Ultra-small package High-precision Voltage Detector with delay circuit, ME2806 Series

General Description

ME2806 Series is a series of high-precision voltage detectors with a built-in delay time generator of fixed time developed using NMOS process. Internal oscillator and counter timer can delay the release signal without external parts. Detect voltage is extremely accurate with minimal temperature drift. NMOS output configurations are available.

Features

- Highly accuracy： ±1%
- Low power consumption：TYP 0.9uA (V_{DD}=3V)
- Detect voltage range ： 1.0V~6.5V in 0.1V increments
- Operating voltage range：0.7V~7.0V
- Detect voltage temperature characteristics：TYP±100ppm/℃
- Output configuration： NMOS

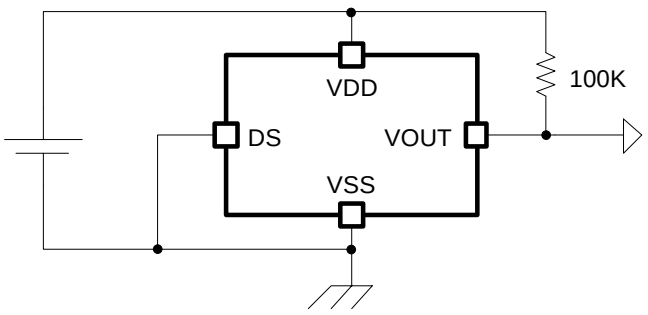
Typical Application

- Power monitor for portable equipment such as notebook computers, digital still cameras, PDA, and cellular phones
- Constant voltage power monitor for cameras, video equipment and communication devices.
- Power monitor for microcomputers and reset for CPUs.
- System battery life and charge voltage monitors

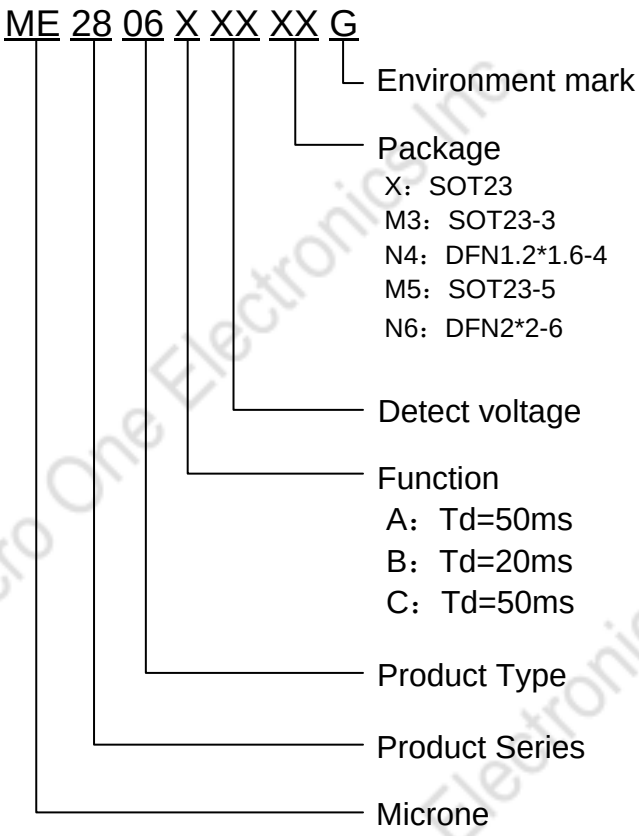
Package

- 3-pin SOT23、SOT23-3
- 4-pin DFN1.2*1.6-4
- 5-pin SOT23-5
- 6-pin DFN2*2-6

Typical Application Circuit

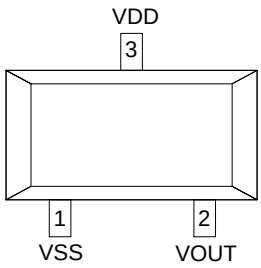


Selection Guide

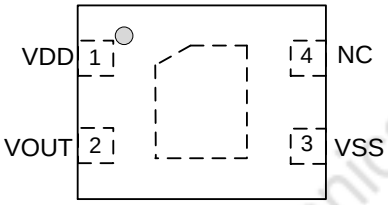


product series	Detect voltage	Delay time（DS low）	Package
ME2806A263XG	2.63V	50ms	SOT23
ME2806A293M3G	2.93V	50ms	SOT23-3
ME2806A293XG	2.93V	50ms	SOT23
ME2806A293N4CG	2.93V	50ms	DFN1.2*1.6-4
ME2806A308M5G	3.08V	50ms	SOT23-5
ME2806A38XG	3.8V	50ms	SOT23
ME2806B14M3G	1.4V	20ms	SOT23-3
ME2806B14N6G	1.4V	20ms	DFN2*2-6
ME2806C22M5G	2.2V	50ms	SOT23-5
ME2806C40M5G	4.0V	50ms	SOT23-5
ME2806C263M5G	2.63V	50ms	SOT23-5
ME2806C293M5G	2.93V	50ms	SOT23-5

