DIO8030

Ultra-Low Power Microprocessor Reset Circuit

Description

The DIO8030 is micro-processor (μP) supervisory circuits that are used to monitor the power supplies in μP and digital systems. The circuits provide excellent reliability.

The DIO8030 has an active-low reset output to perform a single function: assert a reset signal whenever the VCC supply voltage rises above a preset threshold and keeping it asserted for at least 8 ms.

The DIO8030 has an open-drain output which requires an external pull-up resistor connected to power supply. This feature offers high flexibility to reset systems with various supply voltages. The reset comparator is designed to ignore fast transients on VCC, and the outputs are guaranteed to be in the correct logic state for VCC down to 1.0 V over the temperature range.

The device is available in 3-pin SOT23 and SOT23-3 packages.

Features

- Reset pulse width: 8 to 12 ms
- Typical 1.3 μA supply current V_{CC} = 1.8 V
- Guaranteed reset valid to V_{CC} = 1.0 V
- Temperature coefficient of reset threshold: 21 ppm /°C
- Power supply transient immunity
- Operating temperature range: -40°C to 125°C
- Available in SOT23 and SOT23-3

Applications

- Computers
- Controllers
- Intelligent instruments
- Portable/ battery-powered equipments

Ordering Information

Ordering Part No.	Top Marking	MSL	RoHS	T_A	Package	
DIO8030ST3	YW3V	3	Green	-40 to 125°C	SOT23	Tape & Reel, 3000
DIO8030SU3	YW3V	3	Green	-40 to 125°C	SOT23-3	Tape & Reel, 3000

If you encounter any issue in the process of using the device, please contact our customer service at Juneketing@dioo.com or phone us at (+86)-21-62116882. If you have any improvement suggestions regarding the datasheet, we encourage you to contact our technical writing team at docs@dioo.com. Your feedback is invaluable for us to provide a better user experience.

Table of Contents

List of Figures

1. Pin Assignment and Functions

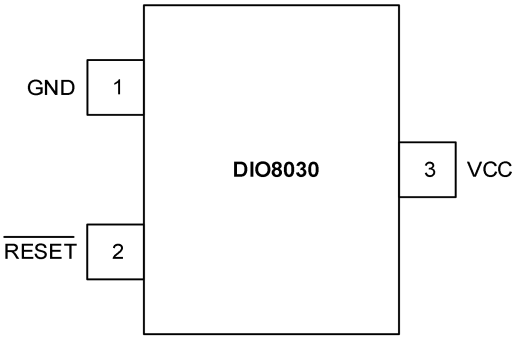


Figure 1. SOT23 / SOT23-3 (Top view)

Pin No.	Name	I/O	Description
1	GND	-	Ground terminal.
2	$\overline{\text{RESET}}$	O	Open-drain output. This output remains low if V_{CC} drops below (V_{RES} - V_{HYST}) for at least 8 ms after V_{CC} rises above V_{RES}.
3	VCC	I	Analog input. This pin is both the power supply to internal circuit and the voltage to be monitored.

2. Absolute Maximum Ratings

Exceeding the maximum ratings listed under Absolute Maximum Ratings when designing is likely to damage the device permanently. Do not design to the maximum limits because long-time exposure to them might impact the device's reliability. The ratings are obtained over an operating free-air temperature range unless otherwise specified.

Symbol	Parameter	Rating	Unit
VCC	Terminal voltage (with respect to GND)	-0.3 to 6.0	V
$\overline{\text{RESET}}$	Terminal voltage (with respect to GND)	-0.3 to 6.0	V
VCC	Input current	20	mA
$\overline{\text{RESET}}$	Input current	20	mA
T_A	Operating temperature	-40 to 125	°C
T_L	Lead temperature range (soldering 10 s)	300	°C
T_{STG}	Storage temperature	-65 to 150	°C

3. Recommended Operating Conditions

Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. The ratings are obtained over an operating free-air temperature range unless otherwise specified.

