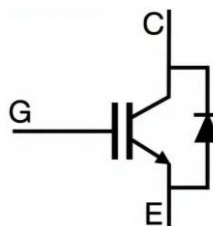


SMGW40H120ADB 1200V 40A Field Stop Trench IGBT

Features:

- Low $V_{CE(sat)}$ Trench IGBT Technology
- Low Switching Loss
- Low Stray Inductance
- Maximum Junction Temperature $-40\sim+175^{\circ}\text{C}$
- Positive $V_{CE(sat)}$ Temperature Coefficient



Applications:

- High-power Converter
- Industrial UPS
- Motor Driver
- Welding Machine
- Solar Inverter

Type	Package	Marking
SMGW40H120ADB	TO247-3	SMGW40H120ADB

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

Symbol	Description	Conditions	Values	Units
V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current, limited by T_{vjmax}	$T_C=100^{\circ}\text{C}$	40	A
		$T_C=25^{\circ}\text{C}$	80	A
I_{CM}	Pulse Collector Current, t_p limited by T_{vjmax}		120	A
I_F	Diode forward current, limited by T_{vjmax}	$T_C=100^{\circ}\text{C}$	40	A
		$T_C=25^{\circ}\text{C}$	80	A
I_{FM}	Diode pulsed current, t_p limited by T_{vjmax}		120	A
P_D	Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$	500	W
T_{JOP}	Maximum Operating Junction Temperature Range		$-40\sim 175$	$^{\circ}\text{C}$
T_{Solder}	Soldering Temperature, 0.063 in. (1.6mm) from case for 10 seconds		235	$^{\circ}\text{C}$

SMGW40H120ADB

IGBT Discrete Datasheet



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

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{(BR)CES}$	Collector-to-Emitter Breakdown Voltage		1200			V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1.5\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=40\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.87	2.25	V
			$T_J=125^{\circ}\text{C}$	2.44		V
			$T_J=175^{\circ}\text{C}$	2.69		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$, $V_{CE}=1200\text{V}$	$T_J=25^{\circ}\text{C}$	1	50	μA
			$T_J=175^{\circ}\text{C}$	3		mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			100	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		2255		pF
C_{oes}	Output Capacitance			203		
C_{res}	Reverse Transfer Capacitance			44		

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

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =40A, R _{Gon} =10Ω, V _{GE} =0/15V, Inductive Load	T _J =25°C		42		ns
			T _J =125°C		41		
			T _J =175°C		40		
t _r	Rise Time		T _J =25°C		82		ns
			T _J =125°C		83		
			T _J =175°C		84		
t _{d(off)}	Turn-off Delay Time		T _J =25°C		200		ns
			T _J =125°C		220		
			T _J =175°C		232		
t _f	Fall Time	T _J =25°C		100		ns	
		T _J =125°C		160			
		T _J =175°C		185			

SMGW40H120ADB

IGBT Discrete Datasheet



E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =40A, R _{Gon} =10Ω, V _{GE} =0/15V, di/dt=380A/μs(T _J =175°C), Inductive Load	T _J =25°C		5.15		mJ
			T _J =125°C		5.35		
			T _J =175°C		5.45		
E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =40A, R _{Goff} =10Ω, V _{GE} =0/15V, du/dt=5550V/μs(T _J =175°C), Inductive Load	T _J =25°C		1.86		mJ
			T _J =125°C		2.53		
			T _J =175°C		2.8		
Q _g	Total Gate Charge	V _{CC} =960V, I _C =40A, V _{GE} =0V/15V			124		nC
Q _{ge}	Gate-emitter Charge				19.5		
Q _{gc}	Gate-collector Charge				74.8		
SCSOA	V _{CC} =600V, V _{GE} =0/15V, R _G =10Ω, T _J =175°C			10			us

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =40A	T _J =25°C		1.53	1.95	V
			T _J =125°C		1.64		
			T _J =175°C		1.61		
I _{rr}	Peak Reverse Recovery Current	I _F =40A, di/dt=635A/μs(T _J =175°C), V _{CC} =600V, V _{GE} =0V	T _J =25°C		19.2		A
			T _J =125°C		24.5		
			T _J =175°C		27.3		
t _{rr}	Reverse Recovery Time		T _J =25°C		333		ns
			T _J =125°C		447		
			T _J =175°C		535		
dI _{rr} /dt	Peak Rate of Fall of Reverse Recovery Current		T _J =25°C		87		A/us
			T _J =125°C		77		
			T _J =175°C		65		

SMGW40H120ADB

IGBT Discrete Datasheet



Q _{rr}	Reverse Recovery Charge	I _F =40A, di/dt=635A/μs(T _J =175°C), V _{CC} =600V, V _{GE} =0V	T _J =25°C		3.84		μC
			T _J =125°C		6.43		
			T _J =175°C		7.72		
E _{rec}	Reverse Recovery Energy		T _J =25°C		1.08		mJ
			T _J =125°C		2.07		
			T _J =175°C		2.58		

Thermal Characteristics

Symbol	Description	Min.	Typ.	Max.	Units
R _{θJC} (IGBT)	Thermal Resistance: Junction-to-Case		0.25		K/W
R _{θJC} (Diode)	Thermal Resistance: Junction-to-Case		0.35		K/W
R _{θJA}	Thermal Resistance: Junction-to-Ambient (typical socket mount)			40	K/W