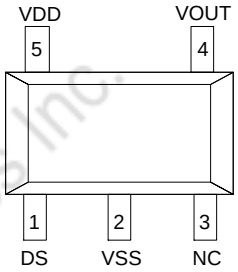
Pin Configuration



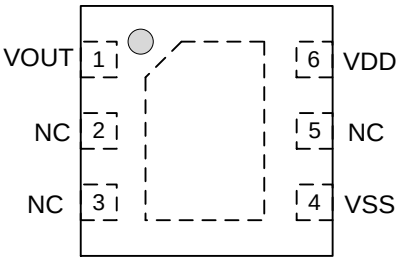
SOT23/SOT23-3



DFN1.2*1.6-4



SOT23-5

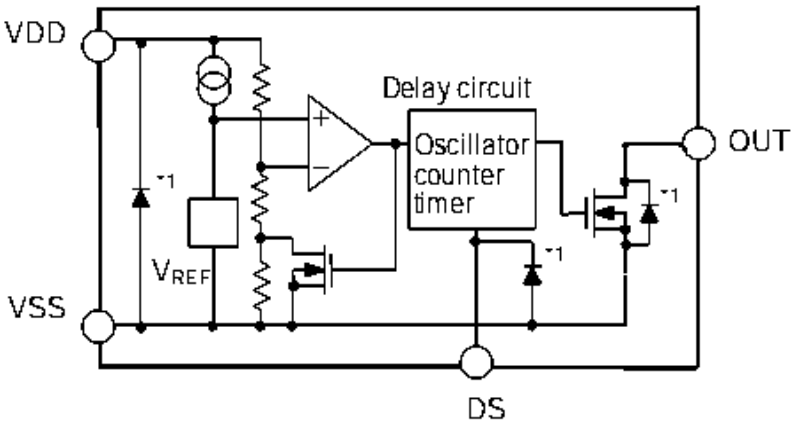


DFN2*2-6

Pin Assignment

PIN Number				Pin Name	Function
SOT23/SOT23-3	DFN1.2*1.6-4	SOT23-5	DFN2*2-6		
1	3	2	4	VSS	Ground
2	2	4	1	VOUT	Output Voltage
3	1	5	6	VDD	Input Voltage
-	-	1	-	DS	ON/OFF switch for delay time
-	4	3	2，3，5	NC	

Block Diagram



*1. Parasitic diode

Absolute Maximum Ratings

Parameter		Symbal	Ratings	Units
V_{DD} Input Voltage		V_{DD}	8	V
Output Current		I_{OUT}	50	mA
Output Voltage	NMOS	V_{OUT}	Vss-0.3~ V_{DD} +0.3	V
Continuous Total Power Dissipation	SOT23-3	Pd	0.5	W
	SOT23		0.4	
	DFN1.2*1.6-4		0.42	
	SOT23-5		0.6	
	DFN2*2-6		1.3	
Thermal resistance(Junction to air)	SOT23-3	θ_{JA}	250	℃/W
	SOT23		330	
	DFN1.2*1.6-4		300	
	SOT23-5		200	
	DFN2*2-6		95	
Operating Ambient Temperature		T_{Opr}	-40~+85	℃
Storage Temperature		T_{stg}	-55~+150	℃
Maximum junction temperature		T_J	-40~+150	℃
Soldering temperature and time		T_{solder}	260℃, 10s	
ESD		MM	400	V
		HBM	4000	V

Electrical Characteristics ($-V_{DET}$(S)=1.0V to 6.5V±1% ,Ta=25°C , unless otherwise noted)

Parameter	Symbol		Conditions	Min.	Typ	Max.	Units	Test circuit
Detect Voltage	-VDET			-VDET（S）×0.99	-VDET(S)	-VDET(S) ×1.01	V	1
Hysteresis Range	VHYS			0.03	0.06	0.1	V	
Supply Current1	ISS1		VDD=2V		0.6	1.0	uA	2
Supply Current2	ISS2		VDD=3V (below 2.5V)	-	0.9	1.5	uA	2
			VDD=5V (2.5V-4.5V)	-	1.4	2.8		
			VDD=7V (4.5V-6.5V)	-	1.8	3.6		
Output Current	IOUT N-ch		VDS=0.5V VDD=0.7V	0.01	0.16	--	mA	3
Operating voltage	VDD			0.7	-	7	V	1
Delay time	Td1	A /C Series	VDD=-VDET+1V DS low	32.5	50	72.5	ms	1
		B Series		13	20	27	ms	1
	Td2		VDD=-VDET+1V DS high	25	50	75	us	4
Temperature characteristics	$\frac{\Delta - VDET}{\Delta Ta \times (-VDET)}$		ΔTa= -40℃ ~ 85℃	-	±100	±350	ppm/℃	1

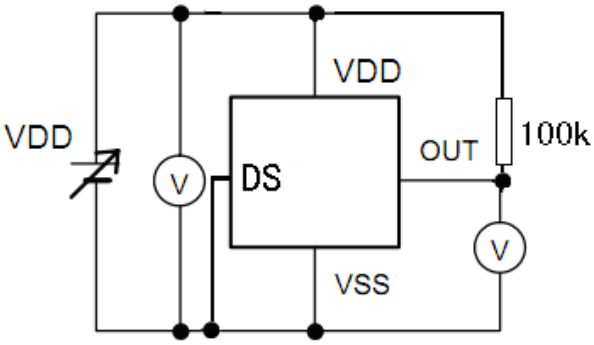
Note： 1、-VDET(S) ： Specified Detection Voltage value

