
P-CHANNEL POWER MOS FET FOR SWITCHING
S-90P0222SUA

The S-90P0222SUA is an P-channel power MOS FET that realizes a low on-state resistance and ultra high-speed switching characteristics. It is suitable for speeding up switching, enabling a high efficient set and energy saving. A gate protection diode is built in as a countermeasure for static electricity. Small SOT-89-3 package realize high-density mounting. This product can be driven directly by a -2.5 V power source. If use this product in combination with SII switching regulator products, you can get the highest performance.

■ Features

- Low on-state resistance: $R_{DS(on)1} = 0.41 \Omega$ Max. ($V_{GS} = -4.5$ V, $I_D = -0.8$ A)
 $R_{DS(on)2} = 0.71 \Omega$ Max. ($V_{GS} = -2.5$ V, $I_D = -0.8$ A)
- Ultra high-speed switching
- Operational voltage: -2.5 V drive available
- Built-in gate protection diode
- Small package: SOT-89-3

■ Applications

- Notebook PCs
- Cellular and portable phones
- On-board power supplies

■ Packages

- SOT-89-3 (Package drawing code: UP003-A)

■ Item code

- Item code : S-90P0222SUA-TF
- Delivery form : Taping only

■ Pin Configuration

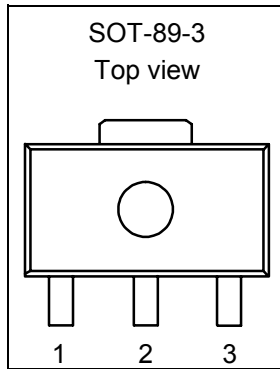


Figure 1

Table 1

Pin No.	Symbol	Description
1	G	Gate pin
2	D	Drain pin
3	S	Source pin

■ Equivalent Circuit

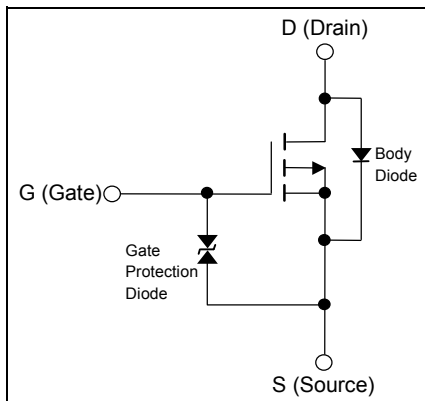


Figure 2

Caution The diode connected between the gate and source of the transistor serves as a protector against electrostatic discharge. Do not apply an electrostatic discharge to this IC that exceeds the performance ratings of the built-in gate protection diode. And when this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

■ Absolute Maximum Ratings

Table 2

(Ta = 25°C unless otherwise specified)

Item	Symbol	Conditions	Ratings	Unit
Drain to source voltage (When between gate and source short circuits)	V_{DSS}	$V_{GS} = 0\text{ V}$	-20	V
Gate to source voltage (When between drain and source short circuits)	V_{GSS}	$V_{DS} = 0\text{ V}$	±12	
Drain current (DC)	I_D		-1.5	A
Drain current (Pulse)	I_{DP}	PW = 10 μs , Duty Cycle ≤ 1%	-4.5	
Reverse drain current	I_{DR}		-1.5	
Power dissipation *1, *2	P_D		2.5	W
Channel temperature	T_{ch}		150	°C
Storage temperature	T_{stg}		-55 to +150	

Caution The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

*1. Mounted on a ceramics board (1225 mm² × 1 mm)

*2. The allowable power dissipation differs depending on the mounting form.

■ **Electrical Characteristics**

DC characteristics

Table 3

(Ta = 25°C unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain cut-off current	I_{DSS}	$V_{DS} = -20\text{ V}, V_{GS} = 0\text{ V}$	—	—	-10	μA
Gate to source leakage current	I_{GSS}	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	
Gate to source cut-off voltage	$V_{GS(off)}$	$I_D = -1\text{ mA}, V_{DS} = -10\text{ V}$	-0.5	—	-1.2	V
Drain to source on-state resistance *1	$R_{DS(on)1}$	$I_D = -0.8\text{ A}, V_{GS} = -4.5\text{ V}$	—	0.31	0.41	Ω
	$R_{DS(on)2}$	$I_D = -0.8\text{ A}, V_{GS} = -2.5\text{ V}$	—	0.50	0.71	
Forward transfer admittance *1	$ Y_{fs} $	$I_D = -0.8\text{ A}, V_{DS} = -10\text{ V}$	—	1.6	—	S
Body drain diode forward voltage	V_f	$I_f = -1.5\text{ A}, V_{GS} = 0\text{ V}$	—	-0.9	-1.1	V

*1. Effective during pulse test (600 μs).

