

## DIO6809/6810

# Ultra Low Power Microprocessor Reset Circuit

### Features

- 140ms min Reset Pulse Width
- 10 $\mu$ A Supply Current @V<sub>CC</sub>=3V
- Guaranteed Reset Valid to V<sub>CC</sub>=1.0V
- Temperature coefficient of reset threshold: 21ppm/°C
- Power Supply Transient Immunity
- Operating Temperature Range: -40°C to 125°C
- Available in SOT23, SOT23-3 and DFN1\*1-4

### Applications

- Computers
- Controllers
- Intelligent Instruments
- Portable/Battery-Powered Equipment

### Descriptions

DIO6809/6810 series are micro-processor ( $\mu$ P) supervisory circuits used to monitor the power supplies in  $\mu$ P and digital systems. They provide excellent circuit reliability and low cost by eliminating external components.

These circuits perform a single function: they assert a reset signal whenever the V<sub>CC</sub> supply voltage declines below a preset threshold, keeping it asserted for at least 140ms after V<sub>CC</sub> has risen above the reset threshold.

The DIO6809/6810 has CMOS outputs. The DIO6809 has an active-low /RESET output, while the DIO6810 has an active-high RESET output. The reset comparator is designed to ignore fast transients on V<sub>CC</sub>, and the outputs are guaranteed to be in the correct logic state for V<sub>CC</sub> down to 1.0V over the temperature range.

The device is available in 3pin SOT23, SOT23-3 and DFN1\*1-4 package.

### Ordering Information

Order Part Number		T <sub>A</sub>	Package	
DIO6809XST3	RoHS	-40 to 125°C	SOT23	Tape & Reel, 3000
DIO6809XSU3	RoHS	-40 to 125°C	SOT23-3	Tape & Reel, 3000
DIO6809XEN4	RoHS	-40 to 125°C	DFN1*1-4	Tape & Reel, 10000
DIO6810XST3	RoHS	-40 to 125°C	SOT23	Tape & Reel, 3000
DIO6810XSU3	RoHS	-40 to 125°C	SOT23-3	Tape & Reel, 3000
DIO6810XEN4	RoHS	-40 to 125°C	DFN1*1-4	Tape & Reel, 10000



## DIO6809/6810

### Ordering Information Complimentary Note

Ordering Code = Part No. + Package Code

ST3: stands for SOT23

SU3: stands for SOT23-3

EN4: stands for DFN1\*1-4

X: Refer to Device Function Reference  
Table on Page 2

### Device Function Reference Table

Part No.	Reset threshold	Reset active Low or High	Output Type	Marking
DIO6809L	4.63V	Low	CMOS	AAAA
DIO6810L	4.63V	High	CMOS	AGAA
DIO6809M	4.38V	Low	CMOS	ABAA
DIO6810M	4.38V	High	CMOS	AHAA
DIO6809J	4.00V	Low	CMOS	CWAA
DIO6810J	4.00V	High	CMOS	CXAA
DIO6809T	3.08V	Low	CMOS	ACAA
DIO6809TEN4	3.08V	Low	CMOS	YWJT
DIO6810T	3.08V	High	CMOS	AJAA
DIO6810TEN4	3.08V	High	CMOS	YWKT
DIO6809S	2.93V	Low	CMOS	ADAA
DIO6810S	2.93V	High	CMOS	AKAA
DIO6809R	2.63V	Low	CMOS	AFAA
DIO6809REN4	2.63V	Low	CMOS	YWJR
DIO6810R	2.63V	High	CMOS	ALAA
DIO6810REN4	2.63V	High	CMOS	YWKR
DIO6809Z	2.32V	Low	CMOS	AEAA
DIO6810Z	2.32V	High	CMOS	AMAA

## Pin Assignment

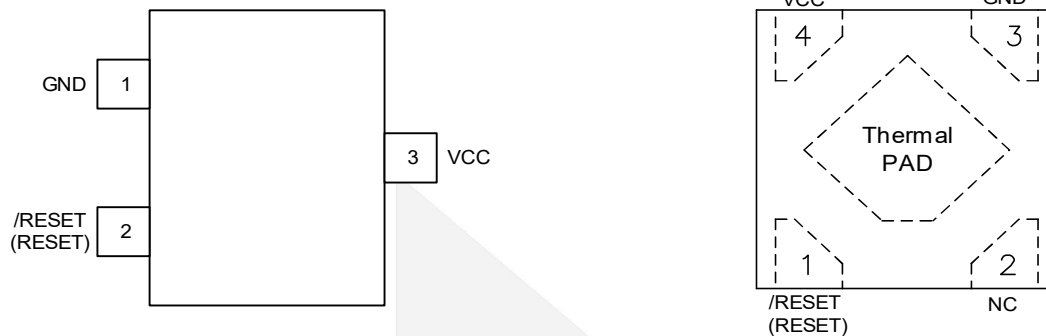


Figure 1 Pin Assignment (Top View)

