



Automotive NJW4250-T1 45V I_{OUT} = 50mA Voltage Tracker

FEATURES

- AEC-Q100 grade 1 qualification in progress
- High Accuracy Tracking Output Voltage ±5mV
- Wide Operating Voltage 4.0V to 40V
- Output Current 50mA (min)
- Low Quiescent Current 40μA (typ)
- Common Pin for Reference and ON/OFF control
- Ceramic Capacitor Compatible
- Thermal Shutdown
- Overcurrent Protection
- Package SOT-23-5

GENERAL DESCRIPTION

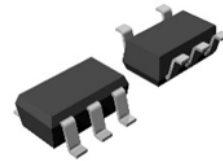
The NJW4250 is voltage tracker with 45V input voltage (absolute maximum rating) and 50mA output current. The adjustable adjust input voltage from 2.5V to 36V, and ±5mV output voltage accuracy over the operating temperature range are guaranteed.

NJW4250 has high-precision tracking output voltage, thermal shutdown function and overcurrent protection function, is ideal for off-board sensors in automotive applications that require high reliability.

Low quiescent current of 40μA and SOT-23-5 small package make the NJW4250 achieves low power and space saving of the system.

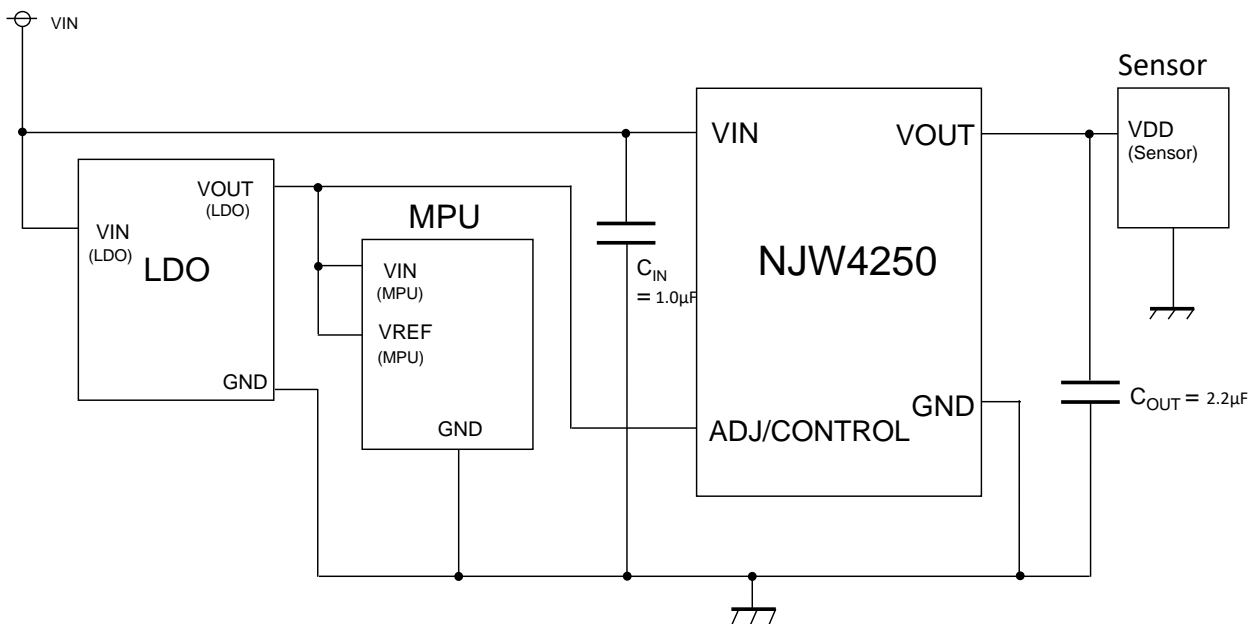
APPLICATIONS

- Automotive applications (ECU, Body equipment)
- Various sensors for industrial machinery



SOT-23-5
2.9x2.8x1.1(mm)

TYPICAL APPLICATION



■PRODUCT NAME INFORMATION

NJW4250 a - bb (ccc)

Description of configuration

Composition	Item	Description
a	Package code	F: SOT-23-5
bb	Grade	Indicates the quality grade. T1: Automotive
(ccc)	Packing	Insert Direction. Refer to the packing specifications.

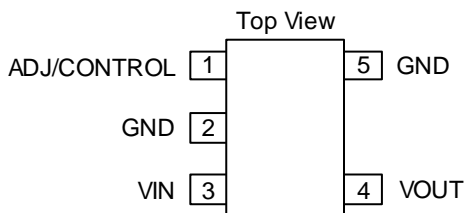
Grade

b	Applications	Operating Temperature Range	Test Temperature
T1	Chassis, Body control and In-vehicle	-40°C to 125°C	-40°C, 25°C, 125°C

■ ORDER INFORMATION

PRODUCT NAME	PACKAGE	RoHS	HALOGEN-FREE	PLATING COMPOSITION	WEIGHT (mg)	QUANTITY PER REEL (pcs/reel)
NJW4250F-T1(T1)	SOT-23-5	✓	✓	Sn2Bi	15	3000

■ PIN DESCRIPTIONS



NJW4250 SOT-23-5 Pin Configuration

Pin No.	Pin Name	I/O	Description
1	ADJ/CONTROL	I	Reference voltage input and ON/OFF control pin
2	GND ⁽¹⁾	-	Ground pin
3	VIN	Power	Power supply input pin
4	VOUT	O	Output pin
5	GND ⁽¹⁾	-	Ground pin

(1) Connect both 2pins of GND terminal to GND.

■ ABSOLUTE MAXIMUM RATINGS

	Symbol	Ratings	Unit
Input Voltage	V_{IN}	-0.3 to 45	V
ADJ/CONTROL Pin Voltage	$V_{ADJ/CONT}$	-0.3 to 45	V
Output Voltage	V_{OUT}	-0.3 to $V_{IN} \leq 45^{(2)}$	V
Junction Temperature ⁽³⁾	T_j	-40 to 150	°C
Storage Temperature	T_{stg}	-50 to 150	°C

(2) When the input voltage is less than 45V, the absolute maximum output voltage is equal to the input voltage.

(3) Calculate the power consumption of the IC from the operating conditions, and calculate the junction temperature with the thermal resistance.

Please refer to "[THERMAL CHARACTERISTICS](#)" for the thermal resistance under our measurement board conditions.

ABSOLUTE MAXIMUM RATINGS
Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause permanent damage and may degrade the lifetime and safety for both device and system using the device in the field. The functional operation at or over these absolute maximum ratings is not assured.