Characteristics diagrams

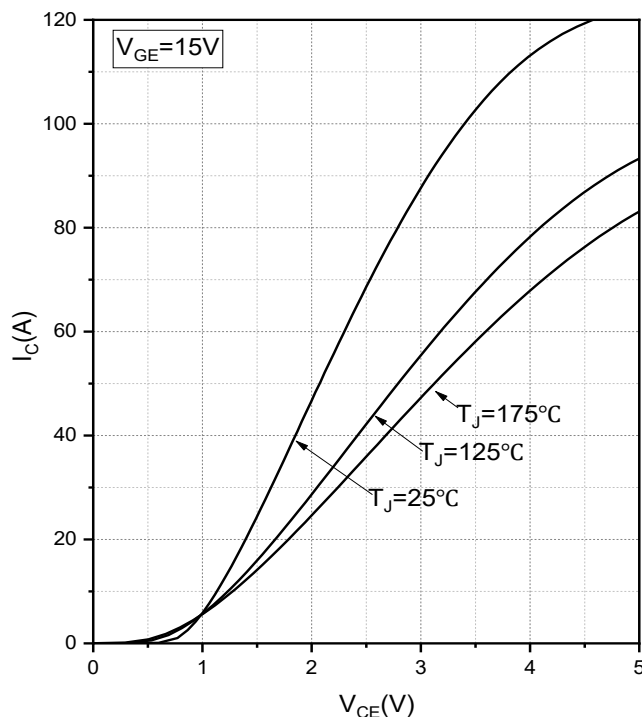


Fig.1 Typical Saturation Voltage Characteristics

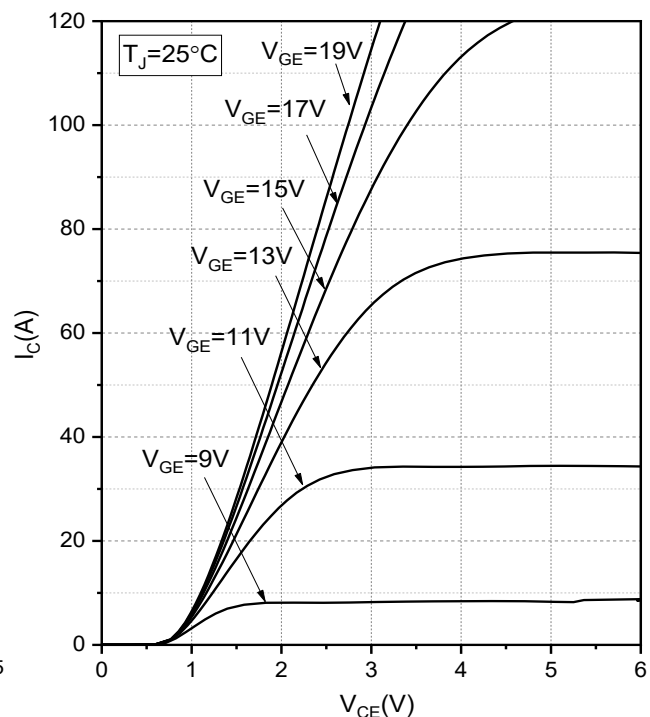


Fig.2 Typical Output Characteristics, $T_J=25^{\circ}\text{C}$

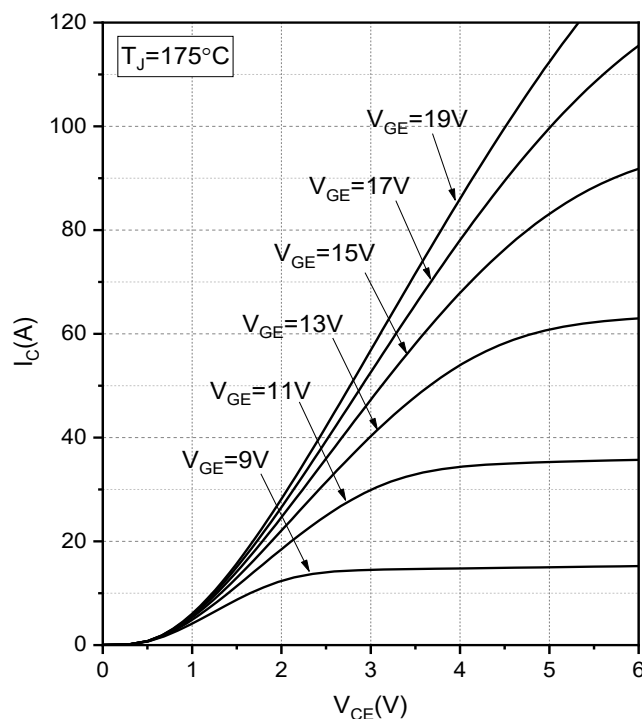


Fig.3 Typical Output Characteristics, $T_J=175^{\circ}\text{C}$

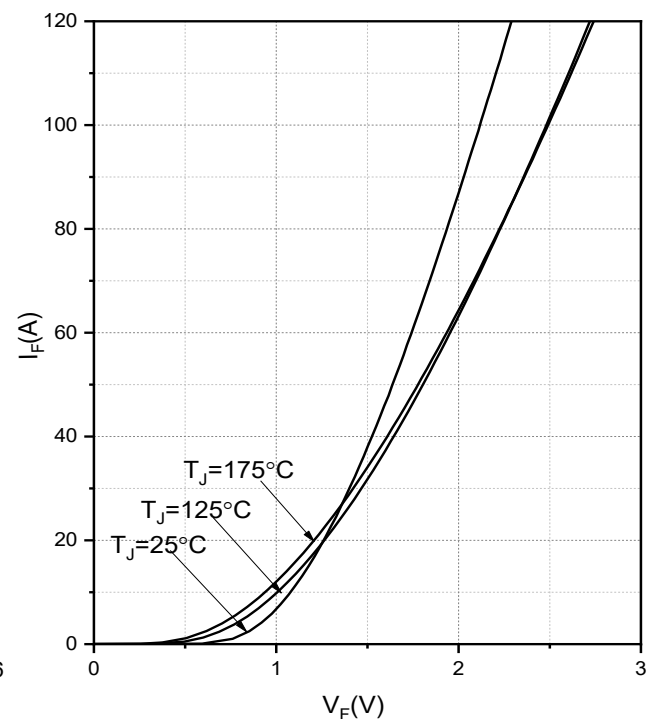


Fig.4 Forward Characteristics of Diode