## Pin Descriptions

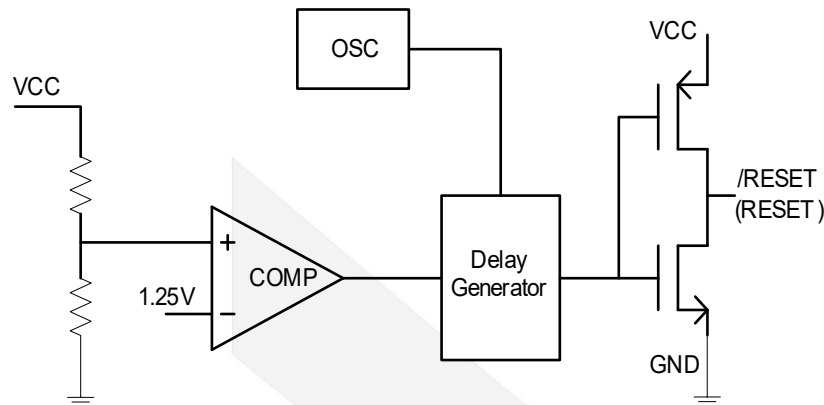
Symbol	Description
GND	Ground terminal
/RESET (DIO6809)	CMOS output. This output remains low if $V_{CC}$ drops below $V_{RES}$ , and for at least 140ms after $V_{CC}$ rises above $V_{RES}+V_{HYST}$
RESET (DIO6810)	CMOS output. This output remains high if $V_{CC}$ drops below $V_{RES}$ , and for at least 140ms after $V_{CC}$ rises above $V_{RES}+V_{HYST}$
VCC	Analog input. This pin is both the power supply to internal circuit and the voltage to be monitored
Thermal PAD	Connect to ground or to a floating copper plane for mechanical stability.

## Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Rating" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Parameter		Rating	Units
Terminal Voltage (With respect to GND)	$V_{CC}$	-0.3 to 6.0	V
	/RESET, RESET	-0.3 to 6.0	
Input Current	$V_{CC}$	20	mA
	/RESET, RESET	20	
Thermal Resistance		300	°C/W
Operating Temperature		-40 to 125	°C
Lead Temperature Range (soldering 10s)		300	°C
Storage Temperature		-65 to 150	°C
ESD HBM, JEDEC: JESD22-A114		4500	V

### Block Diagram



### DC Electrical Characteristics

Typical value:  $V_{CC}=3V$ ,  $T_A=25^{\circ}C$ , unless otherwise noted.

Parameters	Symbol	Test Conditions	Min	Typ	Max	Unit
Maximum input voltage	$V_{CCMAX}$				5.5	V
Minimum input voltage	$V_{CCMIN}$		1.0			V
Supply current	$I_{VCC}$	$V_{CC}=2.0V$		8		uA
		$V_{CC}=3.0V$		10		
		$V_{CC}=5.0V$		14		
Reset Threshold	$V_{RES}$	DIO68_L	4.51	4.63	4.75	V
		DIO68_M	4.25	4.38	4.5	
		DIO68_J	3.9	4.00	4.1	
		DIO68_T	3.0	3.08	3.15	
		DIO68_S	2.85	2.93	3.00	
		DIO68_R	2.56	2.63	2.7	
		DIO68_Z	2.26	2.32	2.38	
Temperature coefficient of reset threshold	$T_C$			21		ppm/ $^{\circ}C$
Reset Threshold hysteresis	$V_{HYST}$			$0.03V_{RES}$		V
$V_{CC}$ to /RESET Delay (DIO6809)		$V_{CC}$ transitions from $V_{RES}+0.1V$ to $V_{RES}-0.1V$		23		us
$V_{CC}$ to RESET Delay (DIO6810)		$V_{CC}$ transitions from $V_{RES}+0.1V$ to $V_{RES}-0.1V$		23		us



