150mA Load, Low Power Consumption, High Input Voltage 30V

LDO-QN6228 series

General Description

QN6228 series are low-dropout linear voltage regulators with a built-in voltage reference module, error amplifier module and feedback resistance network. QN6228 can deliver 150mA output current and allow an input voltage as high as 30V.This series has the function of internal feedback resistor setting from 1.5V to 12V.

Features

- High output accuracy：
  ± 1%（VOUT =3.3V、3.6V、5.0V）
  ±2%（Others）
- Input voltage：up to 30 V
- Output voltage：1.5V ~ 12V
- Ultra-low quiescent current (Typ.= 0.8 μ A)
- Output Current：IOUT = 150mA
  （When VIN = 4.8V and VOUT =3.3V）
- Short-circuit Current：(Typ.= 18mA)
- Low temperature coefficient
- Ceramic capacitor can be used

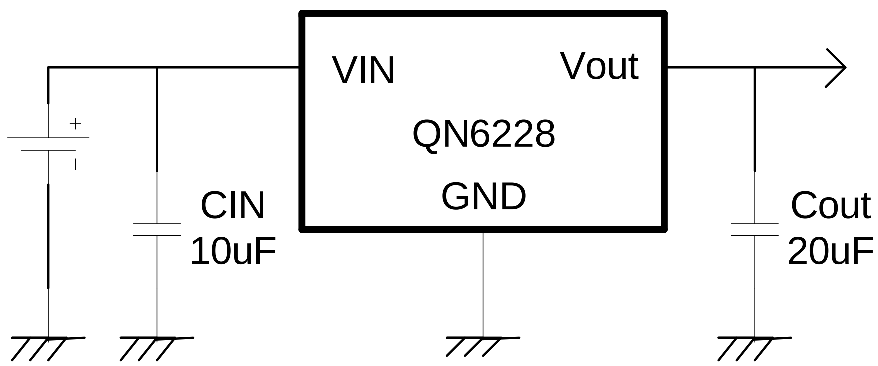
Typical Application

- Battery power supply equipment
- Audio and video equipment
- Communication equipment

Package

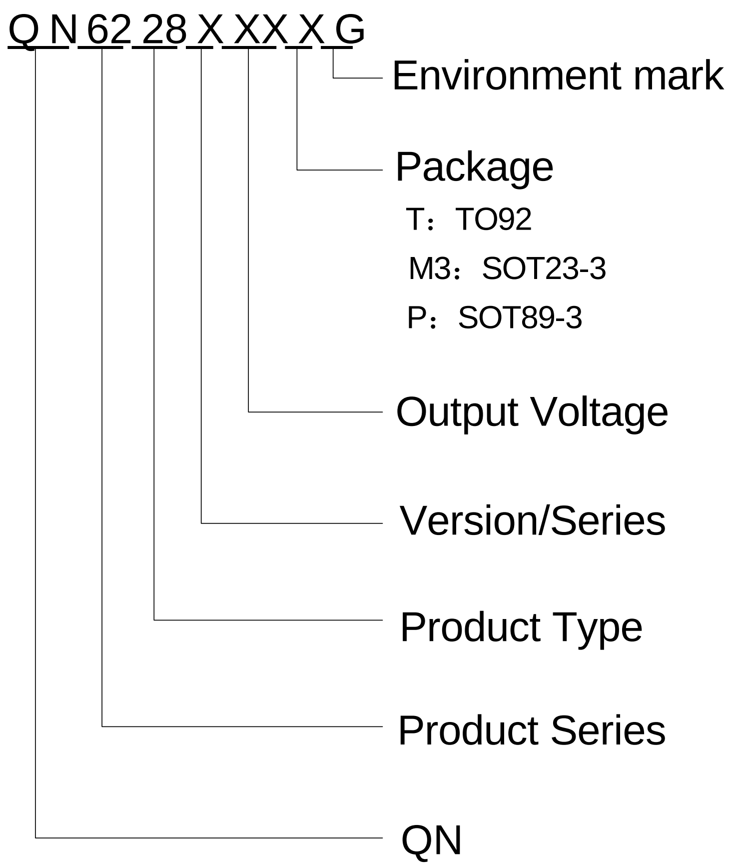
- 3-pin SOT89-3 、TO92 、SOT23-3

Typical Application Circuit



Suggesting : The circuit uses the electrolytic capacitors or tantalum capacitors in the best , When VIN is higher than 15V.