Symbol	Parameter	Rating	Unit
V_{CC}	Supply voltage	1 to 5.5	V
T_A	Operating free-air temperature	-40 to 125	ºC

4. ESD Ratings

When a statically-charged person or object touches an electrostatic discharge sensitive device, the electrostatic charge might be drained through sensitive circuitry in the device. If the electrostatic discharge possesses sufficient energy, damage might occur to the device due to localized overheating.

Model	Condition	Value	Unit
Human-body model	ANSI/ESDA/JEDEC: JESD22-A114	±4500	V

5. Thermal Considerations

The thermal resistance determines the heat insulation property of a material. The higher the thermal resistance is, the lower the heat loss. Accumulation of heat energy degrades the performance of semiconductor components.

Symbol	Metric	Value	Unit
$R_{\theta JA}$	Junction-to-ambient thermal resistance	300	°C/W

6. Electrical Characteristics

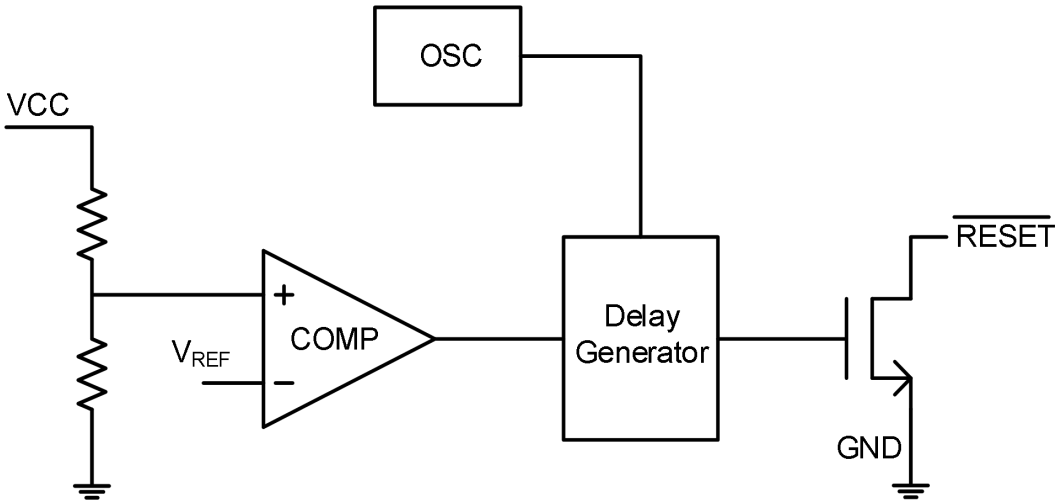
The values are obtained under these conditions unless otherwise specified: typical values at V_{CC} = 1.8 V, T_A = 25°C.

Symbol	Parameters	Test Conditions	Min	Typ	Max	Unit
V_{CCMAX}	Maximum input voltage				5.5	V
V_{CCMIN}	Minimum input voltage		1.0			V
I_{VCC}	Supply current	V_{RES} = 1.6 V		1.3		μA
V_{RES}	Reset threshold	T_A = 25°C		1.6		V
T_C	Temperature coefficient of reset threshold			21		ppm/°C
V_{HYST}	Reset threshold hysteresis			20		mV
	V_{CC} to $\overline{\text{RESET}}$ delay	V_{CC} transitions from (V_{RES} + 0.1) V to (V_{RES} - 0.1) V		23		μs
V_{OL}	$\overline{\text{RESET}}$ output voltage low	V_{CC} = 1.55 V, V_{RES} = 1.6 V, I_{SINK} = 1 mA			0.3	V
t_{RES}	Reset pulse width		8	10	12	ms

Note:

(1) Specifications subject to change without notice.

7. Block Diagram



8. Function Description

A microprocessor's (μP's) reset input starts the μP in a known state. The DIO8030 asserts 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, a voltage divider, an output delay circuit, and an output driver. The DIO8030 has an active-low reset output to assert a reset signal whenever the V_{CC} supply voltage declines below a preset threshold, keeping it asserted for at least 8 ms after V_{CC} has risen above the reset threshold.

The DIO8030 has an open-drain output which requires an external pull-up resistor connected to power supply. This feature offers high flexibility to reset systems with various supply voltages. 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 1.0 V over the temperature range.

