

P-Channel Enhancement Mode Power MOSFET SOT-23

Product Summary

- $V_{DS} = -20V, I_D = -3.8A$
- $R_{DS(on)} < 47m\Omega @ V_{GS} = -4.5V$
- $R_{DS(on)} < 65m\Omega @ V_{GS} = -2.5V$

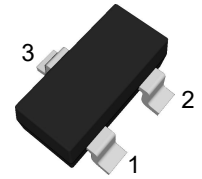
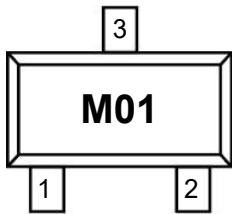
Features

- Advanced Trench Technology
- RoHS and Reach Compliant
- Halogen and Antimony Free
- Moisture Sensitivity Level 1

Application

- Load Switch
- PWM Application
- Power Management

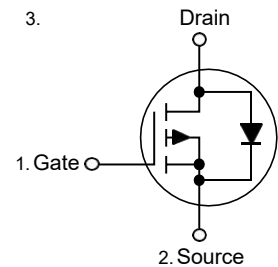
Marking Code



(Top View)

Pin	Description
1	Gate
2	Source
3	Drain

Schematic Diagram



Absolute Maximum Ratings

(Ta=25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$-V_{DS}$	20	V
Gate-Source Voltage	V_{GS}	± 12	V
Drain Current-Continuous	$-I_D$	3.8	A
Drain Current-Pulsed ^{Note1}	$-I_{DM}$	15	A
Maximum Power Dissipation	P_D	1	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

(Ta=25°C unless otherwise specified)

