

Product Summary

- $V_{DS} = -60V, I_D = -2A$
- $R_{DS(on)} < 178m\Omega @ V_{GS} = -10V$
- $R_{DS(on)} < 215m\Omega @ V_{GS} = -4.5V$

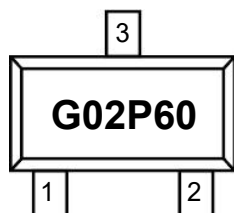
Features

- Advanced Split Gate Trench Technology
- 100% Avalanche Tested
- RoHS and Reach Compliant
- Halogen and Antimony Free
- Moisture Sensitivity Level 3

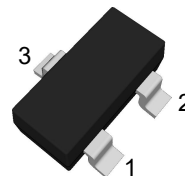
Application

- Load Switch
- PWM Applications
- Power Management

Marking Code



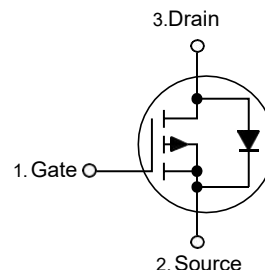
SOT-23



(Top View)

Pin	Description
1	Gate
2	Source
3	Drain

Schematic Diagram



Absolute Maximum Ratings

Ratings at 25°C ambient temperature unless otherwise specified.

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$-V_{DS}$	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	$-I_D$	2	A
Drain Current-Pulsed ^{Note1}	$-I_{DM}$	8.4	A
Maximum Power Dissipation	P_D	1.5	W
Junction Temperature	T_J	150	°C
Storage Temperature Range	T_{STG}	-55 to +150	°C

Thermal Characteristics

Thermal Resistance, Junction-to-Ambient ^{Note2}	$R_{\theta JA}$	125	°C/W
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Electrical Characteristics

(T_J=25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	-V _{(BR)DSS}	V _{GS} =0V, I _D =-250μA	60	--	--	V
Zero Gate Voltage Drain Current	-I _{DSS}	V _{DS} =-60V, V _{GS} =0V	--	--	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	--	--	±100	nA
Gate Threshold Voltage ^{Note3}	-V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	1.1	--	2.4	V
Drain-Source On-Resistance ^{Note3}	R _{DS(on)}	V _{GS} =-10V, I _D =-2A	--	--	178	mΩ
		V _{GS} =-4.5V, I _D =-2A	--	--	215	mΩ
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =-25V, V _{GS} =0V, f=1MHz	--	456	--	pF
Output Capacitance	C _{oss}		--	59	--	pF
Reverse Transfer Capacitance	C _{rss}		--	38	--	pF
Total Gate Charge	Q _g	V _{DS} =-30V, I _D =-2A, V _{GS} =0~-10V	--	4.6	--	nC
Gate-Source Charge	Q _{gs}		--	1.4	--	nC
Gate-Drain Charge	Q _{gd}		--	1.6	--	nC
Switching Characteristics						
Turn-on Delay Time	t _{d(on)}	V _{DD} =-30V, I _D =-2A, V _{GS} =-10V, R _{GEN} =5Ω	--	17.4	--	nS
Turn-on Rise Time	t _r		--	5.4	--	nS
Turn-off Delay Time	t _{d(off)}		--	37.8	--	nS
Turn-off Fall Time	t _f		--	2.4	--	nS
Source-Drain Diode Characteristics						
Diode Forward Voltage ^{Note3}	-V _{SD}	V _{GS} =0V, I _S =-2A	--	--	1.2	V
Diode Forward Current	-I _S		--	--	2	A

Note: 1. R_{θJA} is measured with the device mounted on a 1inch² pad of 2oz copper FR4 PCB

