

NH6302 Series

Low Dropout Regulator



Description

The NH6302 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 NH6302 series can deliver 300mA output current and allow an input voltage as high as 18V. The series are very suitable for the battery- powered equipments, such as RF applications and other systems requiring a quiet voltage source.

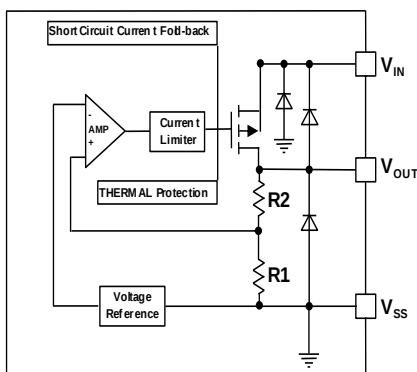
Application

- Cordless Phones
- Radio control systems
- Laptop, Palmtops and PDAs
- Single-lens reflex DSC
- PC peripherals with memory

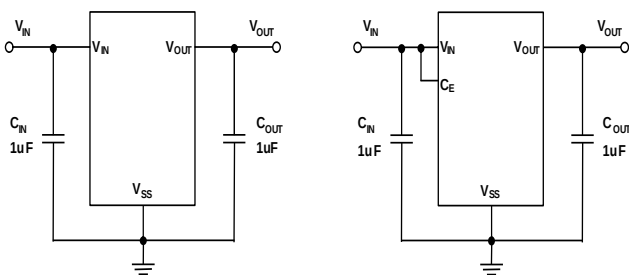
Features

- Low Quiescent Current: 2uA
- Operating Voltage Range: 2.5V~18V
- Output Current: 300mA
- Low Dropout Voltage:
500mV@50mA(V_{OUT}=3.3V)
- Output Voltage: 1.2~ 5V
- High Accuracy: $\pm 2\%/\pm 1\%$ (Typ.)
- High Power Supply Rejection Ratio: 65dB@1kHz
- Low Output Noise:
27xV_{OUT} μ VRMS (10Hz~100kHz)
- Excellent Line and Load Transient Response
- Built-in Current Limiter, Short-Circuit Protection
- Over-Temperature Protection
- Stable with Ceramic or Tantalum Capacitor
- Wireless Communication Equipments
- Portable Audio Video Equipments
- Car Navigation Systems
- LAN Cards
- Ultra Low Power Microcontroller

Block Diagram



Typical Application Circuit



Order Information

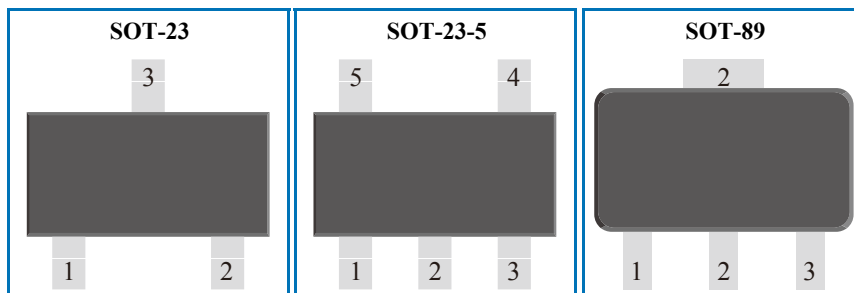
NH6302①②③④⑤⑥

Designator	Description	Symbol	Content
①	Product Type	A	Standard
		B	With Shutdown Function
		D	Without OTP
②	Output Voltage, e.g	Integer	1.8V=18
③	Package	M	SOT-23-3
		S5	SOT-23-5
		K	SOT-89-3
④	Pin Definition	-	-
⑤	Accuracy	1	$\pm 1\%$
		空	$\pm 2\%$

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Function	SOT-23	SOT-23	SOT-23	Pin Name
	S3A	S3F	S3C	
Ground	1	3	3	Vss
Output	2	2	1	Vout
Power input	3	1	2	Vin

Function	SOT-89	SOT-89	SOT-89	Pin Name
	KD	KB	KE	
Ground	1	2	2	Vss
Output	3	1	3	Vout
Power input	2	3	1	Vin

Function	SOT-23-5	SOT-23-5	SOT-23-5	Pin Name
	S5BS	S5BSH	S5AGJ	
Ground	2	2	1	Vss
Output	5	5	3	Vout
Power input	1	1	2	Vin
Enable Pin	3	-	-	CE
NO Connect	4	3/4	4/5	NC