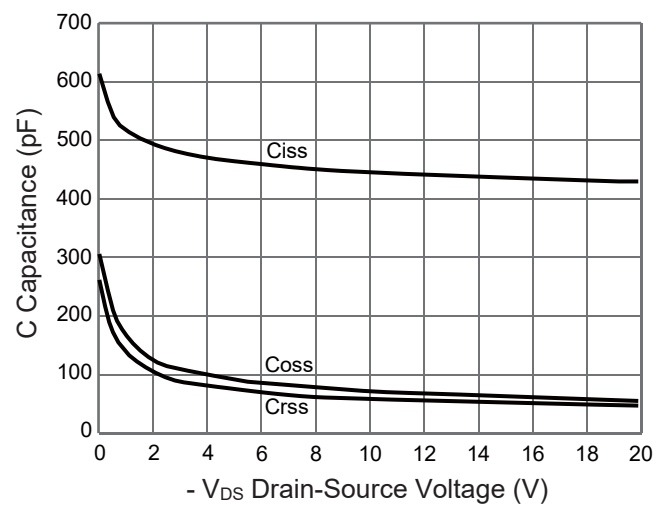
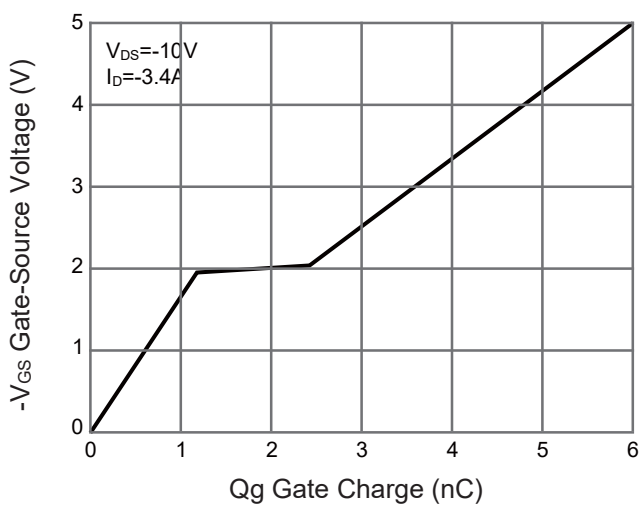
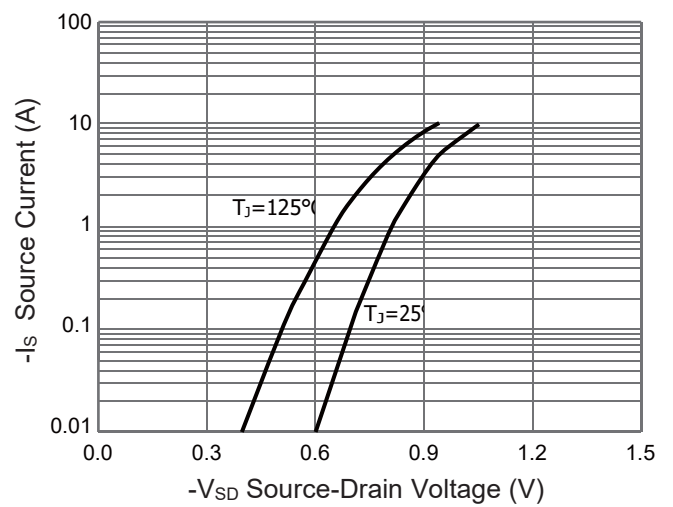
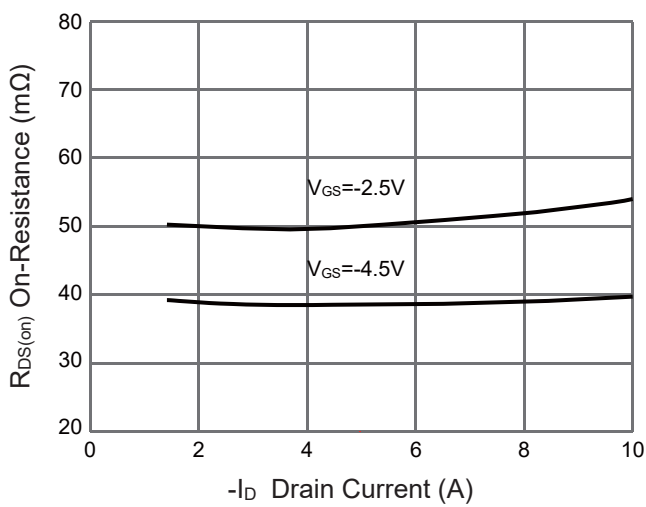
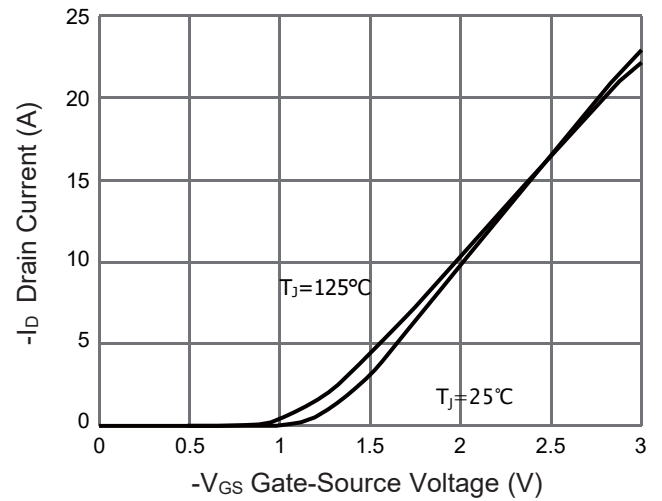
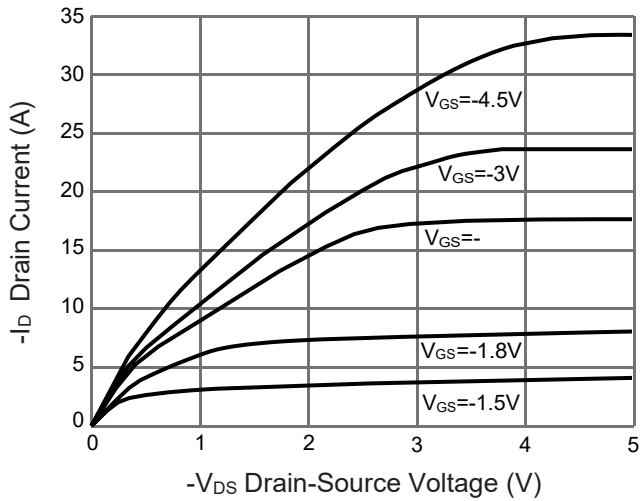
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	$-V_{(BR)DSS}$	$V_{GS}=0V, I_D=-250\mu A$	20	--	--	V
Zero Gate Voltage Drain Current	$-I_{DSS}$	$V_{DS}=-20V, V_{GS}=0V$	--	--	1	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=\pm 12V, V_{DS}=0V$	--	--	± 100	nA
Gate Threshold Voltage ^{Note3}	$-V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	0.4	0.6	1	V
Drain-Source On-Resistance ^{Note3}	$R_{DS(on)}$	$V_{GS}=-4.5V, I_D=-2.8A$	--	38	47	m Ω
		$V_{GS}=-2.5V, I_D=-2A$	--	50	65	m Ω
Forward Transconductance ^{Note3}	g_{FS}	$V_{DS}=-5V, I_D=-1A$	--	5.5	--	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=-10V, V_{GS}=0V, f=1MHz$	--	446	--	pF
Output Capacitance	C_{oss}		--	63	--	pF
Reverse Transfer Capacitance	C_{rss}		--	53	--	pF
Gate Resistance	R_G	$V_{DS}=0V, V_{GS}=0V, f=1MHz$	--	14.5	--	Ω
Total Gate Charge	Q_g	$V_{DS}=-10V, I_D=-3.4A,$ $V_{GS}=-4.5V$	--	5.41	--	nC
Gate-Source Charge	Q_{gs}		--	1.17	--	nC
Gate-Drain Charge	Q_{gd}		--	1.24	--	nC
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=-10V, I_D=-1A,$ $V_{GS}=-4.5V, R_{GEN}=3\Omega$	--	6.4	--	nS
Turn-on Rise Time	t_r		--	21.8	--	nS
Turn-off Delay Time	$t_{d(off)}$		--	37.4	--	nS
Turn-off Fall Time	t_f		--	34	--	nS
Source-Drain Diode Characteristics						
Diode Forward Voltage ^{Note3}	$-V_{SD}$	$V_{GS}=0V, I_S=-3.8A$	--	--	1.2	V
Diode Forward Current ^{Note2}	$-I_S$		--	--	3.8	A

