

NG1002 Series Low Dropout Regulator



Description

The NG1002 series are a group of positive voltage regulators manufactured by CMOS technologies with low power consumption and low dropout voltage, which provide large output currents even when the difference of the input-output voltage is small. The Ng1002 series can deliver 250mA output current and allow an input voltage as high as 36V. The series are very suitable for the battery-powered equipments, such as RF applications and other systems requiring a quiet voltage source.

Features

- Low Quiescent Current: 2 μ A
- Operating Voltage Range: 2.5V ~ 36V
- Output Current: 250mA
- Low Dropout Voltage: 400mV @ 100mA (V_{OUT} = 3.3V)
- Output Voltage: 2.1V ~ 12.0V
- High Accuracy: $\pm 2\%$ / $\pm 1\%$ (Typ.)
- High Power Supply Rejection Ratio: 70dB @ 1kHz
- Low Output Noise: 27xV_{OUT} μ V_{RMS}(10Hz ~ 100kHz)
- Excellent Line and Load Transient Response
- Over Current Protection(OCP)
- Over Temperature Protection(OTP)
- Short Circuit Protection(SCP)

Application

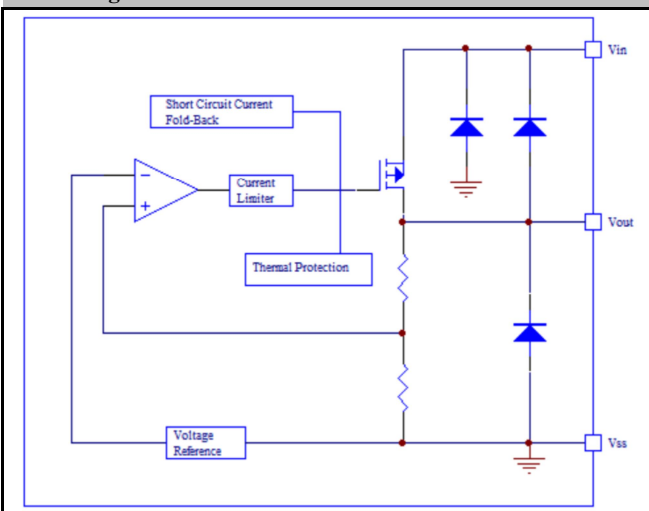
- Wireless Communication Equipments
- Portable Audio Video Equipments
- Car Navigation Systems
- LAN Cards
- Ultra Low Power Microcontroller
- Cordless Phones
- Radio control systems
- Laptop, Palmtops and PDAs
- Single-lens reflex DSC
- PC peripherals with memory

Order Information

NG1002①②③④⑤⑥⑦

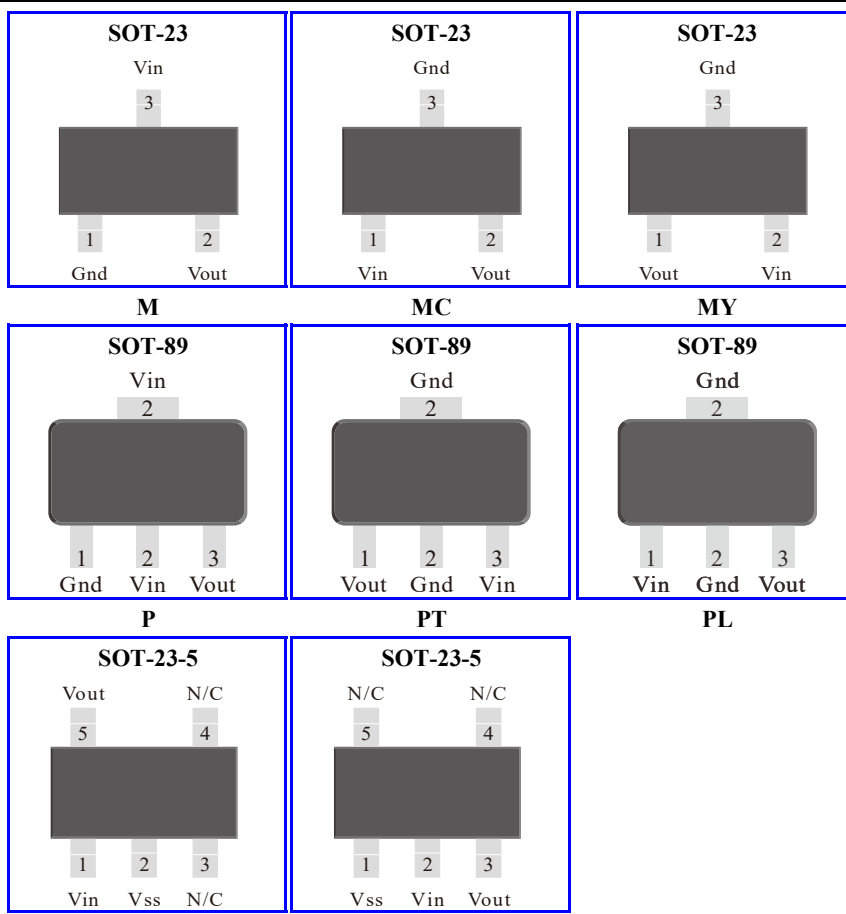
Designator	Description	Symbol	Value
①	Standard	A	
②③④	Output Voltage	Integer	120=12.0V 50=5.0V 33=3.3V
⑤⑥	Package	M/MC/MY P/PT/PL MF/MR	SOT-23 SOT-89 SOT-23-5
⑦	Accuracy	- 1	2% 1%