NH6302 Series
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Absolute Maximum Ratings(Ta=25°C Unless Operating temperature range applies unless otherwise specified)(1)

Parameter	Symbol	Ratings			Unit
Input Voltage(2)	V_{IN}	-0.3	~	24	V
Output Voltage(2)	V_{OUT}	-0.3	~	10	
CE Pin Voltage	V_{CE}	-0.3	~	24	
Maximum Power Dissipation	P_D	SOT-23 400 SOT-89 600			mW

Electrical Characteristics (Ta=25°C Unless Otherwise Noted, $C_{IN}=1\mu F$, $V_{IN}=V_{OUTNOM}+1V$, $C_{OUT}=1\mu F$)

Characteristic	Test Condition	Symbol	Min.	Typ.	Max.	Unit
Input Voltage		V_{IN}	2.5	-	18	V
Output Voltage		V_{OUT}	1.2	-	5.0	V
DC Output Accuracy	$I_{OUT}=1mA$		-1 -2	- -	1 2	%
Dropout Voltage(5)	$I_{OUT}=100mA$ $V_{OUT}=3.3V$	V_{dif}	-	160	-	mV
Supply Current	$I_{OUT}=0mA$	I_{SS}	-	2.0	5.0	uA
Standby Current	$CE = V_{SS}$	I_{STBY}	-	-	0.2	uA
Load Regulation	$V_{IN}=V_{OUT}+1V$ $1mA \leq I_{OUT} \leq 100mA$	ΔV_{OUT}	-	10.0	-	mV
Line Regulation	$I_{OUT}=10mA$, $V_{OUT}+1V \leq V_{IN} \leq 18V$	$\frac{\Delta V_{OUT}}{V_{OUT} \cdot \Delta V_{IN}}$	-	0.01	0.3	%/V
Temperature Coefficient	$I_{OUT}=10mA$, $-40^{\circ}C < T_A < 125^{\circ}C$	$\frac{\Delta V_{OUT}}{V_{OUT} \cdot \Delta T_A}$	-	50.0	-	ppm
Current Limit Value	$V_{OUT} = 0.5 \times V_{OUTNOM}$, $V_{IN} = 5V$	I_{LIMIT}	350	500	-	mA
Short-Circuit Current	$V_{OUT}=V_{SS}$	I_{SHORT}	-	25	-	mA
Power Supply Rejection Ratio	$I_{OUT}=50mA$	100Hz	-	80	-	dB
		1KHZ	-	65	-	
		10KHZ	-	50	-	
		100KHZ	-	45	-	
Output Noise Voltage	BW=10Hz to 100kHz	V_{ON}	-	$27 \times V_{OUT}$	-	μV_{RMS}
Over-Temperature Protection		T_{SHDN}	-	150	-	$^{\circ}C$
Over-Temperature Protection Hysteresis		ΔT_{SHDN}	-	20	-	$^{\circ}C$
CE "High" Voltage		$V_{CE"High"}$	1.5	-	V_{IN}	V
CE "Low" Voltage		$V_{CE"Low"}$	-	-	0.3	V
COOUT Auto-Discharge Resistance	$V_{IN}=5V$, $V_{OUT}=3.0V$, $V_{CE}=V_{SS}$	$R_{DISCHRG}$	-	150	-	Ω

Thermal Characteristics

Parameter	Test Condition	Symbol	Ratings		Unit
Operating Free Air Temperature Range		T _A	-40	to 85	℃
Operating Junction Temperature(3)		T _J	-40	to 125	
Storage Temperature Range		T _{STG}	-40	to 125	
Lead Temperature(Soldering, 10 sec)		T _{SOLDER}	260		
Electrostatic Discharge Capability(4)	Human Body Mode (HBM)	E _{SD}	8		kV
	Machine Model (MM)		400		V

**NH6302 Series
Low Dropout Regulator****APPLICATION INFORMATION****Selection of Input/ Output Capacitors**

In general, all the capacitors need to be low leakage. Any leakage the capacitors have will reduce efficiency, increase the quiescent current.

A recent trend in the design of portable devices has been to use ceramic capacitors to filter DC-DC converter inputs. Ceramic capacitors are often chosen because of their small size, low equivalent series resistance (ESR) and high RMS current capability. Also, recently, 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. (See “Ceramic Input Capacitors Can Cause Overvoltage Transients”——Linear Technology application note 88, March 2001)

Many types of capacitors can be used for input bypassing, 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 3Ω resistor in series with an X5R ceramic capacitor will minimize start-up voltage transients.