■ THERMAL CHARACTERISTICS

Parameter	Ratings	Unit
Junction-To-Ambient Thermal Resistance (θ_{ja})	2-Layer / 4-Layer 259 ⁽⁴⁾ / 193 ⁽⁵⁾	°C/W
Junction-To-Top of Package Characterization Parameter (ψ_{jt})	2-Layer / 4-Layer 67 ⁽⁴⁾ / 58 ⁽⁵⁾	°C/W

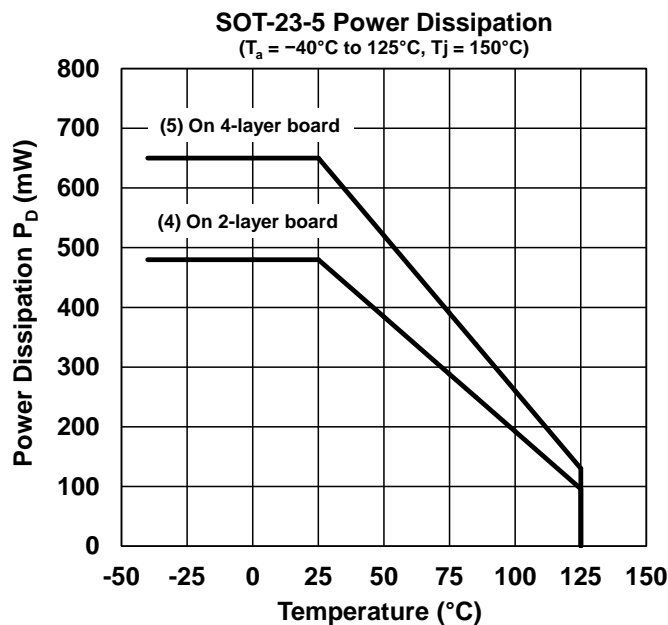
θ_{ja} : Junction-to-Ambient Thermal Resistance

ψ_{jt} : Junction-to-Top Thermal Characterization Parameter

(4) 2-Layer : Mounted on glass epoxy board (76.2mm × 114.3mm × 1.6mm : based on EIA/JEDEC standard, 2-layer FR-4).

(5) 4-Layer : Mounted on glass epoxy board (76.2mm × 114.3mm × 1.6mm : based on EIA/JEDEC standard, 4-layer FR-4), internal Cu area: 74.2mm × 74.2mm.

■ POWER DISSIPATION vs. AMBIENT TEMPERATURE



■ ELECTROSTATIC DISCHARGE RATINGS

	Conditions	Protection Voltage
HBM	C = 100pF, R = 1.5kΩ	± 2000V
CDM		± 1000V

ELECTROSTATIC DISCHARGE RATINGS

The electrostatic discharge test is done based on JEITA ED-4701
 In the HBM method, ESD is applied using the power supply pin and GND pin as reference pins.

■ RECOMMENDED OPERATING CONDITIONS

	Symbol	Ratings	Unit
Operating Voltage	V_{IN}	4.0 to 40	V
ADJ/CONTROL input voltage	$V_{ADJ/CONT}$	0 to 36	V
Operating Temperature	T_a	-40 to 125	°C
Output Current	I_{OUT}	0 to 50	mA

RECOMMENDED OPERATING CONDITIONS

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if when they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

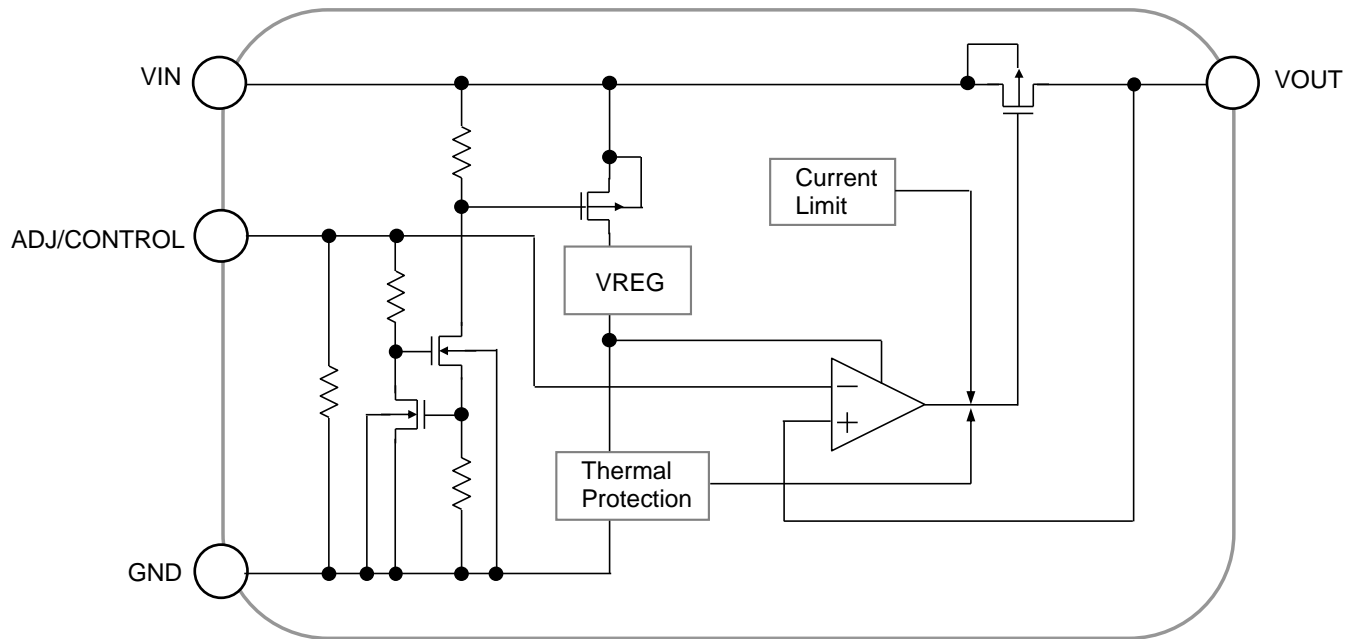
■ ELECTRICAL CHARACTERISTICS

$V_{IN} = 13.5V$, $V_{ADJ/CONT} \geq 2.5V$, $C_{IN} = 1.0\mu F$, $C_{OUT} = 2.2\mu F$, unless otherwise specified.

For parameter that do not describe the temperature condition, the MIN/MAX value under the condition of $T_a = 25^\circ C$ is described.

Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Output Voltage Tracking Accuracy	V_{OUT}	$V_{IN} = V_{OUT} + 1V$ to 40V, $I_{OUT} = 1mA$ to 10mA ($V_{ADJ/CONT} \geq 3V$) $V_{IN} = 4V$ to 40V, $I_{OUT} = 1mA$ to 10mA ($V_{ADJ/CONT} < 3V$)	-5	-	+5	mV
		$V_{IN} = V_{OUT} + 1V$ to 40V, $I_{OUT} = 1mA$ to 10mA ($V_{ADJ/CONT} \geq 3V$) $V_{IN} = 4V$ to 40V, $I_{OUT} = 1mA$ to 10mA ($V_{ADJ/CONT} < 3V$) $T_a = -40^\circ C$ to $125^\circ C$	-5	-	+5	
		$V_{IN} = V_{OUT} + 1V$ to 40V, $I_{OUT} = 1mA$ to 50mA ($V_{ADJ/CONT} \geq 3V$) $V_{IN} = 4V$ to 40V, $I_{OUT} = 1mA$ to 50mA ($V_{ADJ/CONT} < 3V$)	-10	-	+10	
		$V_{IN} = V_{OUT} + 1V$ to 40V, $I_{OUT} = 1mA$ to 50mA ($V_{ADJ/CONT} \geq 3V$) $V_{IN} = 4V$ to 40V, $I_{OUT} = 1mA$ to 50mA ($V_{ADJ/CONT} < 3V$) $T_a = -40^\circ C$ to $125^\circ C$	-10	-	+10	
Quiescent Current	I_q	$I_{OUT} = 0mA$	-	40	70	μA
		$I_{OUT} = 0mA, T_a = -40^\circ C$ to $125^\circ C$	-	-	80	
Quiescent Current at Control OFF	$I_{q(OFF)}$	$V_{ADJ/CONT} = 0V$	-	-	1	μA
		$V_{ADJ/CONT} = 0V, T_a = -40^\circ C$ to $125^\circ C$	-	-	1	
Output Current Limit	I_{LIM}	$V_{OUT} \times 0.9$	51	-	240	mA
		$V_{OUT} \times 0.9, T_a = -40^\circ C$ to $125^\circ C$	51	-	240	
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	$V_{IN} = V_{OUT} + 1V$ to 40V , $I_{OUT} = 10mA$ ($V_{ADJ/CONT} \geq 3V$) $V_{IN} = 4V$ to 40V, $I_{OUT} = 10mA$ ($V_{ADJ/CONT} < 3V$)	-	-	5	mV
		$V_{IN} = V_{OUT} + 1V$ to 40V, $I_{OUT} = 10mA$ ($V_{ADJ/CONT} \geq 3V$) $V_{IN} = 4V$ to 40V, $I_{OUT} = 10mA$ ($V_{ADJ/CONT} < 3V$) $T_a = -40^\circ C$ to $125^\circ C$	-	-	5	
Load Regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	$I_{OUT} = 1mA$ to 30mA	-	-	5	mV
		$I_{OUT} = 1mA$ to 30mA, $T_a = -40^\circ C$ to $125^\circ C$	-	-	5	
Ripple Rejection	RR	$V_{IN} = V_{OUT} + 1V$, $e_{in} = 200mV_{rms}, f = 100Hz$, $I_{OUT} = 10mA$	-	80	-	dB
Dropout Voltage	ΔV_{IO}	$I_{OUT} = 50mA$	-	0.1	0.2	V
		$I_{OUT} = 50mA$, $T_a = -40^\circ C$ to $125^\circ C$	-	-	0.3	
ADJ/CONTROL Current	$I_{ADJ/CONT}$	$V_{ADJ/CONT} = 5V$	-	0.5	2	μA
		$V_{ADJ/CONT} = 5V, T_a = -40^\circ C$ to $125^\circ C$	-	-	3	
ADJ/CONTROL ON Voltage	$V_{ADJ/CONT(ON)}$		2.5	-	36	V
		$T_a = -40^\circ C$ to $125^\circ C$	2.5	-	36	
ADJ/CONTROL OFF Voltage	$V_{ADJ/CONT(OFF)}$		0	-	0.6	V
		$T_a = -40^\circ C$ to $125^\circ C$	0	-	0.6	

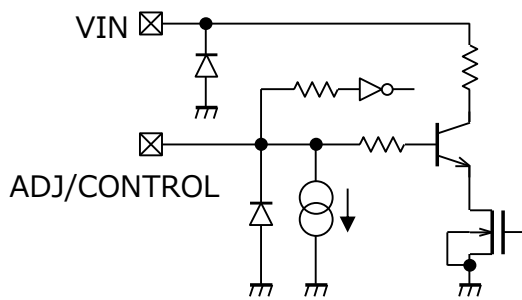
■ BLOCK DIAGRAMS



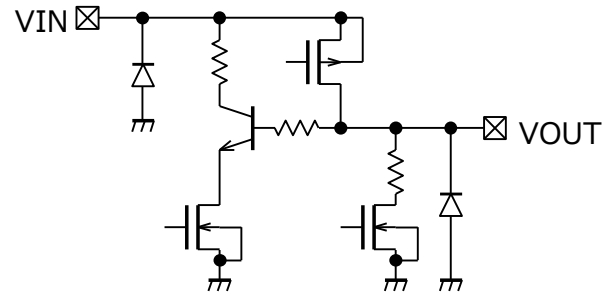
NJW4250-T1 Block Diagram

■ APPLICATION NOTES

Internal Equivalent Circuit Diagram of Pin

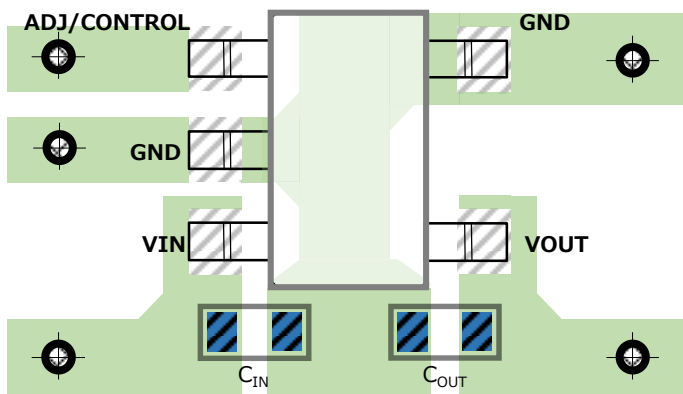


ADJ/CONTROL pin



VOUT pin

Evaluation Board / PCB Layout



NJW4250-T1

Input Capacitor (C_{IN})

The C_{IN} prevents oscillations and reduce power supply ripple of applications when the power supply impedance is high or power supply line is long. Connecting a 1.0μF(effective value) or larger C_{IN} between VIN and GND pins as short path as possible.

Output Capacitor (C_{OUT})

C_{OUT} is necessary for phase compensation of the internal error amplifier inside NJW4250, and the capacitance value and ESR affect the stability of the circuit. If a capacitor less than 2.2μF(effective value) is used, output noise and/or voltage oscillation may occur due to lack of the phase compensation. For stable operation, connect C_{OUT}, which is within the stable operation area with 2.2μF (effective value) or more, between the VOUT pin and the GND pin as short path as possible. As the capacitance value of C_{OUT} increases, output noise and ripple decrease, and the response to output load fluctuations also improves.

Select the output capacitor considering various characteristics such as frequency characteristics, temperature characteristics, and DC bias characteristics. For the C_{OUT}, a capacitor with excellent temperature characteristics and sufficient margin for output voltage is recommended.

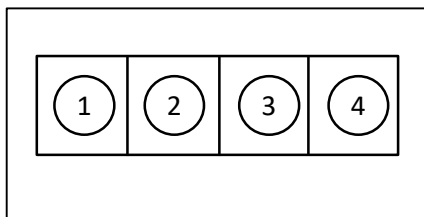
Voltage application to VIN pin and ADJ/CONTROL pin

For the NJW4250, the required tracking output voltage cannot be obtained if (VIN pin voltage) ≤ (ADJ/CONTROL pin voltage). The VIN pin voltage and ADJ/CONTROL pin voltage can be set in any order, but the NJW4250 does not assume a state in which voltage is continuously applied to the ADJ/CONTROL pin while no voltage is applied to the VIN pin. Also, the IC may not operate properly if both the VIN pin voltage and the ADJ/CONTROL pin voltage are not under the recommended operating conditions.