Block Diagram



NG1002 Series

Low Dropout Regulator



Function	SOT-23	SOT-23	SOT-23	Pin Name
	M	MC	MY	
Ground	1	3	3	Gnd
Output	2	2	1	Vout
Power input	3	1	2	Vin

Function	SOT-89	SOT-89	SOT-89	Pin Name
	P	PT	PL	
Ground	1	2	2	Gnd
Output	3	1	3	Vout
Power input	2	3	1	Vin

Function	SOT-23-5	SOT-23-5	Pin Name
	MF	MR	
Ground	1	2	Vin
Output	2	1	Gnd
Power input	3/4	4/5	N/C
Power input	5	3	Vout

NG1002 Series
Low Dropout Regulator



Absolute Maximum Ratings(Operating Temperature Range Applies Unless Otherwise Specified)

Parameter	Test Condition	Symbol	Ratings	Unit
Input Voltage		V_{IN}	-0.3 ~ 40	V
Output Voltage		V_{OUT}	-0.3 ~ 13	V
Output Current		I_{OUT}	250	mA
Power Dissipation	SOT-23	P_D	400	mW
	SOT-89		600	
	SOT-23-5		400	
Electrostatic Discharge Capability	Human Body Mode (HBM)	E_{SD}	2	kV
	Machine Model (MM)		200	V

Electrical Characteristics (Noted: $V_{IN}=V_{OUTNOM}+2V$, $C_{IN}=1\mu F$, $C_{OUT}=10\mu F$, $T_a=25^{\circ}C$ Unless Otherwise Specified)

Characteristic	Test Condition	Symbol	Min.	Typ.	Max.	Unit
Input Voltage		V_{IN}	2.5	-	36	V
Output Voltage		V_{OUT}	2.1	-	12	V
DC Output Accuracy	$I_{OUT}=10mA$		-2	-	2	%
			-1	-	1	
Dropout Voltage	$I_{OUT}=100mA$, $V_{OUT}=3.3V$	V_{DROP}	-	400	-	mV
Supply Current	$I_{OUT}=0mA$, $2.1V \leq V_{OUT} \leq 5V$	I_{SS}	-	2.0	5.0	uA
	$5V < V_{OUT} \leq 12V$		-	5.0	10.0	
Load Regulation	$V_{OUT}+2V \leq V_{IN} \leq 36V$, $1mA \leq I_{OUT} \leq 100mA$	ΔV_{OUT}	-	10.0	-	mV
Line Regulation	$I_{OUT}=10mA$, $V_{OUT}+1V \leq V_{IN} \leq 36V$	$\frac{\Delta V_{OUT}}{V_{OUT} \cdot \Delta V_{IN}}$	-	0.01	0.3	%/V
Temperature Coefficient	$I_{OUT}=10mA$, $-40^{\circ}C < T_A < 125^{\circ}C$	$\frac{\Delta V_{OUT}}{V_{OUT} \cdot \Delta T_A}$	-	50	-	ppm/ $^{\circ}C$
Output Current Limit	$V_{OUT}=0.5V \cdot V_{OUT(Normal)}$	I_{LIMIT}	-	350	-	mA
Short-Circuit Current	$V_{OUT}=V_{SS}$	I_{SHORT}	-	25	-	mA
Power Supply Rejection Ratio	$I_{OUT}=50mA$	P_{SRR}	100Hz	-	80	dB
			1KHz	-	70	
			10KHz	-	60	
			100KHz	-	50	
Output Noise Voltage	BW = 10Hz to 100kHz	V_{ON}	-	$27 \cdot V_{OUT}$	-	μV_{RMS}
Thermal Shutdown Temperature	$I_{LOAD}=30mA$	T_{SD}	-	160	-	$^{\circ}C$
Thermal Shutdown Hysteresis	-	ΔT_{SD}	-	20	-	$^{\circ}C$

