MIC6315

Open-Drain Microprocessor Reset Circuit

Features

- Precision Voltage Monitor for 3V, 3.3V, or 5V Power Supplies
- /RESET Remains Valid with V_{CC} as Low as 1V
- 5 µA Supply Current
- 20 ms, 140 ms, or 1100 ms Minimum Reset Pulse Widths Available
- Manual Reset Input
- Available in 4-Pin SOT-143 Package

Applications

- Portable Equipment
- Intelligent Instruments
- Critical Microprocessor Power Monitoring
- Printers/Computers
- Embedded Controllers

General Description

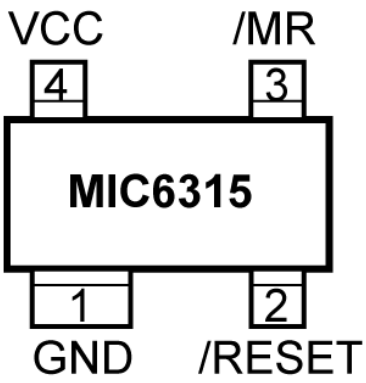
The MIC6315 is an inexpensive reset generator circuit that monitors power supplies in microprocessor-based systems.

The function of this device is to assert a reset if either the power supply drops below a designated reset threshold level or /MR is forced low. Several different reset threshold levels are available to accommodate 3V, 3.3V, or 5V powered systems.

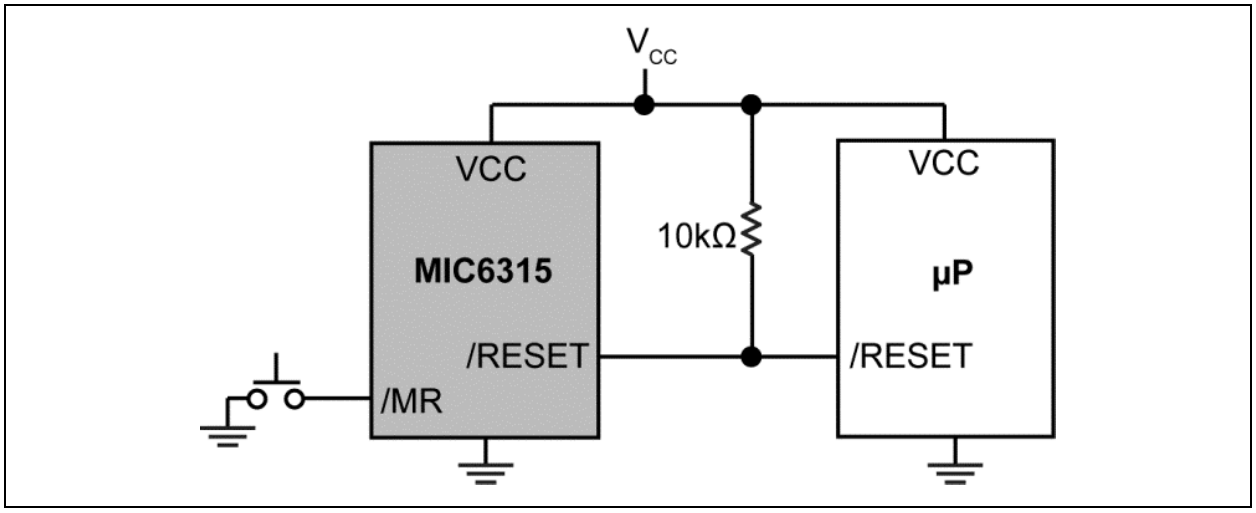
The MIC6315 has an active low, open-drain /RESET output. The reset output remains asserted for a minimum of either 20 ms, 140 ms, or 1100 ms after V_{CC} has risen above the designed reset threshold level. The MIC6315 is available in a 4-pin SOT-143 package.