■ MARKING SPECIFICATION

①②③: Product Code ... Refer to *Part Marking List*

④ : Lot Number ... Alphanumeric Serial Number



1Pin

SOT-23-5 Part Markings

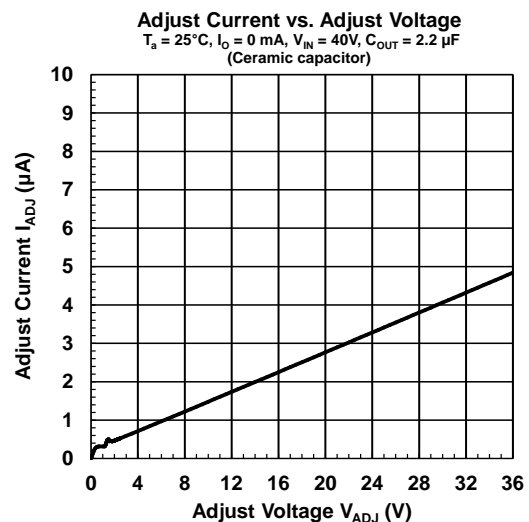
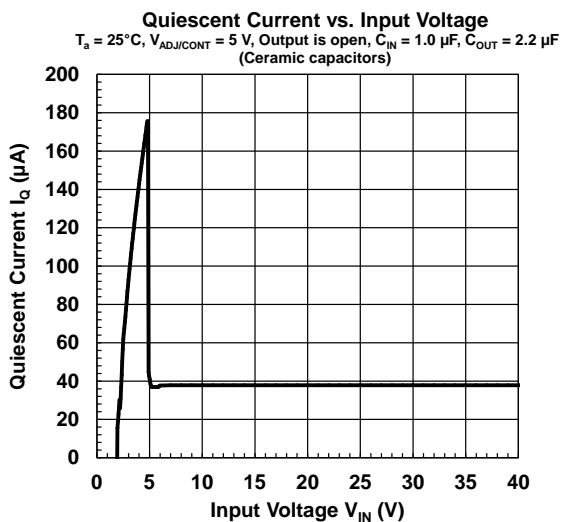
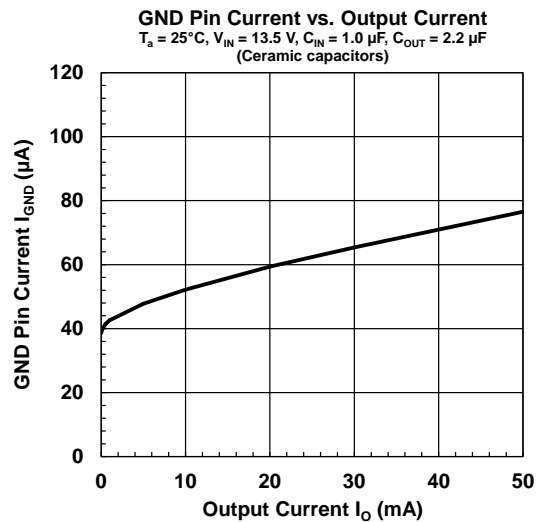
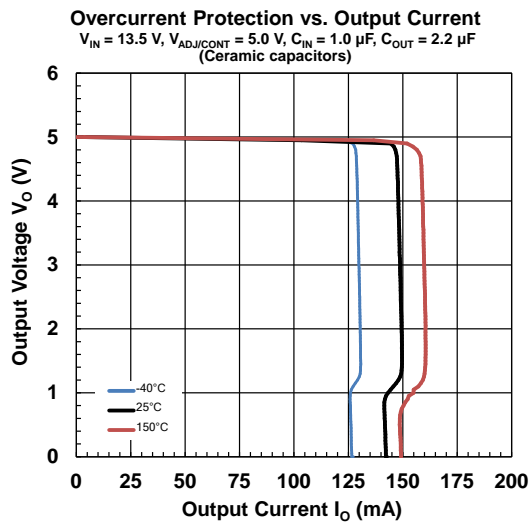
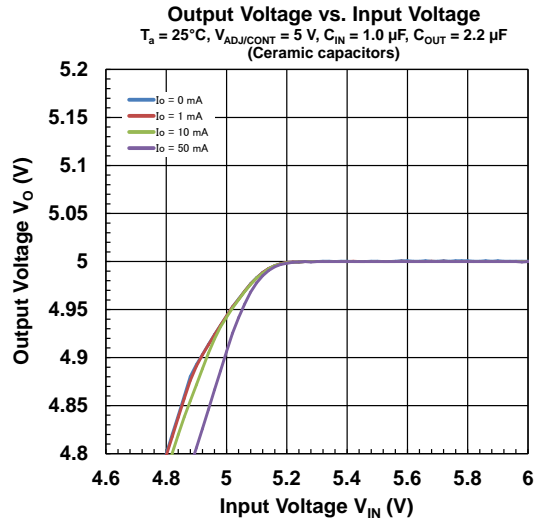
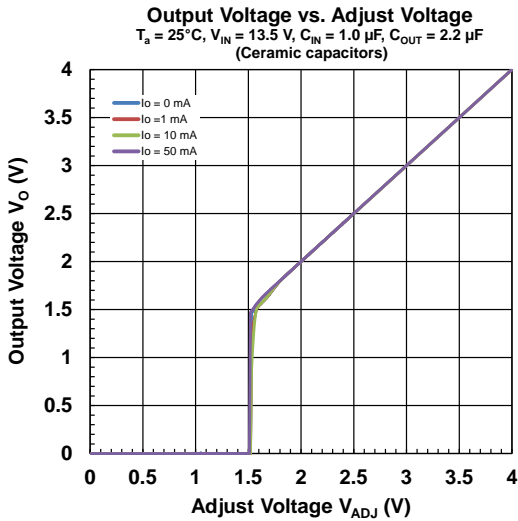
NOTICE
There can be variation in the marking when different AOI (Automated Optical Inspection) equipment is used. In the case of recognizing the marking characteristic with AOI, please contact our sales or distributor before attempting to use AOI.

Part Marking List (SOT-23-5)