The LDO also requires an output capacitor for loop stability. Connect a 1μF tantalum capacitor from OUT to GND close to the pins. For improved transient response, this output capacitor may be ceramic.

Note:

(1) Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) All voltages are with respect to network ground terminal.

(3) This IC includes over temperature protection that is intended to protect the device during momentary overload. Junction temperature will exceed 125°C when over temperature protection is active. Continuous operation above the specified maximum operating junction temperature may impair device reliability.

(4) ESD testing is performed according to the respective JESD22 JEDEC standard. The human body model is a 100 pF capacitor discharged through a 1.5kΩ resistor into each pin. The machine model is a 200pF capacitor discharged directly into each pin.

(5) V_{dif} : The Difference Of Output Voltage And Input Voltage When Input Voltage Is Decreased Gradually Till Output Voltage Equals To 98% Of V_{OUT} (E).

Typical Characteristics Curves

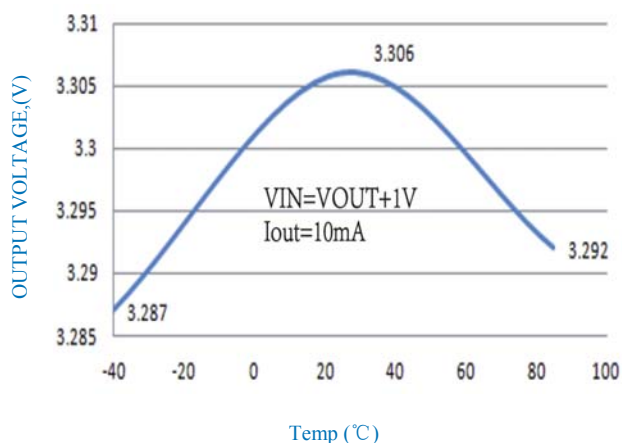


Fig.1-OUTPUT VOLTAGE VS. TEMPERATURE

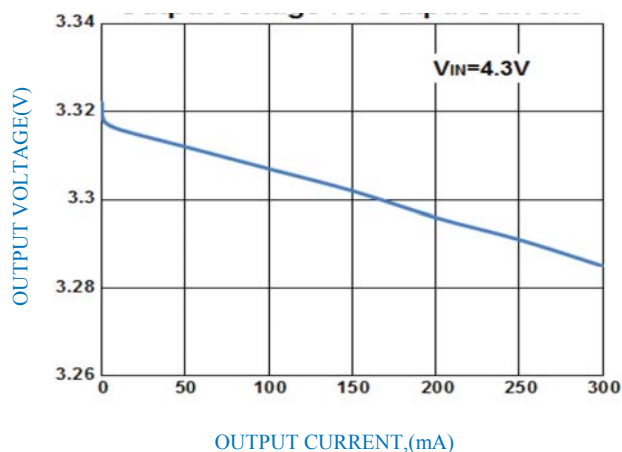


Fig.2-OUTPUT VOLTAGE VS. OUTPUT CURRENT

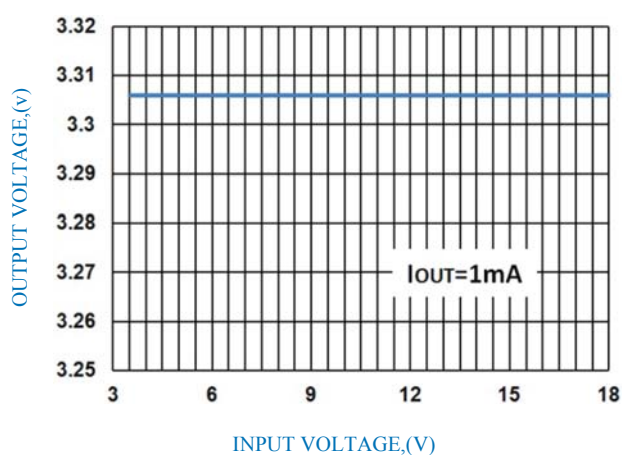


Fig.3-OUTPUT VOLTAGE VS. INPUT VOLTAGE

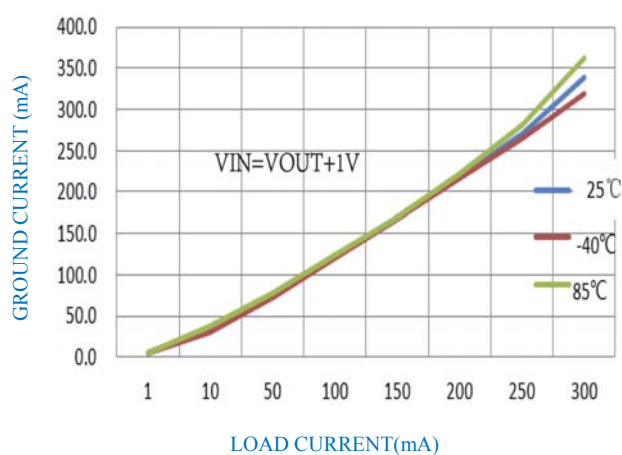