Dynamic characteristics

Table 4

(Ta = 25°C unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input capacitance	C_{iss}	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	—	135	—	pF
Output capacitance	C_{oss}		—	50	—	
Feedback capacitance	C_{rss}		—	40	—	

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Switching characteristics

Table 5

(Ta = 25°C unless otherwise specified)

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-on delay time	$t_{d(on)}$	$V_{GS} = -5\text{ V}$, $I_D = -0.8\text{ A}$, $V_{DD} = -10\text{ V}$	—	10	—	ns
Rise time	t_r		—	40	—	
Turn-off delay time	$t_{d(off)}$		—	45	—	
Fall time	t_f		—	70	—	

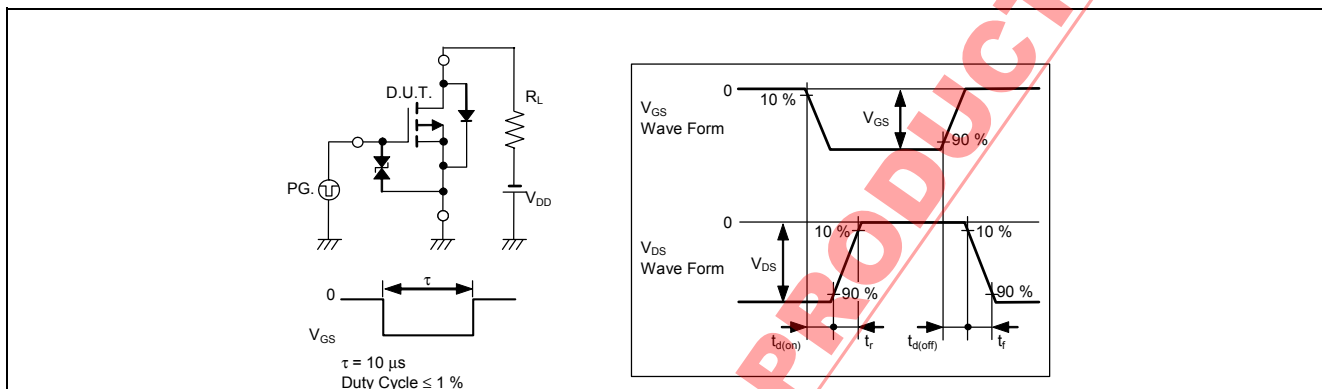


Figure 3

Thermal characteristics

Table 6

(Ta = 25°C unless otherwise specified)

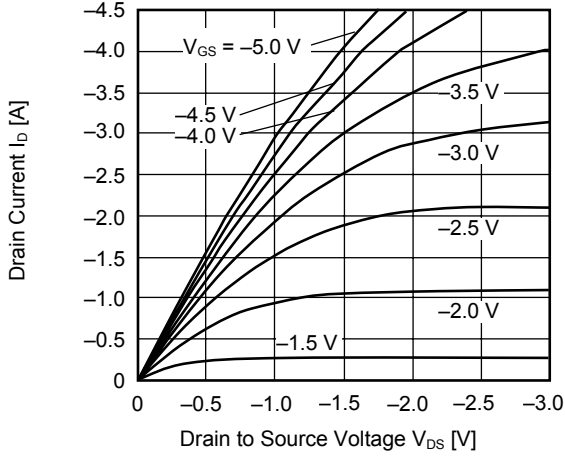
Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Thermal resistance (Channel to ambience)	$R_{th(ch-a)}$	Mounted on a ceramics board (1225 mm ² × 1 mm)	—	50	—	°C/W

