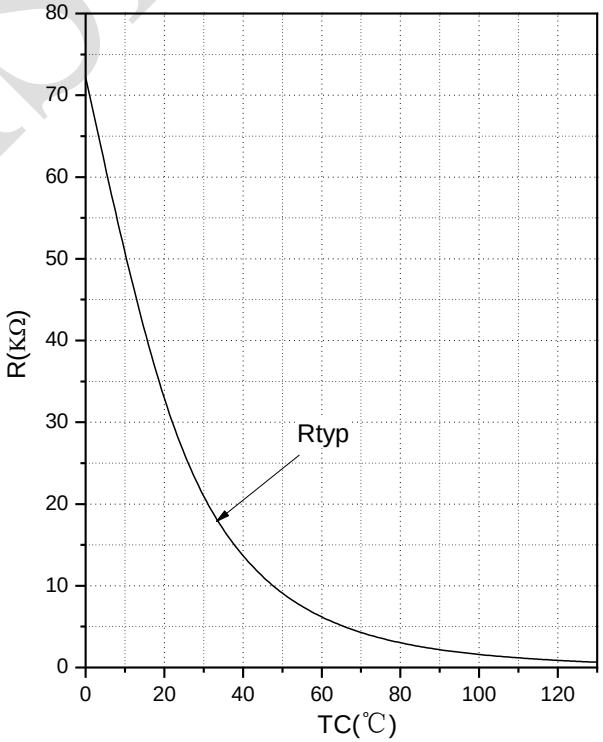


Fig.12 NTC Temperature Characteristics

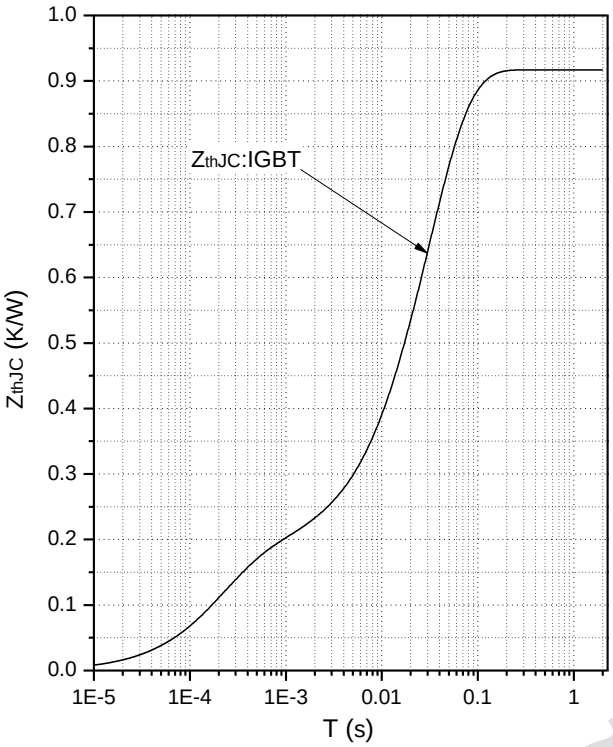


Fig.13 Transient Thermal Impedance IGBT

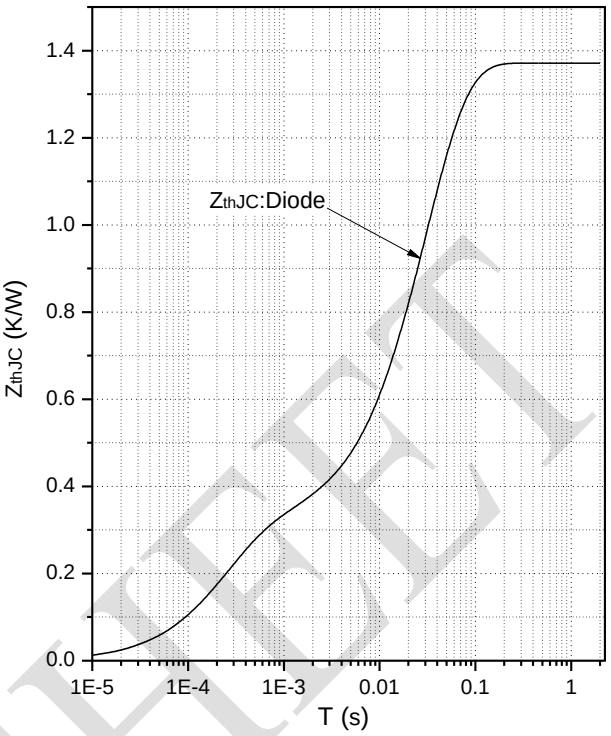
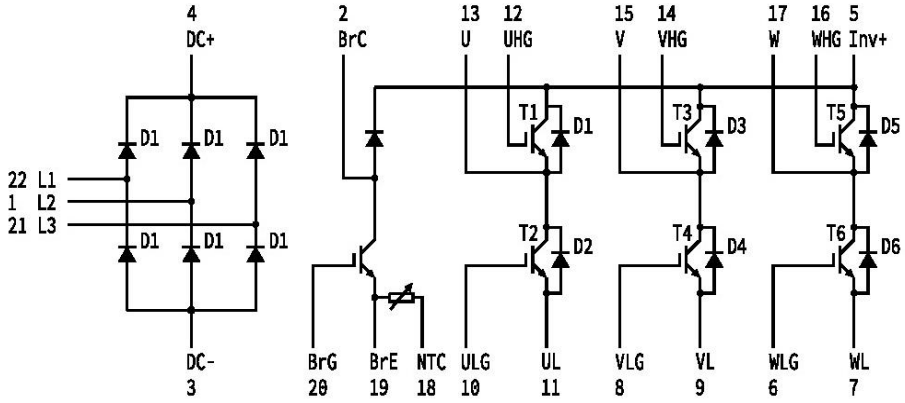
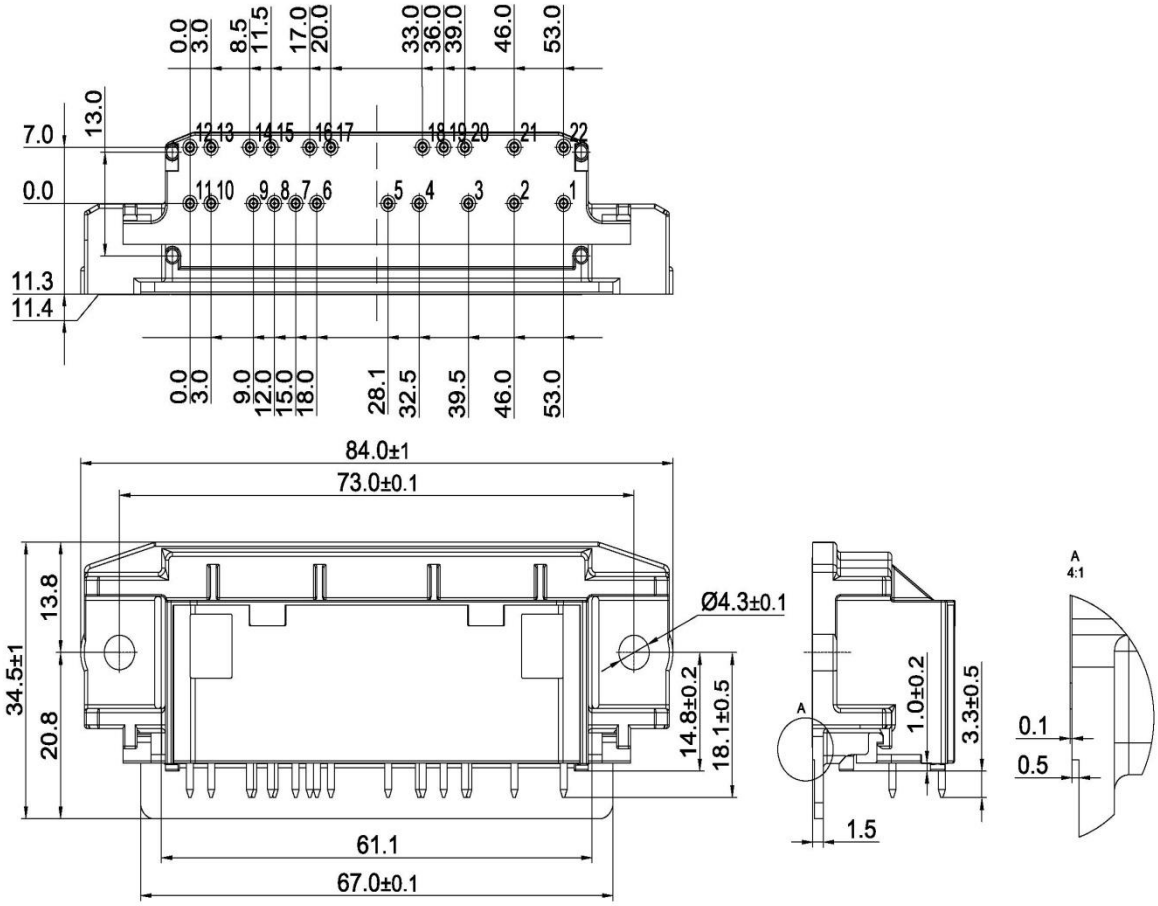


Fig.14 Transient Thermal Impedance Diode

Internal Circuit



Package Outline (Unit: mm):



Date	Revision	Notes
11/20/2020	01	Initial Release
09/29/2021	02	Revised I_R of Rectifier Doide
10/09/2021	03	Add Capacitance data of IGBT
11/22/2021	04	Updated Package Outline
11/29/2021	05	Revised Package Outlone
01/29/2022	06	Revised the I_F-Erec graph
02/25/2022	07	Updated the I_F-Erec graph
01/17/2023	A	Final Version

Announcement

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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”.