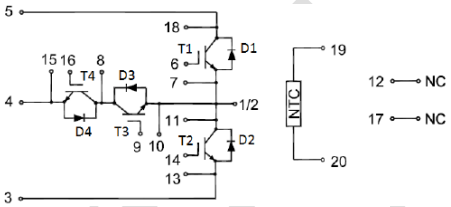
GT150TT120A8H

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)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

Applications：

- 3-Level-Applications
- Motor Drives
- Solar Applications
- UPS Systems

IGBT, T1/T2

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℃	150	A
		T_C = 25℃	300	A
I_{CM}	Peak Collector Current Repetitive	T_J = 175℃	300	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (IGBT)	T_C = 25℃ T_{Jmax}=175℃	1085	W

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

Static Characteristics

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C = 4 mA, V_{CE} = V_{GE}		5.0	5.7	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C =150A, V_{GE} = 15V	T_J = 25℃		1.70	2.00	V
			T_J = 125℃		1.90		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℃				400	nA
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V, f ＝1MHz			9.97		nF
C_{oes}	Output Capacitance				0.94		nF
C_{res}	Reveres Transfer Capacitance				0.64		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 600V, I_C =150A, R_{Gon} =3.3Ω, V_{GE} = ±15V, Inductive Load	T_J = 25℃		245		ns
			T_J = 125℃		234		
t_r	Rise Time		T_J = 25℃		84		ns
			T_J = 125℃		85		
$t_{d(off)}$	Turn-off Delay Time	V_{CC} = 600V, I_C =150A, R_{Goff} =3.3Ω, V_{GE} = ±15V, Inductive Load	T_J = 25℃		263		ns
			T_J = 125℃		271		
t_f	Fall Time		T_J = 25℃		178		ns
			T_J = 125℃		213		
E_{on}	Turn-on Switching Loss	V_{CC} = 600V, I_C =150A, R_{Gon} =3.3Ω, V_{GE} = ±15V, di/dt=1492A/μs(T_J=125℃), Inductive Load	T_J = 25℃		10.1		mJ
			T_J = 125℃		12.5		
E_{off}	Turn-off Switching Loss	V_{CC} = 600V, I_C =150A, R_{Goff} =3.3Ω, V_{GE} = ±15V, du/dt=4367V/μs(T_J=125℃), Inductive Load	T_J = 25℃		8.4		mJ
			T_J = 125℃		13.5		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J = 25℃		728		nC
$R_{g\ internal}$	Internal Gate Resistor		T_J=25℃		5		Ω
RBSOA	RBSOA	I_C=300A, V_{CC}=1050V, Vp=1200V, R_{Goff} = 3.3Ω, V_{GE}=+15V to 0V, T_J =150°C		Trapezoid			
SC data	Vcc=600V, tp=10us, VGE=+/-15V, R_{Gon}=4.7ohm, R_{Goff}=4.7ohm, T_J =25℃				775		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case					0.138	℃/W

Diode, D3/D4

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

V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	150	A
I_{FM}	Peak FWD Current Repetitive	300	A

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

V_{FM}	Forward Voltage	I_F=150A	T_J=25℃		1.60		V
			T_J=125℃		1.70		
			T_J=150℃		1.70		
trr	Reverse Recovery Time	I_F=150A, -diF/dt =1200A/μs(T_J=150℃), V_R=300V, V_{GE}=-15V	T_J=25℃		0.10		μs
			T_J=125℃		0.15		
			T_J=150℃		0.16		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		65.6		A
			T_J=125℃		78.1		
			T_J=150℃		82.8		
Q_{rr}	Reverse Recovery Charge		T_J=25℃		4.07		μC
			T_J=125℃		7.48		
			T_J=150℃		8.77		
E_{rec}	Reverse Recovery Energy		T_J=25℃		0.30		mJ
			T_J=125℃		1.42		
			T_J=150℃		1.72		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case (per Leg)					0.308	℃/W

IGBT, T3/T4

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

V_{CES}	Collector-Emitter Blocking Voltage		650	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C=100℃	150	A
		T_C=25℃	260	A
I_{CM}	Peak Collector Current Repetitive	T_J=175℃	300	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (IGBT)	T_C=25℃ T_{Jmax}=175℃	806	W

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

Static Characteristics

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=2mA, V_{CE}=V_{GE}		5.0	6.0	6.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=150A, V_{GE}=15V	T_J=25℃		1.55	1.80	V
			T_J=125℃		1.70		V
			T_J=150℃		1.70		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=1MHz			12.17		nF
C_{oes}	Output Capacitance				0.56		nF
C_{res}	Reveres Transfer Capacitance				0.40		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=300V, I_C=150A, R_{Gon}=4.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		0.21		μs
			T_J=125℃		0.21		
			T_J=150℃		0.21		
t_r	Rise Time		T_J=25℃		0.10		μs
			T_J=125℃		0.10		
			T_J=150℃		0.10		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=300V, I_C=150A, R_{Goff} =4.7Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		0.22		μs
			T_J=125℃		0.22		
			T_J=150℃		0.22		
t_f	Fall Time		T_J=25℃		0.11		μs
			T_J=125℃		0.14		
			T_J=150℃		0.15		
E_{on}	Turn-on Switching Loss	V_{CC}=300V, I_C=150A, R_{Gon}=4.7Ω, V_{GE}=±15V, di/dt =1200A/μs(TJ=150℃) Inductive Load	T_J=25℃		1.22		mJ
			T_J=125℃		1.64		
			T_J=150℃		1.67		
E_{off}	Turn-off Switching Loss	V_{CC}=300V, I_C=150A, R_{Goff}=4.7Ω, V_{GE}=±15V, du/dt =3600V/μs(TJ=150℃) Inductive Load	T_J=25℃		2.95		mJ
			T_J=125℃		4.35		
			T_J=150℃		4.65		
Q_g	Total Gate Charge	V_{GE}=-15V…+15V	T_J = 25℃		0.89		μC
RBSOA	I_C=300A, V_{CC}=600V, Vp=650V, R_{Goff}=4.7Ω, V_{GE}=+15V to 0V, T_J=150°C			Trapezoid			
SCSOA	V_{CC}=300V, V_{GE}=15V, T_J=150℃			10			μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case (per Leg)					0.186	℃/W