## DIO6809/6810

/RESET Output Voltage Low (DIO6809)	$V_{OL}$	$V_{CC}=2V, V_{RES}>2V, I_{SINK}=1.5mA$			0.3	V
		$V_{CC}=3V, V_{RES}>3V, I_{SINK}=3.2mA$			0.3	
		$V_{CC}=4V, V_{RES}>4V, I_{SINK}=5mA$			0.3	
/RESET Output Voltage High (DIO6809)	$V_{OH}$	$V_{CC}=3V, V_{RES}<3V, I_{SOURCE}=1.2mA$	$V_{CC}-0.4$			V
		$V_{CC}=4V, V_{RES}<4V, I_{SOURCE}=2mA$	$V_{CC}-0.4$			
		$V_{CC}=5V, V_{RES}<5V, I_{SOURCE}=2.5mA$	$V_{CC}-0.4$			
RESET Output Voltage Low (DIO6810)	$V_{OL}$	$V_{CC}=3V, V_{RES}<3V, I_{SINK}=3.2mA$			0.3	V
		$V_{CC}=4V, V_{RES}<4V, I_{SINK}=5mA$			0.3	
		$V_{CC}=5V, V_{RES}<5V, I_{SINK}=6mA$			0.3	
RESET Output Voltage High (DIO6810)	$V_{OH}$	$V_{CC}=2V, V_{RES}>2V, I_{SOURCE}=600\mu A$	$V_{CC}-0.4$			V
		$V_{CC}=3V, V_{RES}>3V, I_{SOURCE}=1.2mA$	$V_{CC}-0.4$			
		$V_{CC}=4V, V_{RES}>4V, I_{SOURCE}=2mA$	$V_{CC}-0.4$			
Reset Pulse Width	$T_{RES}$		140	240	500	ms

Specifications subject to change without notice.

## Applications Information

A microprocessor's ( $\mu P$ 's) reset input starts the  $\mu P$  in a known state. The DIO6809/6810 series assert reset to prevent code-execution errors during power-up, power-down, or brownout conditions. The device consists of a comparator, a low current high precision voltage reference, voltage divider, output delay circuit and output driver. They assert a reset signal whenever the  $V_{CC}$  supply voltage declines below a preset threshold, keeping it asserted for at least 140ms after  $V_{CC}$  has risen above the reset threshold.

The DIO6809/6810 have a CMOS output stage. The DIO6809 have an active-low /RESET output, while the DIO6810 have an active-high RESET output. The reset comparator is designed to ignore fast transients on  $V_{CC}$ , and the outputs are guaranteed to be in the correct logic state for  $V_{CC}$  down to 1.0V over the temperature range. The operation of the device can be best understood by referring to figure 2.

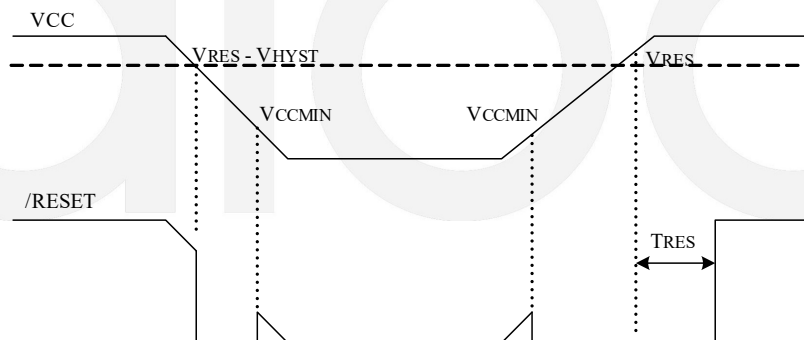


Figure 2

**Negative-Going  $V_{CC}$  Transients**

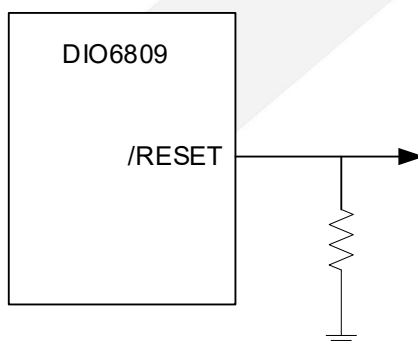
In addition to issuing a reset to the  $\mu P$  during power-up, power-down, and brownout conditions, the DIO6809/6810 series are relatively immune to short-duration negative-going  $V_{CC}$  transients (glitches). As the magnitude of the transient increases (goes farther below the reset threshold), the maximum allowable pulse width decreases. Typically, a  $V_{CC}$  transient that goes 100mV below the reset threshold and lasts 10 $\mu$ s or less will not cause a reset pulse. A 0.1 $\mu$ F bypass capacitor mounted as close as possible to the  $V_{CC}$  pin provides additional transient immunity.