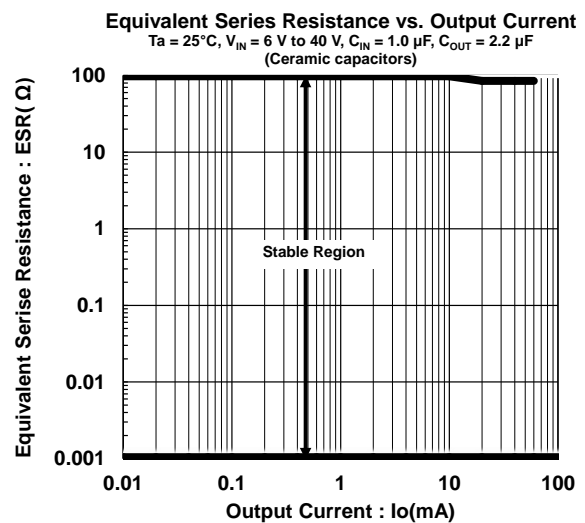
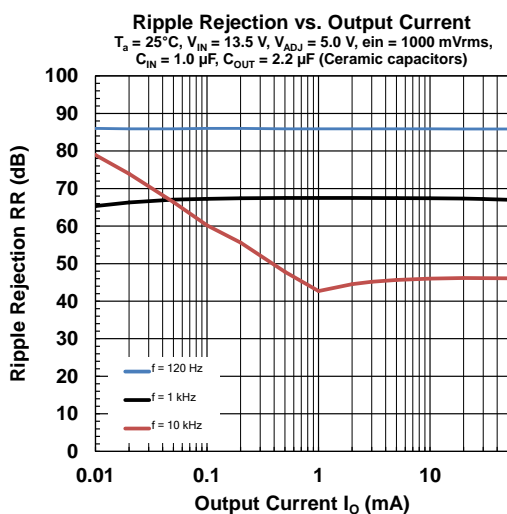
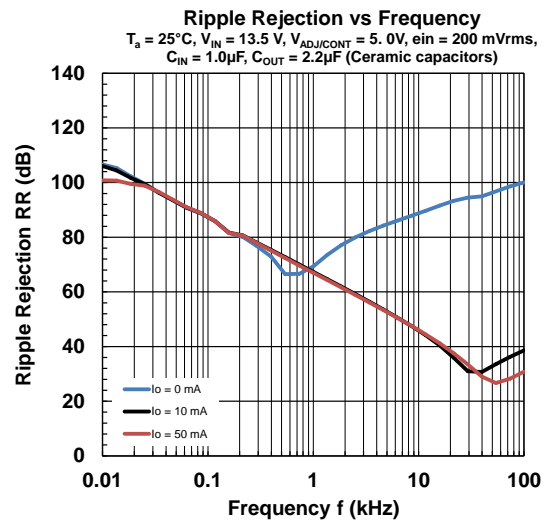
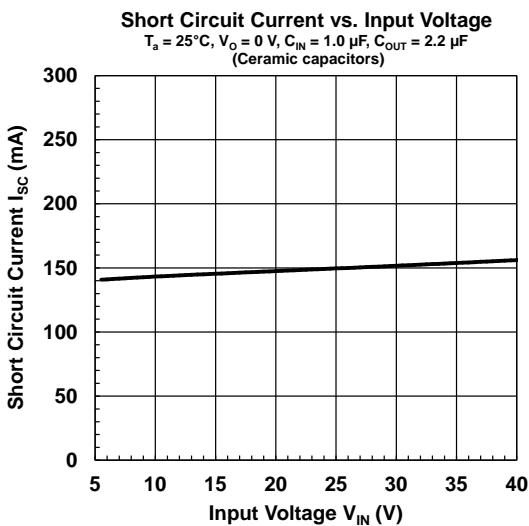
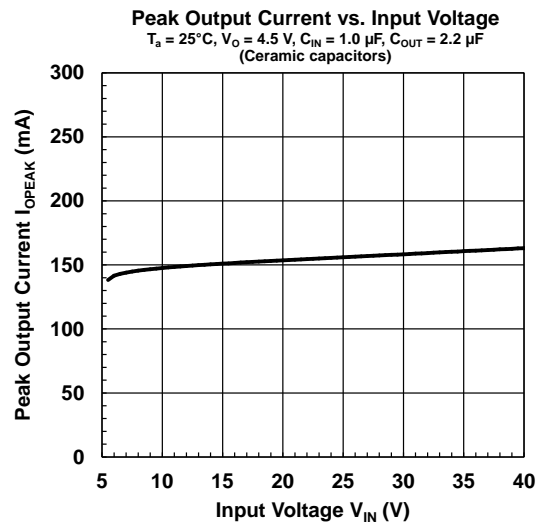
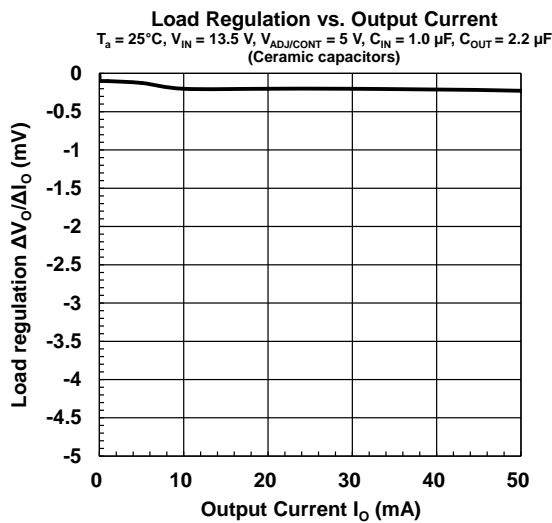
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NJW4250F-T1	A	K	3