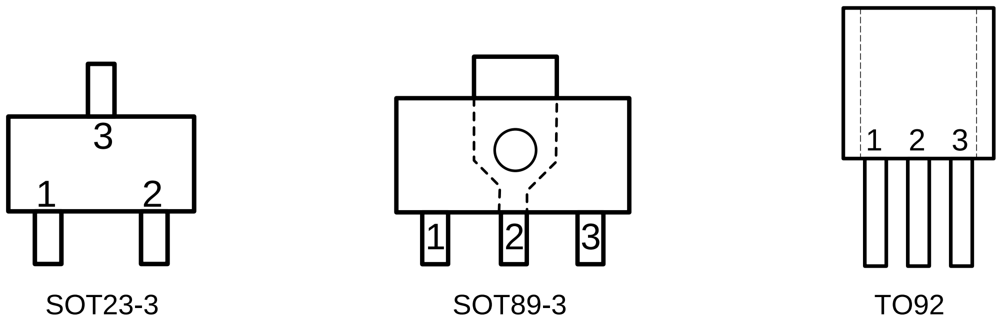
Selection Guide



product series	product description
QN6228A25M3G	V_{OUT} =2.5V; Package: SOT23-3
QN6228A28M3G	V_{OUT} =2.8V; Package: SOT23-3
QN6228A30M3G	V_{OUT} =3.0V; Package: SOT23-3
QN6228A33M3G	V_{OUT} =3.3V; Package: SOT23-3，output accuracy：±1%
QN6228A33PG	V_{OUT} =3.3V; Package: SOT89-3，output accuracy：±1%
QN6228A36M3G	V_{OUT} =3.6V; Package: SOT23-3，output accuracy：±1%
QN6228A36PG	V_{OUT} =3.6V; Package: SOT89-3，output accuracy：±1%
QN6228A50PG	V_{OUT} =5.0V; Package: SOT89-3，output accuracy：±1%
QN6228A50M3G	V_{OUT} =5.0V; Package: SOT23-3，output accuracy：±1%
QN6228A33TG	V_{OUT} =3.3V; Package: TO92， output accuracy：±1%

NOTE: If you need other voltage and package, please contact our sales staff。

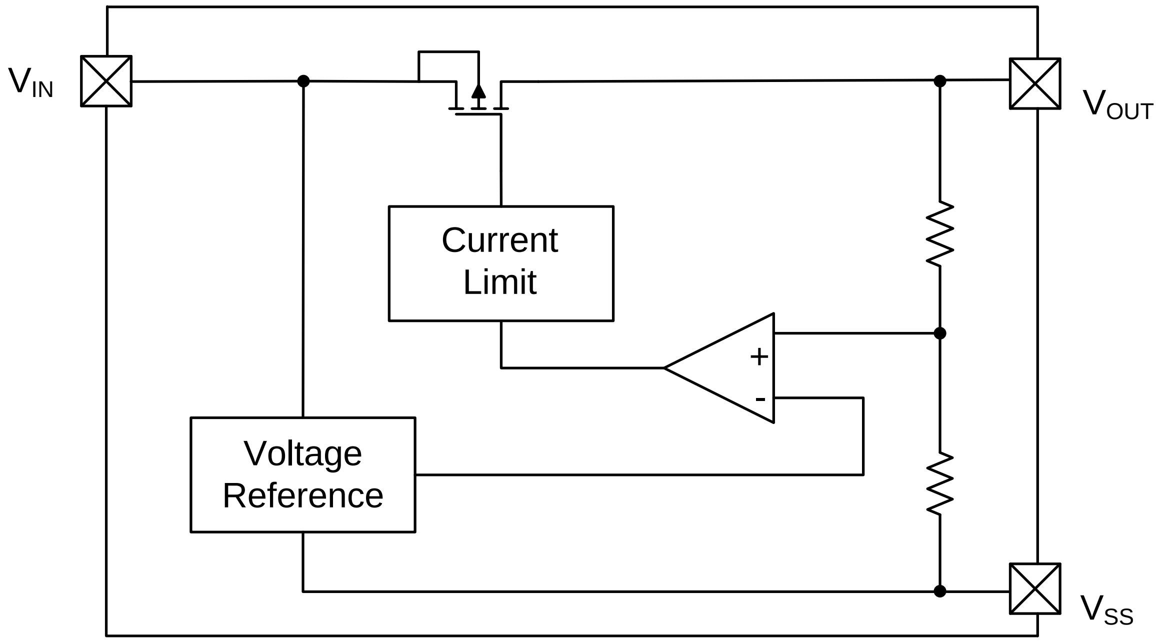
Pin Configuration& Pin Assignment



Pin Assignment

Pin Number		Pin Name	Functions
SOT89-3 / TO92	SOT23-3		
1	1	V_{SS}	Ground
2	3	V_{IN}	Power Input
3	2	V_{OUT}	Output

Block Diagram



Absolute Maximum Ratings

Parameter		Symbol	Ratings	Units
Input Voltage		V_{IN}	30	V
Output Current		I_{OUT}	150	mA
Output Voltage		V_{OUT}	Vss-0.3～V_{IN} +0.3	V
Power Dissipation	SOT89-3	P_D	500	mW
	TO92		500	
	SOT23-3		250	
Operating Junction Temperature Range		T_{OPR}	－40～＋85	℃
Storage Temperature Range		T_{STG}	－55～＋150	℃
Lead Temperature			260℃，10sec	