2. The power dissipation is limited by 150°C junction temperature.

3. The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.

Test Circuit

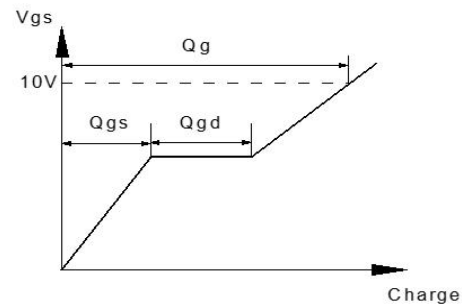
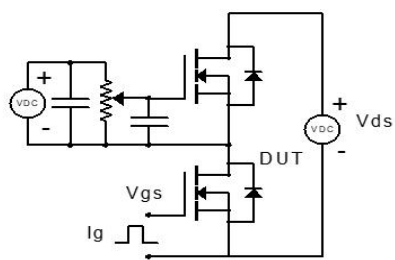


Figure 1: Gate Charge Test Circuit & Waveform

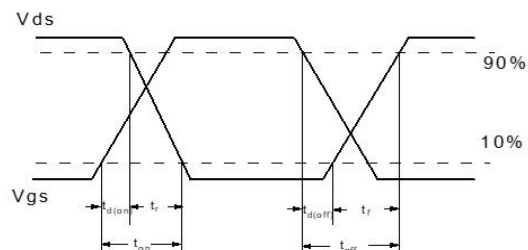
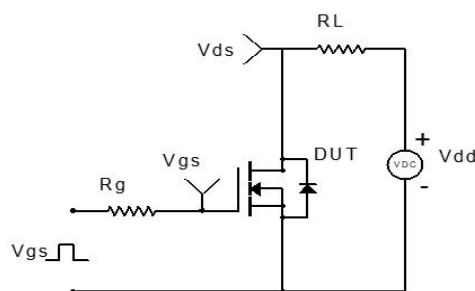


Figure 2: Resistive Switching Test Circuit & Waveform

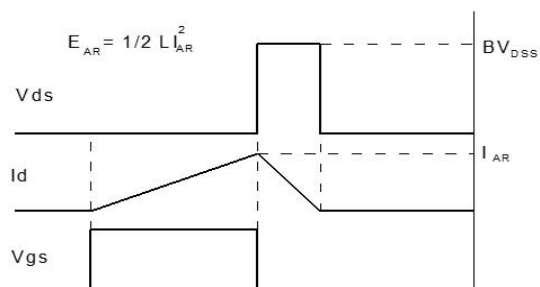
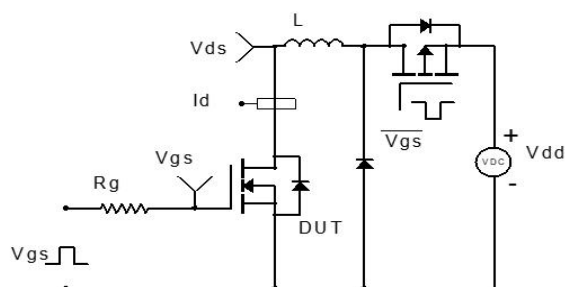


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

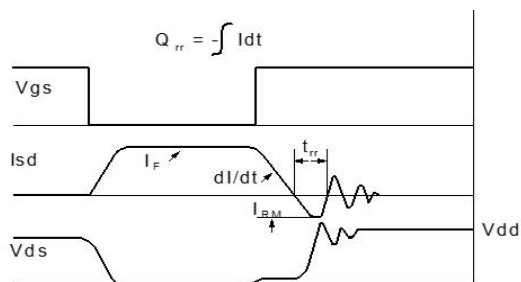
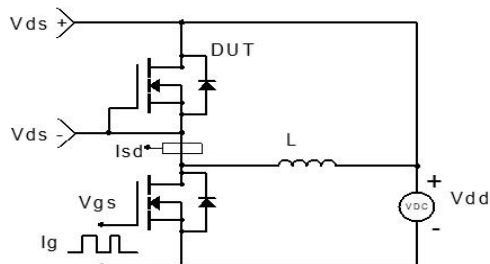


