



SMGW40H120FNB

1200V 40A Field Stop Trench IGBT

Features:

- Maximum Junction Temperature: $T_J=175^{\circ}\text{C}$
- High Speed Switching Series
- Minimized Tail Current
- $V_{CE(sat)}=1.6\text{V}(\text{typ.}) @ I_C=40\text{A}$
- Safe Paralleling
- Very Fast Recovery Antiparallel Diode
- Low Thermal Resistance

Applications:

- Uninterruptible Power Supply
- Welding Machines

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	$T_C=100^{\circ}\text{C}$	40	A
		$T_C=25^{\circ}\text{C}$	80	A
I_{CP}	Pulse Collector Current		160	A
I_F	Continuous Forward Current	$T_C=100^{\circ}\text{C}$	40	A
		$T_C=25^{\circ}\text{C}$	80	A
I_{FP}	Pulse Forward Current		160	A
t_{SC}	Short Circuit Withstand Time	$V_{CC}=600\text{V}, V_{GE}=15\text{V}, T_J=150^{\circ}\text{C}$	>10	μs
P_D	Maximum Power Dissipation	$T_C=25^{\circ}\text{C}$	750	W
T_J	Maximum Junction Temperature		-40~175	$^{\circ}\text{C}$



T _{JOP}	Maximum Operating Junction Temperature Range	-40~175	°C
	Soldering Temperature, for 10 sec.	260 (0.063 in. (1.6mm) from case)	°C

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{(BR)CES}	Collector-to-Emitter Breakdown Voltage	V _{GE} =0V, I _C =1mA		1200			V
V _{GE(th)}	Gate-Emitter Threshold Voltage	I _C =1mA, V _{CE} =V _{GE}		4.0	4.8	5.5	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =40A, V _{GE} =15V	T _J =25°C		1.60	1.85	V
			T _J =125°C		2.05		V
			T _J =150°C		2.15		V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V, V _{CE} =V _{CES}				25	μA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} =±25V, V _{CE} =0V				±200	nA
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=1MHz			5.40		nF
C _{oes}	Output Capacitance				0.19		
C _{res}	Reverse Transfer Capacitance				0.05		

Switching Characteristics of IGBT (T_J=25°C unless otherwise specified)

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =40A, R _G =12Ω, V _{GE} =0V/15V, Inductive Load	T _J =25℃		TBD		ns
			T _J =125℃		TBD		
			T _J =150℃		TBD		
t _r	Rise Time		T _J =25℃		TBD		ns
			T _J =125℃		TBD		
			T _J =150℃		TBD		
t _{d(off)}	Turn-off Delay Time		T _J =25℃		TBD		ns
			T _J =125℃		TBD		
			T _J =150℃		TBD		



t _f	Fall Time	V _{CC} =600V, I _C =40A, R _G =12Ω, V _{GE} =0V/15V, Inductive Load	T _J =25℃		TBD		ns
			T _J =125℃		TBD		
			T _J =150℃		TBD		
E _{on}	Turn-on Switching Loss		T _J =25℃		TBD		mJ
			T _J =125℃		TBD		
			T _J =150℃		TBD		
E _{off}	Turn-off Switching Loss		T _J =25℃		TBD		mJ
			T _J =125℃		TBD		
			T _J =150℃		TBD		
Q _g	Total Gate Charge	V _{CC} =960V, I _C =40A, V _{GE} =0V/15V			190		nC
Q _{ge}	Gate-emitter Charge				37		
Q _{gc}	Gate-collector Charge				78		

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =40A	T _J =25°C		3.20		V
			T _J =125°C		TBD		
			T _J =150°C		TBD		
I _{rr}	Peak Reverse Recovery Current	I _F =40A, V _{rr} =600V, V _{GE} =0V	T _J =25°C		TBD		A
			T _J =125°C		TBD		
			T _J =150°C		TBD		
t _{rr}	Reverse Recovery Time		T _J =25°C		TBD		ns
			T _J =125°C		TBD		
			T _J =150°C		TBD		
dI _{rr} /dt	Peak Rate of Fall of Reverse Recovery Current during t _b		T _J =25°C		TBD		A/us
			T _J =125°C		TBD		
			T _J =150°C		TBD		