Electrical Characteristics

QN6228A25 (V_{IN}= V_{OUT}+1.5V，C_{IN}=C_L=10uF，Ta=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Output Voltage	V_{OUT}(E) (Note 2)	I_{OUT}=10mA	X 0.98	V_{OUT} (T) (Note 1)	X 1.02	V
Input Voltage	V_{IN}		2.5		30	V
Maximum Output Current	I_{OUT} _max	V_{IN}= V_{OUT}+1.5V		150		mA
Load Regulation	ΔV_{OUT}	V_{IN}= V_{OUT} +1.5V, 1mA≤I_{OUT}≤150mA		30	60	mV
Dropout Voltage (Note 3)	V_{DIF}	I_{OUT} =10mA		0.09		V
		I_{OUT} =50mA		0.45		V
Supply Current	I_{SS}	V_{IN}= V_{OUT} +1.5V		0.7	1.5	μA
Line Regulations	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	I_{OUT} =1mA V_{OUT} +1V ≤V_{IN}≤30V		0.04	0.1	%/V
Short-circuit Current	I_{SHORT}	V_{OUT}=0V		18	40	mA
Temperature Coefficient	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta Ta}$	I_{OUT} =10mA -40℃≤Ta≤85℃		65		ppm/℃

QN6228A28 (V_{IN}= V_{OUT}+1.5V，C_{IN}=C_L=10uF，Ta=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Output Voltage	V_{OUT}(E) (Note 2)	I_{OUT}=10mA	X 0.98	V_{OUT} (T) (Note 1)	X 1.02	V
Input Voltage	V_{IN}		2.8		30	V
Maximum Output Current	I_{OUT} _max	V_{IN}= V_{OUT}+1.5V		150		mA
Load Regulation	ΔV_{OUT}	V_{IN}= V_{OUT} +1.5V, 1mA≤I_{OUT}≤150mA		30	60	mV

Dropout Voltage (Note 3)	V_{DIF}	I_{OUT} =10mA		0.08		V
		I_{OUT} =50mA		0.40		V
Supply Current	I_{SS}	V_{IN}= V_{OUT} +1.5V		0.8	1.5	μA
Line Regulations	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	I_{OUT} =1mA V_{OUT} +1V ≤V_{IN}≤30V		0.04	0.1	%/V
Short-circuit Current	I_{SHORT}	V_{OUT}=0V		18	40	mA
Temperature Coefficient	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta Ta}$	I_{OUT} =10mA -40℃≤Ta≤85℃		65		ppm/℃

QN6228A30 (V_{IN}= V_{OUT}+1.5V，C_{IN}=C_L=10uF，Ta=25^{O}C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Output Voltage	V_{OUT}(E) (Note 2)	I_{OUT}=10mA	X 0.98	V_{OUT} (T) (Note 1)	X 1.02	V
Input Voltage	V_{IN}		3.0		30	V
Maximum Output Current	I_{OUT} _max	V_{IN}= V_{OUT}+1.5V		150		mA
Load Regulation	ΔV_{OUT}	V_{IN}= V_{OUT} +1.5V, 1mA≤I_{OUT}≤150mA		30	60	mV
Dropout Voltage (Note 3)	V_{DIF}	I_{OUT} =10mA		0.07		V
		I_{OUT} =50mA		0.35		V
Supply Current	I_{SS}	V_{IN}= V_{OUT} +1.5V		0.8	1.5	μA
Line Regulations	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	I_{OUT} =1mA V_{OUT} +1V ≤V_{IN}≤30V		0.04	0.1	%/V
Short-circuit Current	I_{SHORT}	V_{OUT}=0V		18	40	mA
Temperature Coefficient	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta Ta}$	I_{OUT} =10mA -40℃≤Ta≤85℃		65		ppm/℃

QN6228A33 (V_{IN}= V_{OUT}+1.5V，C_{IN}=C_L=10uF，Ta=25^{O}C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Output Voltage	V_{OUT}(E) (Note 2)	I_{OUT}=10mA	X 0.99	V_{OUT} (T) (Note 1)	X 1.01	V
Input Voltage	V_{IN}		3.3		30	V
Maximum Output Current	I_{OUT} _max	V_{IN}= V_{OUT}+1.5V		150		mA
Load Regulation	ΔV_{OUT}	V_{IN}= V_{OUT} +1.5V, 1mA≤I_{OUT}≤150mA		30	60	mV
Dropout Voltage (Note 3)	V_{DIF}	I_{OUT} =10mA		0.07		V
		I_{OUT} =50mA		0.35		V
Supply Current	I_{SS}	V_{IN}= V_{OUT} +1.5V		0.8	1.5	μA
Line Regulations	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	I_{OUT} =1mA V_{OUT} +1V ≤V_{IN}≤30V		0.04	0.1	%/V
Short-circuit Current	I_{SHORT}	V_{OUT}=0V		18	40	mA
Temperature Coefficient	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta Ta}$	I_{OUT} =10mA -40℃≤Ta≤85℃		65		ppm/℃

QN6228A36

(V_{IN}= V_{OUT}+1.5V，C_{IN}=C_L=10uF，Ta=25^{O}C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Output Voltage	V_{OUT}(E) (Note 2)	I_{OUT}=10mA	X 0.99	V_{OUT} (T) (Note 1)	X 1.01	V
Input Voltage	V_{IN}		3.6		30	V
Maximum Output Current	I_{OUT} _max	V_{IN}= V_{OUT}+1.5V		150		mA
Load Regulation	ΔV_{OUT}	V_{IN}= V_{OUT} +1.5V, 1mA≤I_{OUT}≤150mA		30	60	mV
Dropout Voltage (Note 3)	V_{DIF}	I_{OUT} =10mA		0.07		V
		I_{OUT} =50mA		0.35		V
Supply Current	I_{SS}	V_{IN}= V_{OUT} +1.5V		0.8	1.5	μA
Line Regulations	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	I_{OUT} =1mA V_{OUT} +1V ≤V_{IN}≤30V		0.04	0.1	%/V
Short-circuit Current	I_{SHORT}	V_{OUT}=0V		18	40	mA
Temperature Coefficient	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta Ta}$	I_{OUT} =10mA -40℃≤Ta≤85℃		65		ppm/℃