2、-VDET ： Actual Detection Voltage value

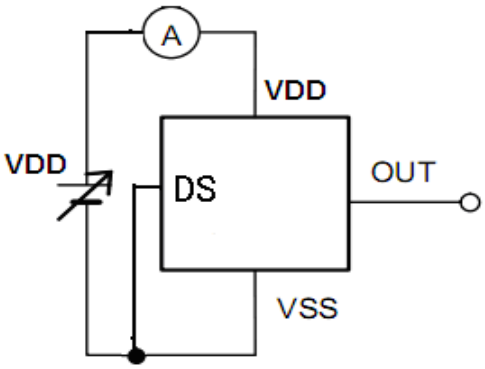
3、Release Voltage：+VDET=-VDET+VHYS

Test Circuits:

1.



2.



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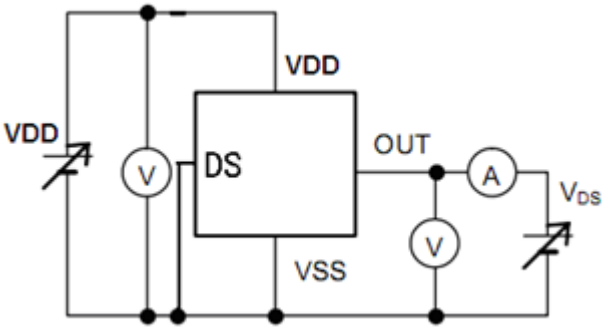
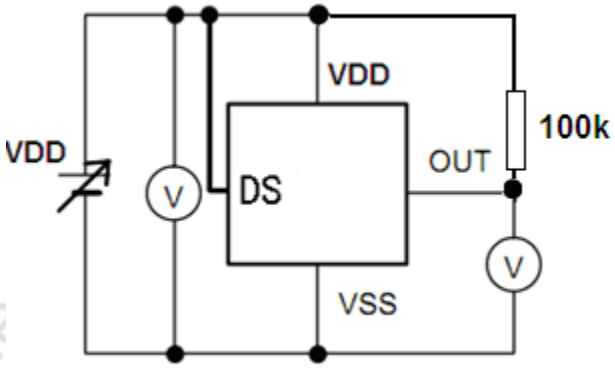


4.



Functional Description

1. Basic Operation: NMOS Output (Active Low)

1-1. When the power supply voltage (VDD) is higher than the release voltage (+VDET), the Nch transistor is OFF to provide VDD (high) at the output. Since the Nch transistor N1 in Figure 1 is OFF, the comparator input voltage is

$$\frac{(R_B + R_C)VDD}{R_A + R_B + R_C}.$$

1-2. When the VDD goes below +VDET, the output provides the VDD level, as long as VDD remains above the detection voltage (–VDET). When the VDD falls below –VDET (point A in Figure 2), the Nch transistor becomes ON, the VSS level appears at the output. At this time the Nch transistor N1 in Figure 1 becomes ON, the comparator input voltage is changed to

$$\frac{R_B \cdot VDD}{R_A + R_B}.$$

1-3. When the VDD falls below the minimum operating voltage, the output becomes undefined, or goes to VDD when

the output is pulled up to VDD.

1-4. The VSS level appears when VDD rises above the minimum operating voltage. The VSS level still appears even when VDD surpasses the –VDET, as long as it does not exceed the release voltage +VDET.

1-5. When VDD rises above +VDET (point B in Figure 2), the Nch transistor becomes OFF to provide VDD at the output. The VDD at the OUT pin is delayed for Td due to the delay circuit.