The operation of the device can be best understood by referring to Figure 2.

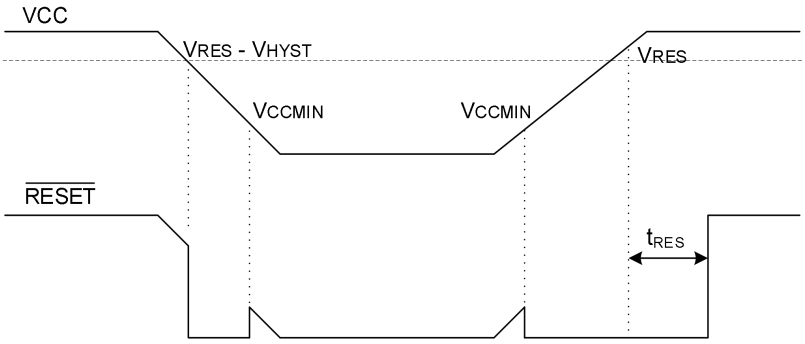


Figure 2. Reset timing

8.1. High-accuracy reference

The comparator in DIO8030 has a bandgap reference of 0.8 V. The bandgap reference provides a stable reference voltage that is relatively independent of temperature, making it ideal for use in high-precision voltage regulators. By using a bandgap reference in a chopping circuit, the output voltage can be regulated with high accuracy and stability over a wide range of operating conditions, making it suitable for a wide range of applications, including power supplies for electronic devices, motor control circuits, and other power electronics systems.

9. Application Information

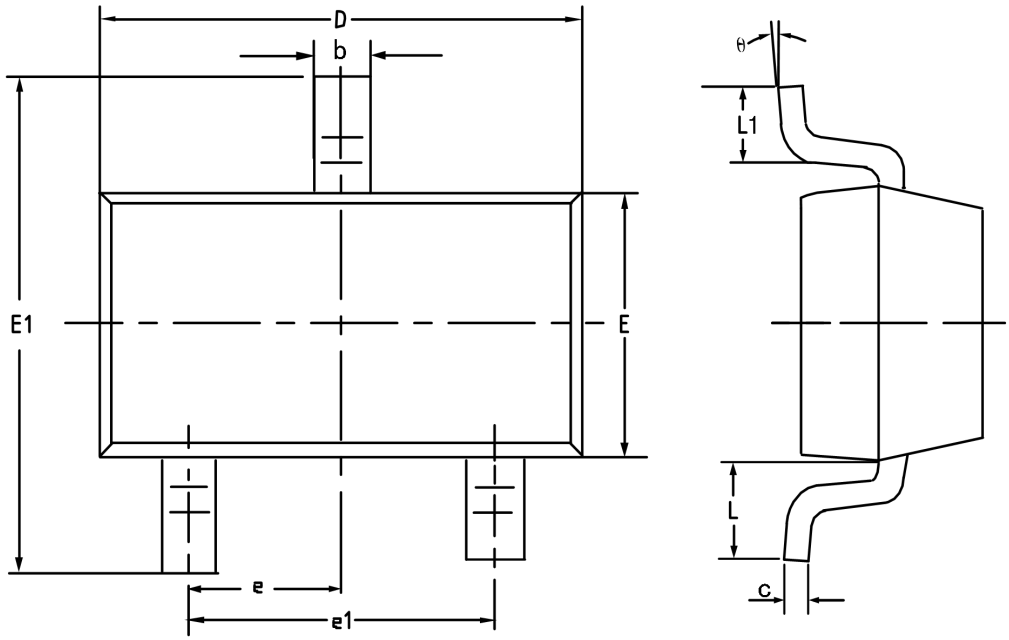
Important notice: Validation and testing are the most reliable ways to confirm system functionality. The application information is not part of the specification and is for reference purposes only.