Figure 4: Diode Recovery Test Circuit & Waveform

Typical Operating Characteristics

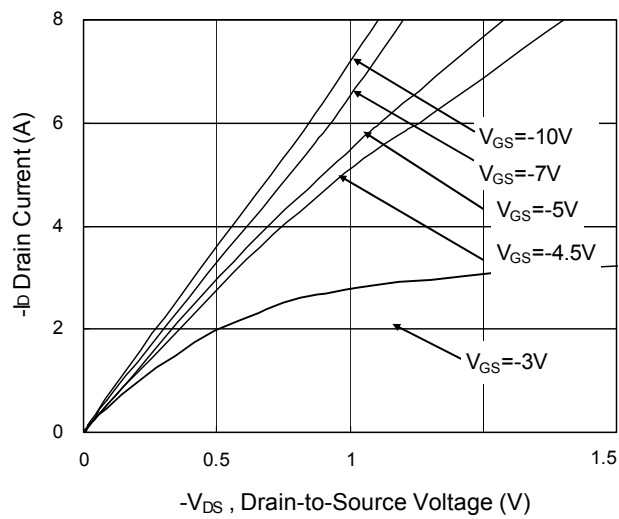


Fig.1 Typical Output Characteristics

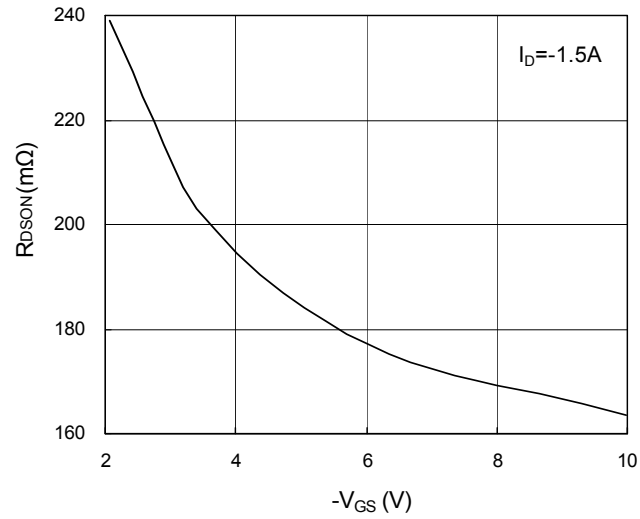