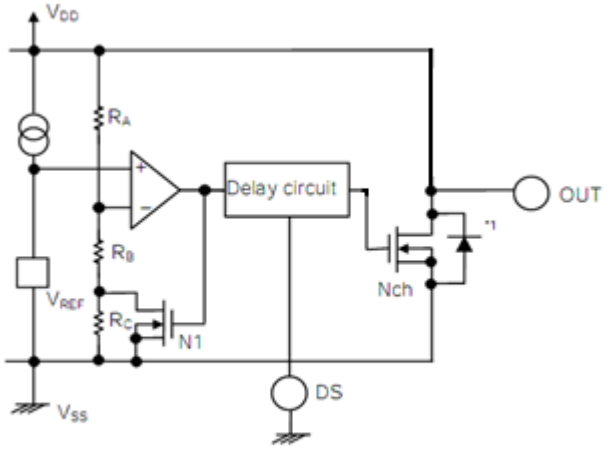


Figure 1 Operation 1

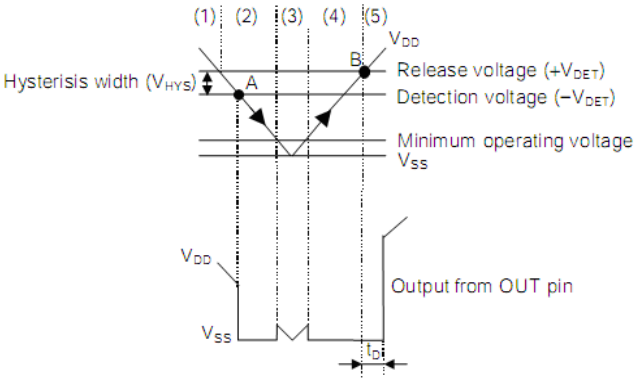


Figure 2 Operation 2

2. Delay Circuit

2-1. Delay Time

The delay circuit delays the output signal from the time at which the power voltage (VDD) exceeds the release voltage (+VDET) when VDD is turned on. The output signal is not delayed when the VDD goes below the detection voltage (–VDET). (Refer to Figure 2.) The delay time (t_D) is a fixed value that is determined by a built-in oscillation circuit and counter.

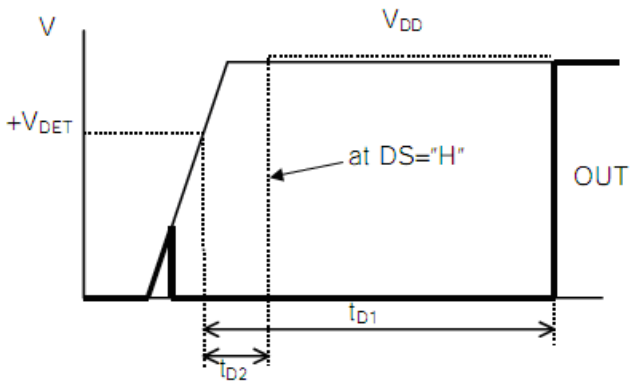


Figure 3

2-2. DS Pin (ON/OFF Switch Pin for Delay Time)

The DS pin should be connected to Low or High. When the DS pin is High, the output delay time becomes short since the output signal is taken from the middle of counter circuit (Refer to Figure 3).

Directions for use

1、Please use this IC within the stated maximum ratings. Operation beyond these limits may cause degrading or permanent damage to the device.

2、When a resistor is connected between the VDD pin and the input with NMOS output configurations, oscillation may occur as a result of voltage drops at RIN if load current(IOUT) exists.(refer to the Oscillation Description(1) below)

3、When a resistor is connected between the VDD pin and the input with NMOS output configurations, oscillation may occur as a result of through current at the time of voltage release even if load current(IOUT) does not exist. (refer to the Oscillation Description(2) below)

4、With a resistor connected between the VDD and the input, detect and release voltage will rise as a result of the IC's

5、supply current　flowing through the VDD pin.

6、In order to stabilize the IC's operations, please ensure that VDD pin's input frequency's rise and fall times are more than several u Sec/V.

Oscillation Description

1、Output current oscillation with the NMOS output configuration

When the voltage applied at IN rises, release operations commence and the detector's output voltage increase. Load current(I_{OUT}) will flow at R_L. Because a voltage drop(R_{IN}*I_{OUT}) is produces at the R_{IN} resistor, located between the input(IN) and the V_{DD} pin. The load current will flow via the IC's pin. The voltage drop will also lead to a fall in the voltage level at the V_{DD} pin. When the V_{DD} pin voltage level falls below the detect voltage level, detect operations will commence. Fllowing detect operations, load current flow will cease and since voltage drop at R_{IN} will disapper, the voltage level at the V_{DD} pin will rise and release operations will begin over again. Oscillation may occur with this "release-detect-release" repetition. Further, this condition will also appear via means of a similar mechanism during detect operations.

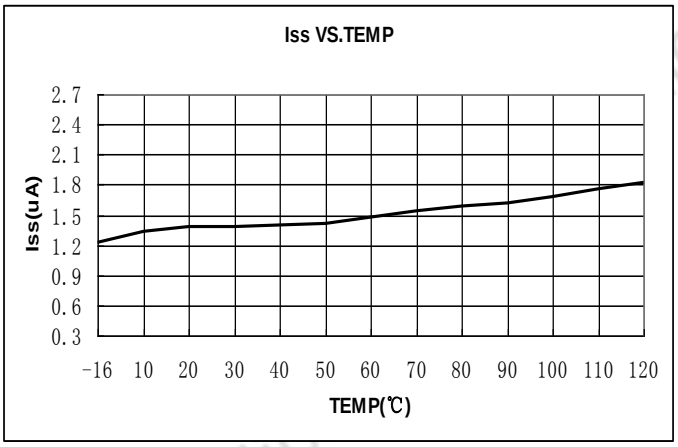
2、Oscillation as a result of　through current

Since the ME2806 series are NMOS IC's, through current will flow when the IC's internal circuit switching operates(during release and detect operations). Consequently, oscillation is liable to occur as a result of drops in voltage at the through current's resistor (R_{IN}) during release voltage operations.(refer to diagram 2) since hysteresis exists during detect operations, oscillation is unlikely to occur.