Fig.4-GROUND CURRENT VS. LOAD CURRENT

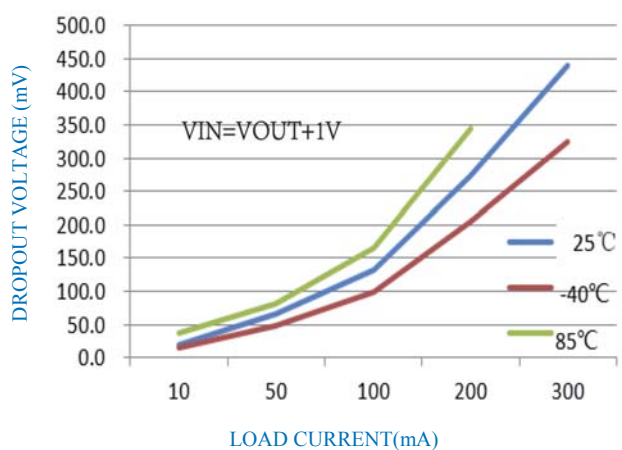


Fig.5-MAX. DROPOUT VOLTAGE VS. LOAD CURRENT

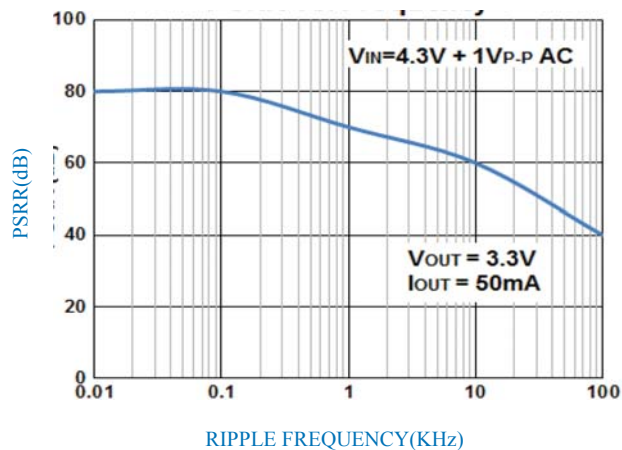


Fig.6-PSRR VS. FREQUENCY

Typical Characteristics Curves

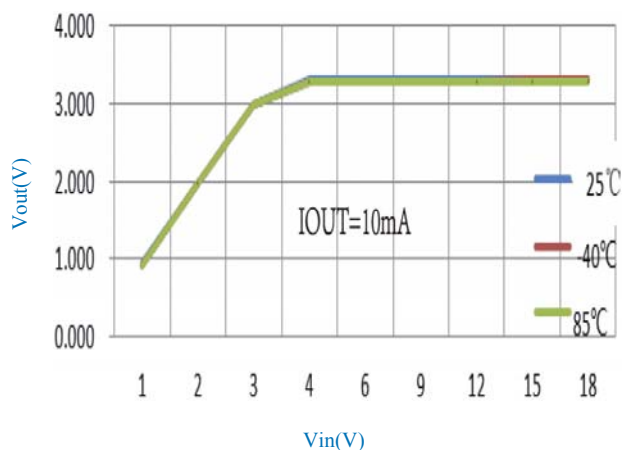


Fig.7-Line Regulation

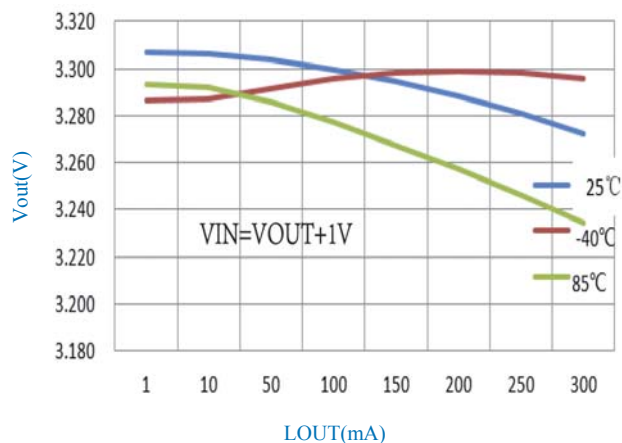


Fig.8- Load Regulation

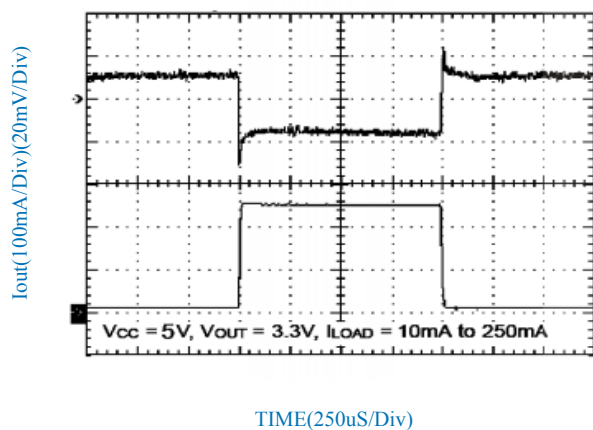


Fig.9-LOAD TRANSIENT RESPONSE

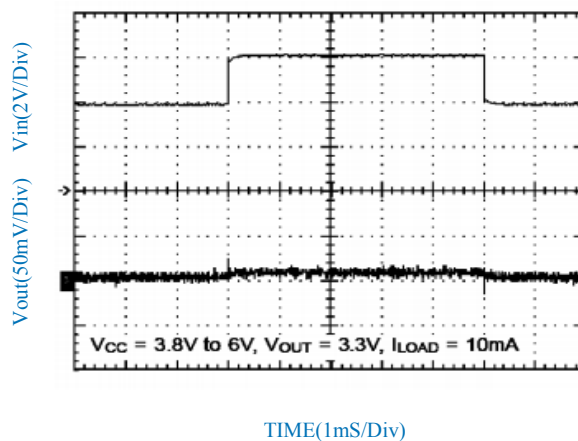


Fig.10-LINE TRANSIENT RESPONSE

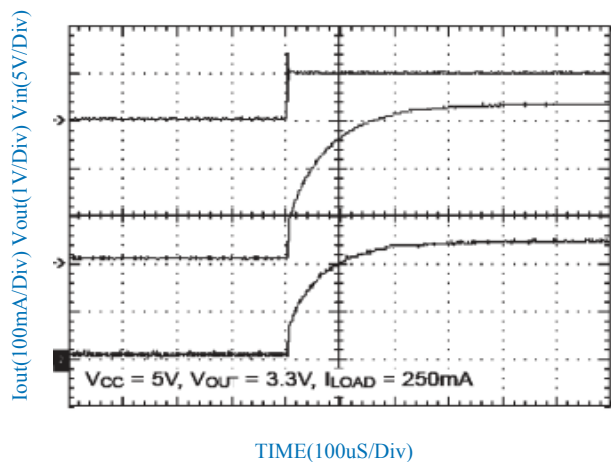


Fig.11-POWER UP RESPONSE

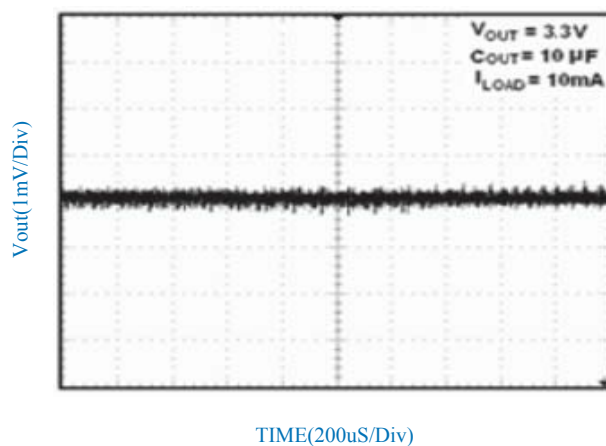
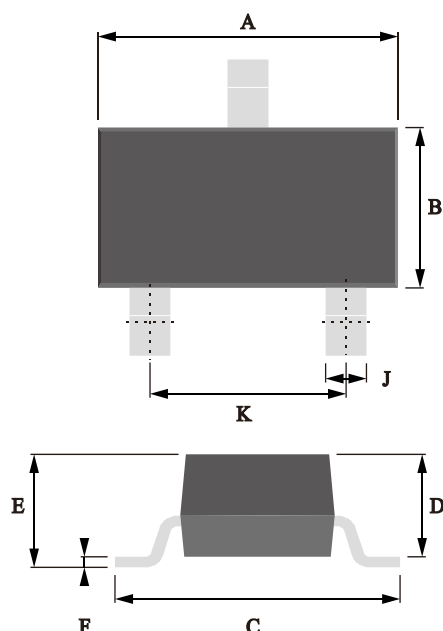