QN6228A50 (V_{IN}= V_{OUT}+1.5V，C_{IN}=C_L=10uF，Ta=25^{O}C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Output Voltage	V_{OUT}(E) (Note 2)	I_{OUT}=10mA	X 0.99	V_{OUT} (T) (Note 1)	X 1.01	V
Input Voltage	V_{IN}		5.0		30	V
Maximum Output Current	I_{OUT} _max	V_{IN}= V_{OUT}+1.5V		150		mA
Load Regulation	ΔV_{OUT}	V_{IN}= V_{OUT} +1.5V, 1mA≤I_{OUT}≤150mA		20	50	mV
Dropout Voltage (Note 3)	V_{DIF}	I_{OUT} =10mA		0.06		V
		I_{OUT} =50mA		0.32		V
Supply Current	I_{SS}	V_{IN}= V_{OUT} +1.5V		1.0	1.8	μA
Line Regulations	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	I_{OUT} =1mA V_{OUT} +1V ≤V_{IN}≤30V		0.06	0.1	%/V
Short-circuit Current	I_{SHORT}	V_{OUT}=0V		15	40	mA
Temperature Coefficient	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta Ta}$	I_{OUT} =10mA -40℃≤Ta≤85℃		65		ppm/℃

Note ：

1. V_{OUT} (T) ： Specified Output Voltage

2.V_{OUT} (E) ： Effective Output Voltage (ie. The output voltage when "V_{OUT} (T)+ 2.0V"is provided at the V_{IN} pin while maintaining a certain I_{OUT} value.)

3.V_{DIF}： V_{IN1} –V_{OUT} (E)'

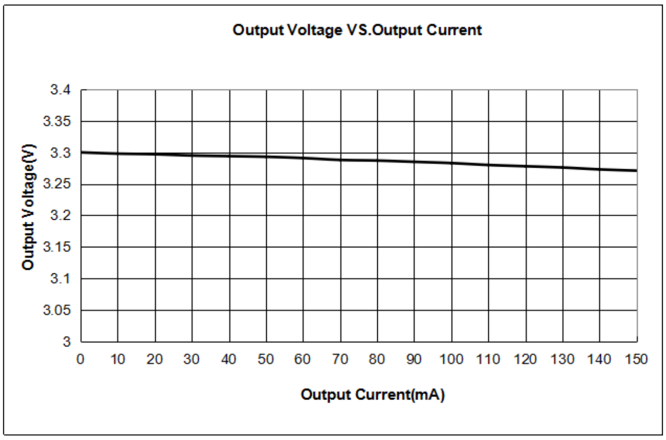
V_{IN1} ： The input voltage when V_{OUT}(E)' appears as input voltage is gradually decreased.

V_{OUT} (E)'=A voltage equal to 98% of the output voltage whenever an amply stabilized I_{OUT} and {V_{OUT} (T)+2.2V} is input.

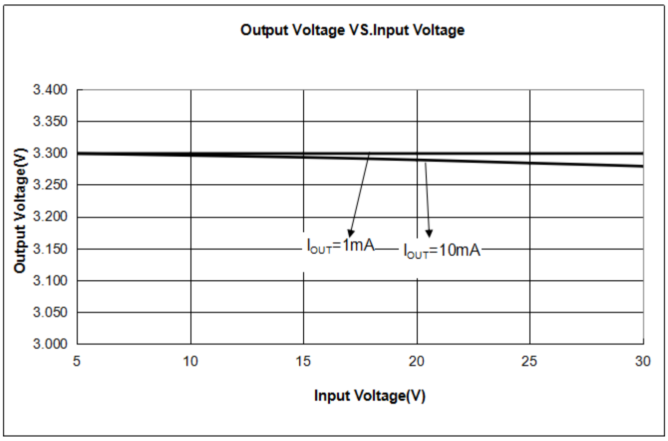
Type Characteristics

QN6228A33

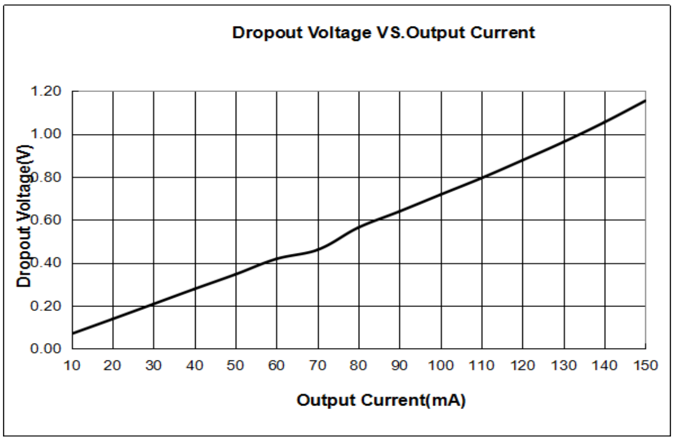
(1) Output Voltage VS. Output Current (**Ta = 25 °C**)
($V_{IN}=V_{OUT}+1.5V$)