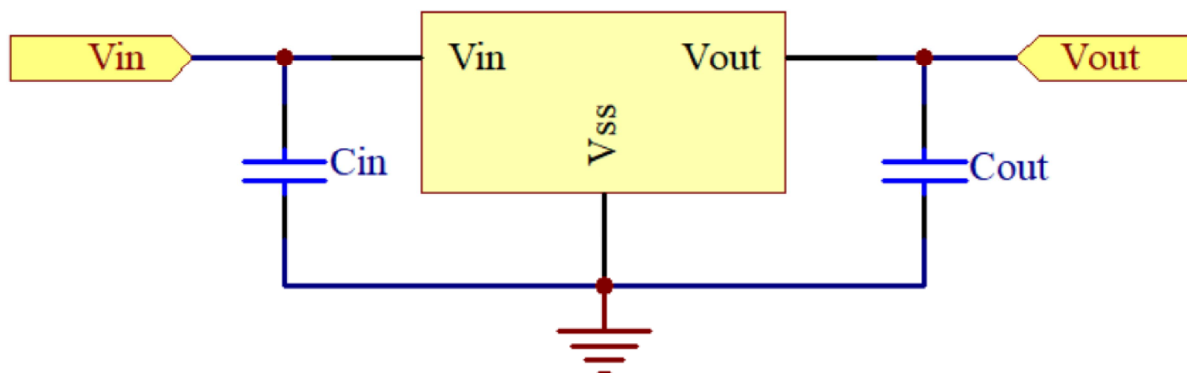
Thermal Characteristics

Parameter	Test Condition	Symbol	Ratings	Unit
Operating Junction Temperature		T_J	-40 to 150	$^{\circ}C$
Storage temperature range		T_{STG}	-55 to 150	

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Typical Application Circuit



External Components List

Symbol	Description
Cin	1.0 μ F or more, 10 μ F is recommended
Cout	1.0 μ F or more, 10 μ F is recommended

External Components List

Selection of Input/ Output Capacitors

Phase compensation is provided to secure operation even when the load current is varied. For this purpose, use a 1.0 μ F or more output capacitor (Cout) with good frequency characteristics and proper ESR (Equivalent Series Resistance). Connect a 1.0 μ F or more input capacitor (Cin) between the Vin pin and the Vss pin as close as possible to the pins. The value of the output overshoot or undershoot transient response varies depending on the value of the output capacitor. When selecting the output capacitor, perform sufficient evaluation, including evaluation of temperature characteristics, on the actual device.

In the design of portable devices the ceramic capacitors are often chosen because of their small size, low equivalent series resistance (ESR) and high RMS current capability. Also, designers have been looking to ceramic capacitors due to shortages of tantalum capacitors.

Unfortunately, using ceramic capacitors for input filtering can cause problems. Applying a voltage step to a ceramic capacitor causes a large current surge that stores energy in the inductances of the power leads. A large voltage spike is created when the stored energy is transferred from these inductances into the ceramic capacitor. These voltage spikes can easily be twice the amplitude of the input voltage step.

Many types of capacitors can be used for input by passing, however, caution must be exercised when using multilayer ceramic capacitors (MLCC). Because of the self-resonant and high Q characteristics of some types of ceramic capacitors, high voltage transients can be generated under some start-up conditions, such as connecting the LDO input to a live power source. Adding a 3 Ω resistor in series with an X5R ceramic capacitor will minimize start-up voltage transients.