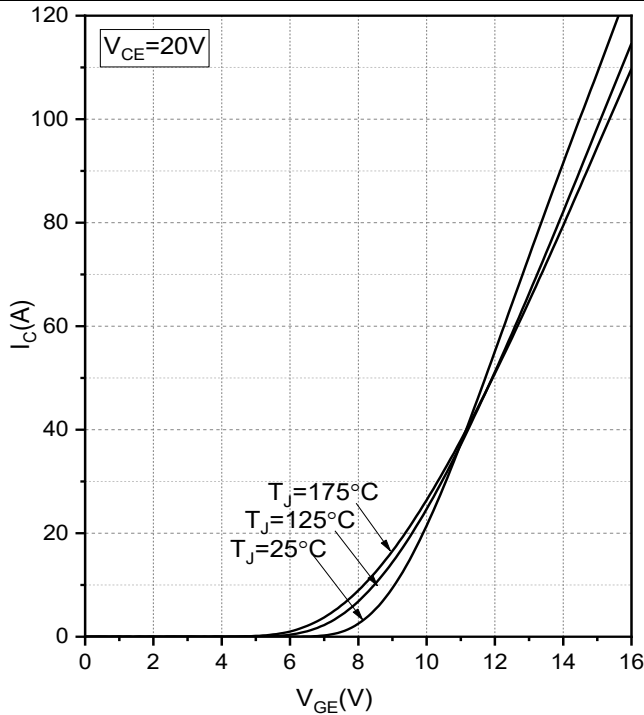


Fig.5 Transfer Characteristic

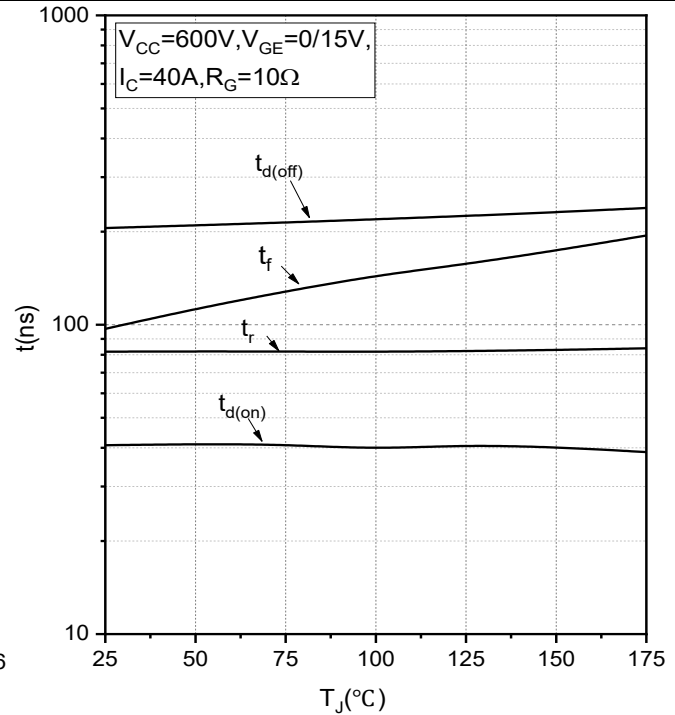


Fig.6 Typical Switching Times as a Function of Junction Temperature

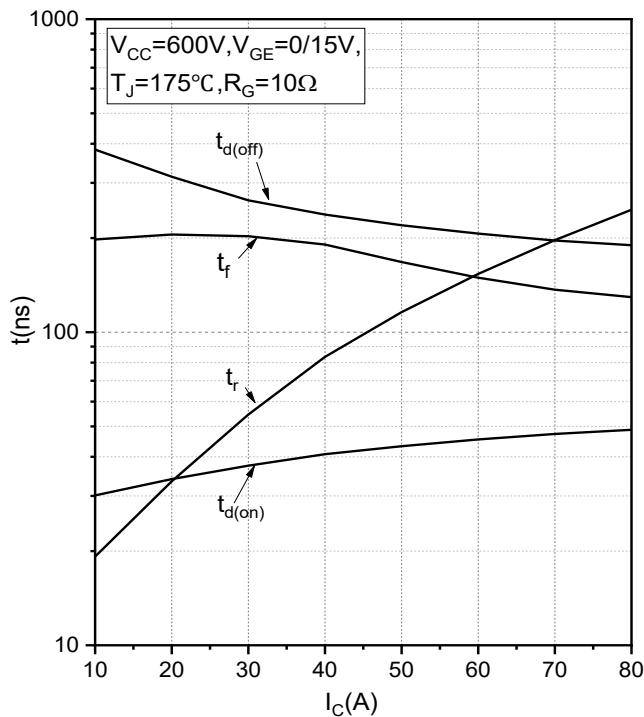


Fig.7 Typical Switching Times as a Function of Collector current, $T_J = 175^\circ\text{C}$

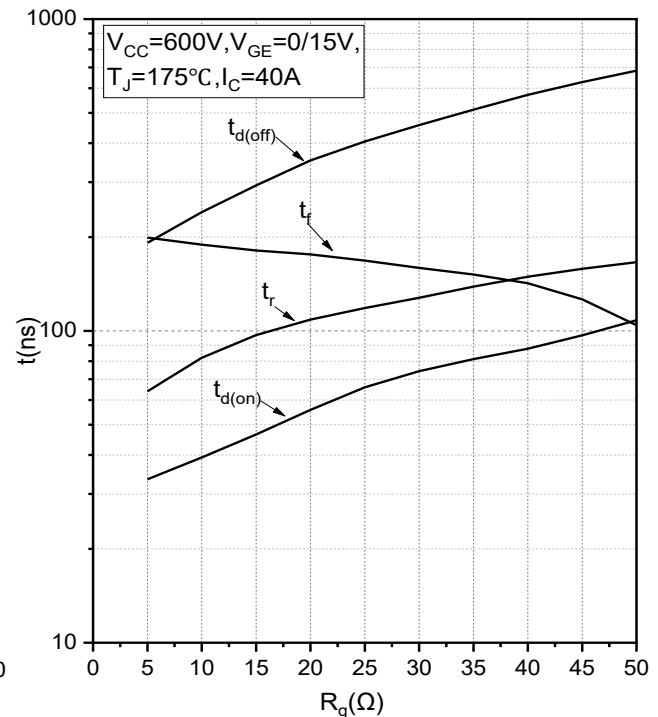


Fig.8 Typical Switching Times as a Function of Gate Resistor, $T_J = 175^\circ\text{C}$