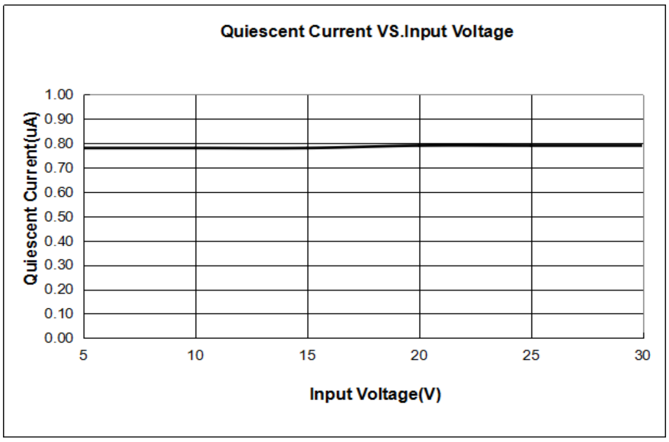
(2) Output Voltage VS. Input Voltage (**Ta = 25 °C**)



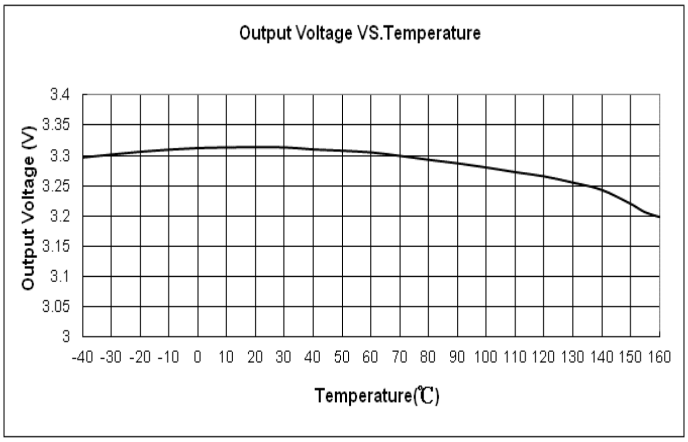
(3) Dropout Voltage VS. Output Current (**Ta = 25 °C**)



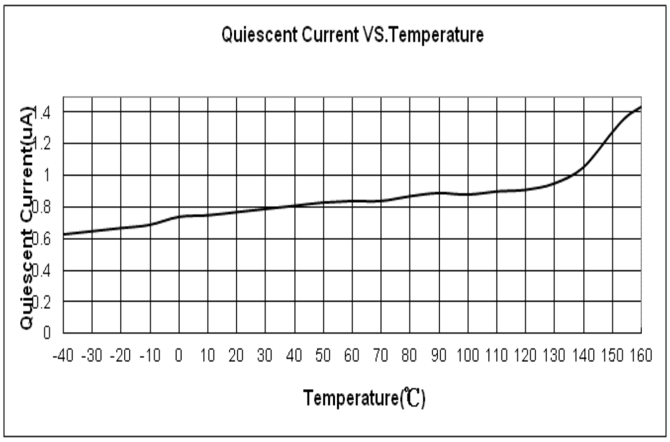
(4) Quiescent Current VS. Input Voltage (**Ta = 25 °C**)



(5) Output Voltage VS. Temperature
(I_{OUT}=10mA)

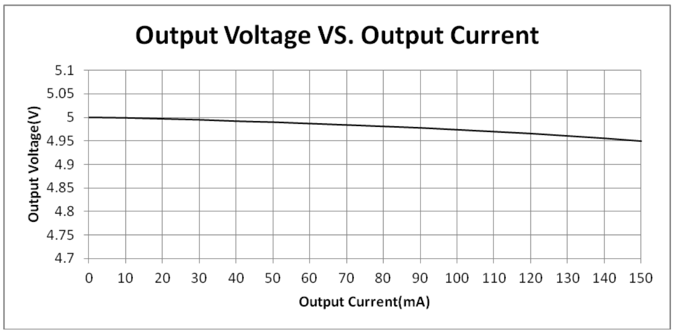


(6) Quiescent Current VS. Temperature
($V_{IN}=V_{OUT}+1.5V$)