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Low Dropout Regulator



Typical Characteristics Curves

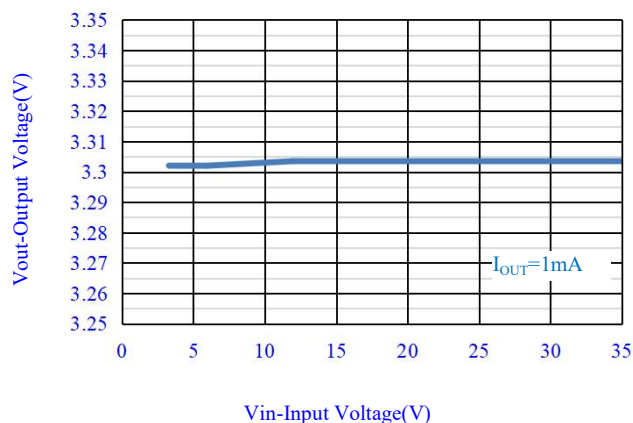


Fig.1-Output Voltage Vs Input Voltage

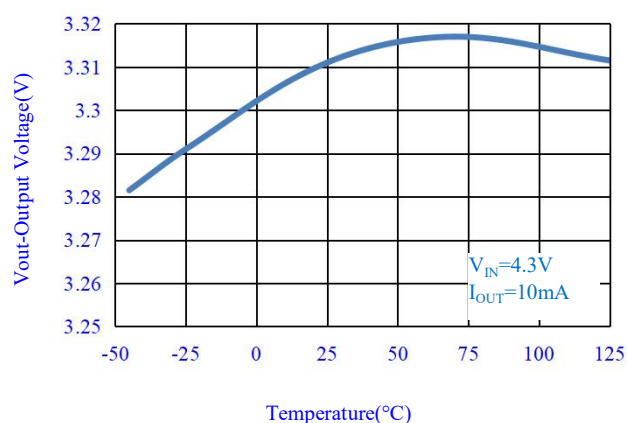


Fig.2-Output Voltage VS Temperature

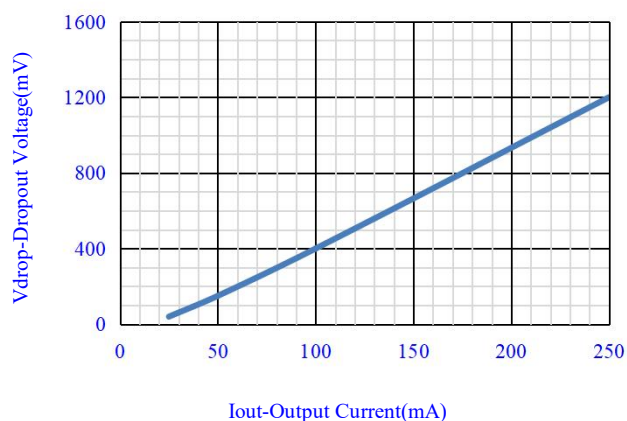


Fig.3-Dropout Voltage VS Output Current

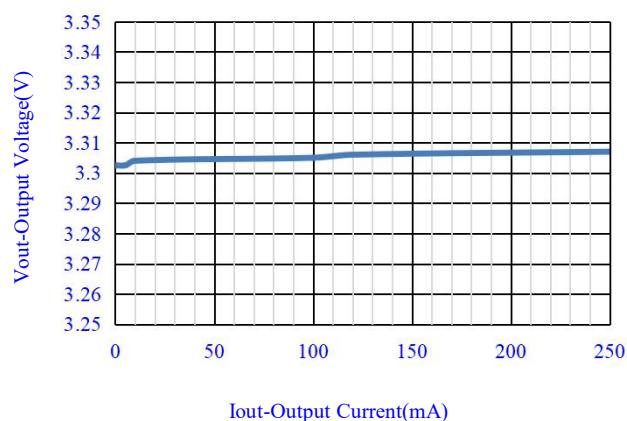


Fig.4-Output Voltage Vs Output Current

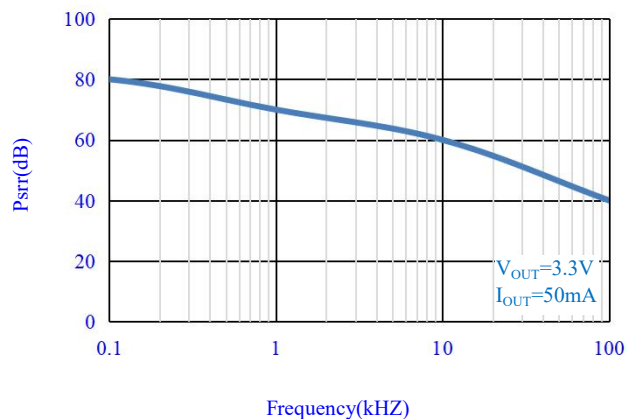


Fig.5-Psrr VS Frequency

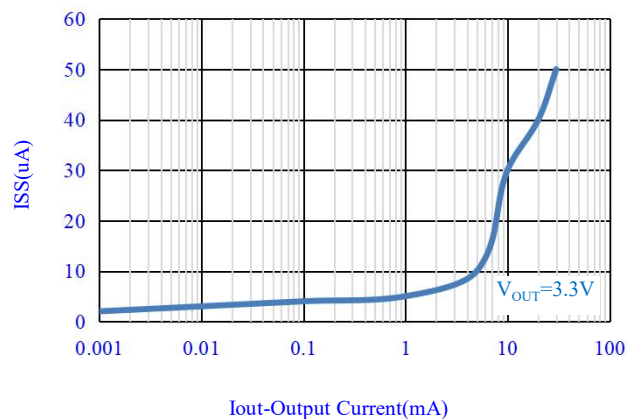


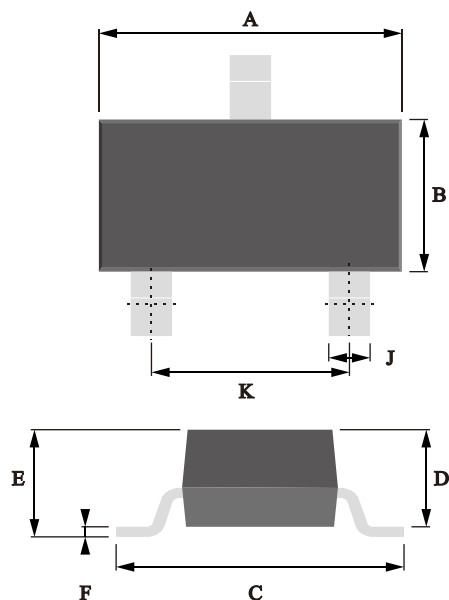
Fig.6-Iss VS Output Current