Diode, D1/D2

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

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

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F = 150A	T_J = 25℃		2.05		V
			T_J = 125℃		2.10		
t_{rr}	Reverse Recovery Time	I_F＝150A, -diF/dt =1200A/μs(T_J=125℃), V_{rr} = 600V, V_{GE} = -15V	T_J = 25℃		267		ns
			T_J = 125℃		415		
I_{rr}	Peak Reverse Recovery Current		T_J = 25℃		78		A
			T_J = 125℃		98		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		9.18		μC
			T_J = 125℃		17.9		
E_{rec}	Reverse Recovery Energy		T_J = 25℃		3.2		mJ
			T_J = 125℃		6.4		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case					0.212	℃/W

Internal NTC-Thermistor Characteristics

R_{25}	T_C =25℃	5		kΩ
△R/R	T_C =100℃， R_{100} =481Ω		±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

Module

Symbol	Description		Min	Typ	Max	Unit
V_{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f = 50Hz, 1minute	2500			V
Internal Isolation				Al2O3		
Material of Module Base plate				Copper		
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)				0.02	℃/W
M	Power Terminals Screw:M6		3.0		6.0	N·m
M	Mounting Screw:M5		3.0		6.0	N·m
G	Weight			390		g

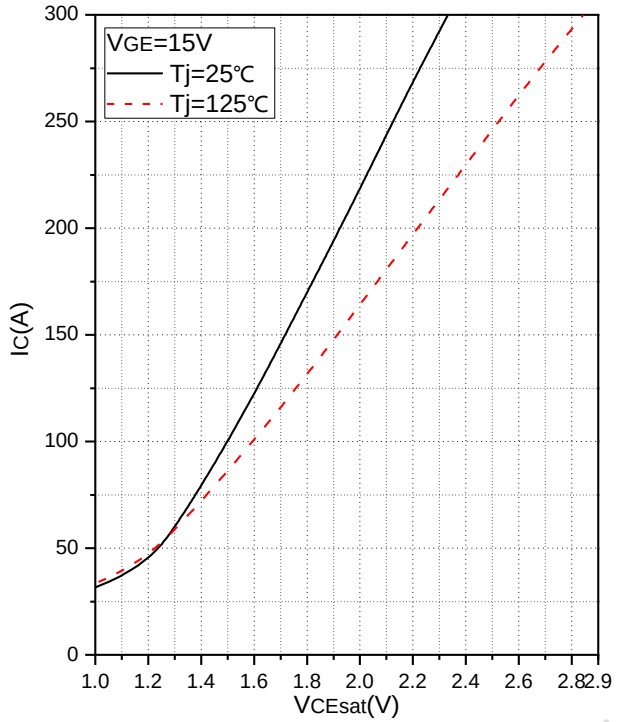


Fig.1 Typical Saturation Voltage Characteristics (IGBT T1/T2)

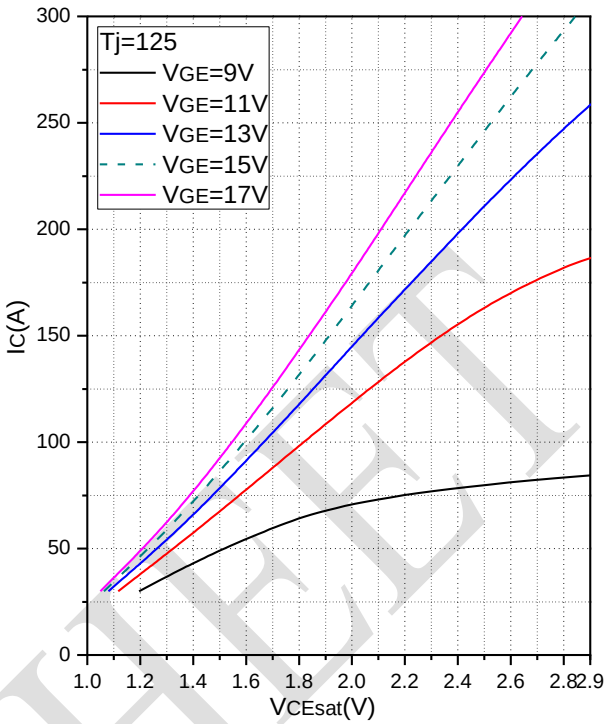


Fig.2 Typical Output Characteristics (IGBT T1/T2)