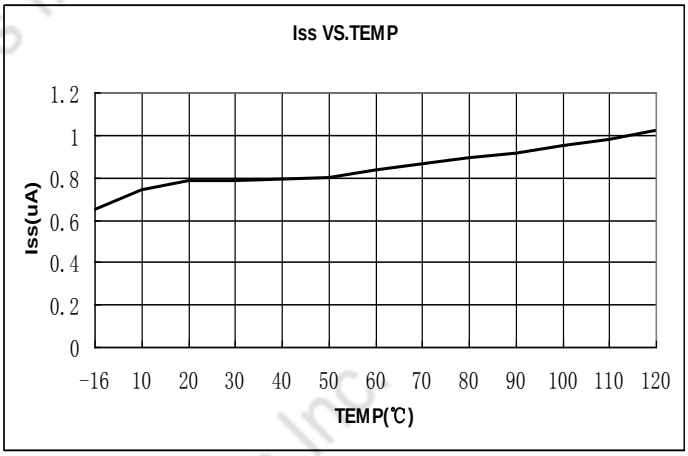
Type Characteristics

1、Supply current vs. Ambient temperature

VDD=5V,-VDET=2.63V

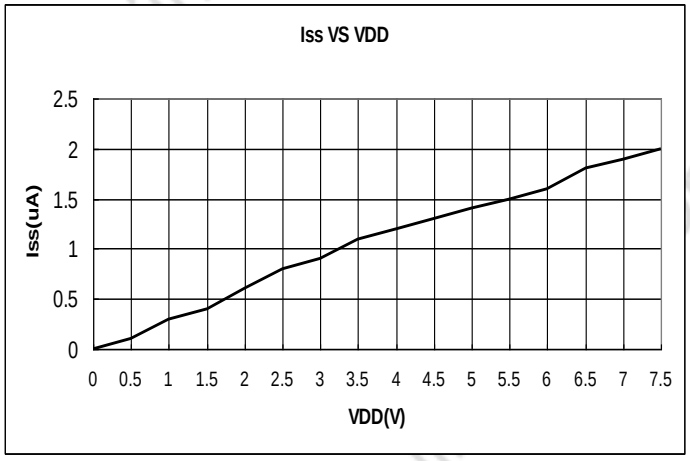


VDD=2.5V,-VDET=2.63V



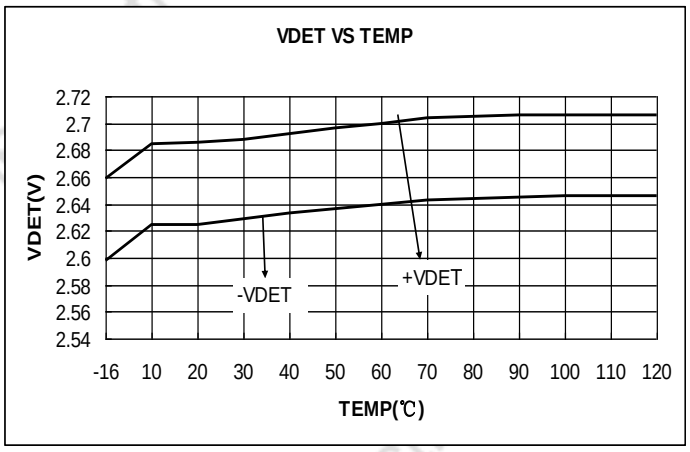
2、Supply current vs. Input voltage

-VDET=2.63V （T=25℃）



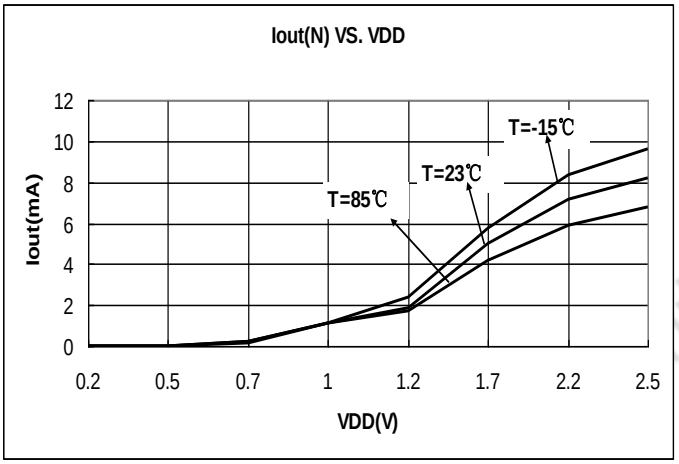
3、Detect, Release voltage vs. Ambient temperature