Q _{rr}	Reverse Recovery Charge	I _F =40A, V _{rr} =600V, V _{GE} =0V	T _J =25℃		TBD		μC
			T _J =125℃		TBD		
			T _J =150℃		TBD		
E _{rec}	Reverse Recovery Energy		T _J =25℃		TBD		mJ
			T _J =125℃		TBD		
			T _J =150℃		TBD		

Thermal Characteristics (T_C=25°C unless otherwise specified)

Symbol	Description	Min.	Typ.	Max.	Units
R _{θJC} (IGBT)	Thermal Resistance: Junction-to-Case		0.20		°C/W
R _{θJC} (Diode)	Thermal Resistance: Junction-to-Case			0.55	°C/W
R _{θJA}	Thermal Resistance: Junction-to-Ambient (typical socket mount)			40	°C/W

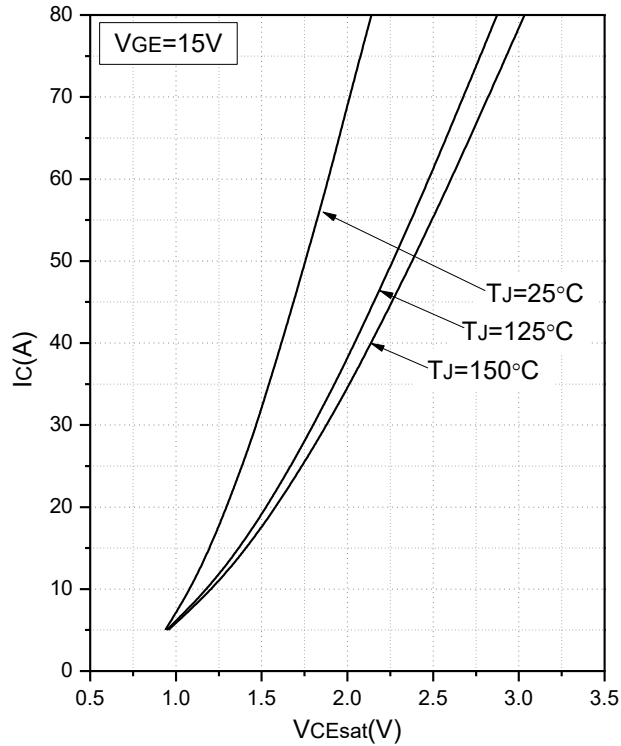


Fig.1 Typical Saturation Voltage Characteristics

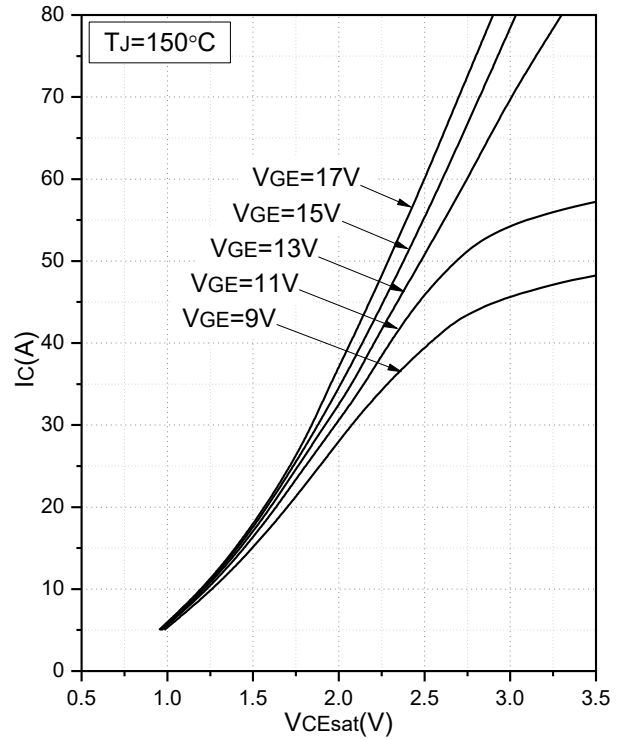


Fig.2 Typical Output Characteristics

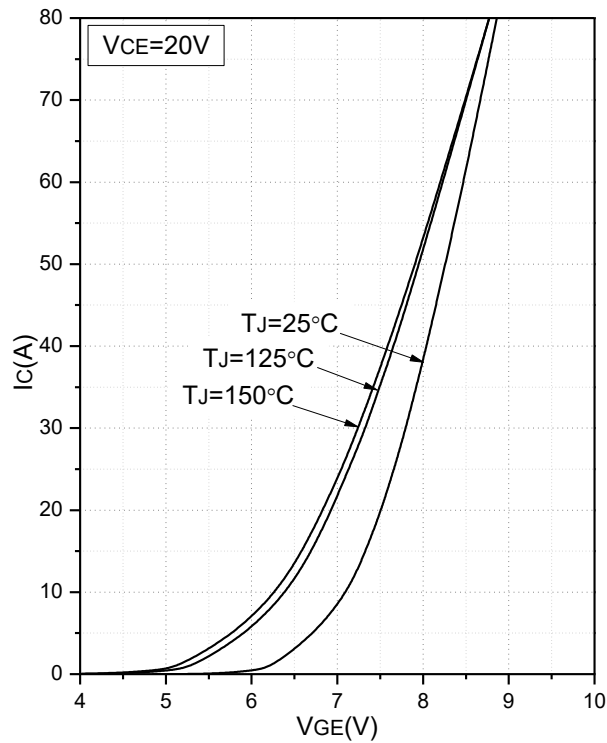