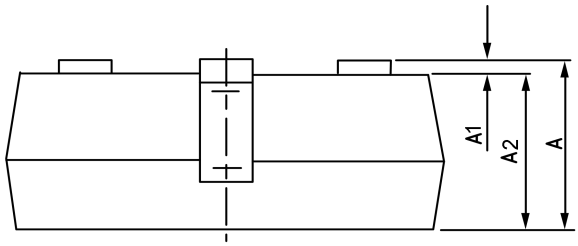
9.1. Negative-going V_{CC} transients

In addition to issuing a reset to the μP during power-up, power-down, and brownout conditions, the DIO8030 is 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 100 mV below the reset threshold and lasts approximately 20 μs or less will not cause a reset pulse. A 0.1 μF bypass capacitor mounted as close as possible to the VCC pin provides additional transient immunity.

10. Physical Dimensions

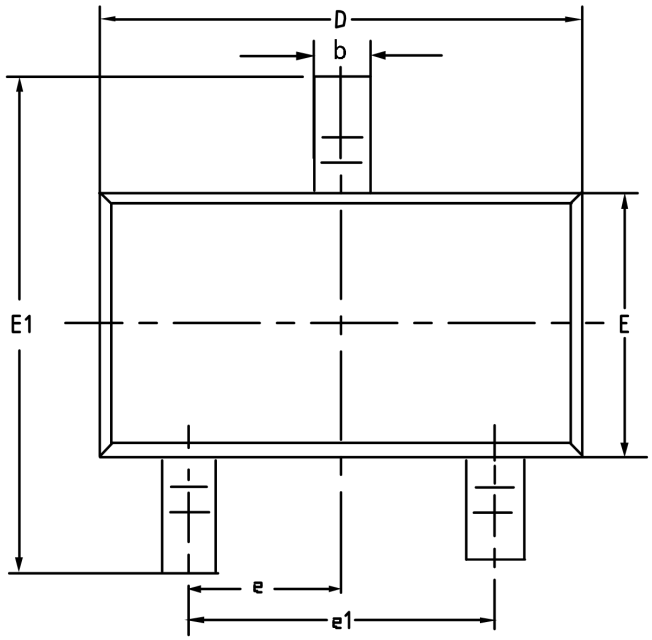
10.1. SOT23

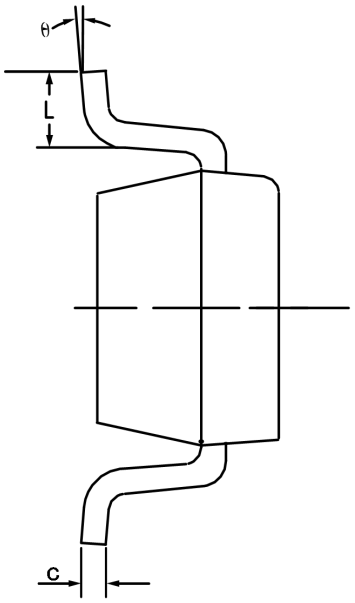


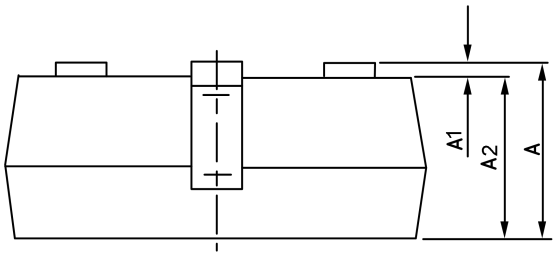


Common Dimensions (Units of measure = Millimeter)		
Symbol	**Min**	**Max**
A	0.90	1.15
A1	0.00	0.10
A2	0.90	1.05
b	0.30	0.50
c	0.08	0.15
D	2.80	3.00
E	1.20	1.40
E1	2.25	2.55
e	0.95 TYP	
e1	1.80	2.00
L	0.55 REF	
L1	0.30	0.50
Θ	0°	8°

10.2. SOT23-3







Common Dimensions (Units of measure = Millimeter)		
Symbol	**Min**	**Max**
A	1.05	1.25
A1	0	0.10
A2	1.05	1.15
b	0.30	0.50
c	0.10	0.20
D	2.82	3.02
E	1.50	1.70
E1	2.65	2.95
e	0.95 BSC	
e1	1.80	2.00
L	0.30	0.60
Θ	0°	8°

Disclaimer

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