■ Precautions

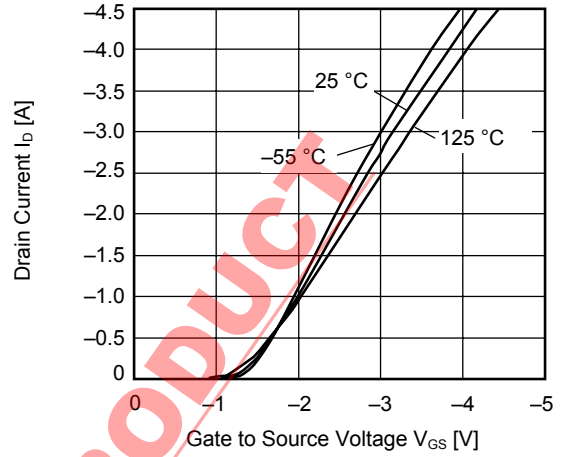
- The application conditions for the input voltage, output voltage, and load current should not exceed the allowable package power dissipation after mounting.
- SII claims no responsibility for any disputes arising out of or in connection with any infringement by products including this IC of patents owned by a third party.

■ Typical Characteristics

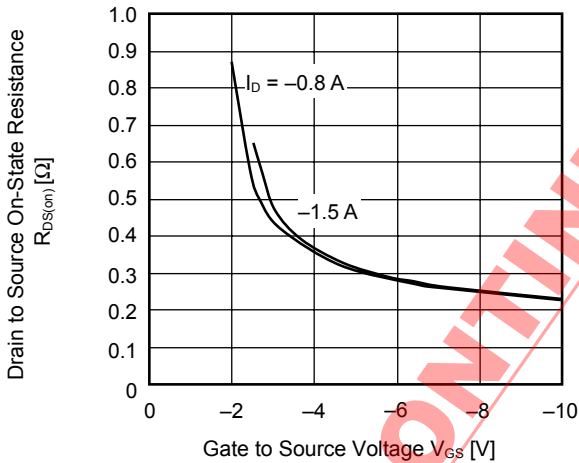
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE
Pulse test (600 μ s), $T_a = 25^\circ\text{C}$



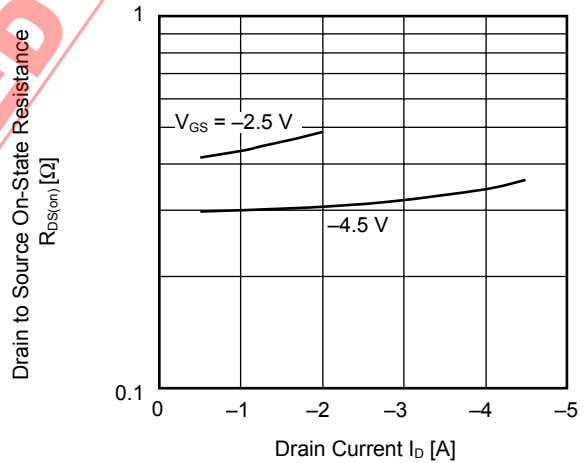
DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE
Pulse test (600 μ s), $V_{DS} = -10\text{ V}$



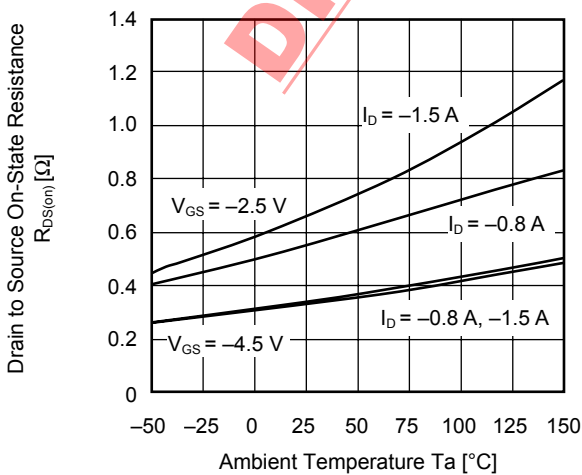
DRAIN TO SOURCE ON-STATE RESISTANCE
vs. GATE TO SOURCE VOLTAGE
Pulse test (600 μ s), $T_a = 25^\circ\text{C}$