Fig.2 On-Resistance v.s Gate-Source

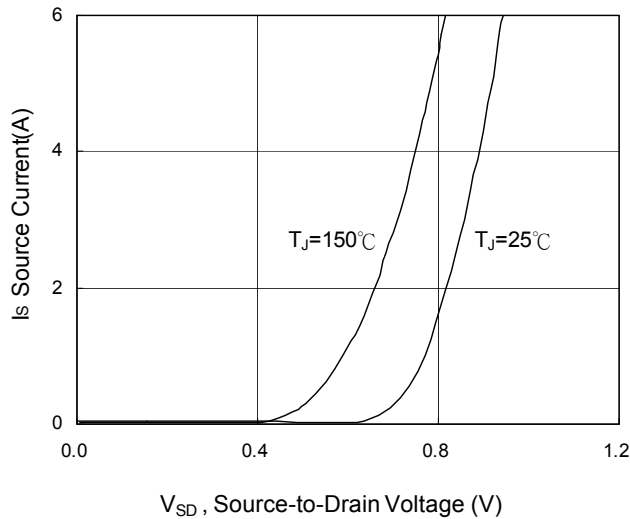


Fig.3 Forward Characteristics Of Reverse

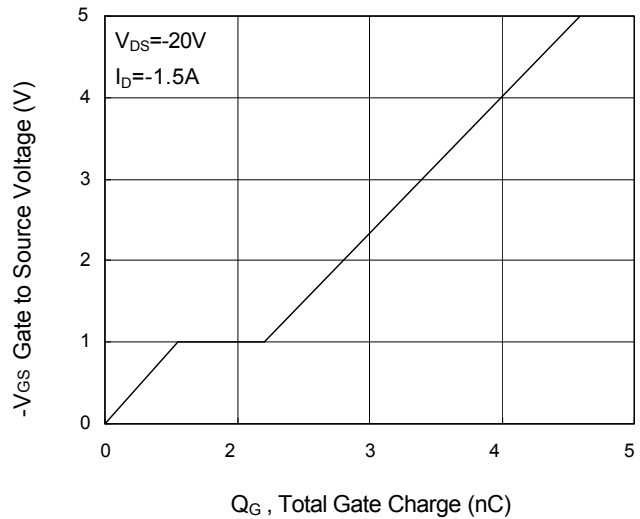


Fig.4 Gate-Charge Characteristics