Fig.3 Transfer Characteristic

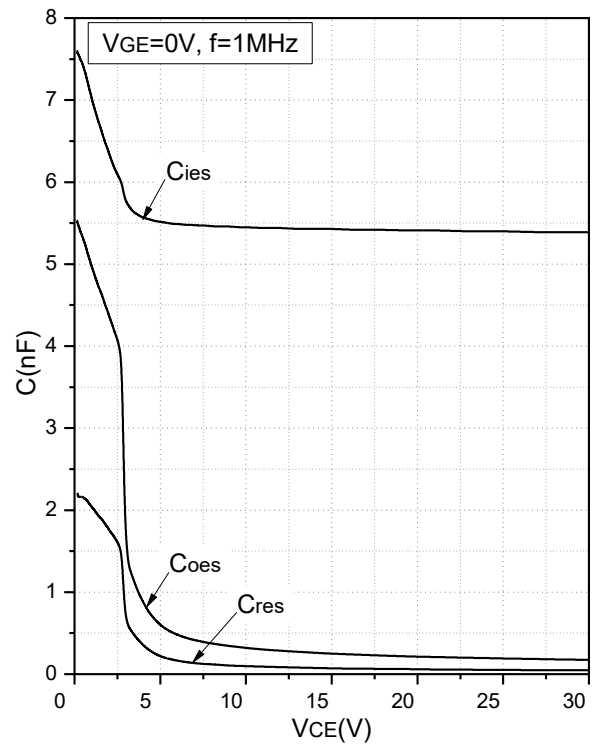


Fig.4 Capacitance Characteristics

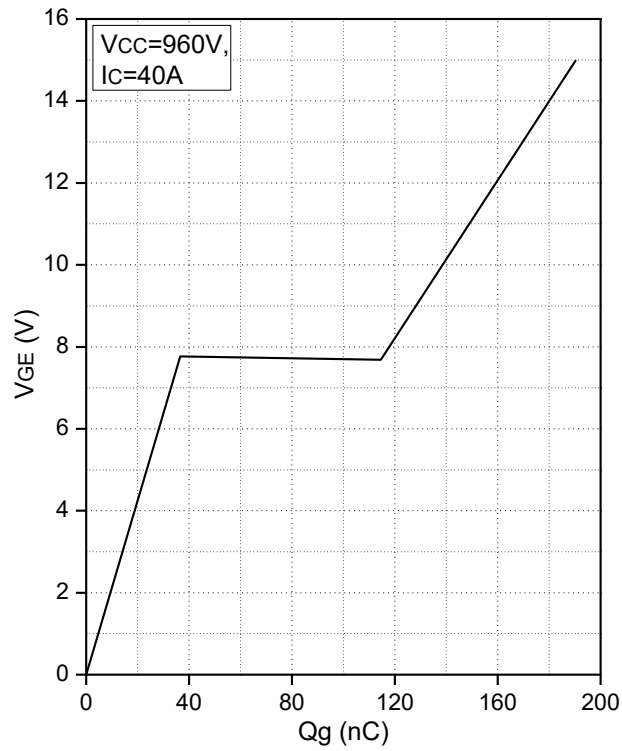


Fig.5 Typ. Gate Charge Characteristics

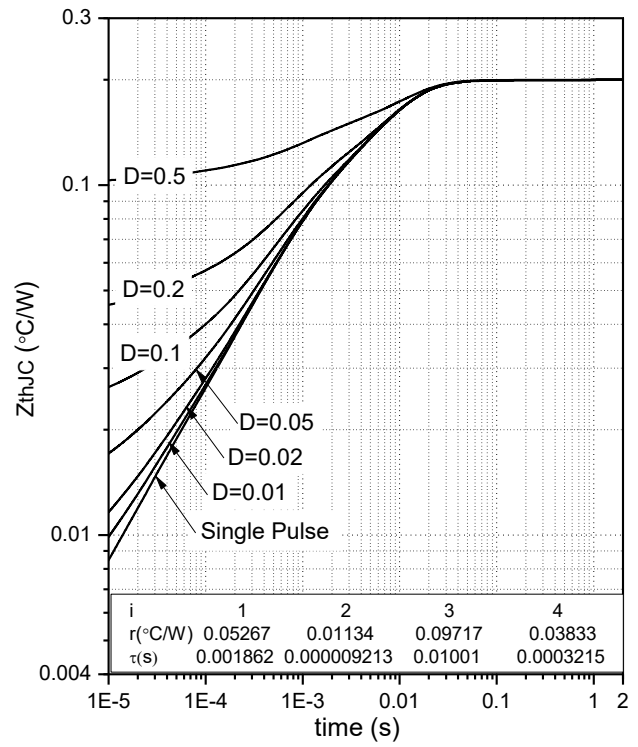


Fig.6 Transient Thermal Impedance (IGBT)



Test Circuit:

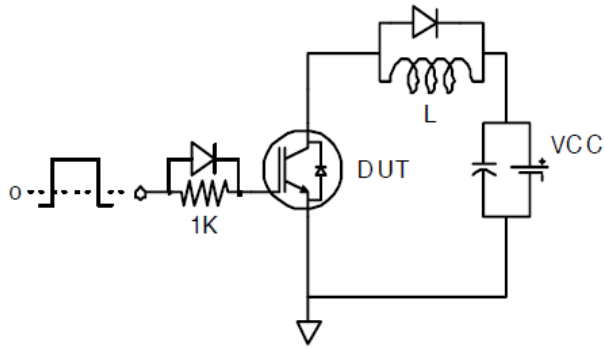


Fig.7 Gate Charge Circuit (turn-off)