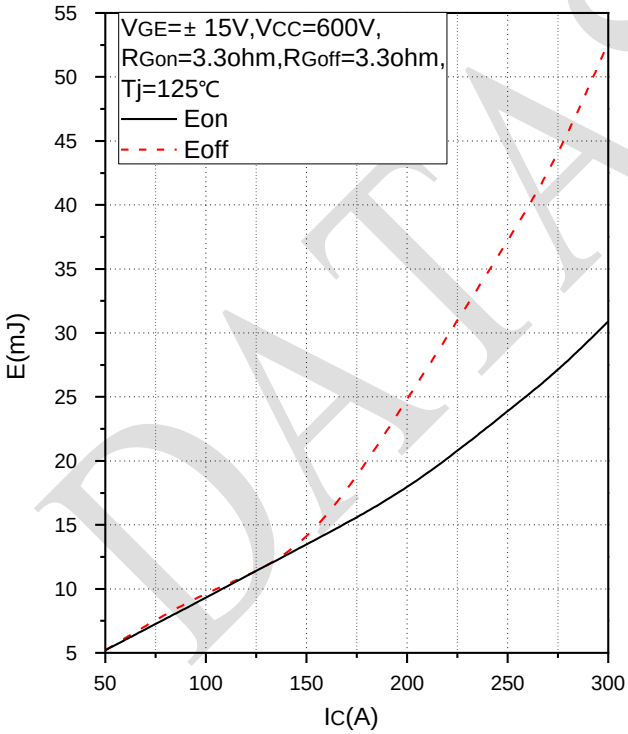


Fig.3 Typical Switching Loss vs. Collector Current (IGBT T1/T2)

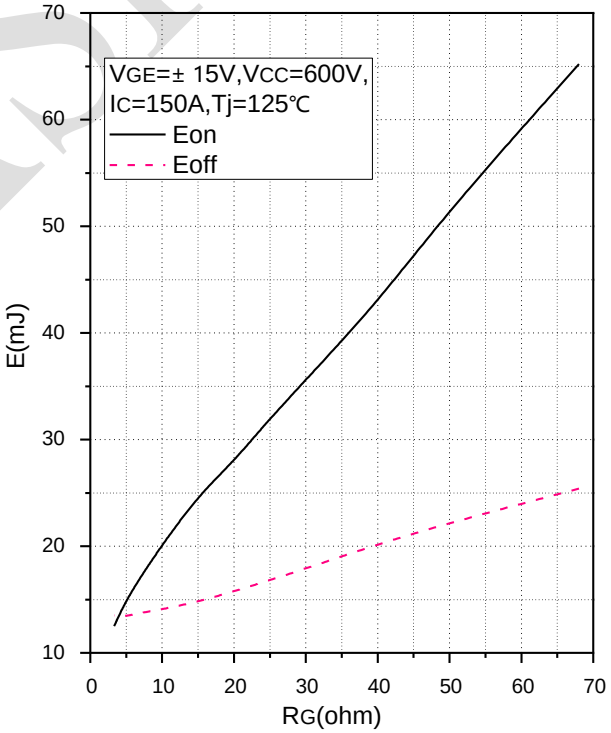


Fig.4 Typical Switching Loss vs. Gate Resistance (IGBTT1/T2)

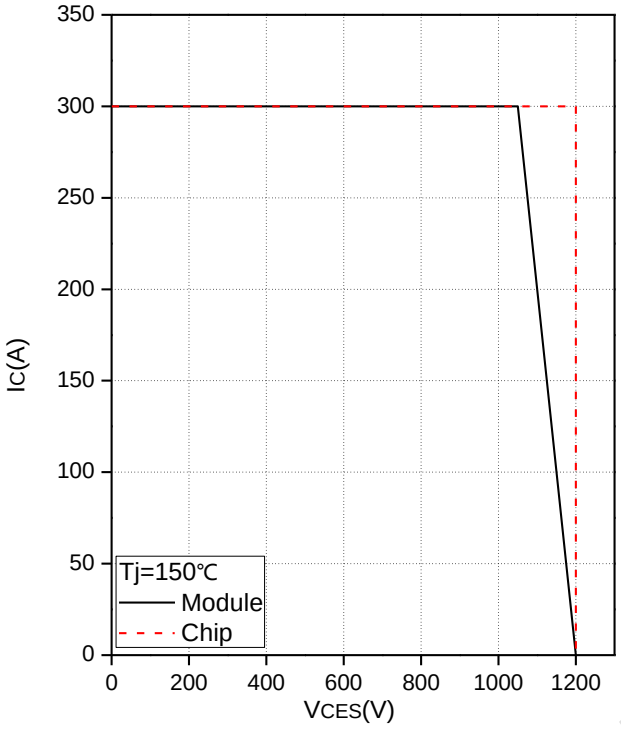


Fig.5 Reverse Bias Safe Operation Area (RBSOA)
(IGBT T1/T2)

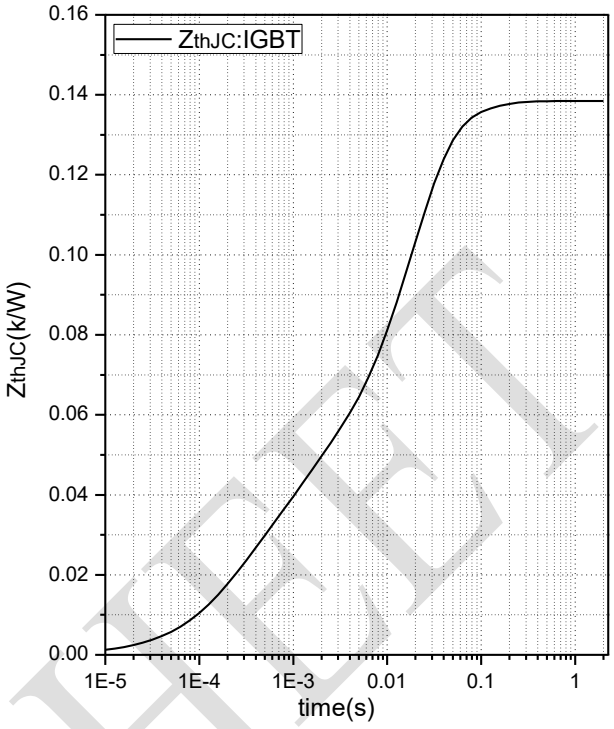


Fig.6 Transient Thermal Impedance
(IGBT T1/T2)