-VDET=2.63V



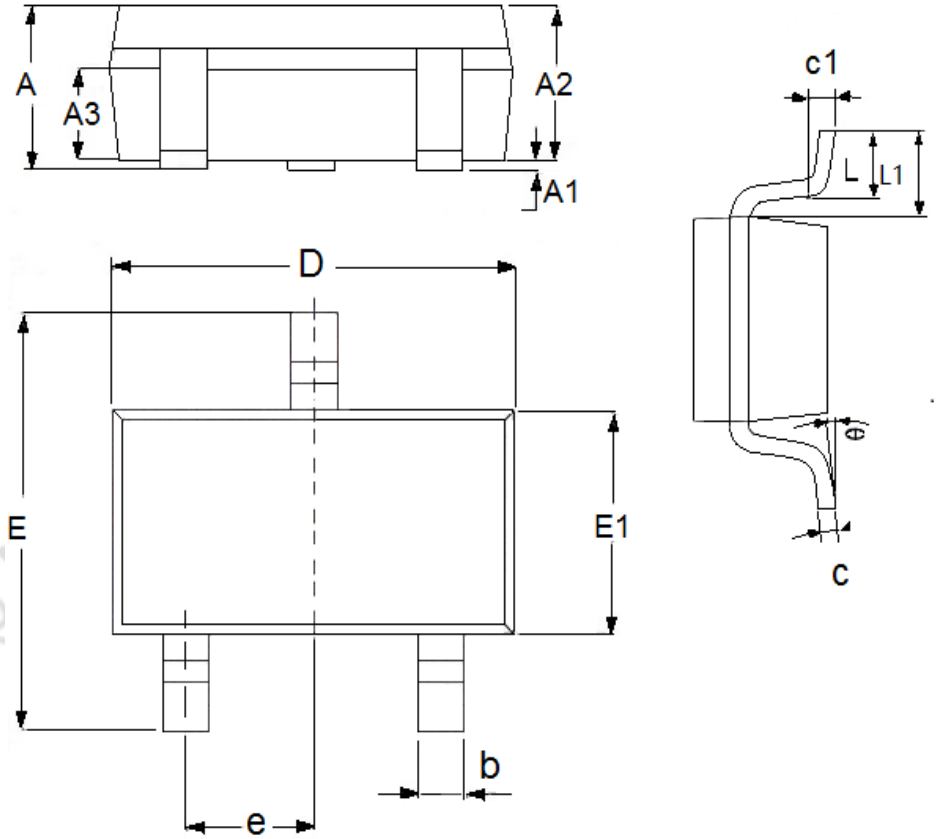
4、 Output current vs. Input voltage

N-ch VDS=0.5V,-VDET=2.63V



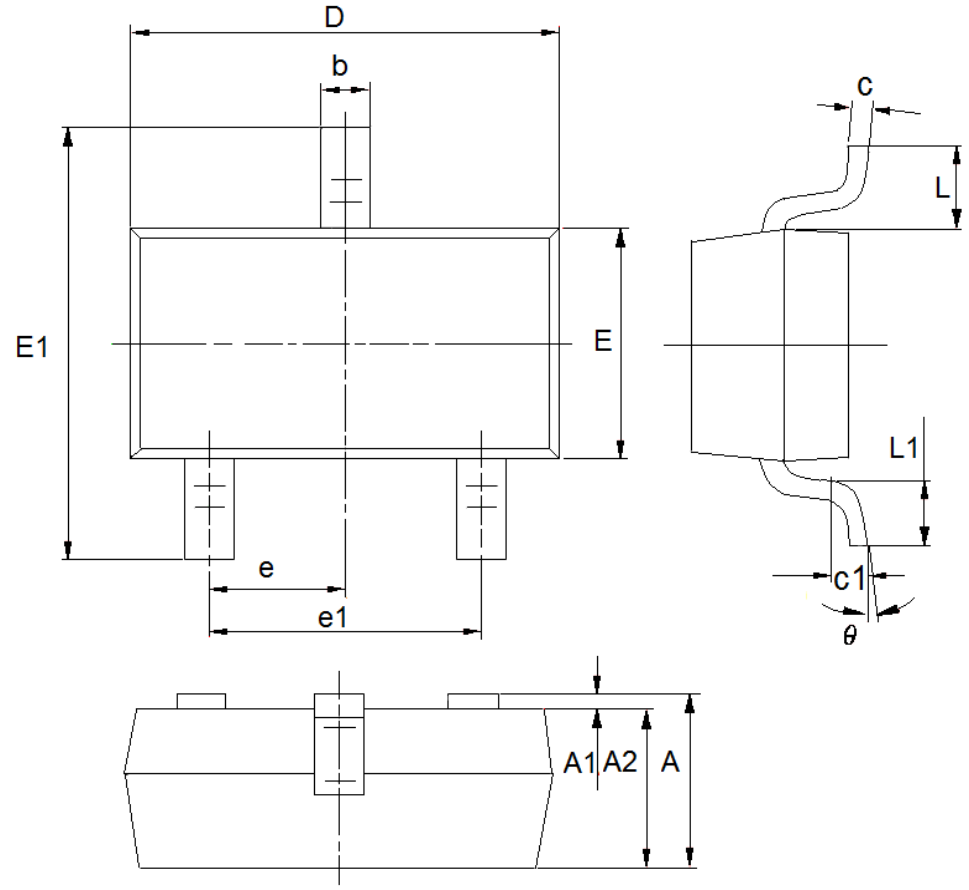
Package Information

- **Package Type：SOT23-3**



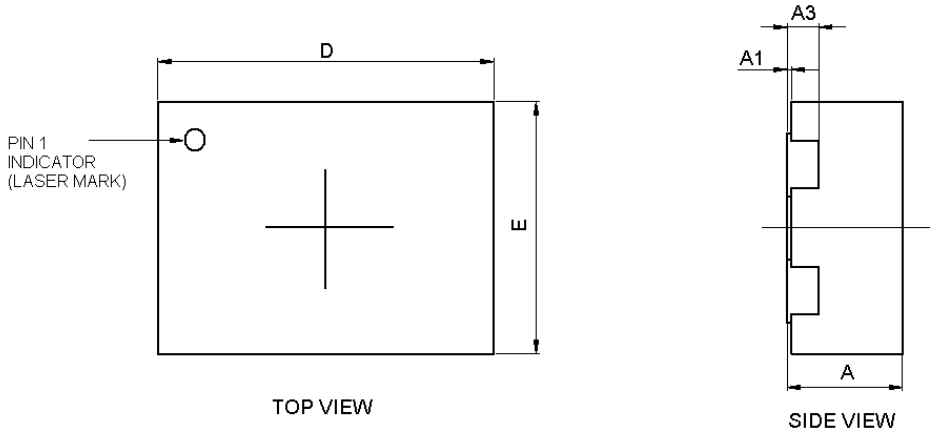
DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	1.05	1.45	0.0413	0.0571
A1	0	0.15	0.0000	0.0059
A2	0.9	1.3	0.0354	0.0512
A3	0.6	0.7	0.0236	0.0276
b	0.25	0.5	0.0098	0.0197
c	0.1	0.25	0.0039	0.0098
D	2.8	3.1	0.1102	0.1220
E	2.6	3.1	0.1023	0.1220
E1	1.5	1.8	0.0591	0.0709
e	0.95(TYP)		0.0374(TYP)	