Fig.12-OUTPUT NOISE 10Hz to 100KHz

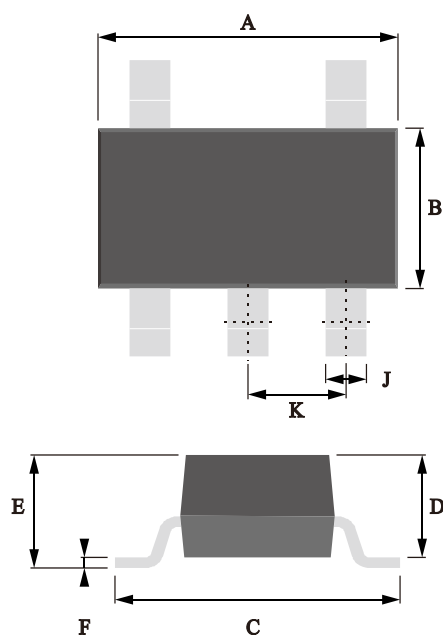
OUTLINE DRAWINGS



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

OUTLINE DRAWINGS

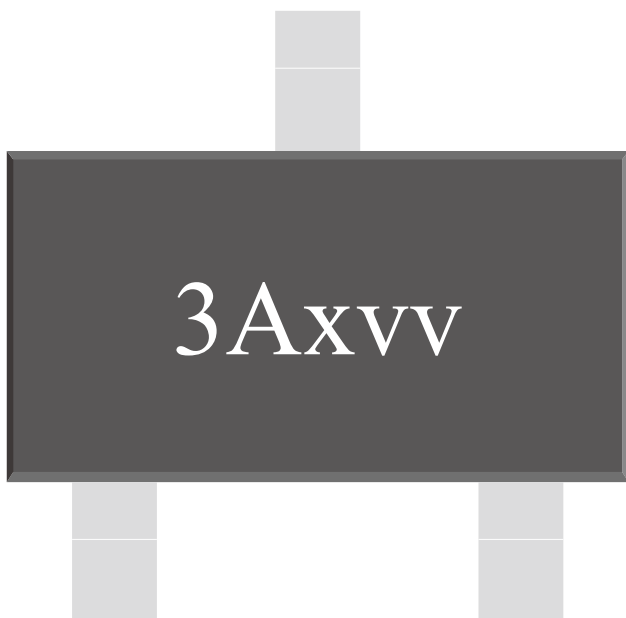


SOT-23-5

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

PACKAGE TYPE :SOT-23 MARKING

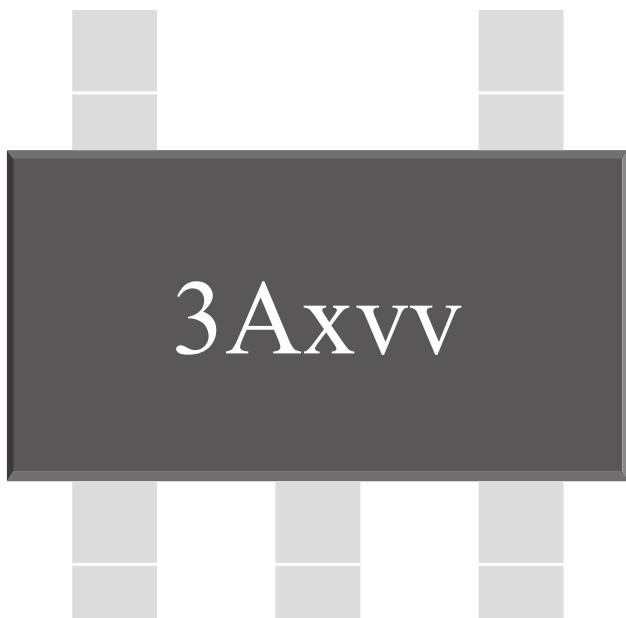
MARKING INSTRUCTION



3Axvv=mark
vv=Date Code,According To Actual Changes

PACKAGE TYPE :SOT-23-5 MARKING

MARKING INSTRUCTION

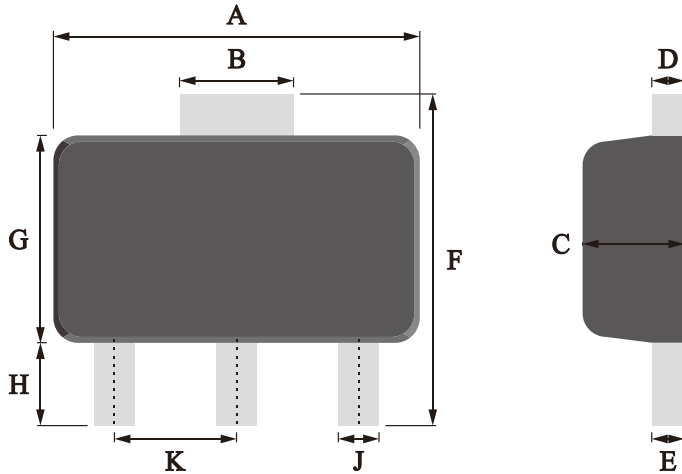


3Axvv=mark
vv=Date Code,According To Actual Changes

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-23-5	P1	0.033	7" Reel	3000	45000	180000

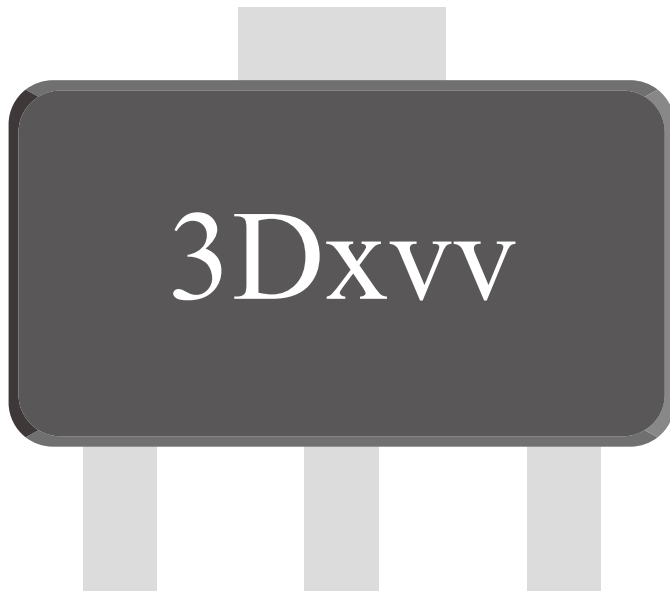
OUTLINE DRAWINGS



SOT-89

OUTLINE DIMENSIONS						
Dim.	Milimeters			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

PACKAGE TYPE :SOT-89 MARKING



MARKING INSTRUCTION

3Dxvv=mark

vv=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-89	P1	0.055	7" Reel	1000	10000	40000

NH6302 Series

Low Dropout Regulator



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 (T _{smax} to T _p)	3°C/second max.	3°C/second max.
	Preheat-Temperature Min (T _{S min}) -Temperature Max (T _{S max}) -Time(t _{s min} to t _{s max})	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
	Time maintained above: -Temperature (T _L) - Time (t _L)	183°C 60-150 seconds	217°C 60-150 seconds
	Peak Temperature(T _P)	240 +0/-5 °C	260 +0/-5 °C
	Time within 5°C of actual peak temperature (t _p)	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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- When the appearance of the product and chip size does not change, in order to product the customer. quality, change the internal structure and the production process Niuhang can not notify

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Specification Revision History

Rev.	Date	Changed Items	Pre-Changed Content	Changed Content
A/1	2014-10-20	First Issue		
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