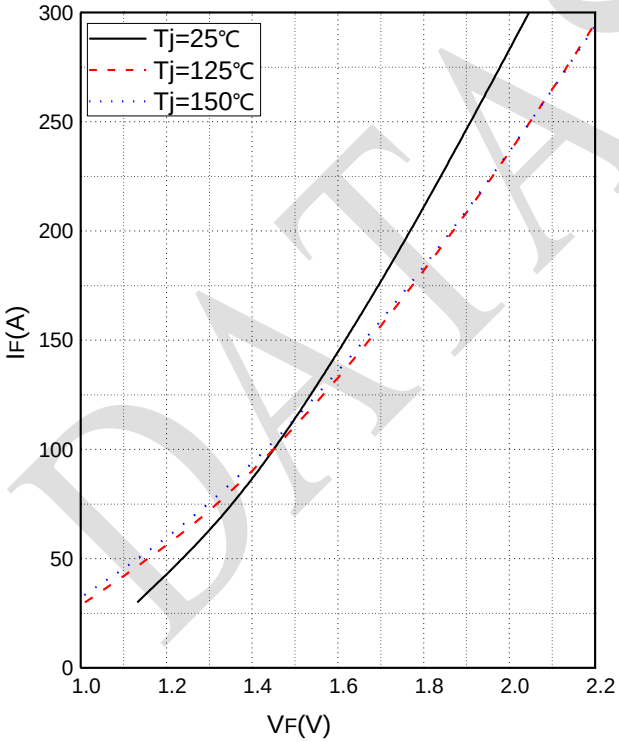


Fig.7 Forward Characteristics of Diode
(Diode D3/D4)

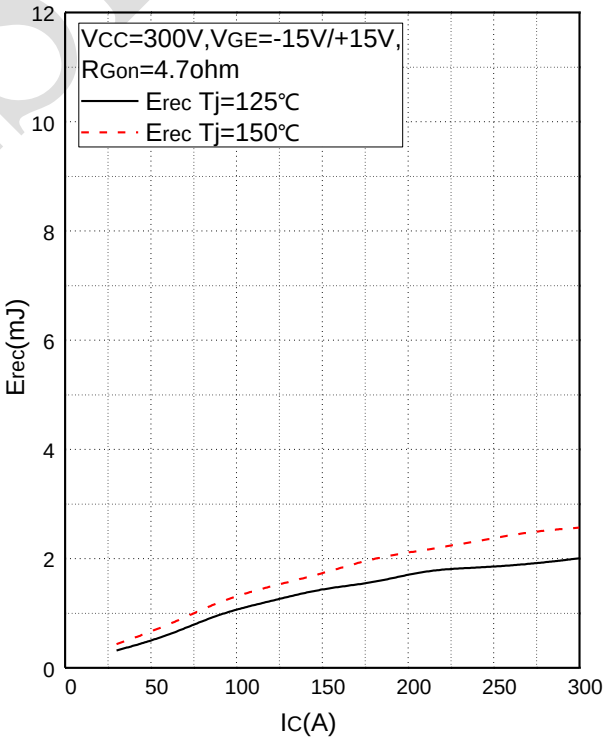


Fig.8 Typical Switching Loss vs. Collector Current
(Diode D3/D4)

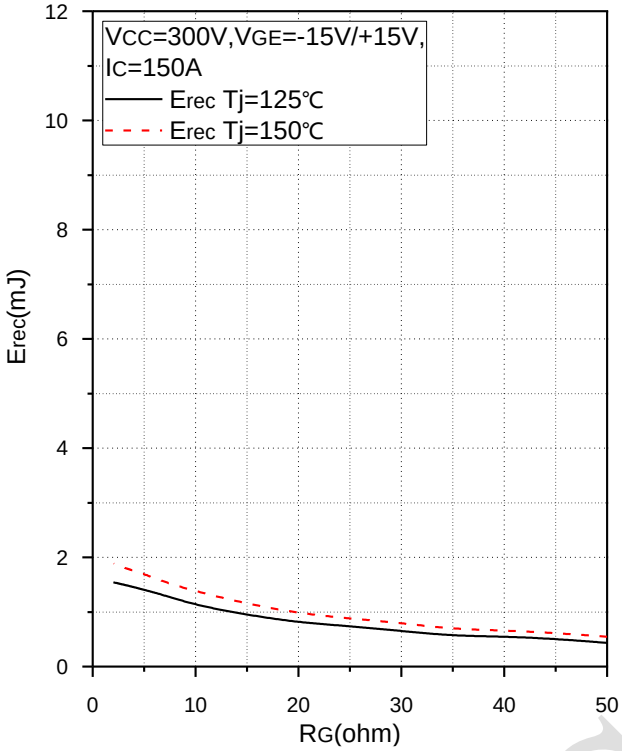


Fig.9 Typical Switching Loss vs. Gate Resistance
(Diode D3/D4)

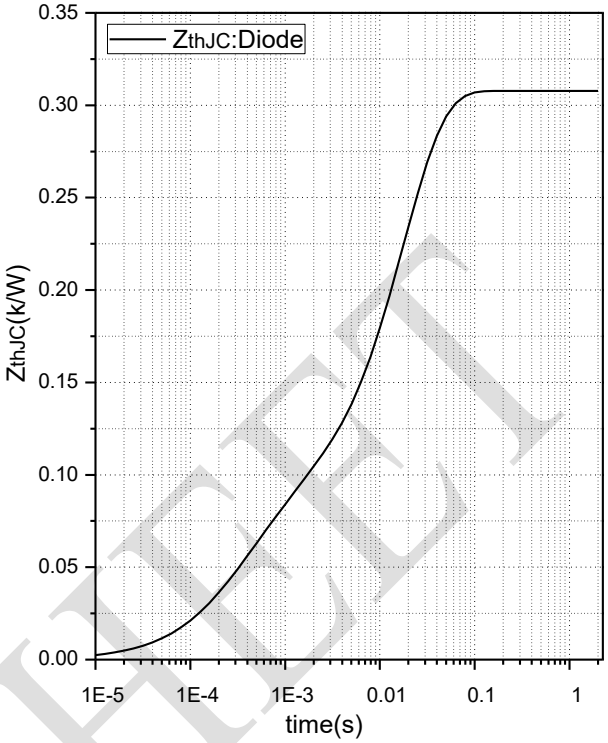


Fig.10 Transient Thermal Impedance
(Diode D3/D4)