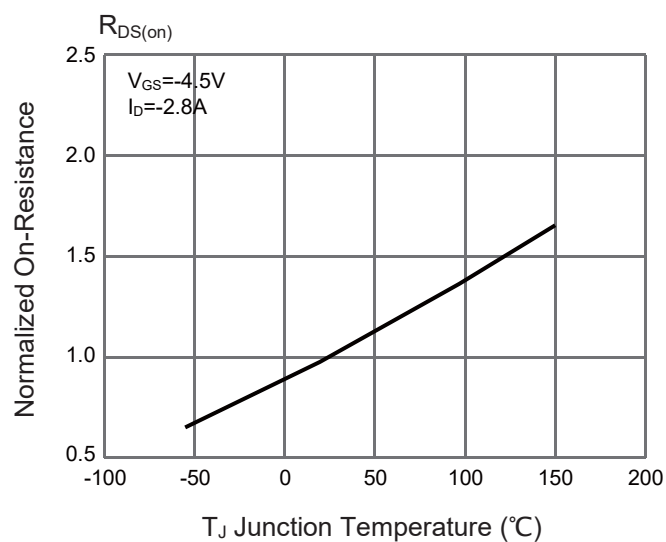
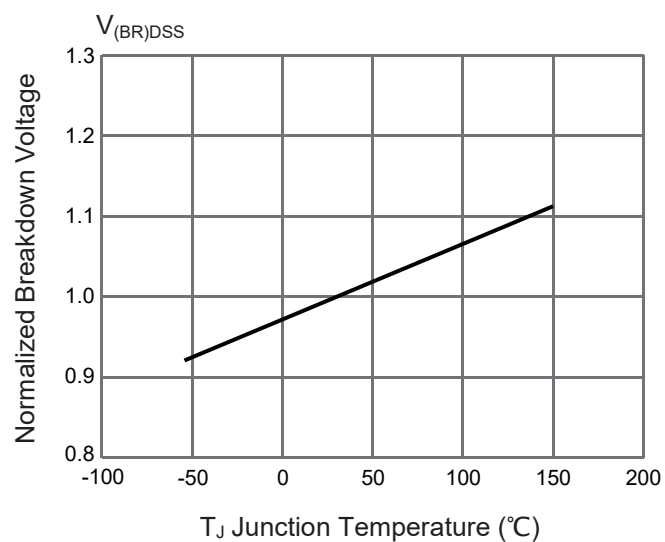
Note: 1. Repetitive Rating: Pulse width limited by maximum junction temperature.