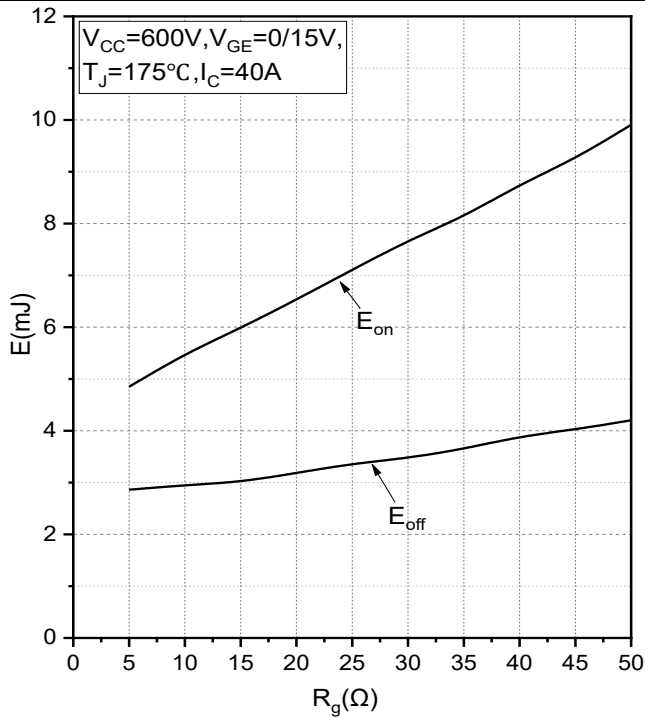


Fig.9 Typical Switching Energy Losses as a Function of Gate Resistor, $T_J=175^\circ C$

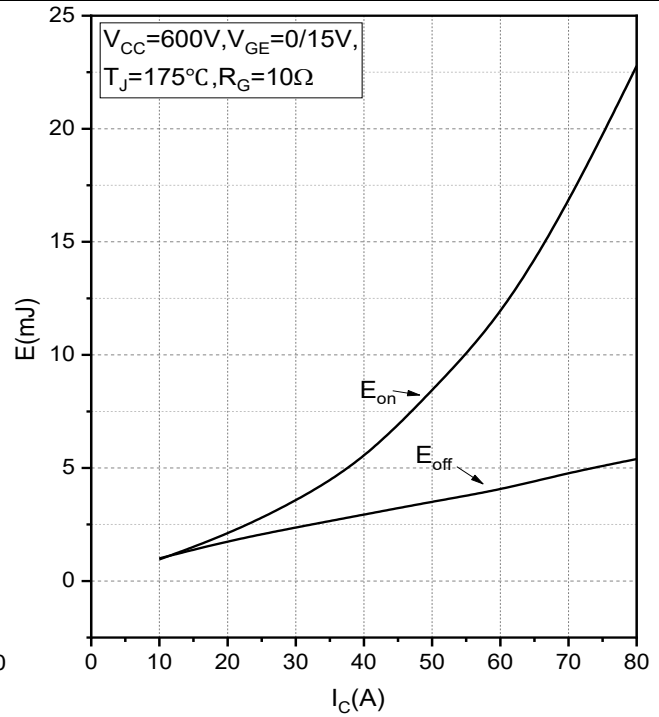


Fig.10 Typical Switching Energy Losses as a Function of Collector Current, $T_J=175^\circ C$

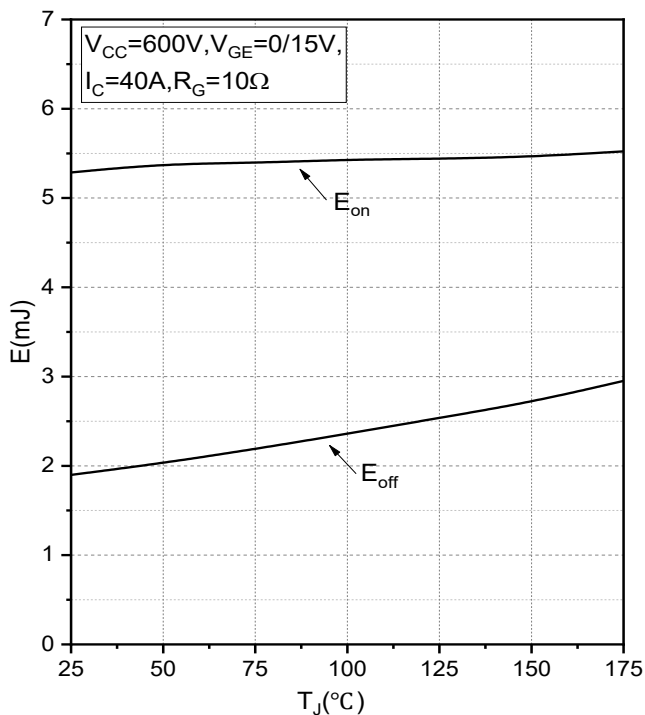


Fig.11 Typical Switching Energy Losses as a Function of Junction Temperature

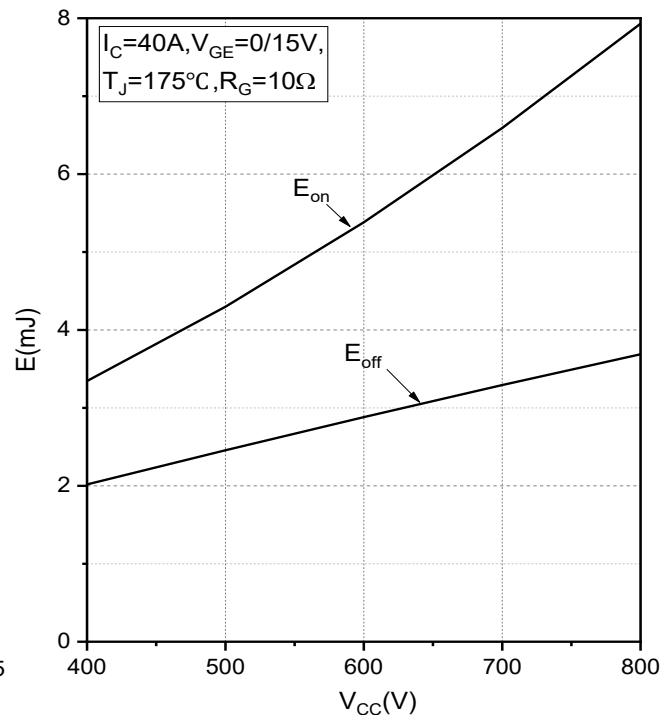


Fig.12 Typical Switching Energy Losses as a Function of Collector Emitter Voltage