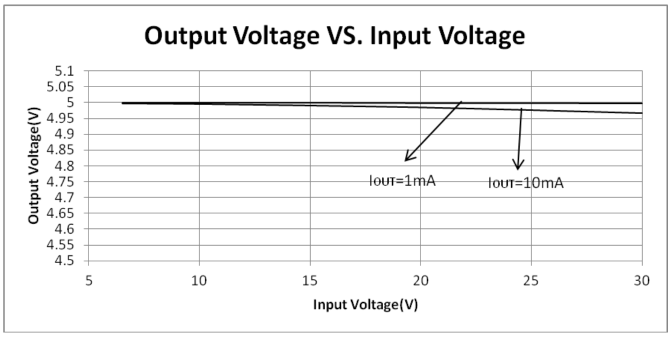


QN6228A50

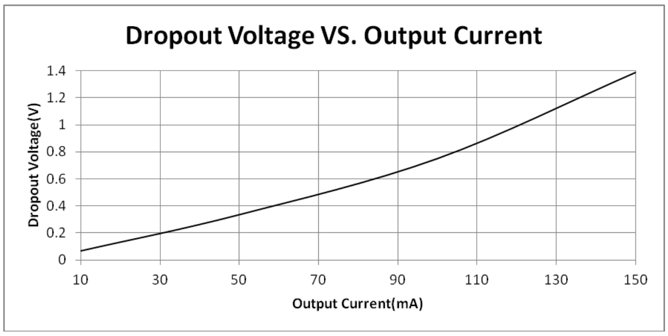
（1）Output Voltage VS. Output Current （ **Ta = 25 °C**）（V_{IN}=V_{OUT}+1.5V）



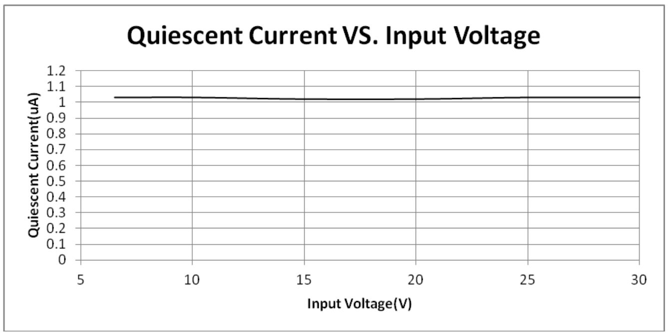
（2）Output Voltage VS. Input Voltage （ **Ta = 25 °C**）



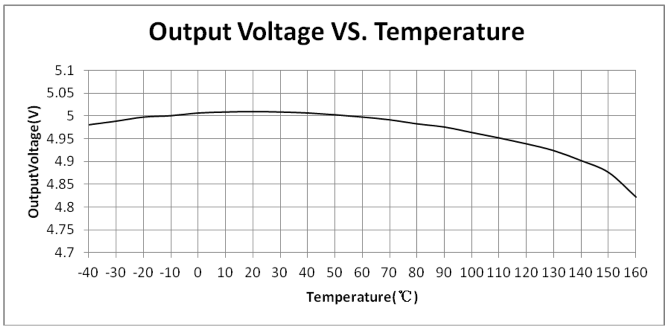
（3）Dropout Voltage VS. Output Current （ **Ta = 25 °C**）



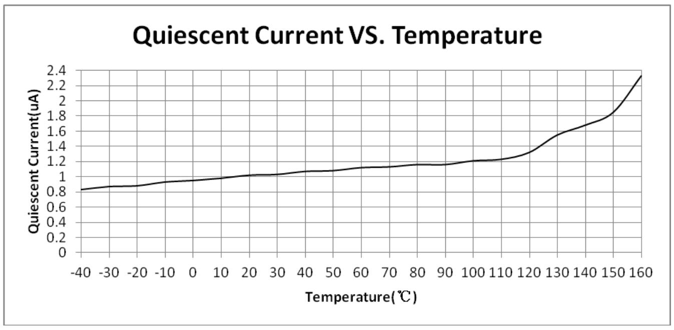
（4）Quiescent Current VS. Input Voltage（**Ta = 25 °C**）



（5） Output Voltage VS. Temperature (I_{OUT}=10mA)



（6）Quiescent Current VS. Temperature （V_{IN}=V_{OUT}+1.5V）



Applications Information

Input Capacitor and Output Capacitor

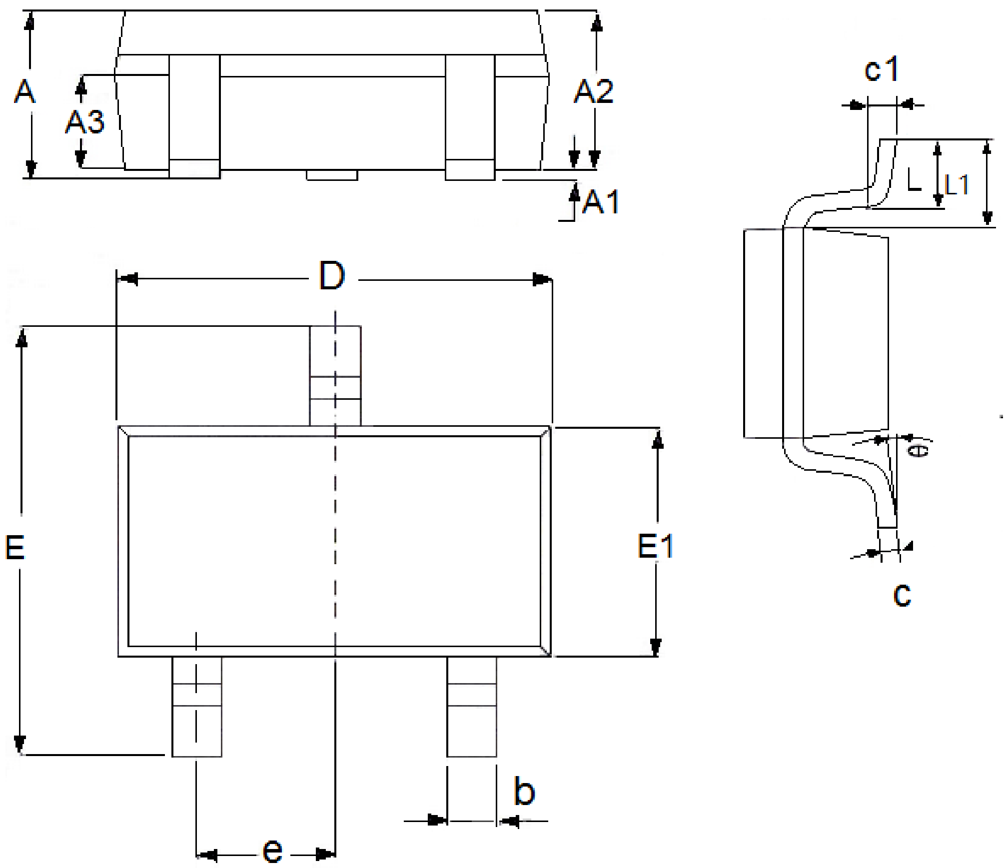
Ceramic capacitors are suitable for smaller volume applications because of its high capacitance and low cost. Its high ripple current, high voltage rating and low ESR make it more suitable for converter applications. The low output voltage ripple and small peripheral circuit size can be obtained by using ceramic capacitor. The X5R or X7R models are selected as output and input capacitors, which have better temperature and voltage characteristics.