2. Surface Mounted on FR4 Board, $t \leq 10$ sec.

3. Pulse Test: Pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

Typical Characteristic Curves

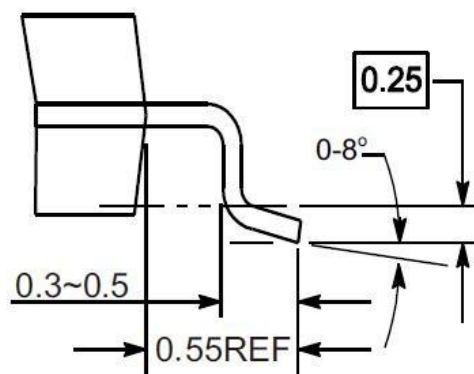
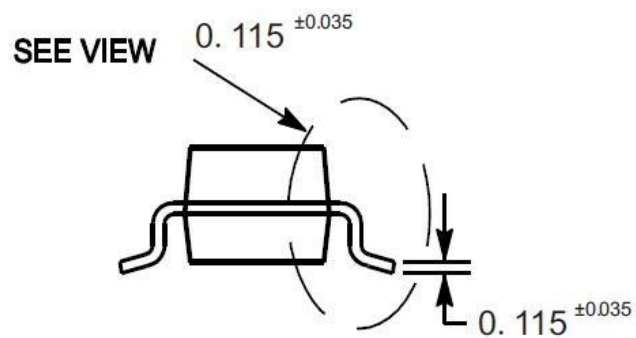
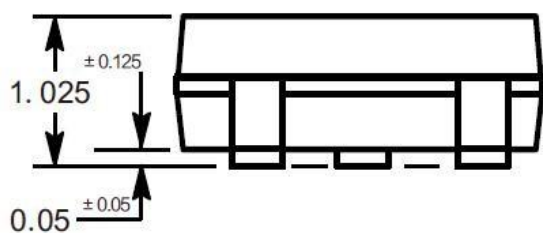
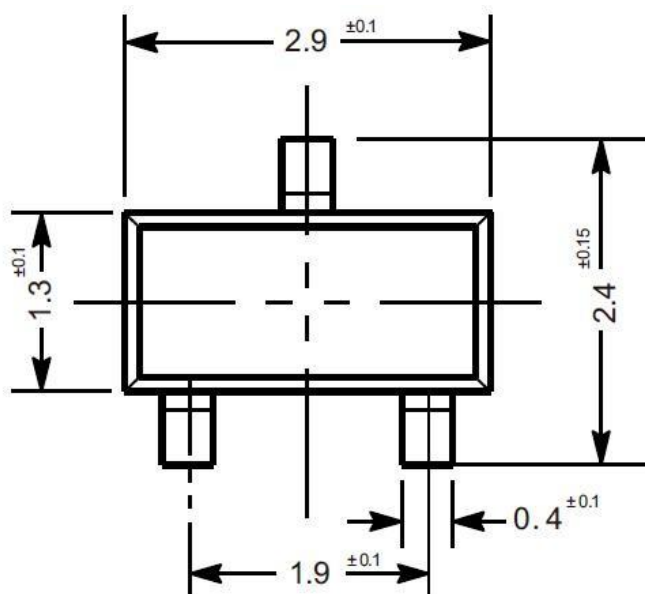