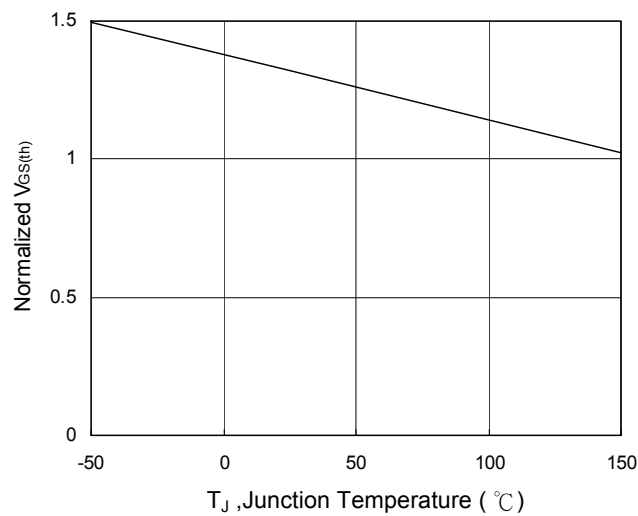


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

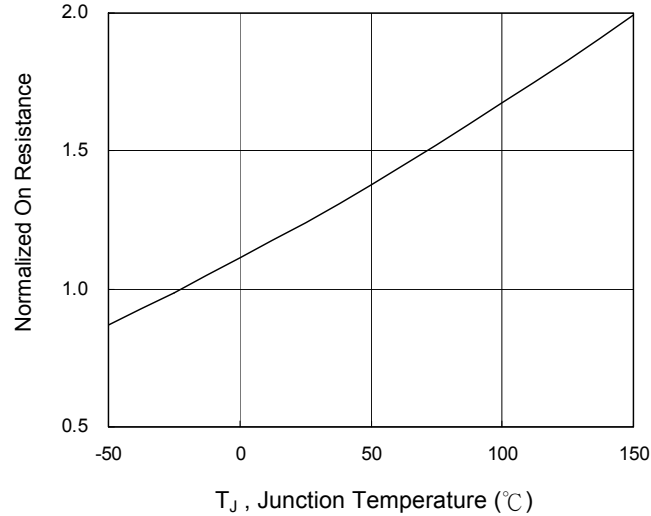


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