**Ensuring a Valid Reset Output Down to  $V_{CC} = 0$** 

When  $V_{CC}$  falls below 1.0V, the DIO6809 /RESET output no longer sinks current—it becomes an open circuit. Therefore, high-impedance CMOS logic inputs connected to /RESET can drift to undetermined voltages. This presents no problem in most applications, since most  $\mu P$  and other circuitry is inoperative with  $V_{CC}$  below 1.0V.

However, in applications where /RESET must be valid down to 0V, a pull-down resistor is needed from /RESET pin to GND as shown in Figure 3, then /RESET output will be held at low state. The resistor's value is not critical, it should be about 100K $\Omega$ , large enough not to load /RESET, small enough to pull /RESET to ground.

A 100K $\Omega$  pull-up resistor to  $V_{CC}$  is also recommended for the DIO6810 if active high RESET is required to remain valid for  $V_{CC} < 1.0V$ .

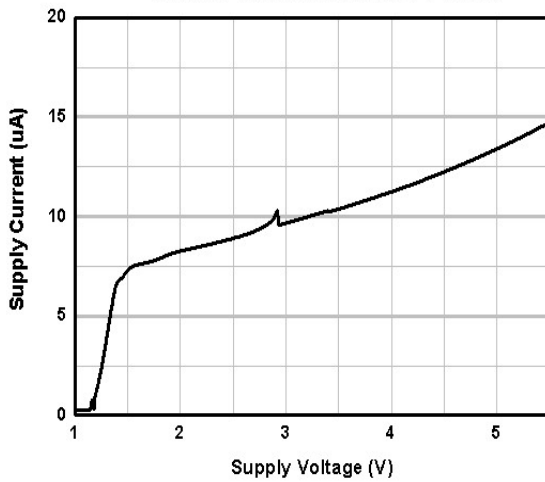


**Figure 3 RESET Valid to Ground Circuit**

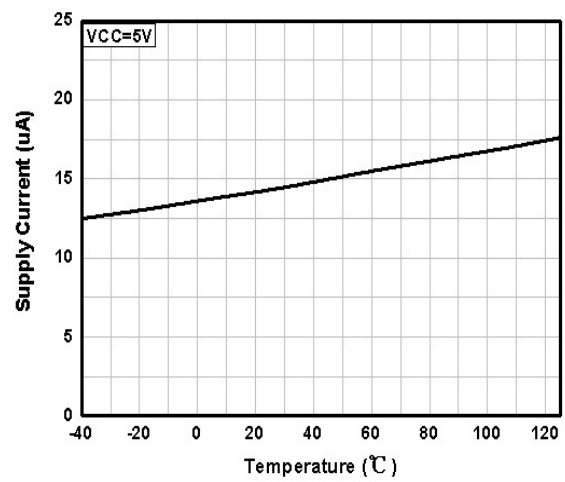
### Typical Performance Characteristics

All typical value:  $V_{CC}=5V$ ,  $T_A=25^{\circ}C$ , unless otherwise specified.