L	0.25	0.6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

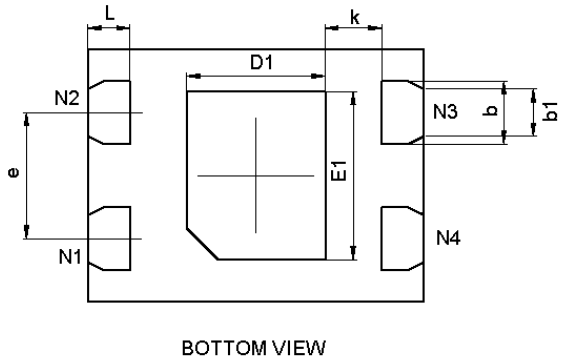
- **Package Type：SOT23**



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	0.9	1.15	0.0354	0.0453
A1	0	0.14	0.0000	0.0055
A2	0.9	1.05	0.0354	0.0413
b	0.28	0.52	0.0110	0.0205
c	0.07	0.23	0.0028	0.0091
D	2.8	3.0	0.1102	0.1181
e1	1.8	2.0	0.0709	0.0787
E	1.2	1.4	0.0472	0.0551
E1	2.2	2.6	0.0866	0.1024
e	0.95(TYP)		0.0374(TYP)	
L	0.55(TYP)		0.0217(TYP)	
L1	0.25	0.55	0.0098	0.0217
θ	0	8°	0.0000	8°
c1	0.25(TYP)		0.0098(TYP)	