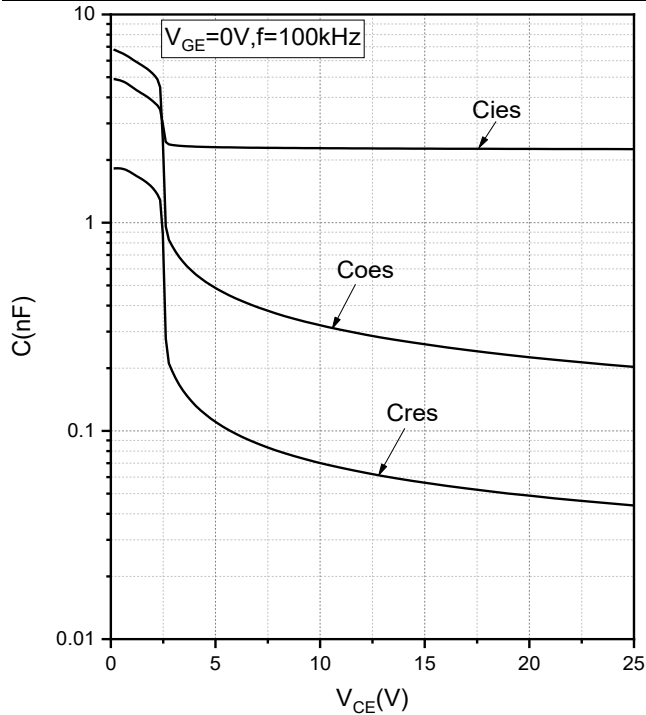


Fig. 13 Capacitance Characteristics

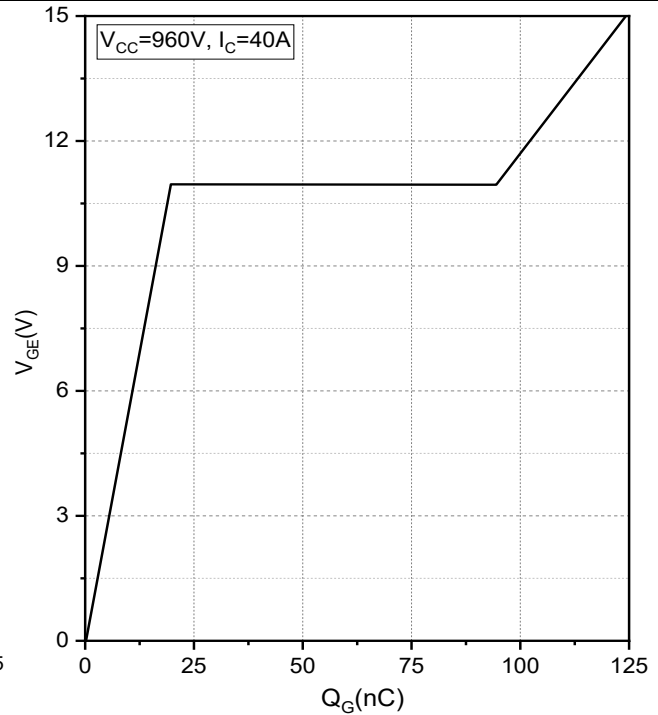


Fig. 14 Typical Gate Charge Characteristics

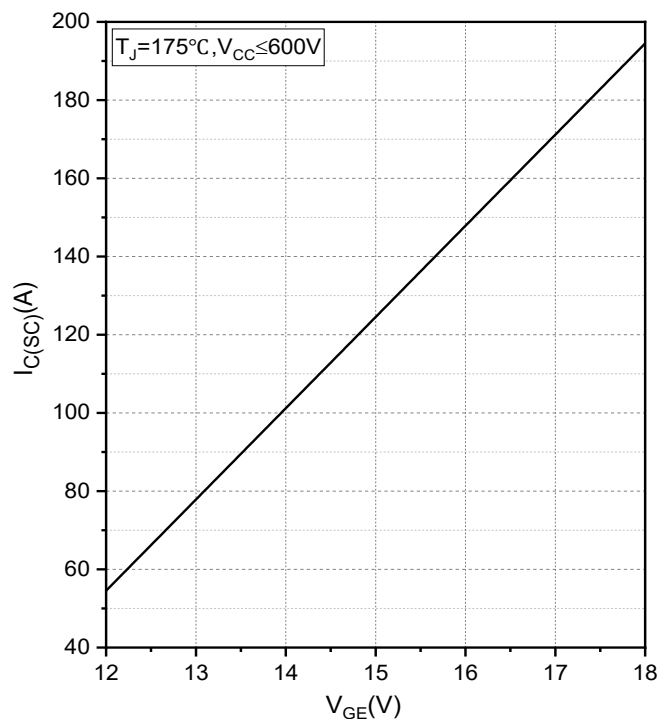


Fig. 15 Typical Short Circuit Collector Current as function of Gate-Emitter Voltage