Package Type

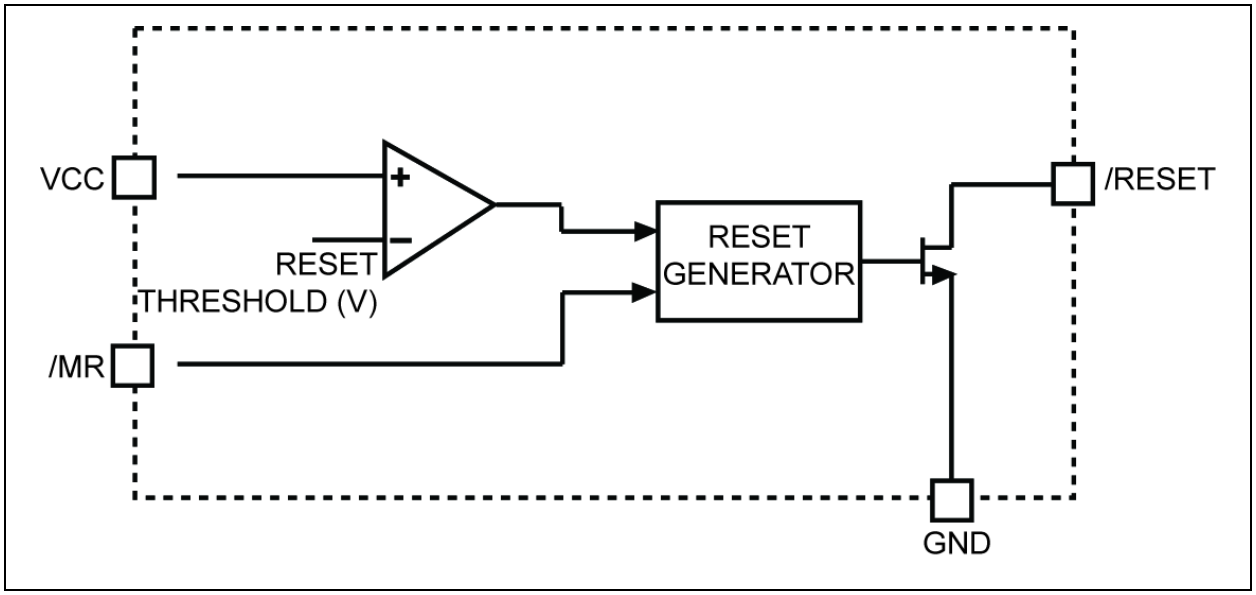
MIC6315
4-Lead SOT-143 (U)
(Top View)



Typical Application Circuit



Functional Block Diagram



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

Terminal Voltage
(VCC, /RESET) ..... –0.3V to +6.0V
(/MR) ..... –0.3V to (V_{CC} + 0.3V)
Rate of Rise (VCC) 100V/µs
Input Current (VCC, /MR) ..... 20 mA
Output Current (/RESET) ..... 20 mA
ESD Rating (Note 1) ..... 3 kV

Operating Ratings ‡

Input Voltage (/RESET) ..... GND to +5.5V
Power Dissipation (T_A = +70°C) ..... 320 mW

† Notice: Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.
‡ Notice: The device is not guaranteed to function outside its operating ratings.

Note 1: Devices are ESD sensitive. Handling precautions are recommended. Human body model, 1.5 kΩ in series with 100 pF.

ELECTRICAL CHARACTERISTICS

Electrical Characteristics: For typical values, V_{CC} = 2.5V to 5.5V; T_A = +25°C, **bold** values valid for –40°C ≤ T_A ≤ +85°C, unless noted.