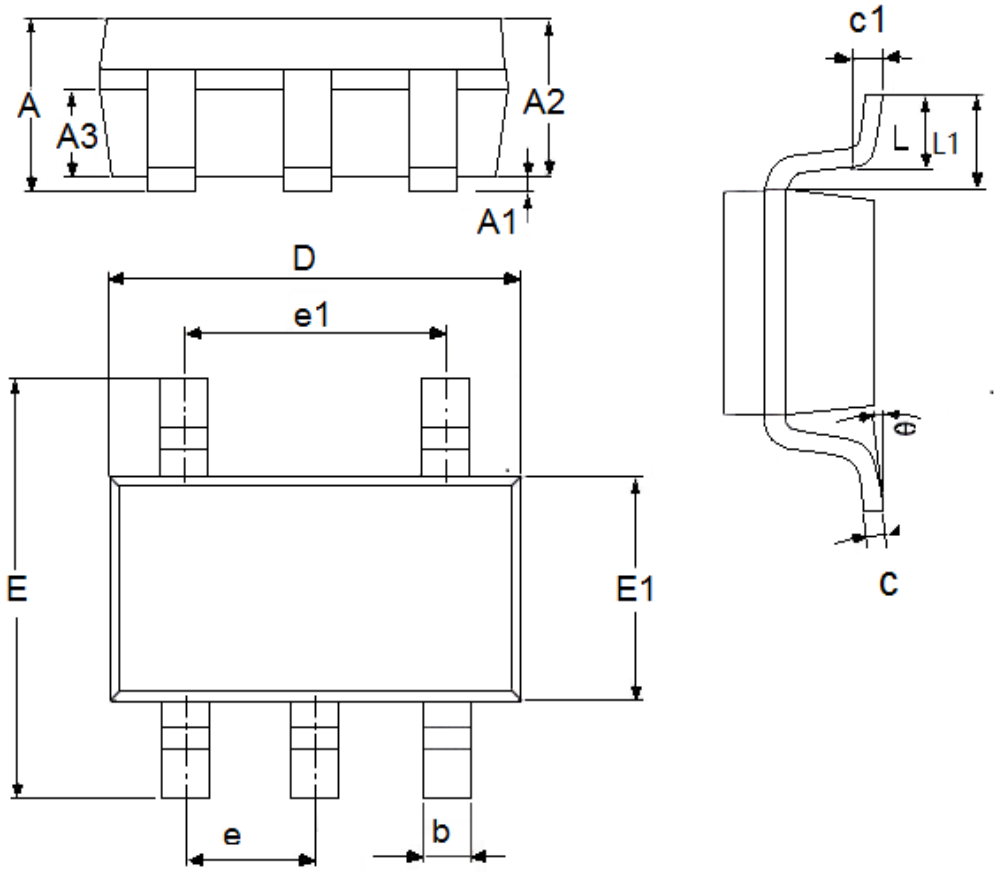
- **Package Type：DFN1.2*1.6-4**





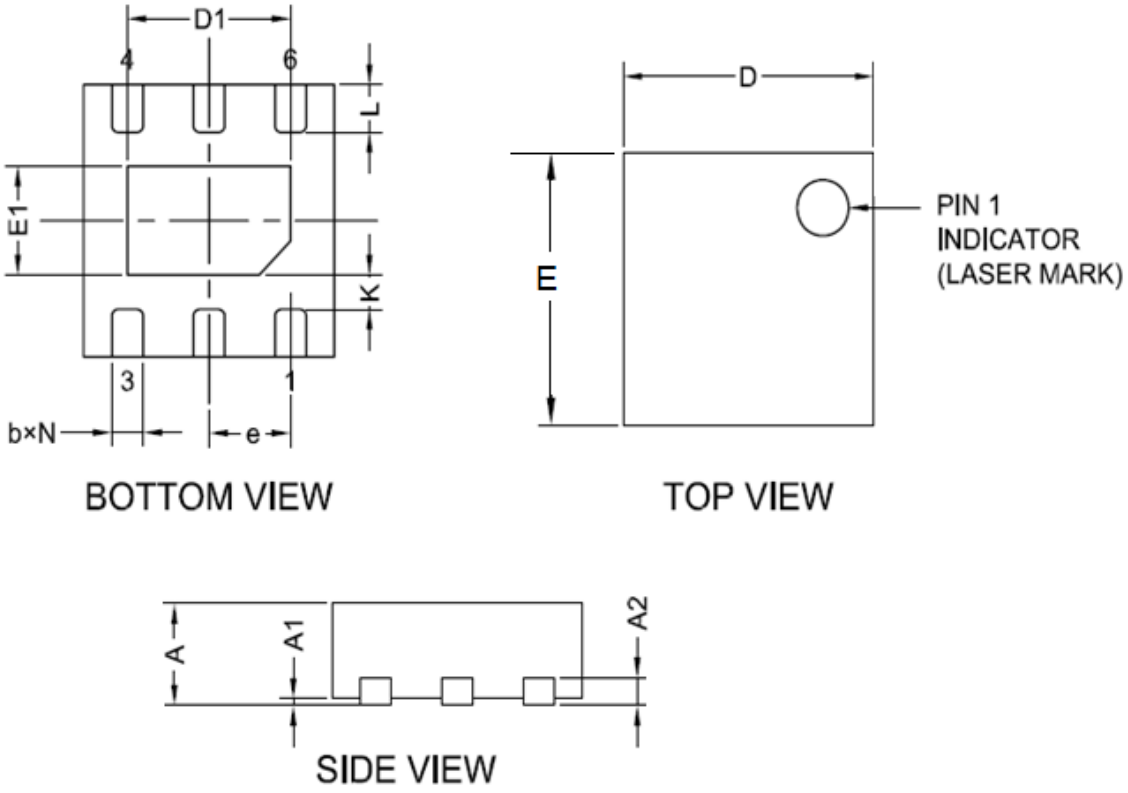
DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	0.5	0.6	0.0197	0.0236
A1	0	0.05	0	0.0020
A3	0.152 (TYP)		0.006 (TYP)	
D	1.5	1.7	0.0591	0.0669
E	1.1	1.3	0.0433	0.0512
D1	0.56	0.76	0.0221	0.0299
E1	0.7	0.9	0.0276	0.0355
b	0.25	0.35	0.0098	0.0138
b1	0.175	0.275	0.0069	0.0108
e	0.6 (TYP)		0.0236 (TYP)	
L	0.15	0.25	0.0059	0.0098
k	0.2 (TYP)		0.0079 (TYP)	

- **Package Type：SOT23-5**



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	0.23	0.0039	0.0091
D	2.82	3.05	0.1110	0.1201
e1	1.9(TYP)		0.0748(TYP)	
E	2.6	3.05	0.1024	0.1201
E1	1.5	1.75	0.0512	0.0689
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)	

- **Package Type：DFN2*2-6**



DIM	Millimeters		Inches	
	Min	Max	Min	Max
A	0.7	0.8	0.0276	0.0315
A1	0	0.05	0	0.002
A2	0.203(TYP)		0.008(TYP)	
b	0.18	0.4	0.0071	0.0157
D	1.9	2.1	0.0748	0.0827
E	1.9	2.1	0.0748	0.0827
E1	0.5	0.9	0.0197	0.0354
e	0.65(TYP)		0.0256(TYP)	
L	0.25	0.426	0.0098	0.0168
K	0.2	—	0.0079	—
D1	1	1.45	0.0393	0.0571

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