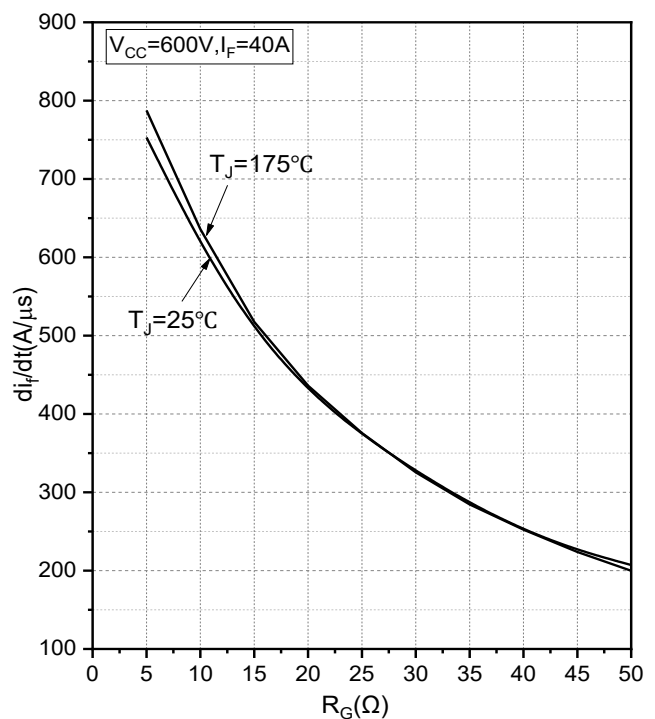


Fig. 16 Typical Diode Current Slope as a Function of gate resistor

SMGW40H120ADB

IGBT Discrete Datasheet

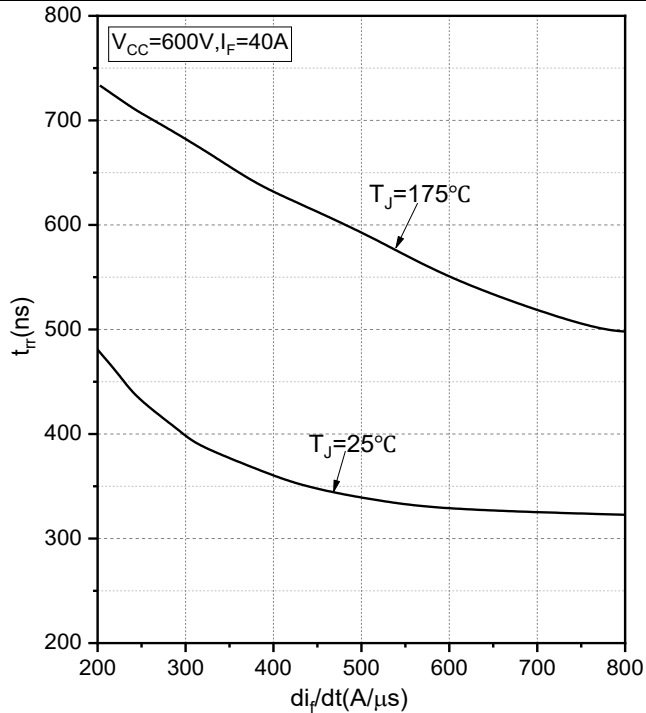


Fig.17 Typical Reverse Recovery Time as a Function of Diode Current Slope

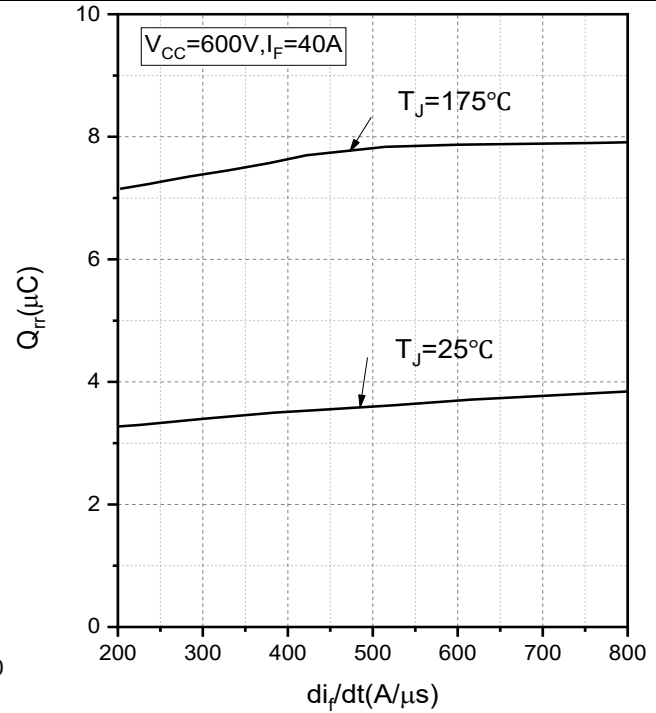


Fig.18 Typical Reverse Recovery Charge as a Function of Diode Current Slope

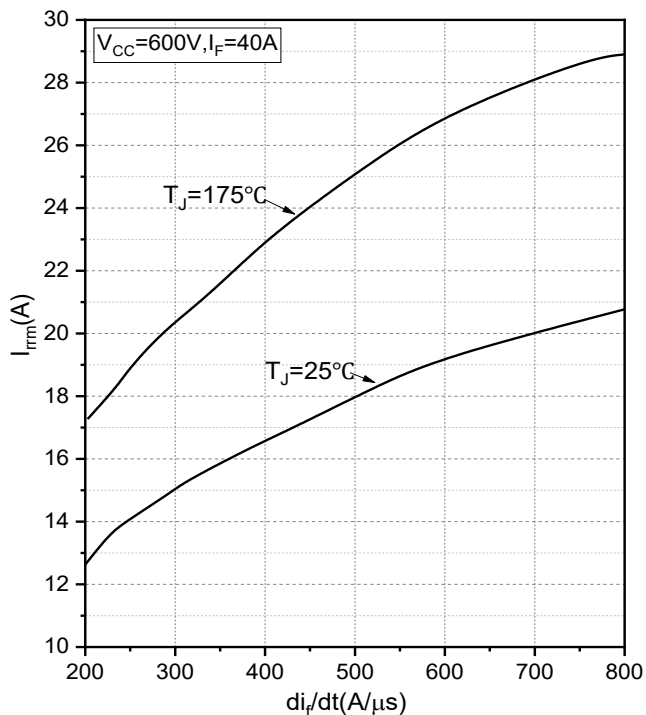