When the VIN voltage is greater than 15V, if the input capacitor is ceramic capacitor, the high voltage spike generated at the VIN pin will exceed 40V, which may cause permanent damage to the chip. Therefore, we suggest that customers using electrolytic or tantalum capacitors with better power consumption in the application of VIN>15V, can effectively protect chips and improve system reliability.

When the VIN voltage is very fast, the internal circuit of the chip is too late to respond and the output voltage is prone to exceed the rated output voltage, that is, the output voltage overshoot., the overshoot of the output voltage is especially serious in the following: 1. VIN rising fast. 2. The output capacitance is small. 3. The output load is small. When the system has the output voltage overshoot, the customers can increase the output capacitance to alleviate this situation.

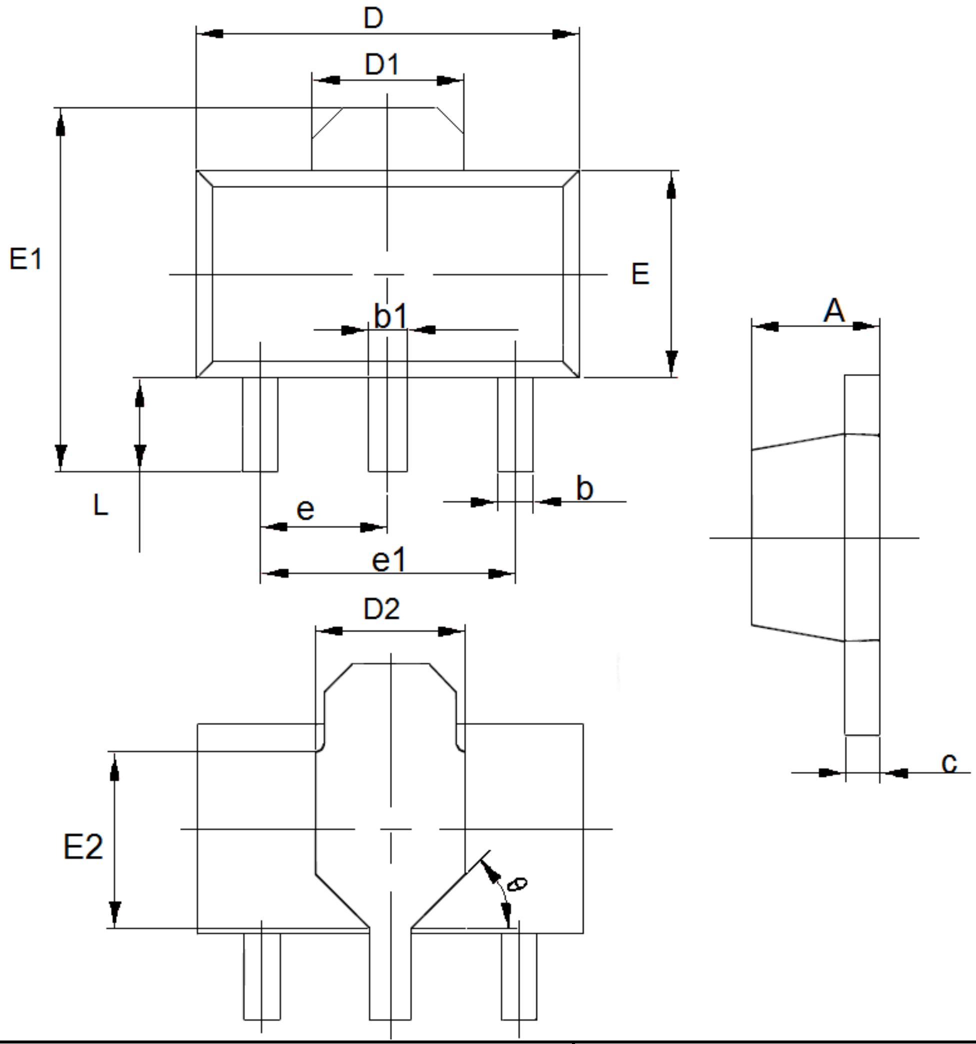
Packaging Information

- **Packaging Type: SOT23-3**



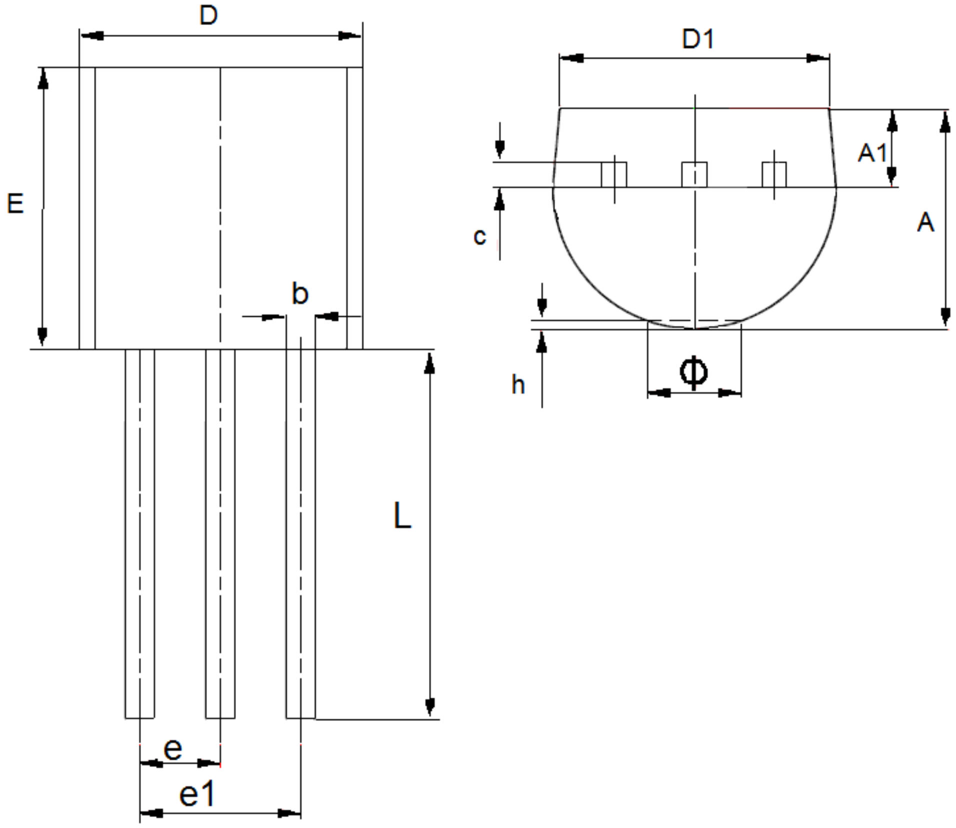
DIM	Millimeters		Inches	
	Min	**Max**	**Min**	**Max**
A	1.05	1.45	0.0413	0.0571