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Operating Voltage Range	V_{CC}	**1**	—	**5.5**	V	—
Supply Current	I_{CC}	—	5	**15**	µA	V_{CC} = 5.5V, no load
		—	5	**10**		V_{CC} = 3.6V, no load
Reset Voltage Threshold	V_{TH}	**V_{TH} – 2.5%**	V_{TH}	**V_{TH} + 2.5%**	V	Note 1
Reset Timeout Period	t_{RST}	**20**	28	**44**	ms	D2U
		140	200	**320**		D3U
		1100	1500	**2500**		D4U
/RESET Output Voltage	V_{OL}	—	—	**0.4**	V	V_{CC} ≥ 4.0V, I_{SNK} = 3.2 mA
		—	—	**0.3**		V_{CC} ≥ 2.5V, I_{SNK} = 1.2 mA
		—	—	**0.3**		V_{CC} ≥ 1.0V, I_{SNK} = 50 µA
/RESET Output Leakage	—	—	—	**1**	µA	/RESET deasserted
/MR Minimum Pulse Width	—	**10**	—	—	µs	—
/MR-to-Reset Delay	—	—	0.5	—	µs	—
/MR Input Threshold	V_{IH}	**2.3**	—	—	V	V_{TH} > 4.0V
		0.7 x V_{CC}	—	—		V_{TH} < 4.0V

Note 1: Various reset thresholds available. See the Product Identification System section or contact Microchip.

ELECTRICAL CHARACTERISTICS (CONTINUED)

Electrical Characteristics: For typical values, V_{CC} = 2.5V to 5.5V; T_A = +25°C, **bold** values valid for –40°C ≤ T_A ≤ +85°C, unless noted.

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
/MR Input Threshold	V_{IL}	—	—	**0.8**	V	V_{TH} > 4.0V
		—	—	**0.25 x V_{CC}**		V_{TH} < 4.0V
/MR Pull-Up Resistance	—	**10**	20	**30**	kΩ	—
/MR Glitch Immunity	—	—	100	—	ns	—

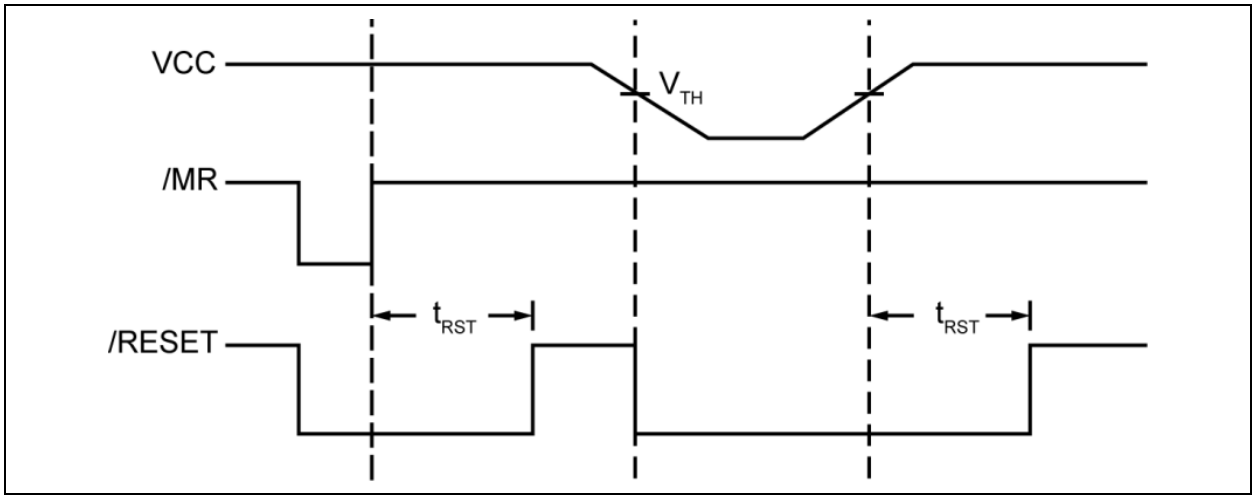
Note 1: Various reset thresholds available. See the Product Identification System section or contact Microchip.

TEMPERATURE SPECIFICATIONS

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Junction Temperature Range	T_J	–40	—	+125	°C	Note 1
Operating Temperature Range	T_A	–40	—	+85	°C	—
Storage Temperature Range	T_S	–65	—	+150	°C	—
Lead Temperature	—	—	—	+300	°C	Soldering, 10 sec.