■ TYPICAL CHARACTERISTICS

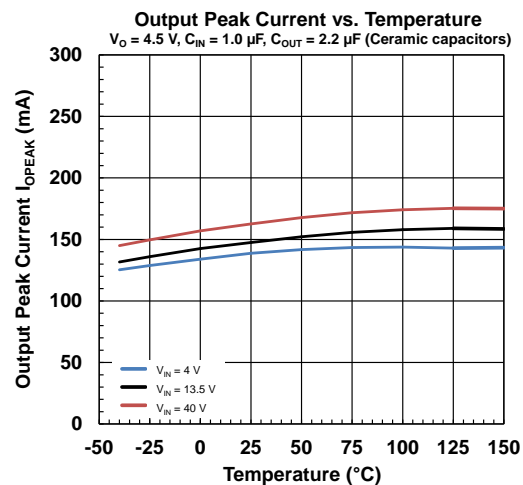
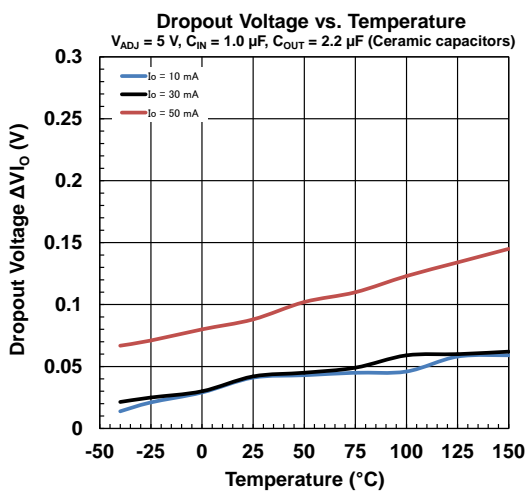
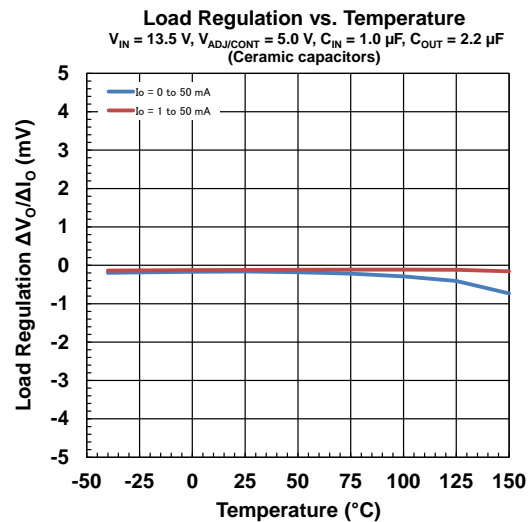
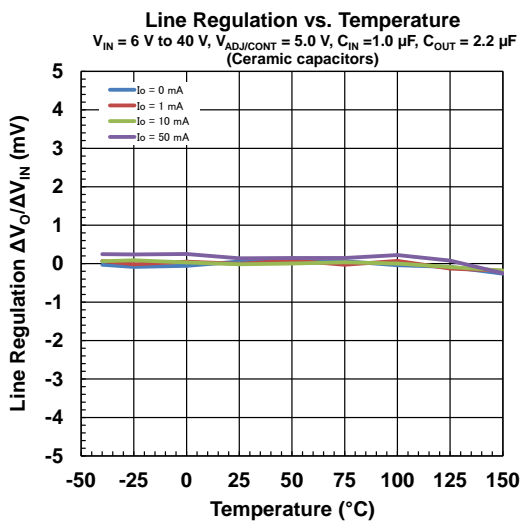
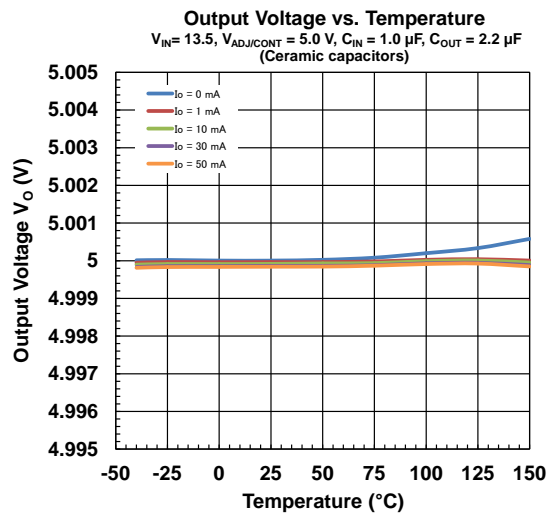
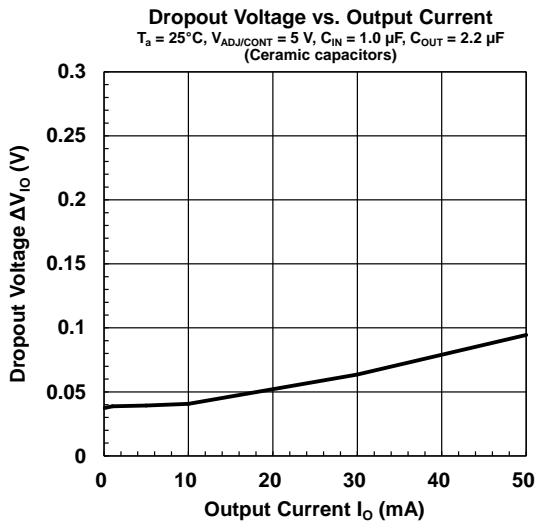
Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.



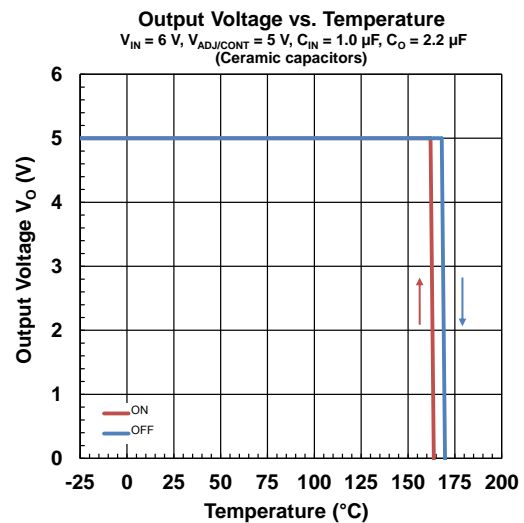
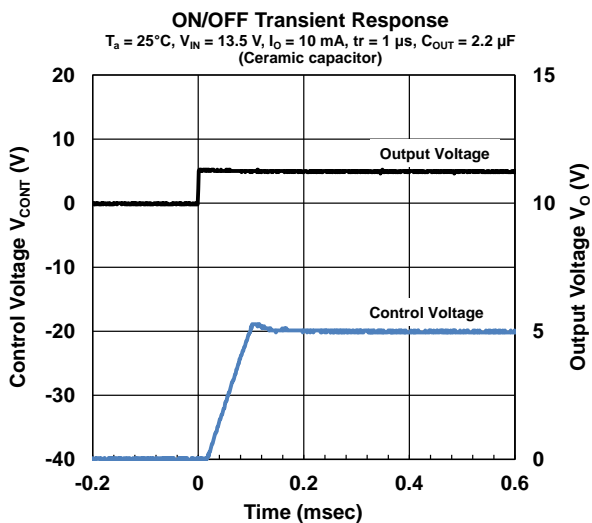
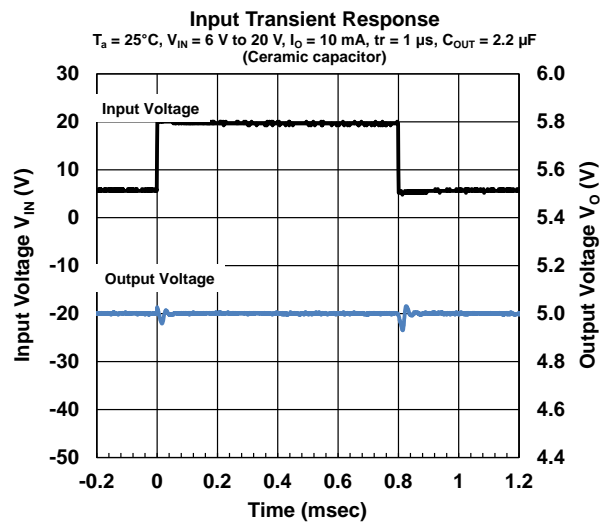
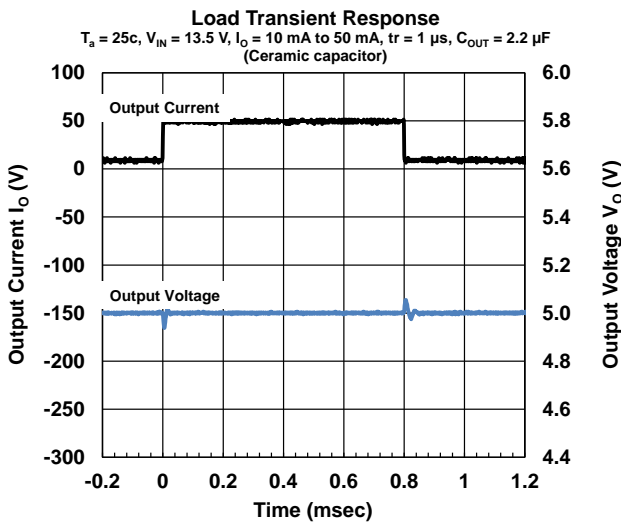
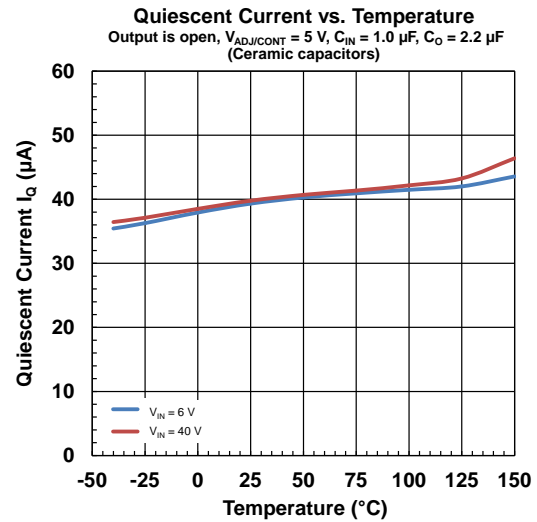
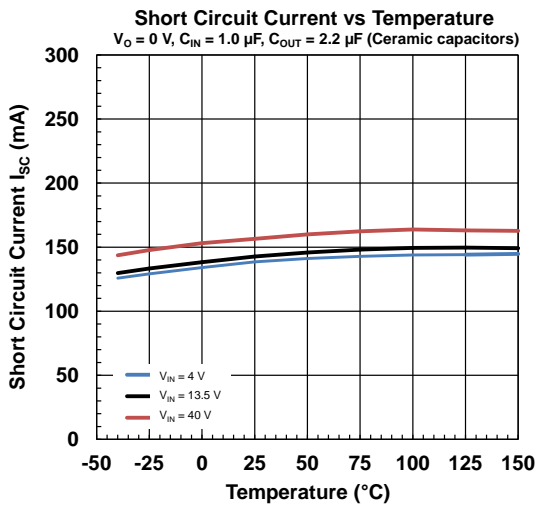
■ TYPICAL CHARACTERISTICS