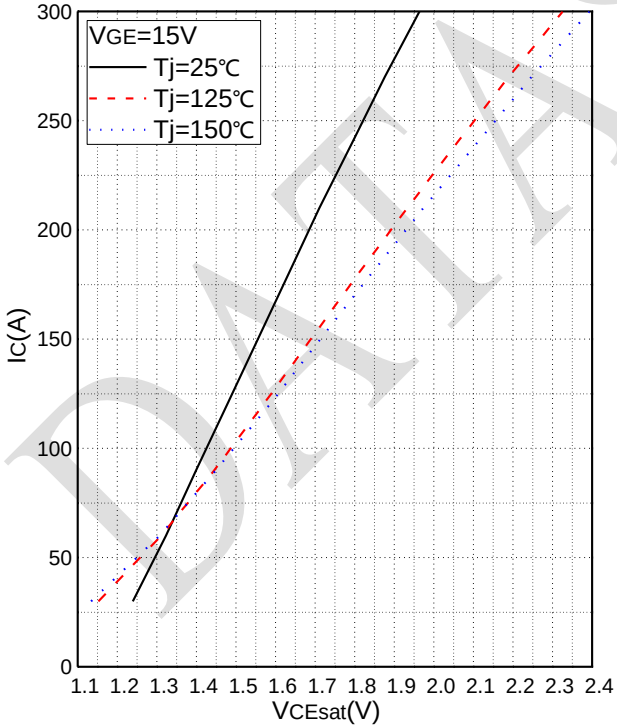


Fig.11 Typical Saturation Voltage Characteristics
(IGBT T3/T4)

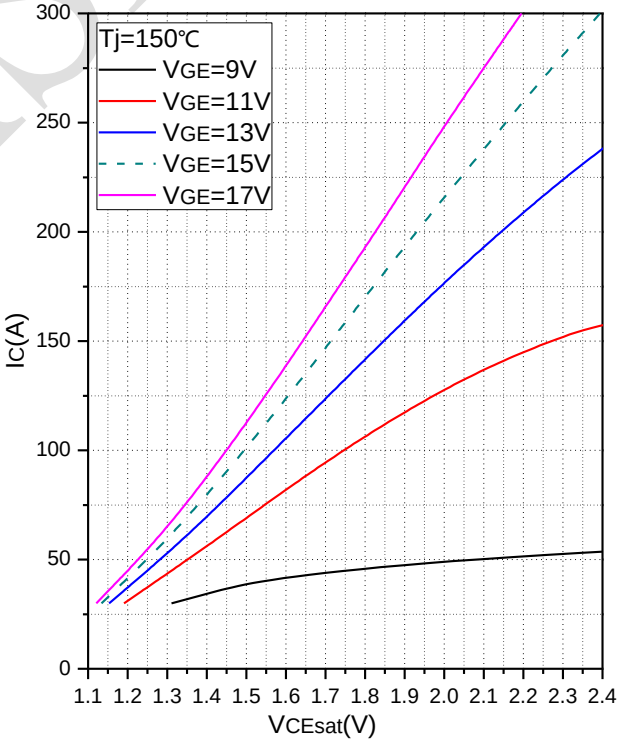


Fig.12 Typical Output Characteristics
(IGBT T3/T4)

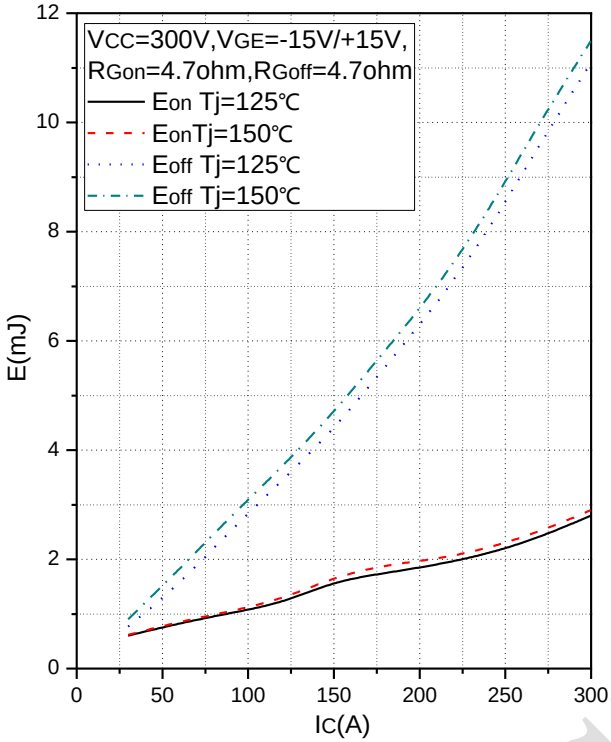


Fig.13 Typical Switching Loss vs. Collector Current (IGBT T3/T4)