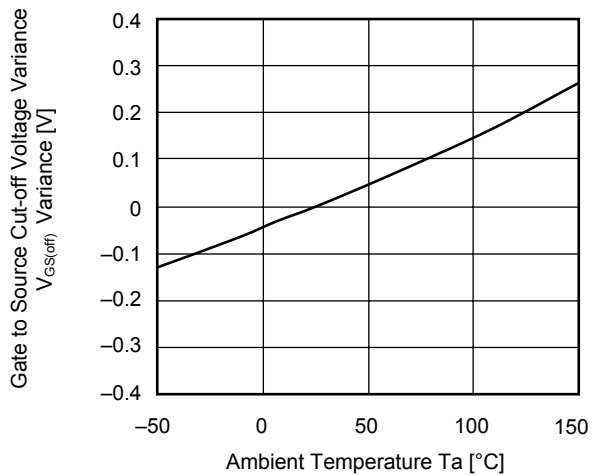
DRAIN TO SOURCE ON-STATE RESISTANCE
vs. DRAIN CURRENT
Pulse test (600 μ s), $T_a = 25^\circ\text{C}$



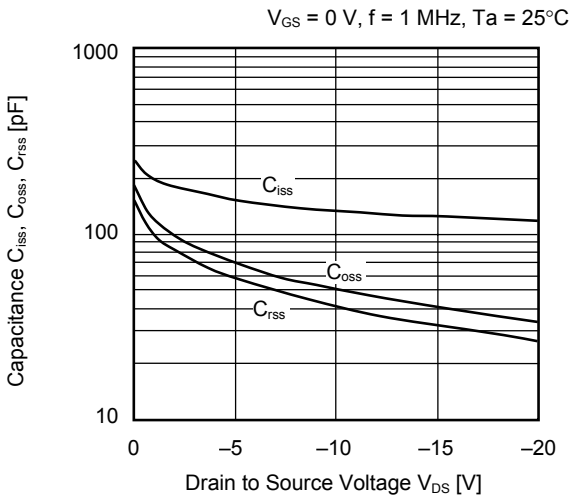
DRAIN TO SOURCE ON-STATE RESISTANCE
vs. AMBIENT TEMPERATURE
Pulse test (600 μ s)



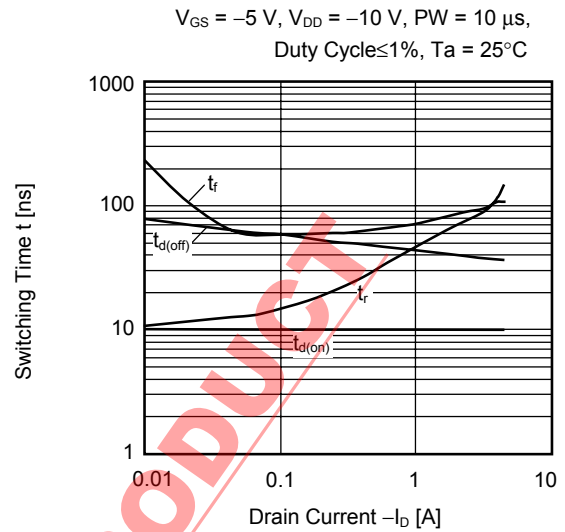
GATE TO SOURCE CUT-OFF VOLTAGE VARIANCE
vs. AMBIENT TEMPERATURE
 $V_{DS} = -10\text{ V}$, $I_D = -1\text{ mA}$



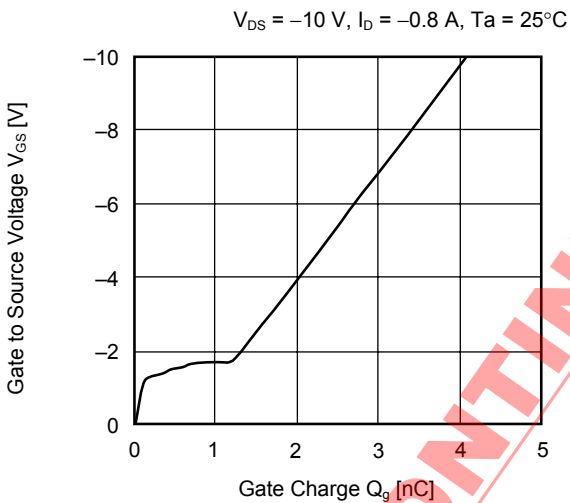
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