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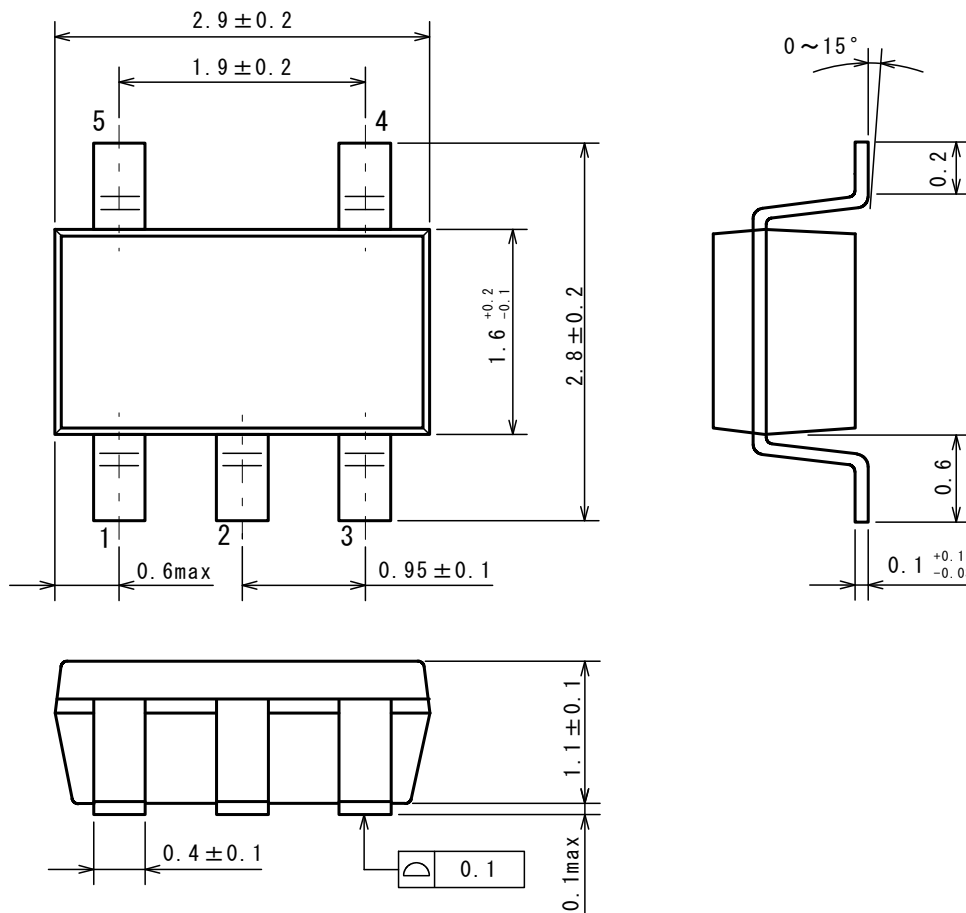


■ REVISION HISTORY

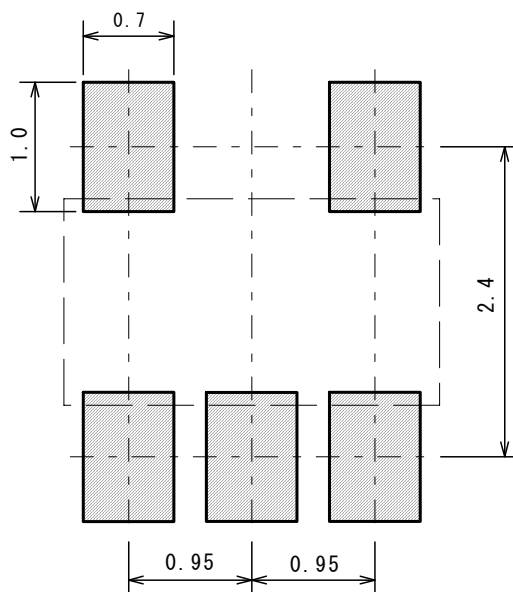
Date	Revision	Changes
September 19, 2023	Ver.1.0	Initial Version

■ PACKAGE DIMENSIONS

UNIT: mm



■ EXAMPLE OF SOLDER PADS DIMENSIONS



Nisshinbo Micro Devices Inc.