A1	0	0.15	0.0000	0.0059
A2	0.9	1.3	0.0354	0.0512
A3	0.6	0.7	0.0236	0.0276
b	0.25	0.5	0.0098	0.0197
c	0.1	0.25	0.0039	0.0098
D	2.8	3.1	0.1102	0.1220
E	2.6	3.1	0.1023	0.1220
E1	1.5	1.8	0.0591	0.0709
e	0.95(TYP)		0.0374(TYP)	
L	0.25	0.6	0.0098	0.0236
L1	0.59(TYP)		0.0232(TYP)	
θ	0	8°	0.0000	8°
c1	0.2(TYP)		0.0079(TYP)	

- **Packaging Type: SOT89-3**



DIM	Millimeters		Inches	
	Min	**Max**	**Min**	**Max**
A	1.4	1.6	0.0551	0.0630
b	0.32	0.52	0.0126	0.0205
b1	0.4	0.58	0.0157	0.0228
c	0.35	0.45	0.0138	0.0177
D	4.4	4.6	0.1732	0.1811
D1	1.55(TYP)		0.061(TYP)	
D2	1.75(TYP)		0.0689(TYP)	
e1	3.0(TYP)		0.1181(TYP)	
E	2.3	2.6	0.0906	0.1023
E1	3.94	4.4	0.1551	0.1732
E2	1.9(TYP)		0.0748(TYP)	
e	1.5(TYP)		0.0591(TYP)	
L	0.8	1.2	0.0315	0.0472
θ	45°		45°	

- **Packaging Type: TO-92**



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	3.3	3.7	0.1299	0.1457
A1	1.1	1.4	0.0433	0.0551
b	0.38	0.55	0.015	0.0217
c	0.36	0.51	0.0142	0.0201
D	4.3	4.7	0.1693	0.185
D1	3.43	—	0.135	—
E	4.3	4.7	0.1693	0.185
e	1.27TYP		0.05TYP	
e1	2.44	2.64	0.0961	0.1039
L	14.1	14.5	0.5551	0.5709
h	0	0.38	0	0.015
Φ	—	1.6	—	0.063