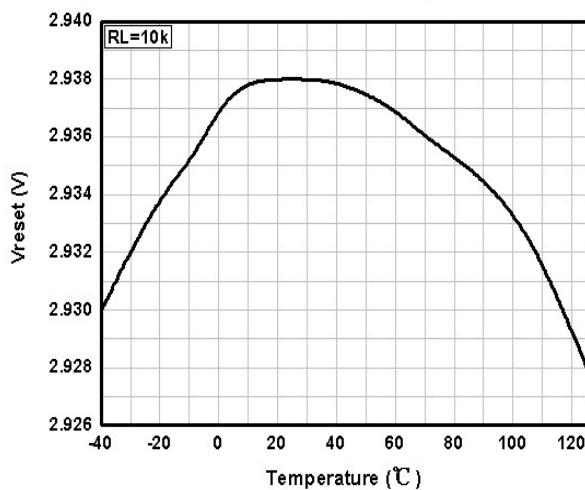
Supply Current vs. Supply Voltage



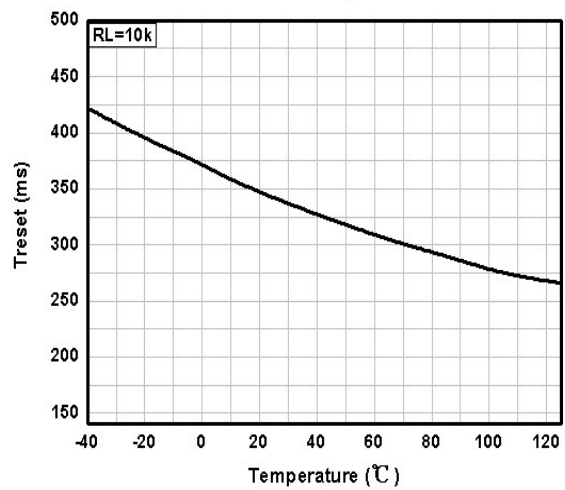
Supply Current vs. Temperature

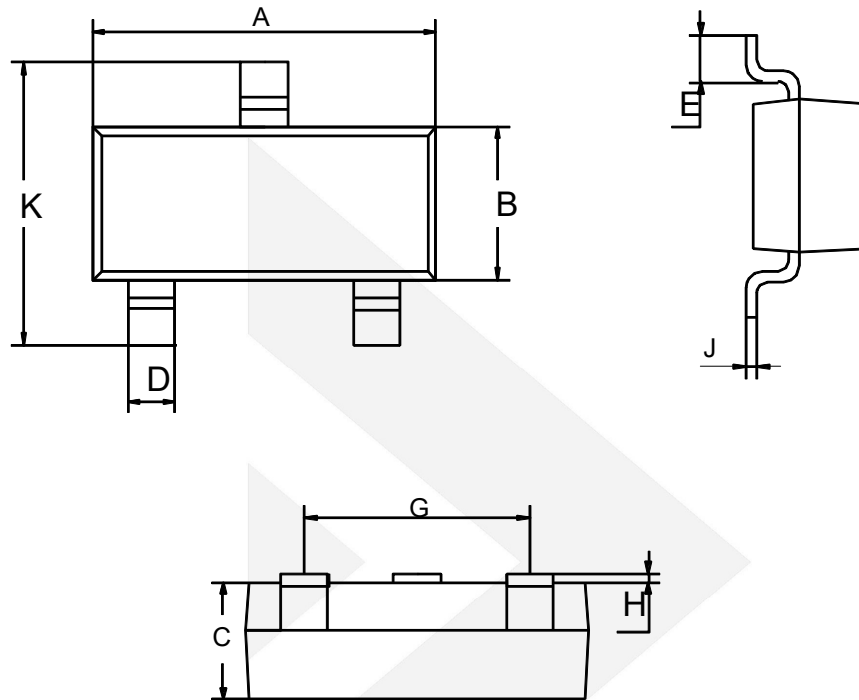


Reset Threshold vs. Temperature



Treset vs. Temperature

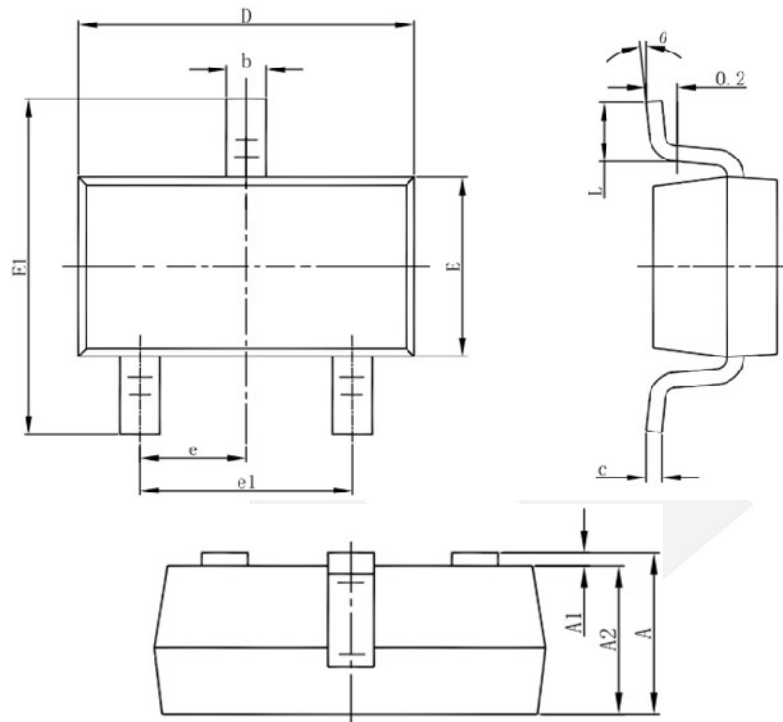


**Physical Dimensions: SOT23**


COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)		
Symbol	MIN	MAX
A	2.70	3.10
B	1.10	1.50
C	1.0 Typical	
D	0.4 Typical	
E	0.35	0.48
G	1.80	2.00
H	0.02	0.1
J	0.1 Typical	
K	2.20	2.60