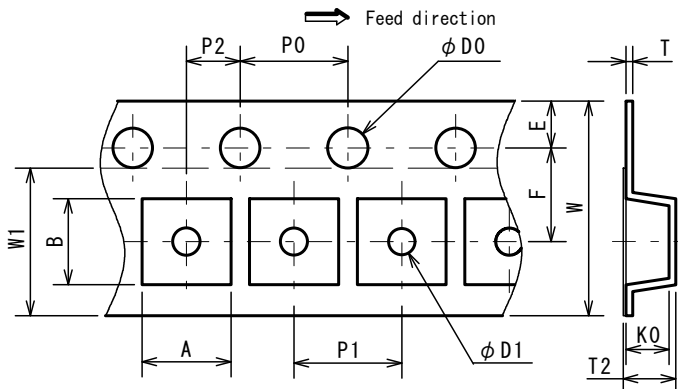
SOT-23-5

PI-SOT-23-5-E-B

■ PACKING SPEC

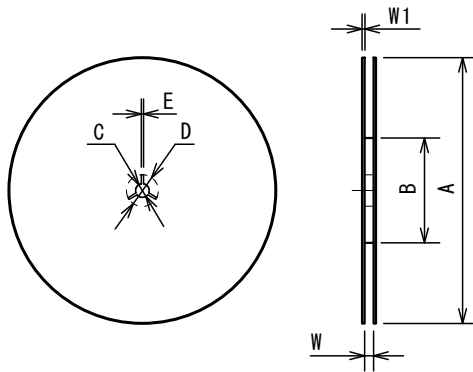
UNIT: mm

TAPING DIMENSIONS



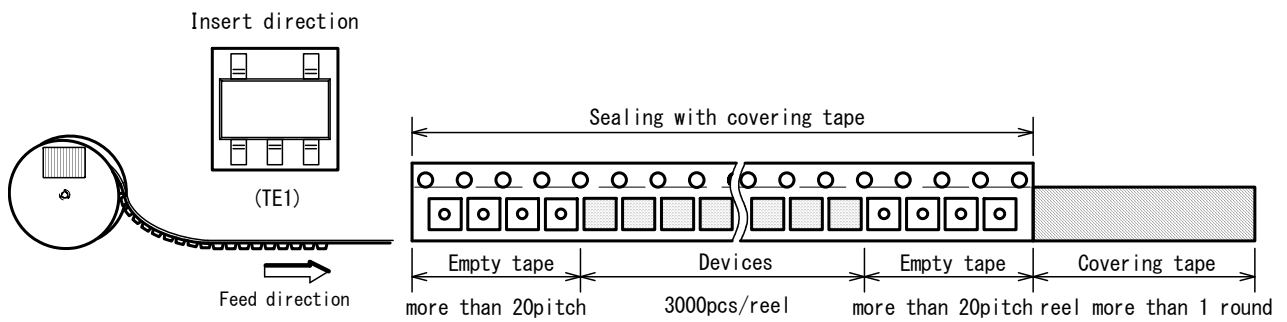
SYMBOL	DIMENSION	REMARKS
A	3.3±0.1	BOTTOM DIMENSION
B	3.2±0.1	BOTTOM DIMENSION
D0	1.55	
D1	1.05	
E	1.75±0.1	
F	3.5±0.05	
P0	4.0±0.1	
P1	4.0±0.1	
P2	2.0±0.05	
T	0.25±0.05	
T2	1.82	
K0	1.5±0.1	
W	8.0±0.3	
W1	5.5	THICKNESS 0.1MAX

REEL DIMENSIONS

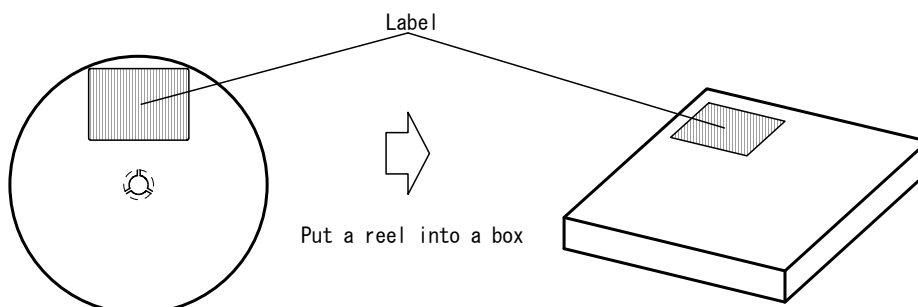


SYMBOL	DIMENSION
A	φ 180±1
B	φ 60±1
C	φ 13±0.2
D	φ 21±0.8
E	2±0.5
W	9±0.5
W1	1.2±0.2

TAPING STATE



PACKING STATE



1. The products and the product specifications described in this document are subject to change or discontinuation of production without notice for reasons such as improvement. Therefore, before deciding to use the products, please refer to our sales representatives for the latest information thereon.
2. The materials in this document may not be copied or otherwise reproduced in whole or in part without the prior written consent of us.
3. This product and any technical information relating thereto are subject to complementary export controls (so-called KNOW controls) under the Foreign Exchange and Foreign Trade Law, and related politics ministerial ordinance of the law. (Note that the complementary export controls are inapplicable to any application-specific products, except rockets and pilotless aircraft, that are insusceptible to design or program changes.) Accordingly, when exporting or carrying abroad this product, follow the Foreign Exchange and Foreign Trade Control Law and its related regulations with respect to the complementary export controls.
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5. The products listed in this document are intended and designed for automotive applications. Those customers intending to use a product in an application requiring extreme quality and reliability, for example, in a highly specific application where the failure or misoperation of the product could result in human injury or death should first contact us.
 - Aerospace Equipment
 - Equipment Used in the Deep Sea
 - Power Generator Control Equipment (nuclear, steam, hydraulic, etc.)
 - Life Maintenance Medical Equipment
 - Fire Alarms / Intruder Detectors
 - Vehicle Control Equipment (airplane, railroad, ship, etc.)
 - Various Safety Devices
 - Traffic control system
 - Combustion equipment

In case your company desires to use this product for any applications other than general electronic equipment mentioned above, make sure to contact our company in advance. Note that the important requirements mentioned in this section are not applicable to cases where operation requirements such as application conditions are confirmed by our company in writing after consultation with your company.

6. We are making our continuous effort to improve the quality and reliability of our products, but semiconductor products are likely to fail with certain probability. In order to prevent any injury to persons or damages to property resulting from such failure, customers should be careful enough to incorporate safety measures in their design, such as redundancy feature, fire containment feature and fail-safe feature. We do not assume any liability or responsibility for any loss or damage arising from misuse or inappropriate use of the products.
7. The products have been designed and tested to function within controlled environmental conditions. Do not use products under conditions that deviate from methods or applications specified in this datasheet. Failure to employ the products in the proper applications can lead to deterioration, destruction or failure of the products. We shall not be responsible for any bodily injury, fires or accident, property damage or any consequential damages resulting from misuse or misapplication of the products.
8. **Quality Warranty**
 - 8-1. **Quality Warranty Period**

In the case of a product purchased through an authorized distributor or directly from us, the warranty period for this product shall be one (1) year after delivery to your company. For defective products that occurred during this period, we will take the quality warranty measures described in section 8-2. However, if there is an agreement on the warranty period in the basic transaction agreement, quality assurance agreement, delivery specifications, etc., it shall be followed.
 - 8-2. **Quality Warranty Remedies**

When it has been proved defective due to manufacturing factors as a result of defect analysis by us, we will either deliver a substitute for the defective product or refund the purchase price of the defective product.
Note that such delivery or refund is sole and exclusive remedies to your company for the defective product.
 - 8-3. **Remedies after Quality Warranty Period**

With respect to any defect of this product found after the quality warranty period, the defect will be analyzed by us. On the basis of the defect analysis results, the scope and amounts of damage shall be determined by mutual agreement of both parties. Then we will deal with upper limit in Section 8-2. This provision is not intended to limit any legal rights of your company.
9. Anti-radiation design is not implemented in the products described in this document.
10. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
11. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
12. Warning for handling Gallium and Arsenic (GaAs) products (Applying to GaAs MMIC, Photo Reflector). These products use Gallium (Ga) and Arsenic (As) which are specified as poisonous chemicals by law. For the prevention of a hazard, do not burn, destroy, or process chemically to make them as gas or power. When the product is disposed of, please follow the related regulation and do not mix this with general industrial waste or household waste.
13. Please contact our sales representatives should you have any questions or comments concerning the products or the technical information.



Nisshinbo Micro Devices Inc.

Official website

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