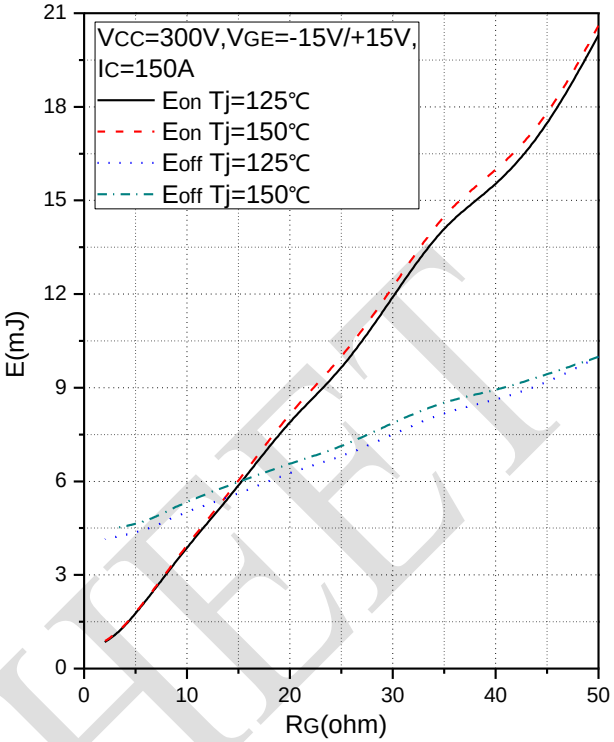


Fig.14 Typical Switching Loss vs. Gate Resistance (IGBT T3/T4)

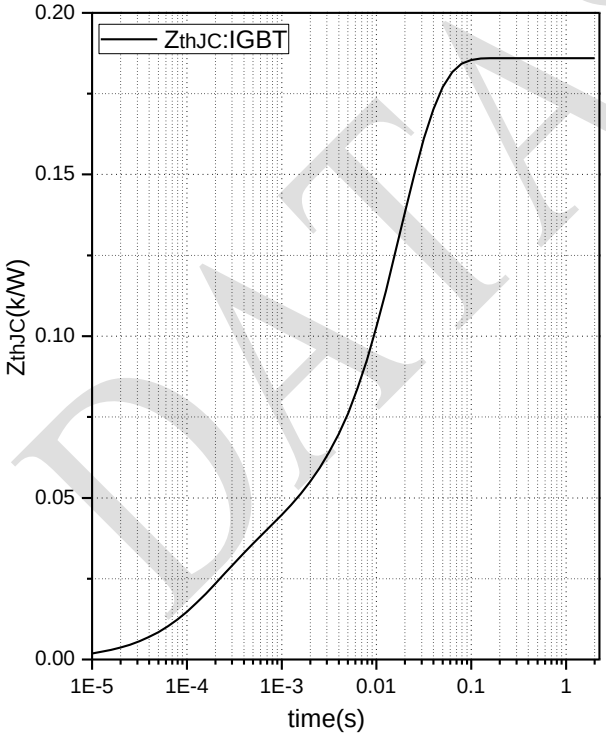


Fig.15 Transient Thermal Impedance (IGBT T3/T4)

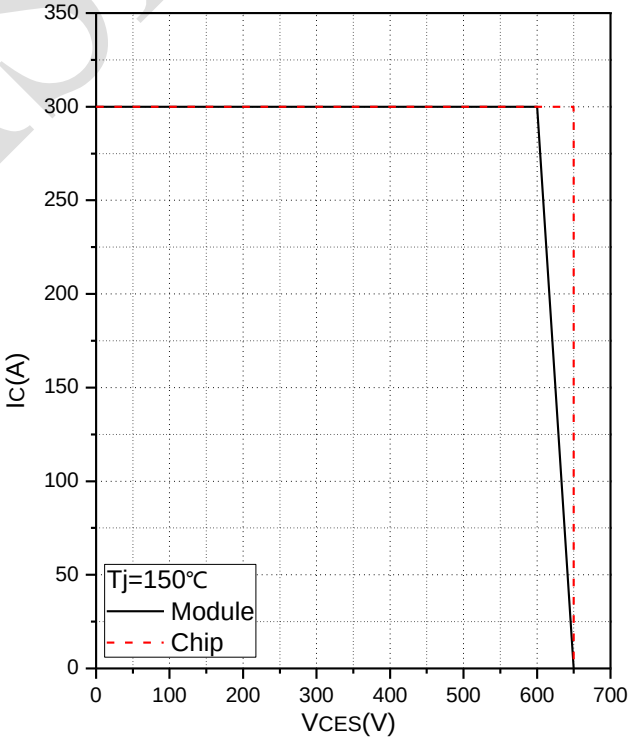


Fig.16 Reverse Bias Safe Operation Area (RBSOA) (IGBT T3/T4)

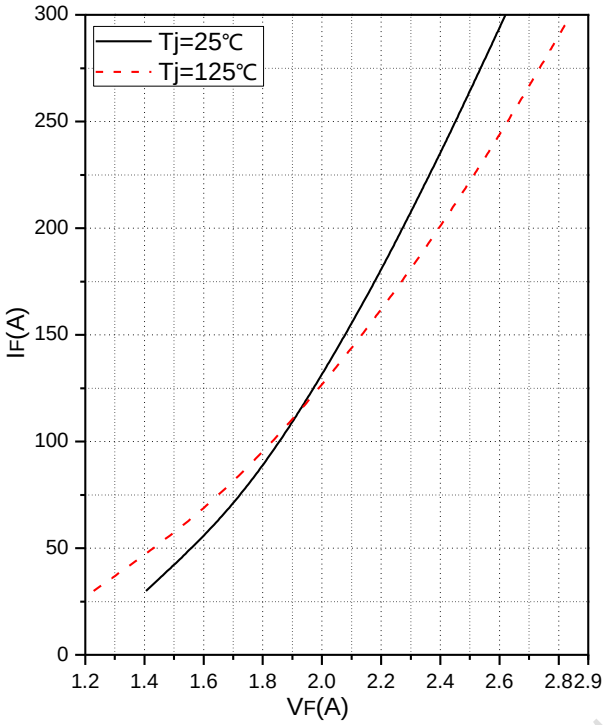


Fig.17 Forward Characteristics
(Diode D1/D2)