Fig.19 Typical Reverse Recovery Current as a Function of Diode Current Slope

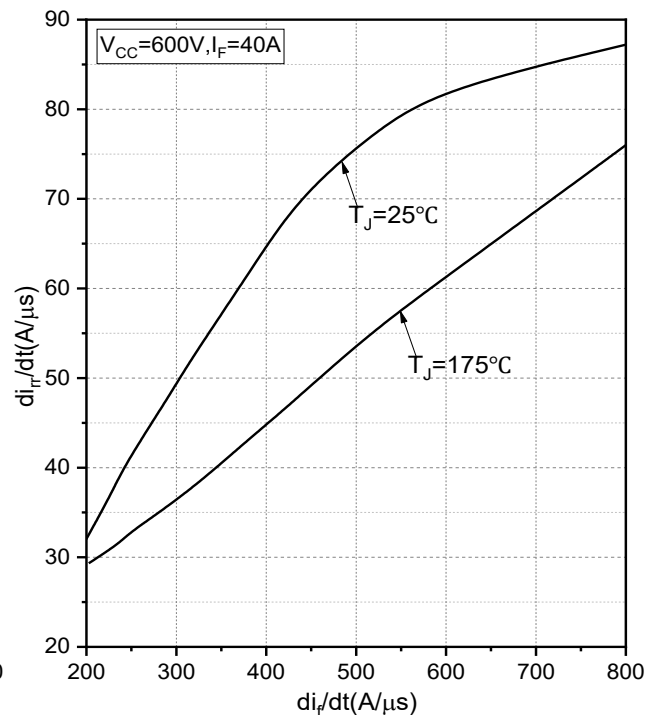


Fig.20 Typical Diode Peak Rate of Fall Of Reverse Recovery Current as a Function of Diode Current Slope

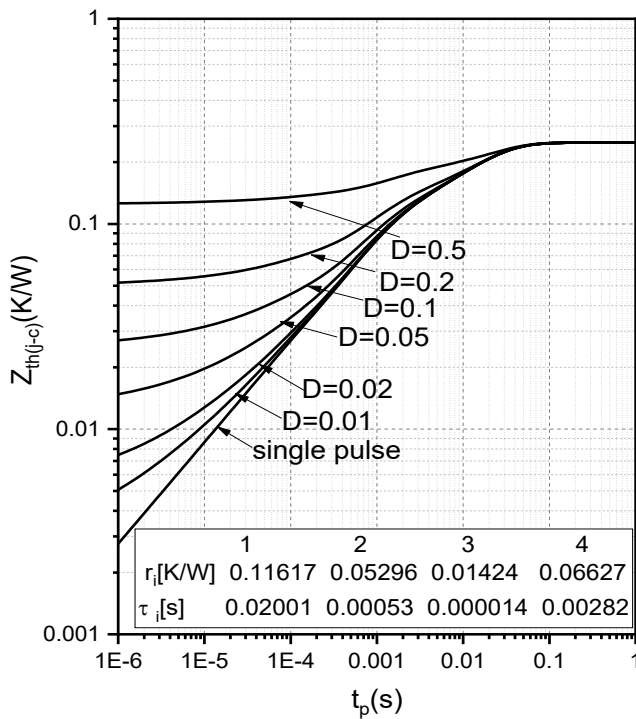


Fig.21 Transient Thermal Impedance (IGBT)

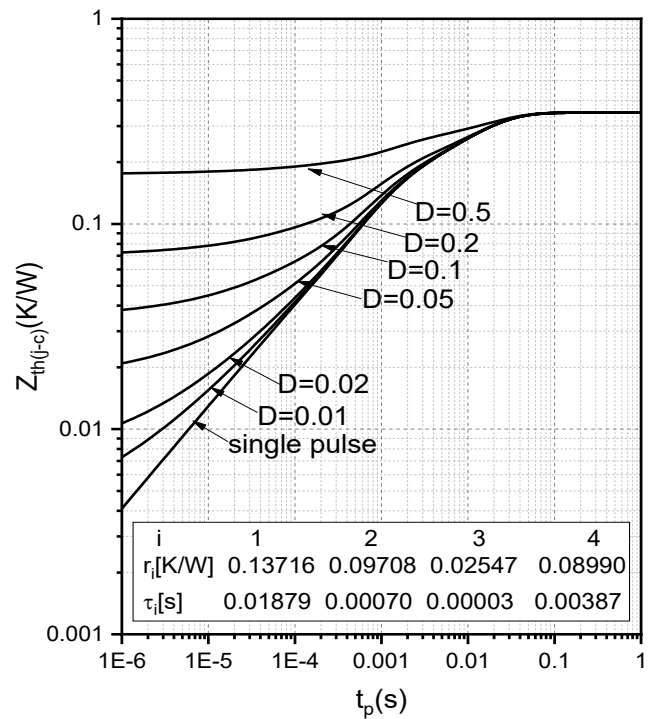


Fig.22 Transient Thermal Impedance (Diode)