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OUTLINE DRAWINGS

SOT-23

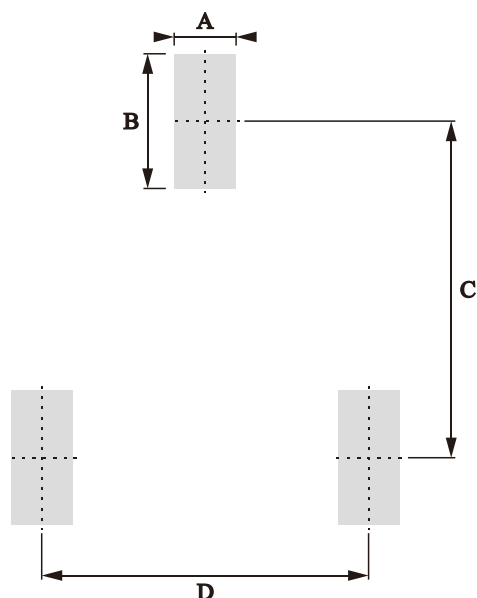


OUTLINE DIMENSIONS

Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.80	-	3.20	0.1102	-	0.1260
B	1.15	-	1.45	0.0453	-	0.0571
C	2.25	-	2.65	0.0886	-	0.1043
D	0.85	-	1.15	0.0335	-	0.0453
E	0.90	-	1.20	0.0354	-	0.0472
F	0.08	-	0.18	0.0031	-	0.0071
J	0.30	-	0.50	0.0118	-	0.0197
K	1.70	-	2.10	0.0669	-	0.0827

COMPONENT PITCH DIMENSION DIAGRAM

SOT-23



OUTLINE DIMENSIONS

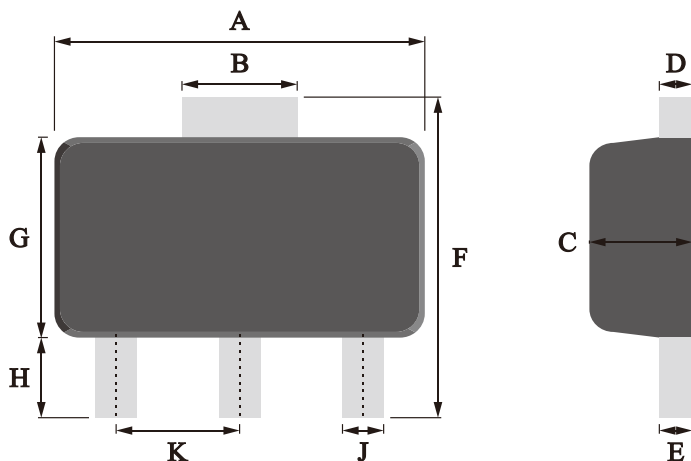
Dim.	Milimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	0.60	-	-	0.0000	-
B	-	0.80	-	-	0.0315	-
C	-	2.00	-	-	0.0787	-
D	-	1.90	-	-	0.0748	-