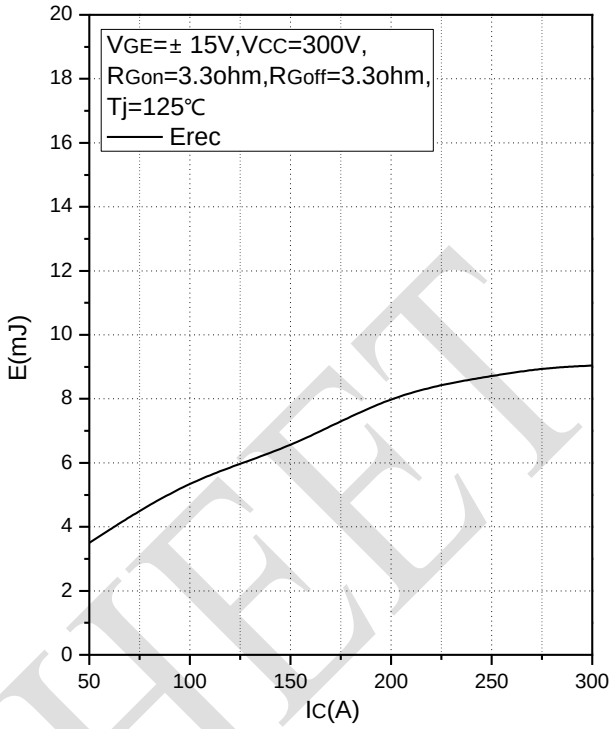


Fig.18 Typical Switching Loss vs. Collector Current
(Diode D1/D2)

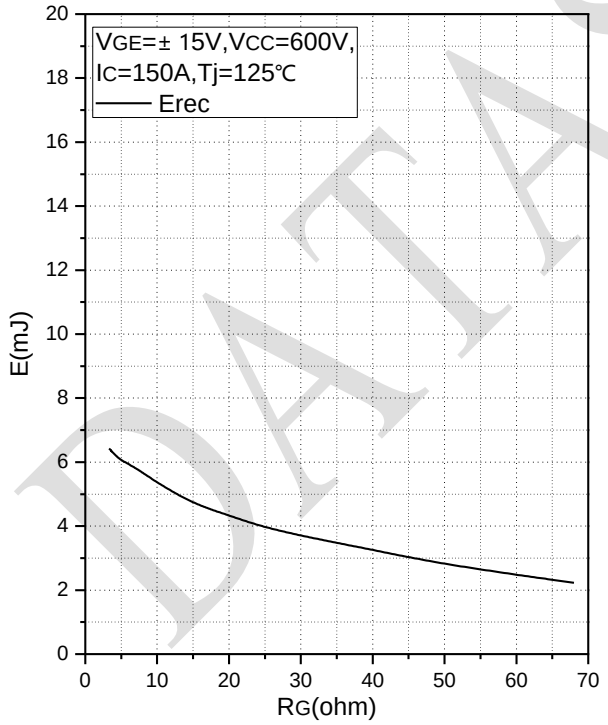


Fig.19 Typical Switching Loss vs. Gate Resistance
(Diode D1/D2)

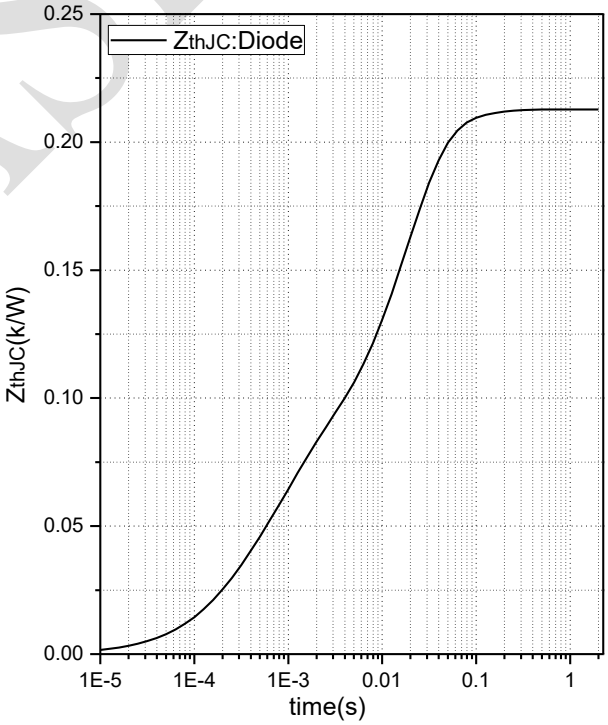


Fig.20 Transient Thermal Impedance
(Diode D1/D2)