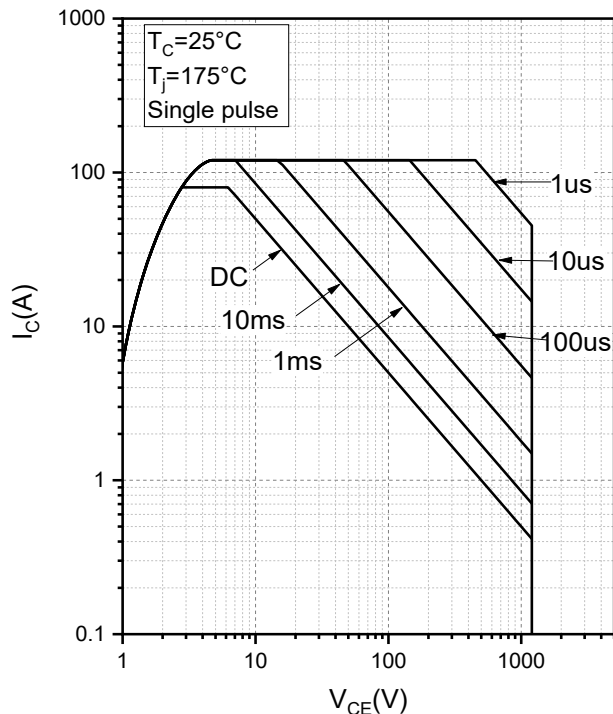


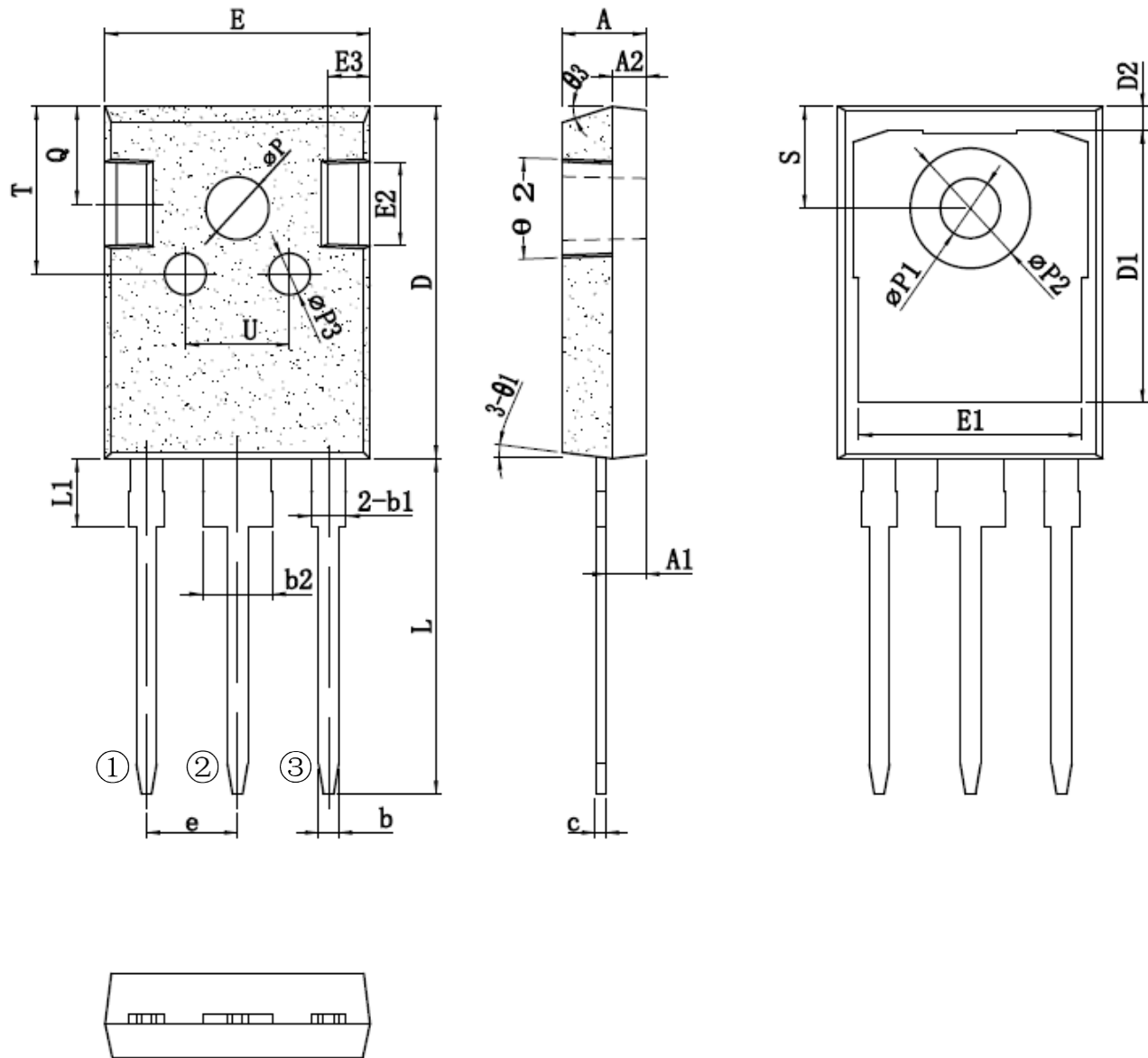
Fig.23 Forward Bias Safe Operating Area, IGBT

SMGW40H120ADB

IGBT Discrete Datasheet



TO-247 Package Outline (Unit: mm):



CONNECTION

- ① GATE
- ② COLLECTOR
- ③ EMITTER

SMGW40H120ADB

IGBT Discrete Datasheet



TO-247 Package Mechanical Data:

SYMBOL	mm		
	MIN	NOM	MAX
*A	4.90	5.00	5.10
*A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
*b	1.15	1.20	1.25
*b1	1.95	2.10	2.25
*b2	2.95	3.10	3.25
*c	0.55	0.60	0.65
*D	20.90	21.00	21.10
D1	16.35	16.55	16.75
D2	1.05	1.20	1.35
*E	15.70	15.80	15.90
E1	13.10	13.25	13.40
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
*e	5.40	5.44	5.48
*L	19.80	19.98	20.15
*L1	-	-	4.30
*ΦP	3.60	3.70	3.80
*ΦP1	3.45	3.55	3.65
ΦP2	7.03	7.18	7.33
ΦP3	2.40	2.50	2.60
Q	5.60	5.80	6.00
*S	6.05	6.15	6.25
T	9.80	10.00	10.20
U	6.00	6.20	6.40
θ1	5°	7°	9°
θ2	1°	3°	5°
θ3	13°	15°	17°



Revision	Notes
02	Engineering Sample Datasheet

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".