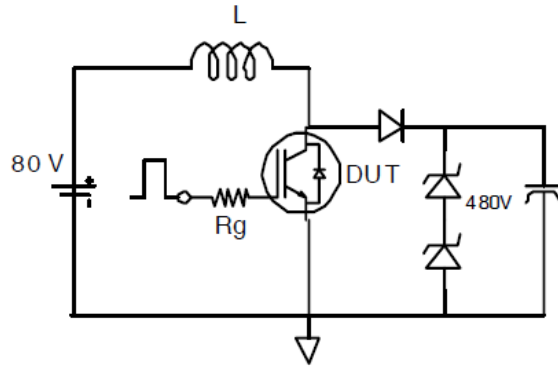


Fig.8 RBSOA Circuit

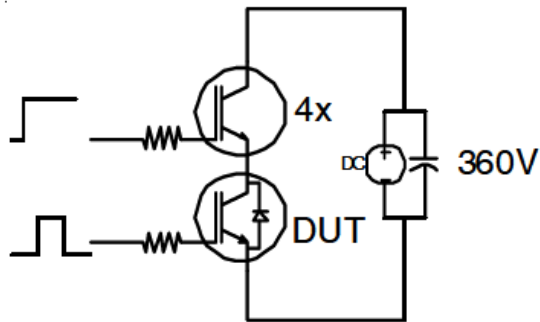


Fig.9 S.C. SOA Circuit

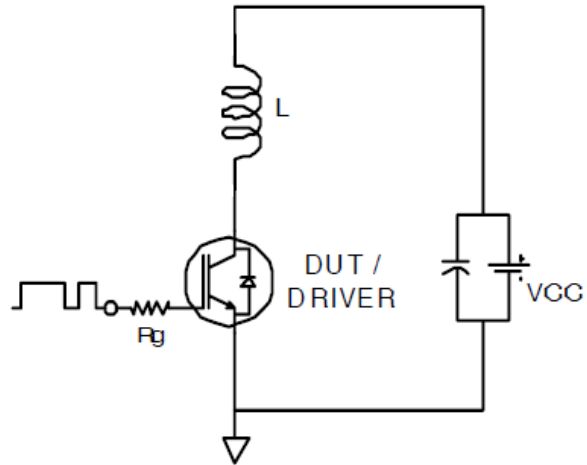


Fig.10 Switching Loss Circuit

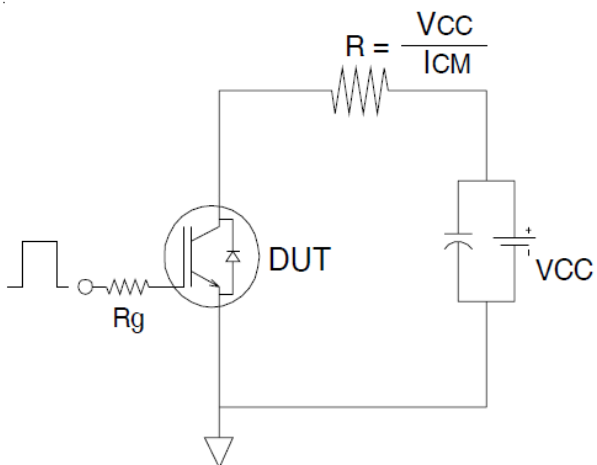


Fig.11 Resistive Load Circuit

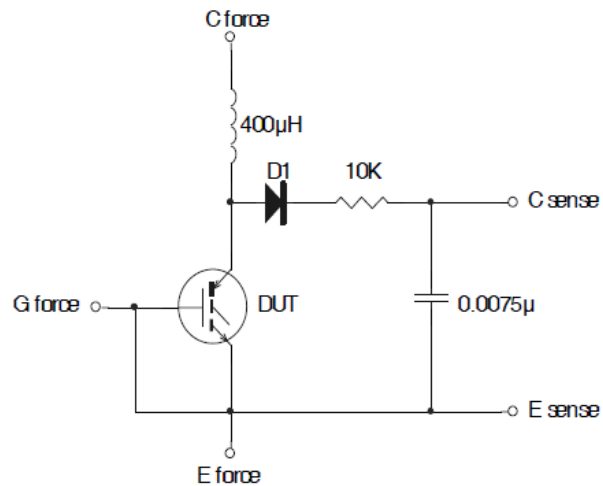
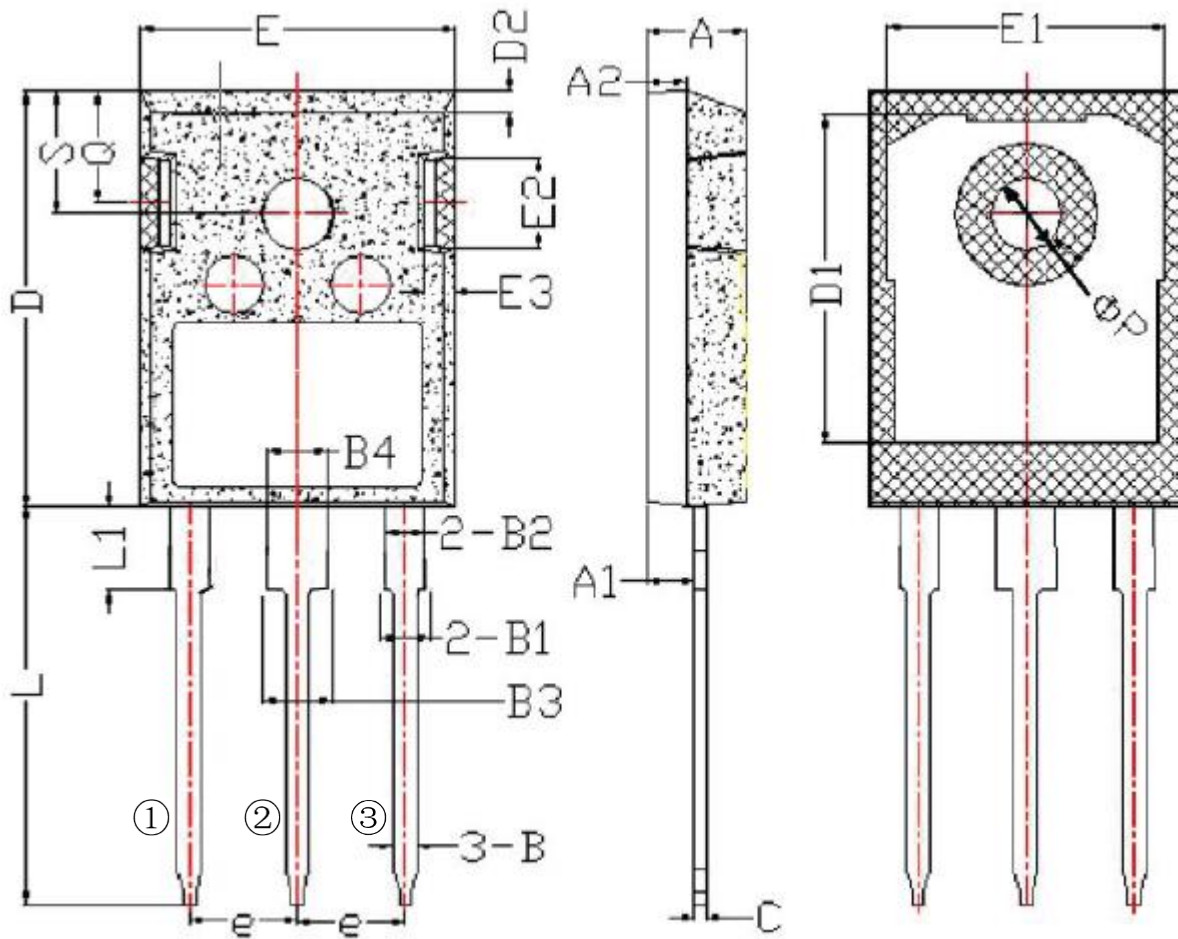


Fig.12 BVCES Filter Circuit



TO-247 Package Outline (Unit: mm):



CONNECTION

- ① GATE
- ② COLLECTOR
- ③ EMITTER



TO-247 Package Mechanical Data:

项目	尺寸 (mm)	Min (mm)	Max (mm)
A	5.00±0.08	4.92	5.08
A1	2.35±0.08	2.27	2.43
A2	2.00±0.08	1.92	2.08
B	1.20±0.04	1.16	1.24
B1	2.00±0.10	1.90	2.10
B2	2.00±0.05	1.95	2.05
B3	3.00±0.10	2.90	3.10
B4	3.00±0.05	2.95	3.05
C	0.60±0.02	0.58	0.62
D	20.90±0.20	20.70	21.10
D1	16.55±0.10	16.45	16.65
E	15.90±0.10	15.80	16.00
E1	14.02±0.10	13.92	14.12
E2	4.80±0.60	4.20	5.40
E3	1.80±0.50	1.30	2.30
e	5.44±0.10	5.34	5.54
L	20.00±0.40	19.60	20.40
L1	4.30±0.20	4.1	4.5
ΦP (扇热片面)	3.65±0.10	3.55	3.75
Q	5.60±0.10	5.50	5.70
S	6.20±0.10	6.10	6.30



Revision	Notes
01	Initial Release

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”.