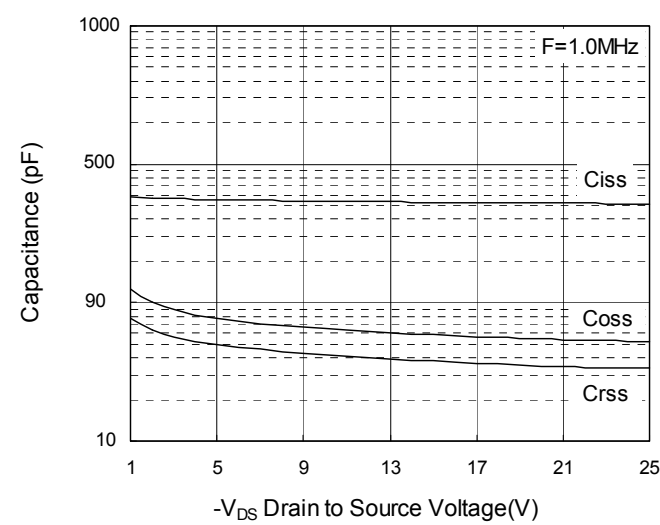


Fig.7 Capacitance

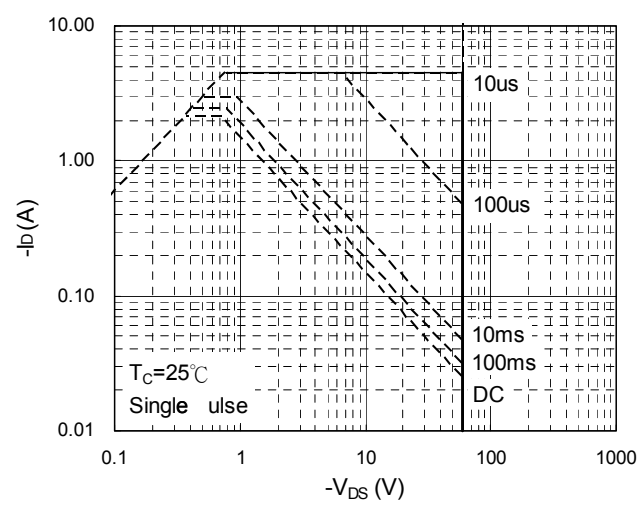


Fig.8 Safe Operating Area

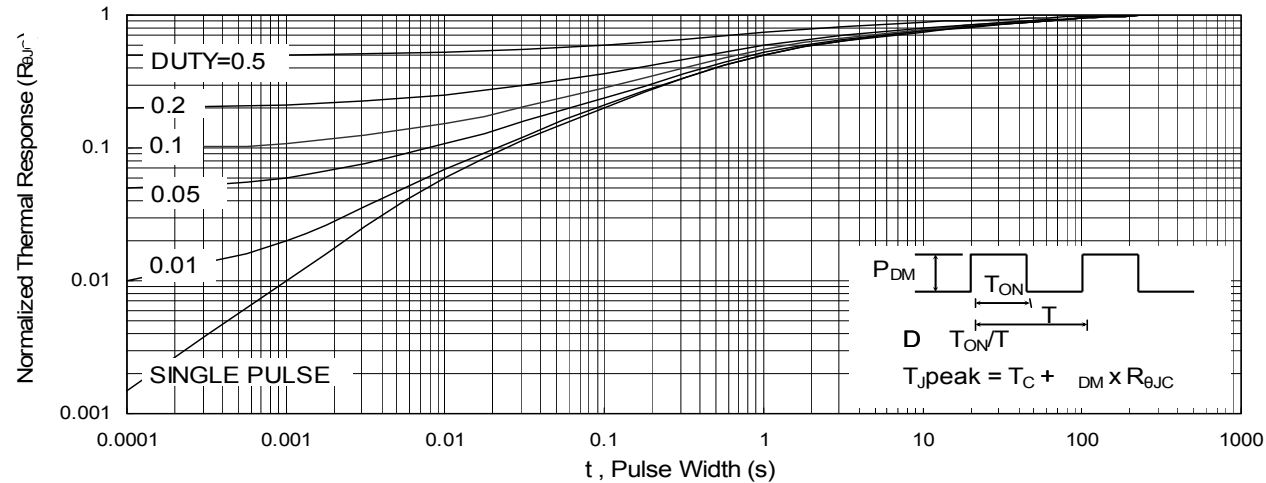
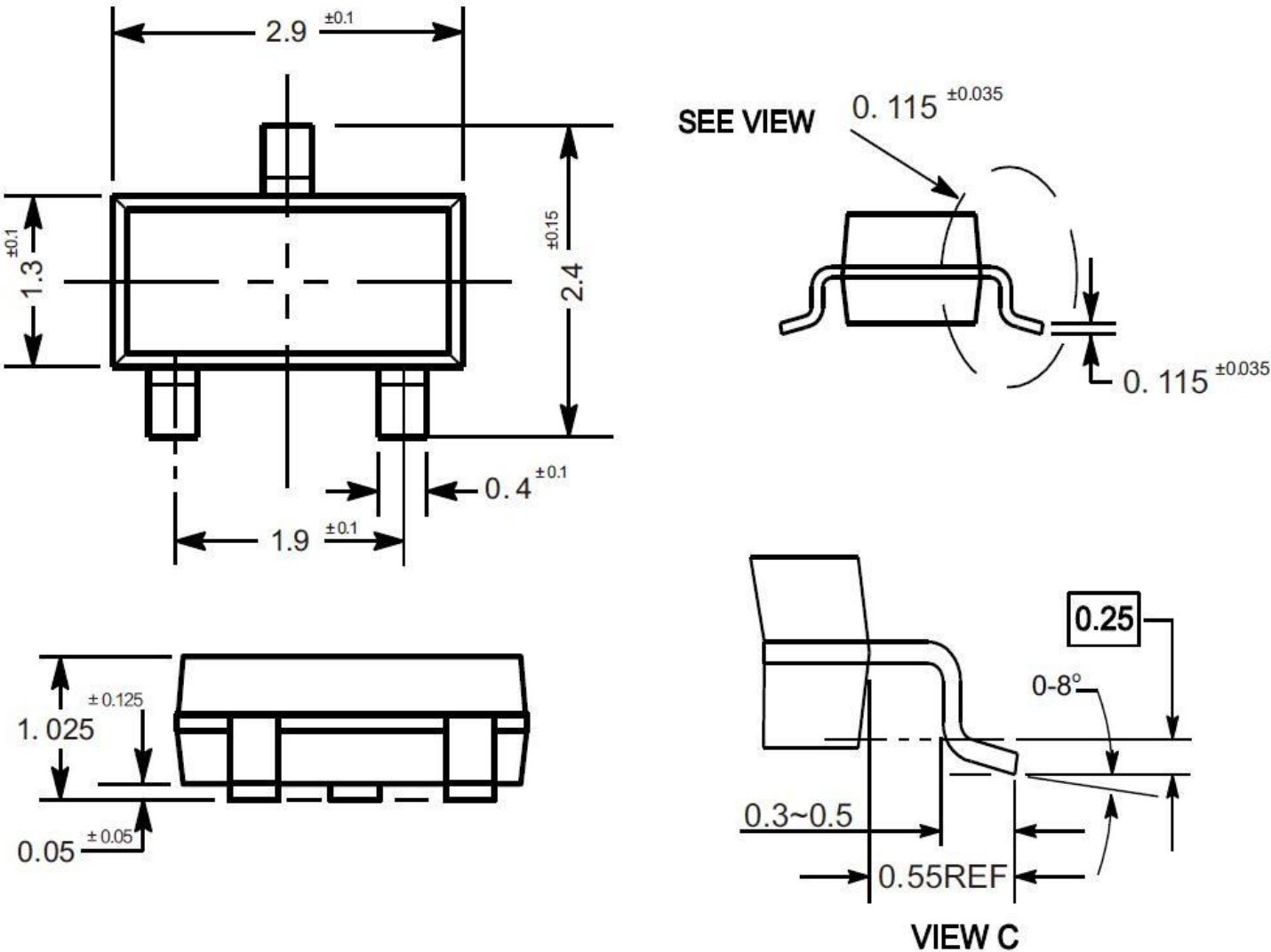