Package Outline

SOT-23

Dimensions in mm



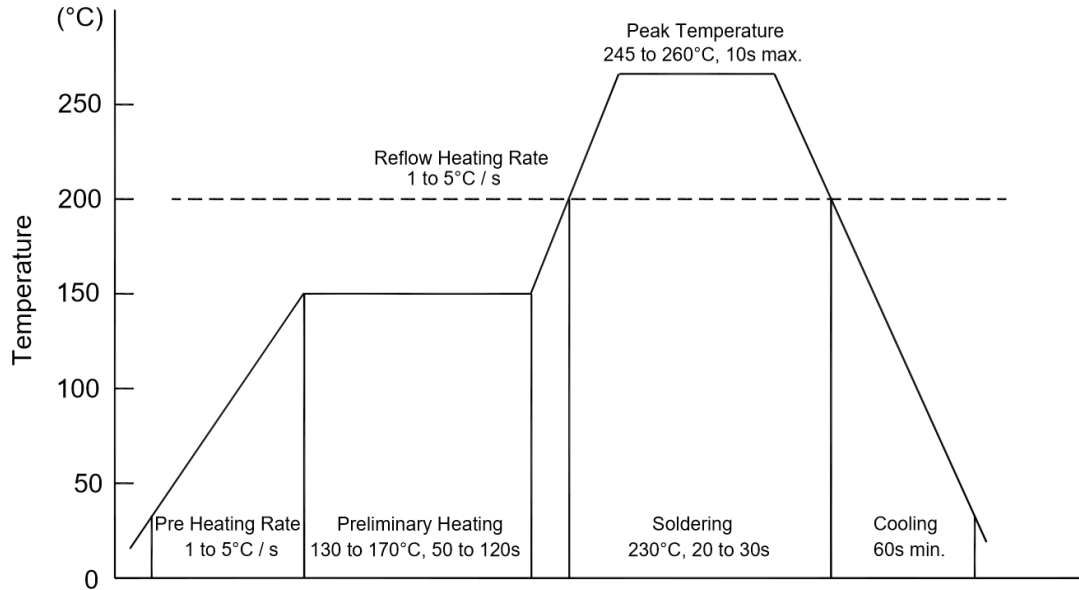
VIEW C

Ordering Information

Device	Package	Shipping
TN2301APSA	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