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OUTLINE DRAWINGS

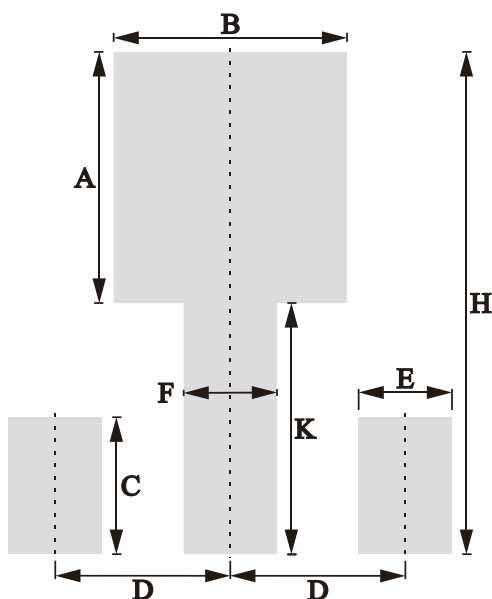
SOT-89



OUTLINE DIMENSIONS						
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.00	-	5.00	0.1575	-	0.1969
B	1.40	-	1.80	0.0551	-	0.0709
C	1.25	-	1.75	0.0492	-	0.0689
D	0.20	-	0.60	0.0079	-	0.0236
E	0.20	-	0.60	0.0079	-	0.0236
F	3.60	-	4.40	0.1417	-	0.1732
G	2.20	-	2.80	0.0866	-	0.1102
H	0.80	-	1.20	0.0315	-	0.0472
J	0.30	-	0.70	0.0118	-	0.0276
K	1.25	-	1.75	0.0492	-	0.0689

COMPONENT PITCH DIMENSION DIAGRAM

SOT-89



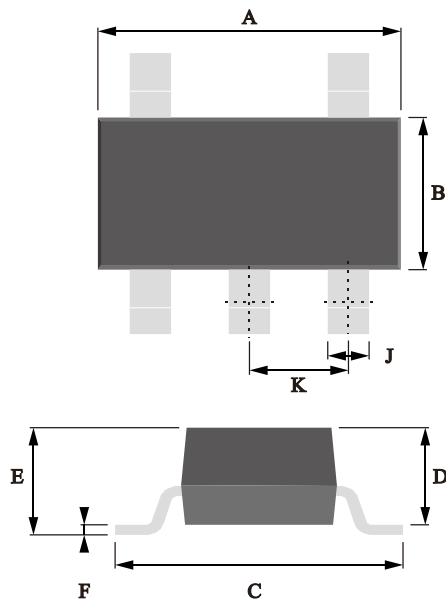
OUTLINE DIMENSIONS						
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	2.20	-	-	0.0866	-
B	-	2.00	-	-	0.0787	-
C	-	1.20	-	-	0.0472	-
D	-	1.50	-	-	0.0591	-
E	-	0.80	-	-	0.0315	-
F	-	0.80	-	-	0.0315	-
H	-	47.00	-	-	1.8504	-
K	-	2.20	-	-	0.0866	-