Fig.9 Normalized Maximum Transient Thermal Impedance

Package Outline

SOT-23

Dimensions in mm

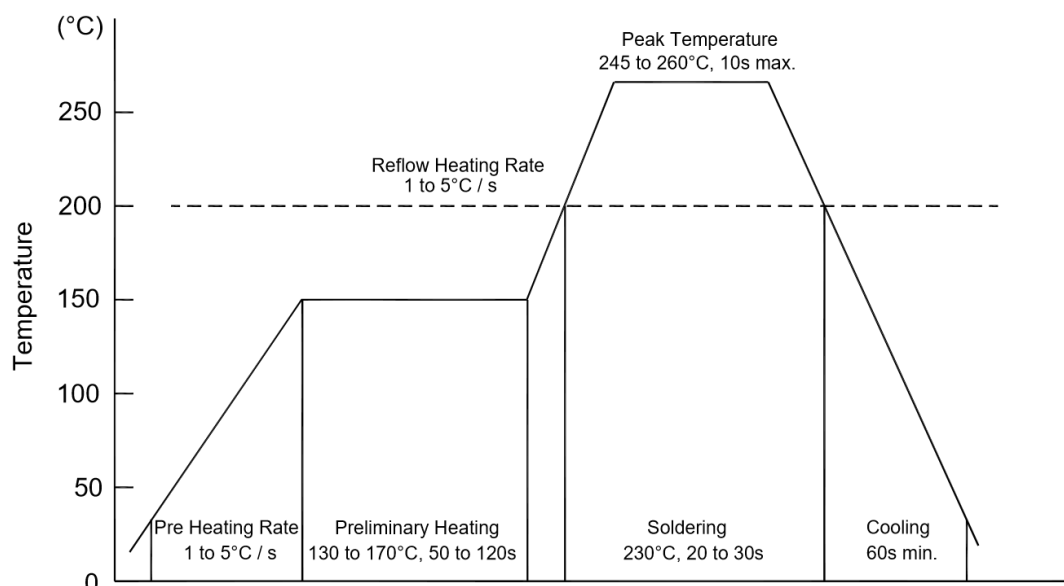


Ordering Information

Device	Package	Shipping
TNG02P60SA	SOT-23	3,000PCS/Reel&7inches

Conditions of Soldering and Storage

◆ Recommended condition of reflow soldering



Recommended peak temperature is over 245°C. If peak temperature is below 245°C, you may adjust the following parameters:

- Time length of peak temperature (longer)
- Time length of soldering (longer)
- Thickness of solder paste (thicker)

◆ Conditions of hand soldering

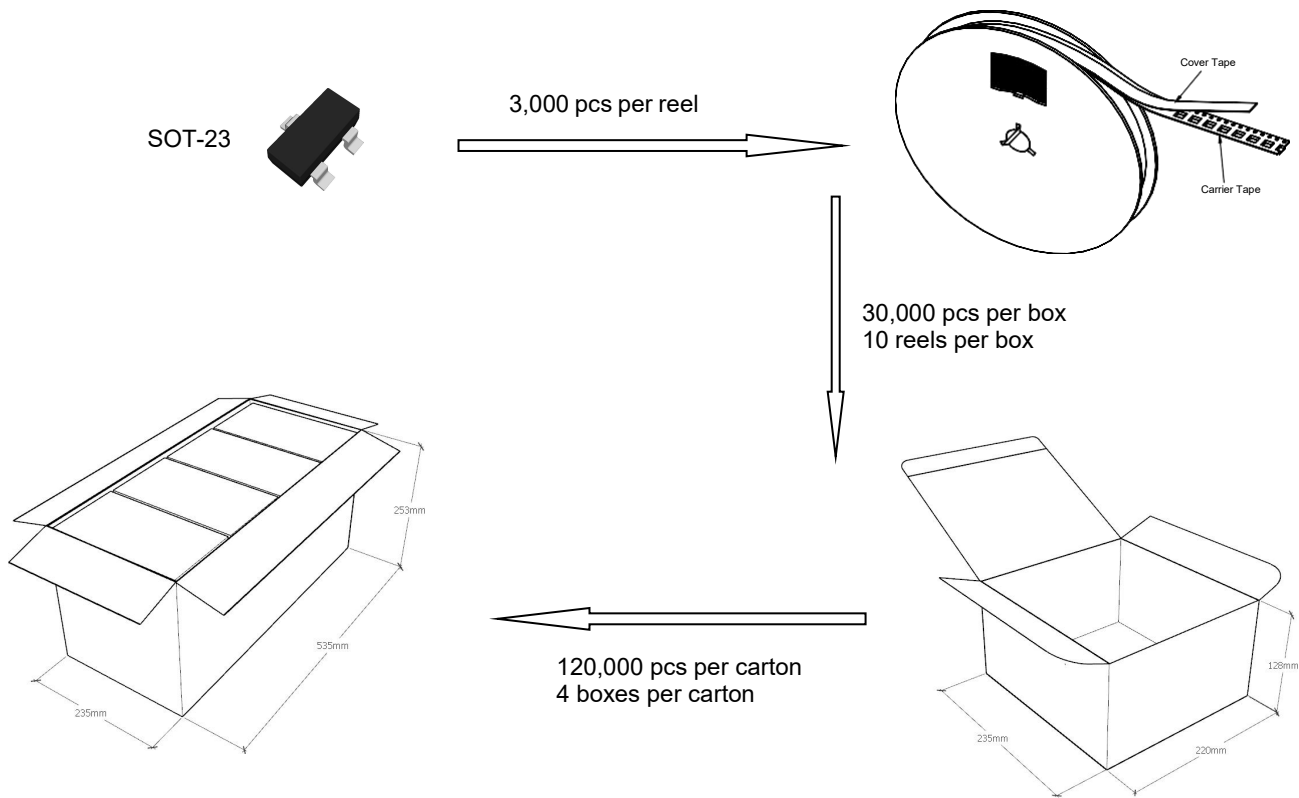
- Temperature: 300°C
- Time: 3s max.
- Times: one time