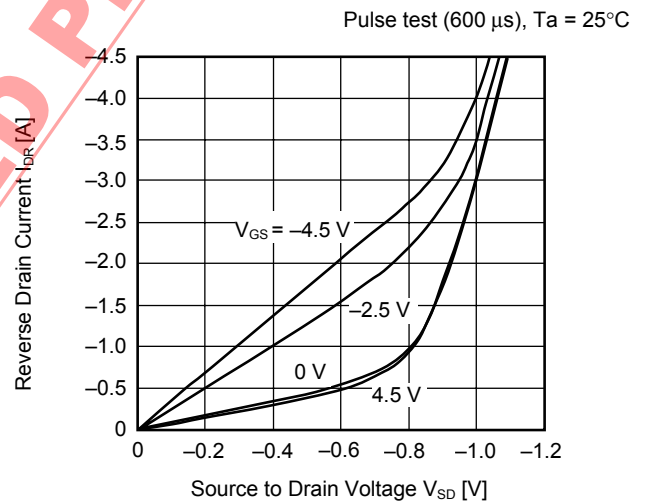
SWITCHING TIME vs. DRAIN CURRENT



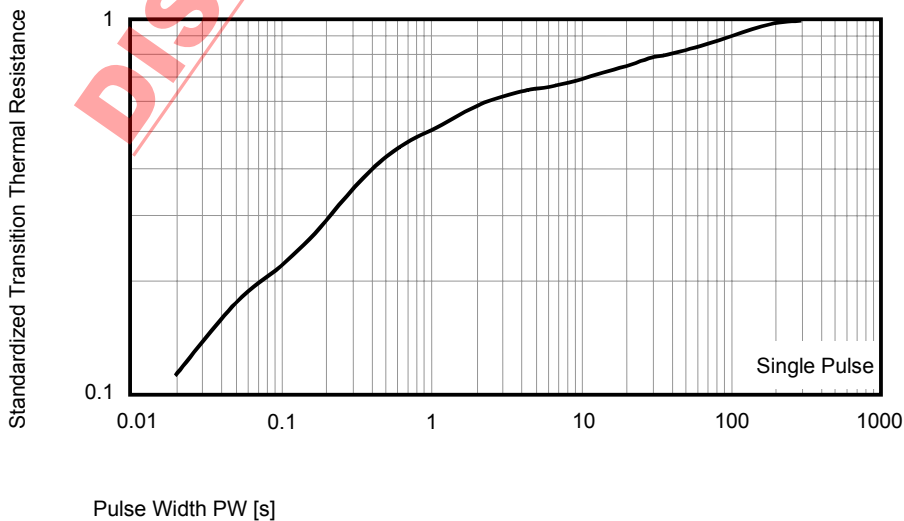
GATE TO SOURCE VOLTAGE vs. GATE CHARGE



REVERSE DRAIN CURRENT vs. SOURCE TO DRAIN VOLTAGE

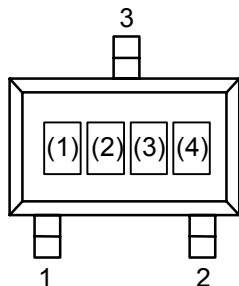


STANDARDIZED TRANSITION THERMAL RESISTANCE vs. PULSE WIDTH
 $R_{th(ch-a)} = 50^\circ\text{C/W}$, $T_a = 25^\circ\text{C}$, Mounted on a ceramics board ($1225\text{ mm}^2 \times 1\text{ mm}$)



■ Marking Specification

SOT-23-3
Top view

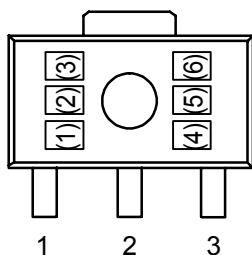


(1)~(3) : Product code (Refer to **Product name vs. Product code**)
(4) : Lot number