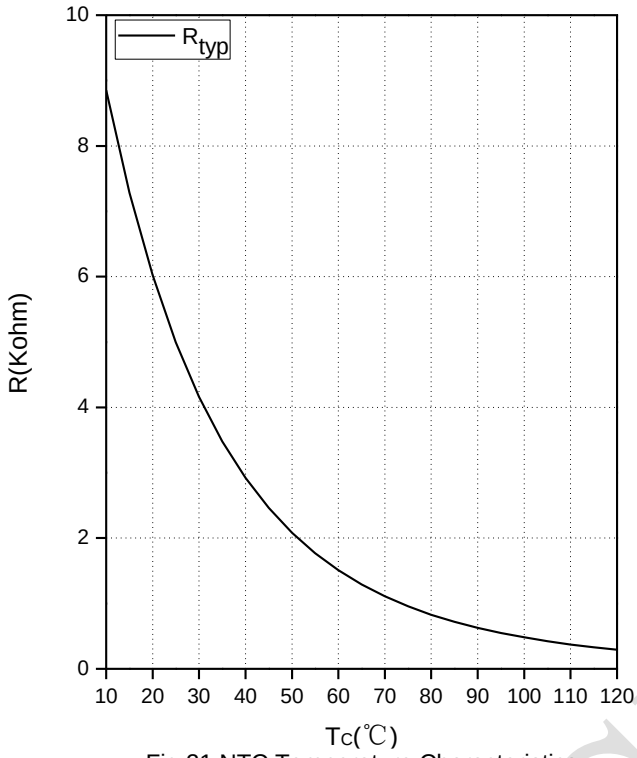
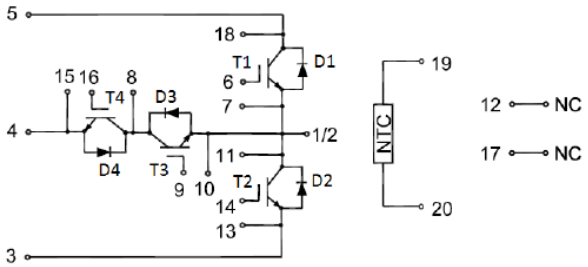
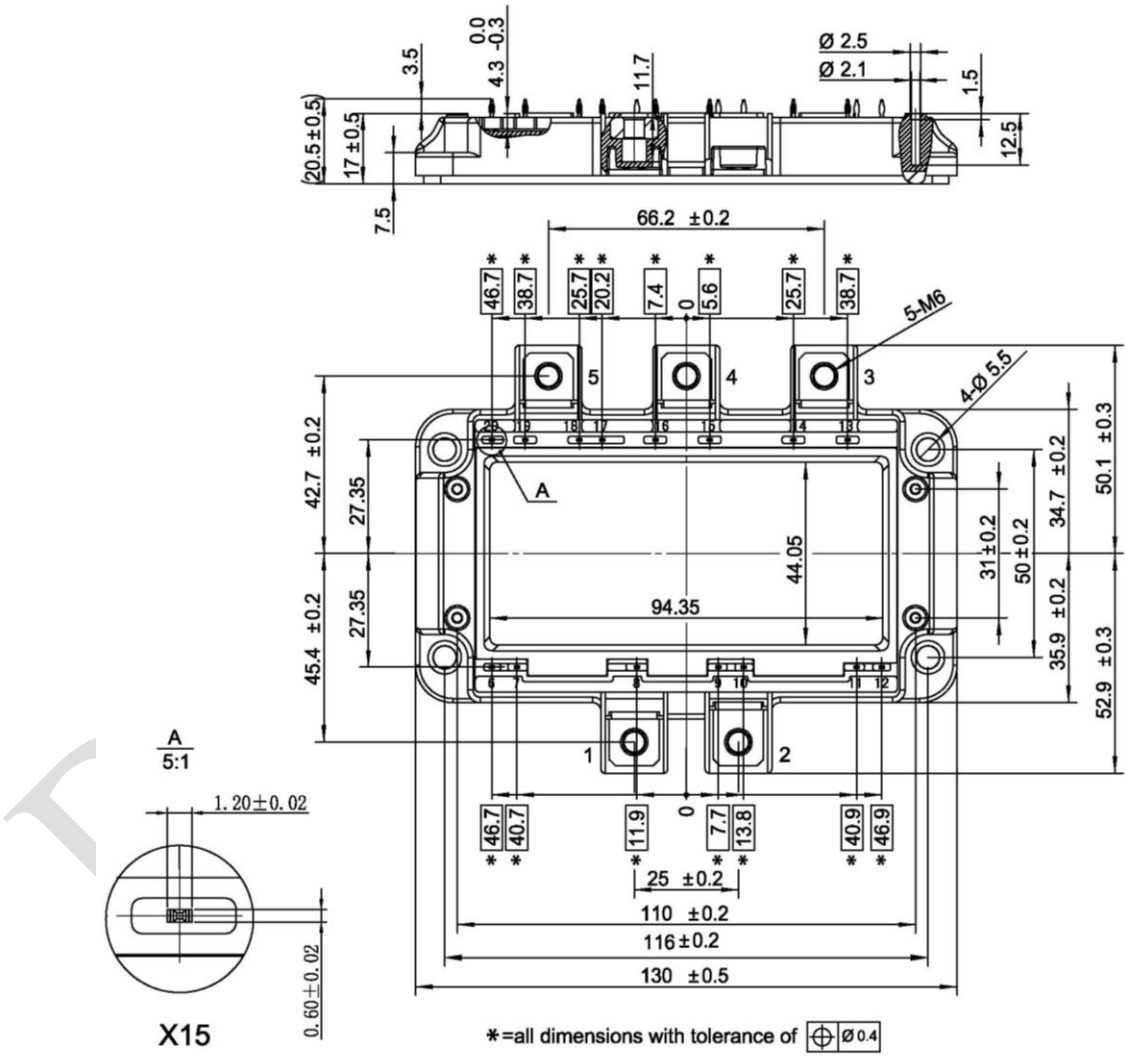


Fig.21 NTC Temperature Characteristics

Internal Circuit:



Package Outline (Unit: mm):



Date	Revision	Notes
05/20/2020	01	Initial Release

Announcement

Information in this document is believed to be accurate and reliable. However, NJSME does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

Right to Make Changes

NJSME reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

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”.