◆ Storage conditions

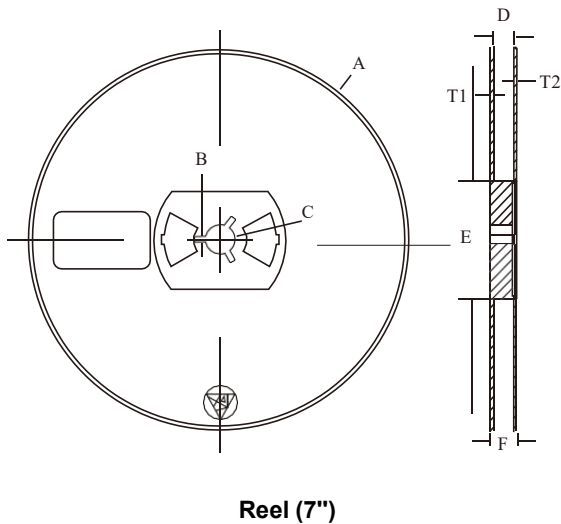
- **Temperature**
5 to 40°C
- **Humidity**
30 to 80% RH
- **Recommended period**
One year after manufacturing

Package Specifications

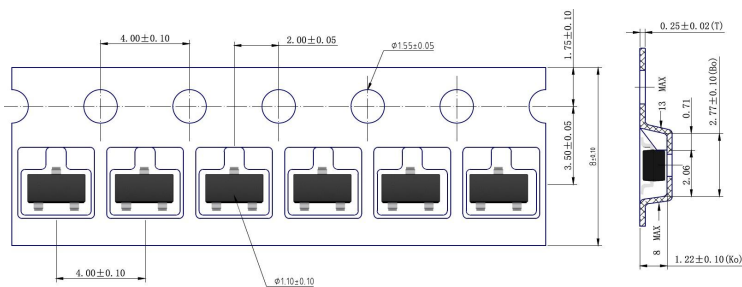
- The method of packaging



◆ Embossed tape and reel data



Symbol	Value (unit: mm)
A	Ø 177.8±1
B	2.7±0.2
C	Ø 13.5±0.2
E	Ø 54.5±0.2
F	12.3±0.3
D	9.6+2/-0.3
T1	1.0±0.2
T2	1.2±0.2



Contact Information

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For additional information, please contact your local Sales Representative.



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