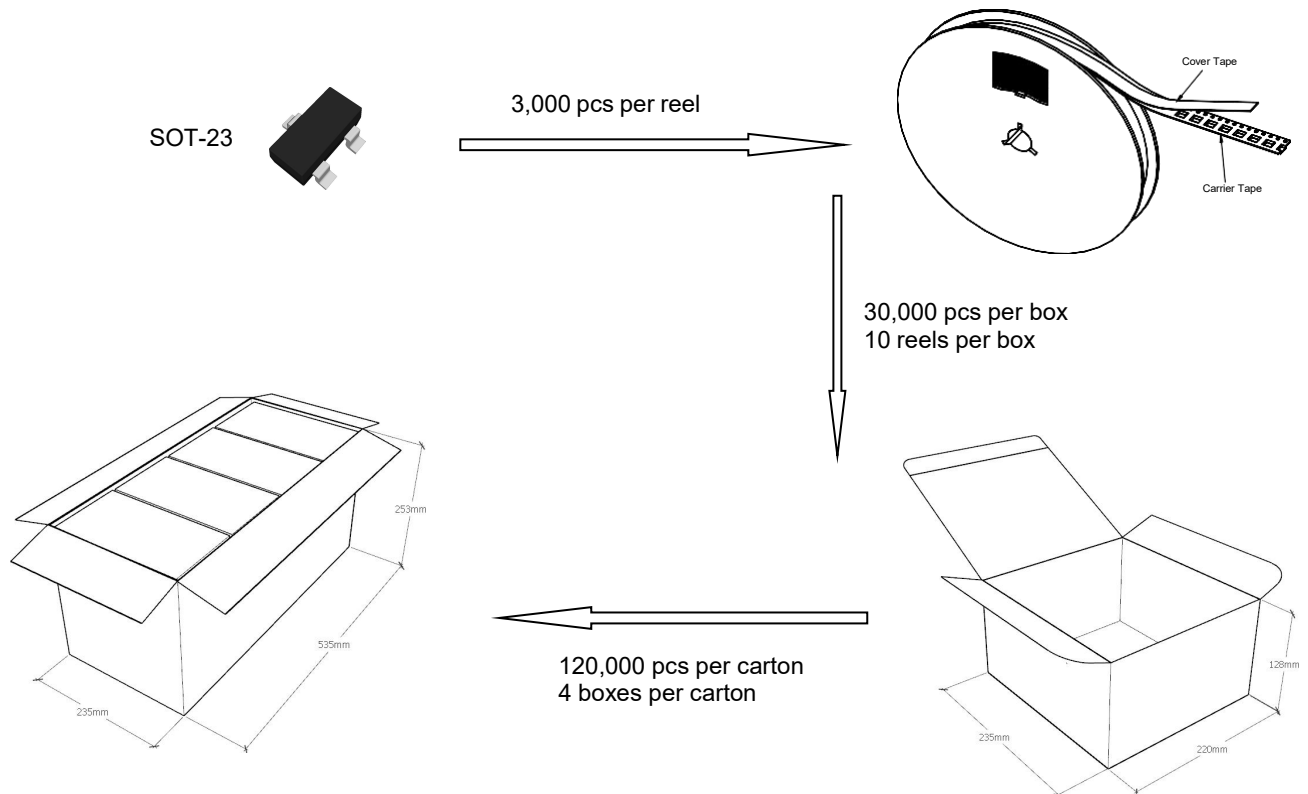
- Temperature: 300°C
- Time: 3s max.
- Times: one time

◆ Storage conditions

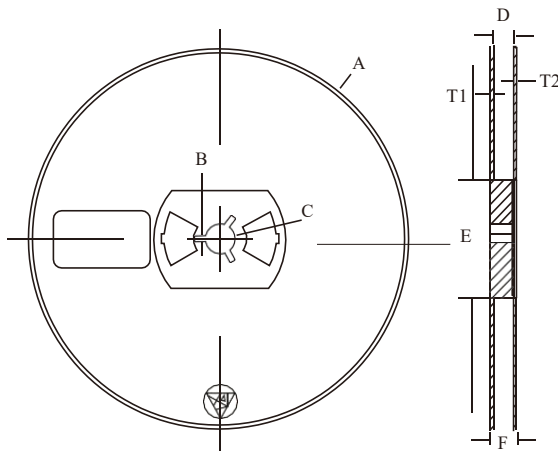
- **Temperature**
5 to 40°C
- **Humidity**
30 to 80% RH
- **Recommended period**
One year after manufacturing

Package Specifications

- The method of packaging



◆ Embossed tape and reel data



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

Reel (7")