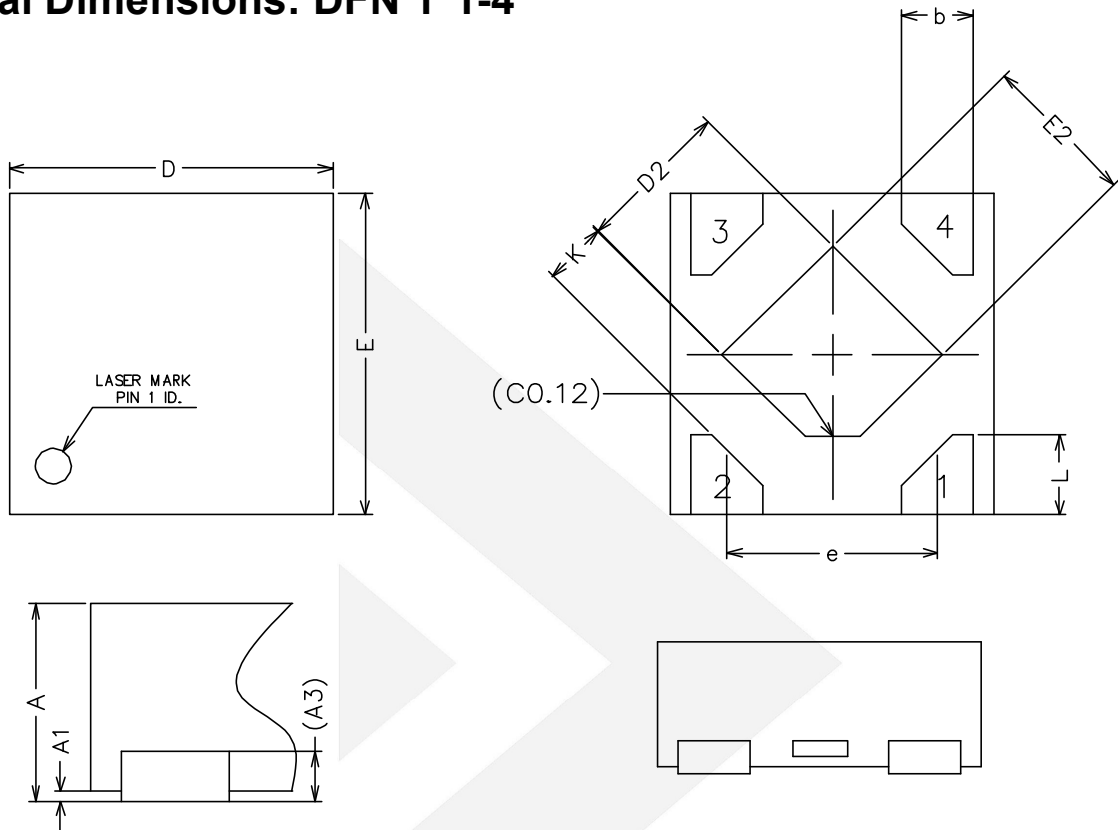


### Physical Dimensions: SOT23-3



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
Θ	0°	8°	0°	8°

### Physical Dimensions: DFN 1\*1-4



COMMON DIMENSIONS (UNITS OF MEASURE=MILLIMETER)			
Symbol	MIN	NOM	MAX
A	0.34	0.37	0.40
A1	0	0.02	0.05
A3	0.10 REF		
b	0.17	0.22	0.27
D	0.95	1.00	1.05
E	0.95	1.00	1.05
D2	0.43	0.48	0.53
E2	0.43	0.48	0.53
L	0.20	0.25	0.30
e	0.60	0.65	0.70
K	0.15	-	-

## CONTACT US

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A large, light gray watermark of the Dioo logo is centered on the page. It consists of a stylized arrow pointing right, followed by the word "dioo" in a lowercase, sans-serif font.

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