Product name vs. Product code

Product name	Product code		
	(1)	(2)	(3)
S-90P0112SMA-TF	O	N	S

SOT-89-3
Top view



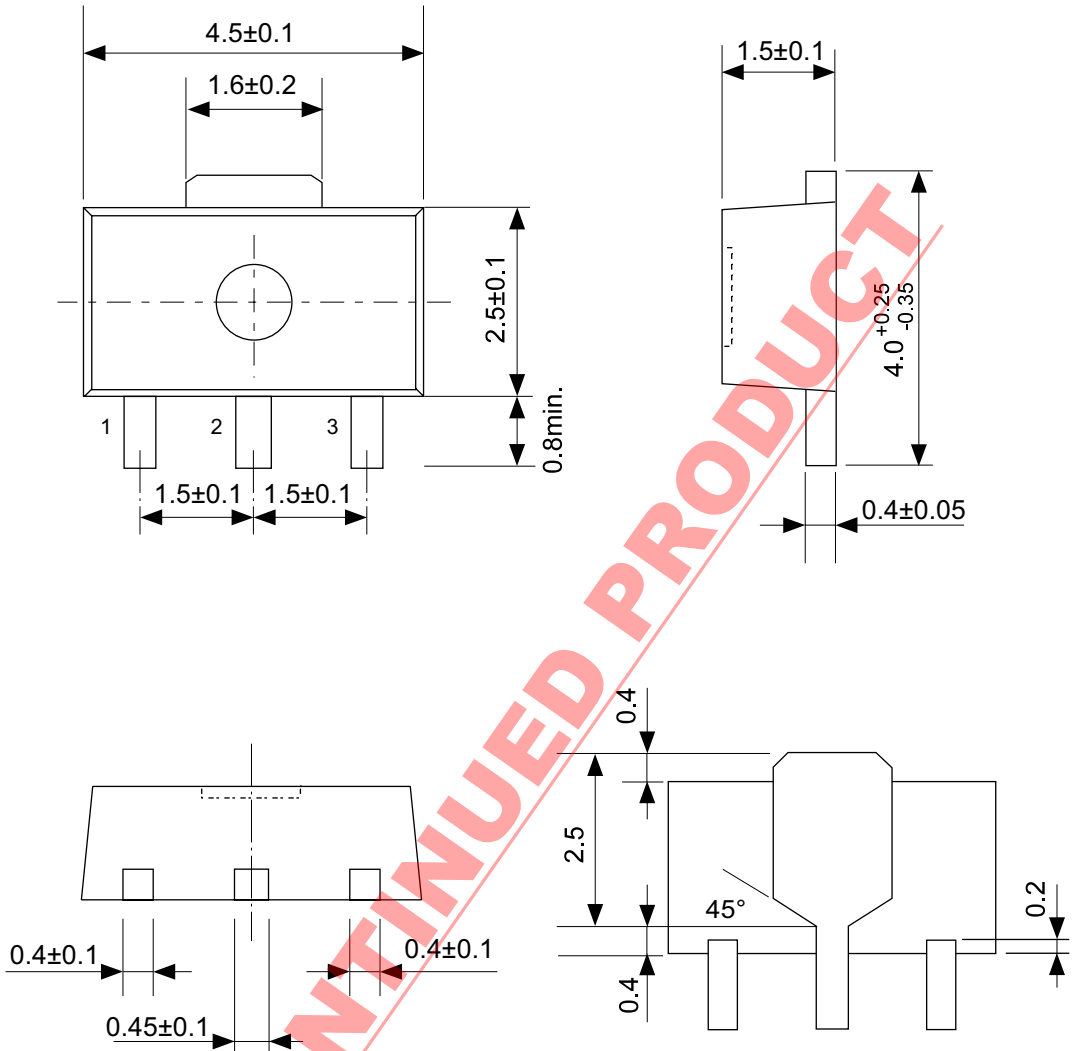
(1)~(3) : Product code (Refer to **Product name vs. Product code**)
(4)~(6) : Lot number

Product name vs. Product code

Product name	Product code		
	(1)	(2)	(3)
★ S-90P0222SUA-TF	O	N	W
S-90P0332SUA-TF	O	N	X

Remark The mark ★ shows the product indicated in this data sheet.