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OUTLINE DRAWINGS

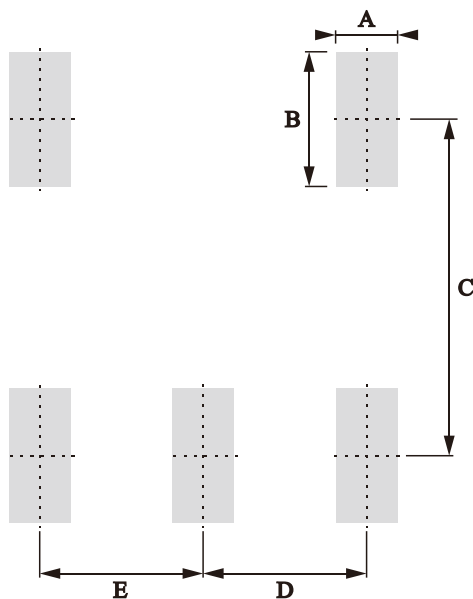
SOT-23-5



OUTLINE DIMENSIONS						
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.80	-	3.20	0.1102	-	0.1260
B	1.15	-	1.45	0.0453	-	0.0571
C	2.25	-	2.65	0.0886	-	0.1043
D	0.85	-	1.15	0.0335	-	0.0453
E	0.90	-	1.20	0.0354	-	0.0472
F	0.08	-	0.18	0.0031	-	0.0071
J	0.30	-	0.50	0.0118	-	0.0197
K	1.70	-	2.10	0.0669	-	0.0827

COMPONENT PITCH DIMENSION DIAGRAM

SOT-23-5



OUTLINE DIMENSIONS						
Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	0.60	-	-	0.0000	-
B	-	0.80	-	-	0.0315	-
C	-	2.00	-	-	0.0787	-
D	-	0.95	-	-	0.0374	-
E	-	0.95	-	-	0.0374	-

NG1002 Series

Low Dropout Regulator



PACKAGE TYPE :SOT-23 MARKING

MARKING INSTRUCTION



MAKYW=Mark

MAK=Product Modle Code,According To Actual Changes

YW=Date Code,According To Actual Changes

PACKAGE TYPE :SOT-89 MARKING

MARKING INSTRUCTION



MAKYW=Mark

MAK=Product Modle Code,According To Actual Changes

YM=Date Code,According To Actual Changes

PACKING INFORMATION

Package Type	Package Code	Product Weight Approx(g/Pcs)	Package Method	Quantity (Pcs/Min. Pack.)	Quantity (Pcs/Inner Box)	Quantity (Pcs/Carton)
SOT-23	P1	0.008	7" Reel	3000	45000	180000
SOT-89	P1	0.055	7" Reel	1000	10000	40000

NG1002 Series

Low Dropout Regulator



PACKAGE TYPE :SOT-23-5 MARKING

MARKING INSTRUCTION



MAKYW=Mark

MAK=Product Modle Code,According To Actual Changes

YW=Date Code,According To Actual Changes

PACKING INFORMATION

Package Type	Package Code	Product Weight Approx(g/Pcs)	Package Method	Quantity (Pcs/Min. Pack.)	Quantity (Pcs/Inner Box)	Quantity (Pcs/Carton)
SOT-23-5	P1	0.033	7" Reel	3000	45000	180000

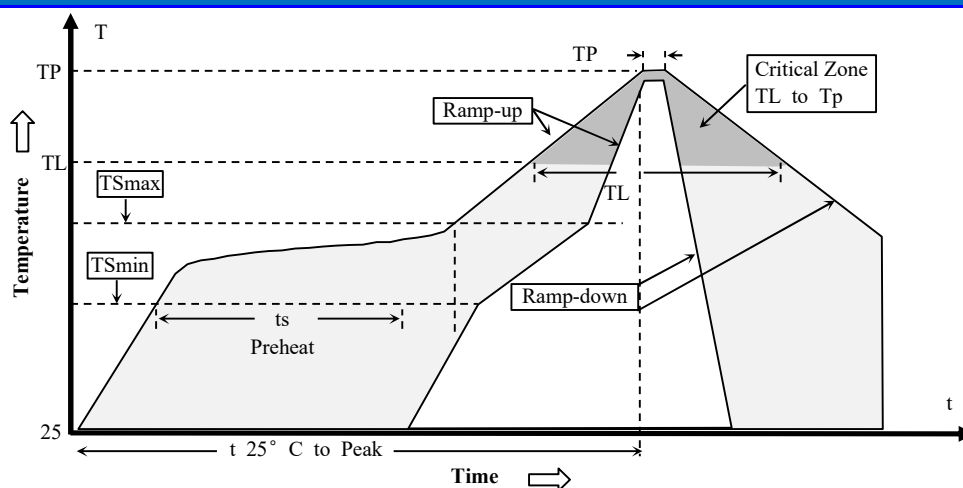
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Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat -Temperature Min(TS min) -Temperature Max(TS max) -Time(ts min to ts max)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: -Temperature (TL) - Time (tL)	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature(TP)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

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