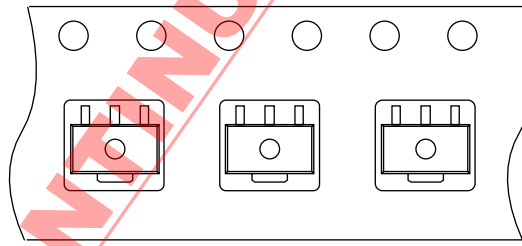
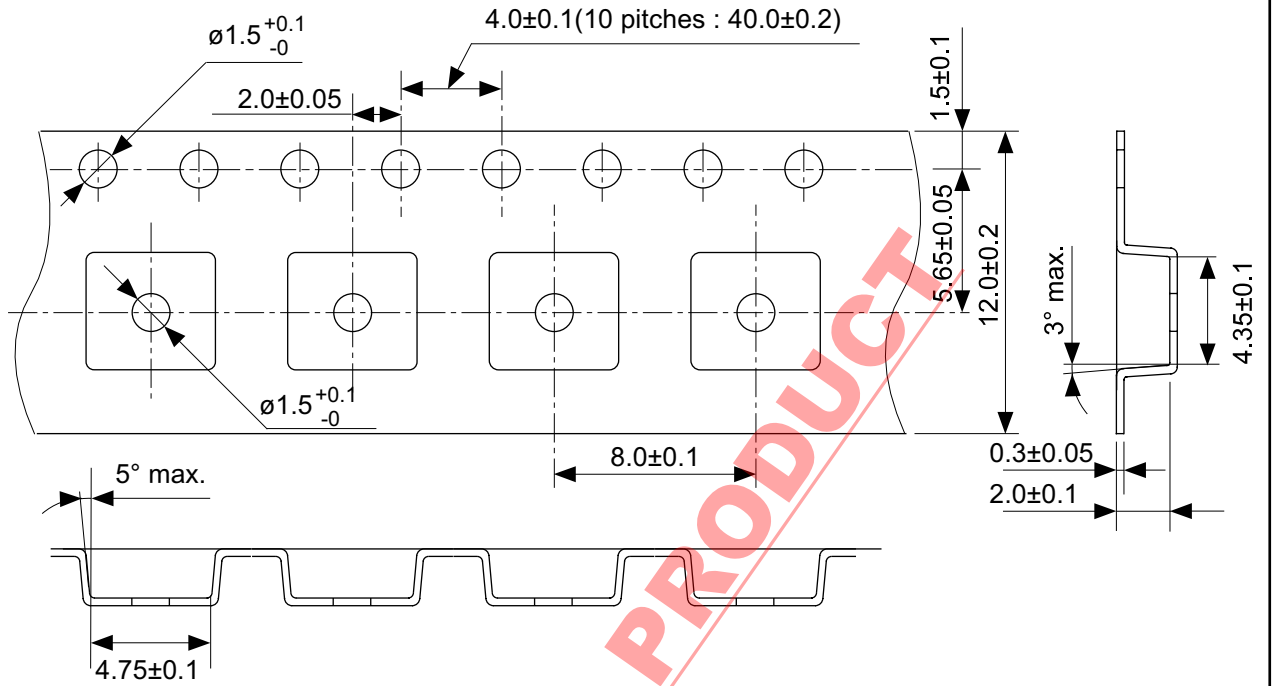
DISCONTINUED PRODUCT



DISCONTINUED PRODUCT

No. UP003-A-P-SD-1.1

TITLE	SOT893-A-PKG Dimensions
No.	UP003-A-P-SD-1.1
SCALE	
UNIT	mm
Seiko Instruments Inc.	

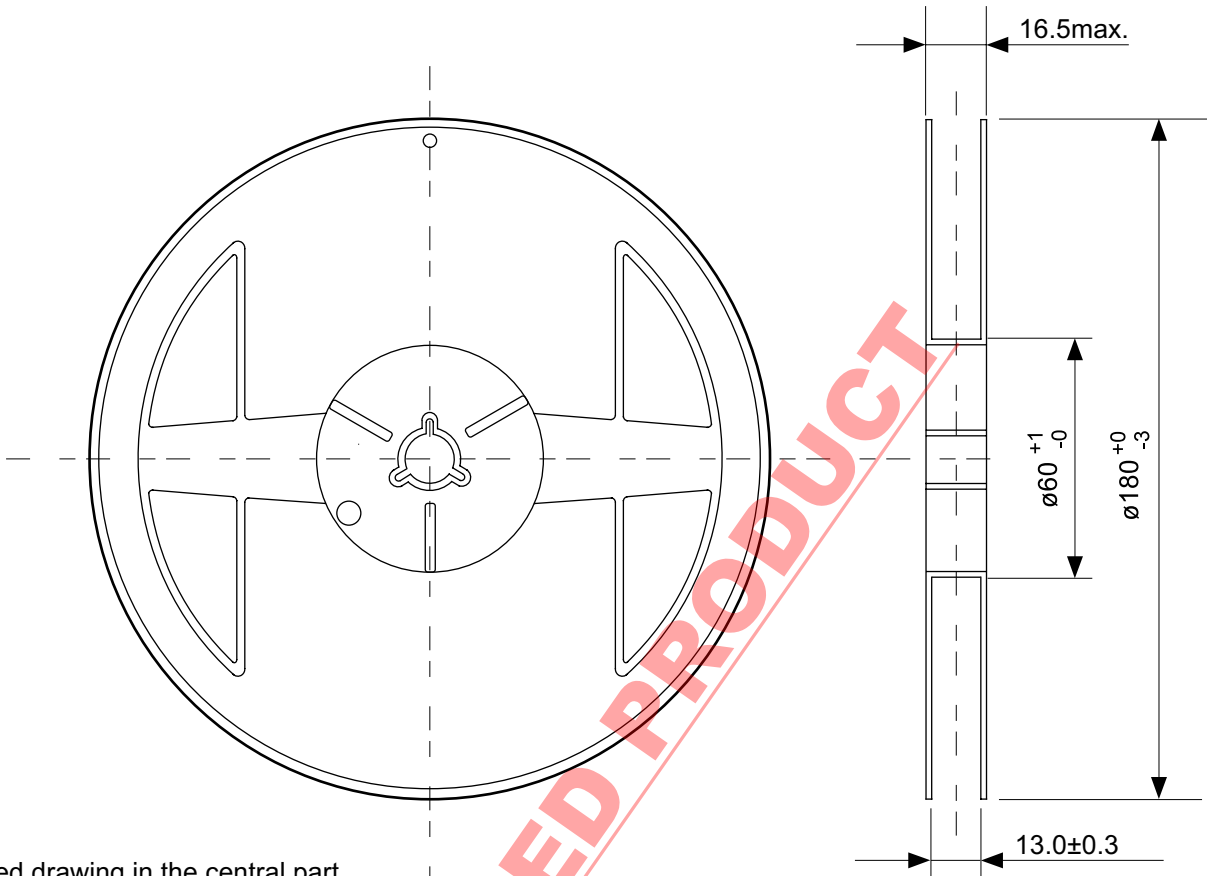


Feed direction

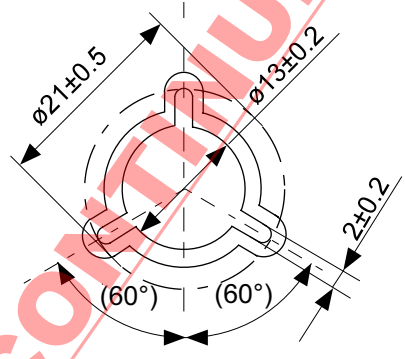
DISCONTINUED PRODUCT

No. UP003-A-C-SD-1.1

TITLE	SOT893-A-Carrier Tape
No.	UP003-A-C-SD-1.1
SCALE	
UNIT	mm
Seiko Instruments Inc.	



Enlarged drawing in the central part



DISCONTINUED PRODUCT

No. UP003-A-R-SD-1.1

TITLE	SOT893-A-Reel		
No.	UP003-A-R-SD-1.1		
SCALE		QTY.	1,000
UNIT	mm		
Seiko Instruments Inc.			

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