Note 1: The maximum allowable power dissipation is a function of ambient temperature, the maximum allowable junction temperature and the thermal resistance from junction to air (i.e., T_A, T_J, θ_{JA}). Exceeding the maximum allowable power dissipation will cause the device operating junction temperature to exceed the maximum +125°C rating. Sustained junction temperatures above +125°C can impact the device reliability.

Timing Diagram



2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

TABLE 2-1: PIN FUNCTION TABLE

Pin Number	Pin Name	Description
1	GND	IC Ground.
2	/RESET	/RESET goes low if V_{CC} falls below the reset threshold and remains asserted for one reset timeout period after V_{CC} exceeds the reset threshold.
3	/MR	Manual Reset Input: A logic LOW on /MR forces a reset. The reset will remain asserted as long as /MR is held LOW and for one reset timeout period after /MR goes HIGH. This input can be shorted to ground via a switch or be driven by TTL or CMOS logic. Float if unused.
4	VCC	Power supply input.

3.0 APPLICATION INFORMATION

3.1 Microprocessor Reset

The /RESET pin is asserted whenever V_{CC} falls below the reset threshold voltage or if /MR (manual reset) is forced low. The /RESET pin remains asserted for the duration of the reset timeout period after V_{CC} has risen above the reset threshold or /MR has returned high. The reset function ensures the microprocessor is properly reset and powers up in a known condition after a power failure. /RESET will remain valid with V_{CC} as low as 1V.

The /RESET output is a simple open-drain N-channel MOSFET structure. A pull-up resistor must be used to pull this output up to some voltage. For most applications, this voltage will be the same power supply that supplies V_{CC} to the MIC6315. It is possible, however, to tie this resistor to some other voltage. This will allow the MIC6315 to monitor one voltage while level-shifting the /RESET output to some other voltage. The pull-up voltage must be limited to 6.0V or less (absolute maximum) to avoid damage to the MIC6315. The resistor must be small enough to supply current to the inputs and leakage paths that are driven by the /RESET output.

3.2 /RESET Valid at Low Voltage

As V_{CC} drops to 0V, the MIC6315 will no longer be able to pull the /RESET output low. At this point, the pull-up resistor will pull the output high. The value of the pull-up resistor and the voltage it is connected to will affect the point at which this happens.

3.3 Wire OR'ing the /RESET Output

Because the RESET output is open-drain, several reset sources can be wire-OR'ed, in parallel, to allow resets from multiple sources.

3.4 V_{CC} Transients

The MIC6315 is relatively immune to negative-going V_{CC} glitches below the reset threshold. Typically, a negative-going transient 125 mV below the reset threshold with duration of 20 µs or less will not cause an unwanted reset. If additional transient immunity is needed, a bypass capacitor can be placed a close as possible to the MIC6315.

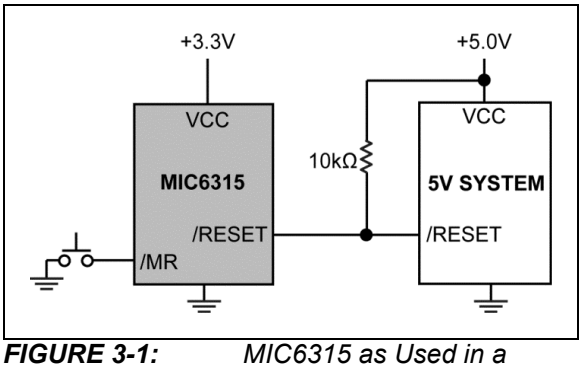


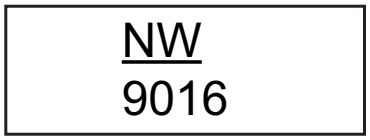
FIGURE 3-1: *MIC6315 as Used in a Multiple Supply System.*

4.0 PACKAGING INFORMATION

4.1 Package Marking Information

4-Lead SOT-143*

Example



Legend:	XX...X	Product code or customer-specific information
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week ‘01’)
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package.
	●, ▲, ▼	Pin one index is identified by a dot, delta up, or delta down (triangle mark).

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo.

Underbar (_) and/or Overbar (¯) symbol may not be to scale.

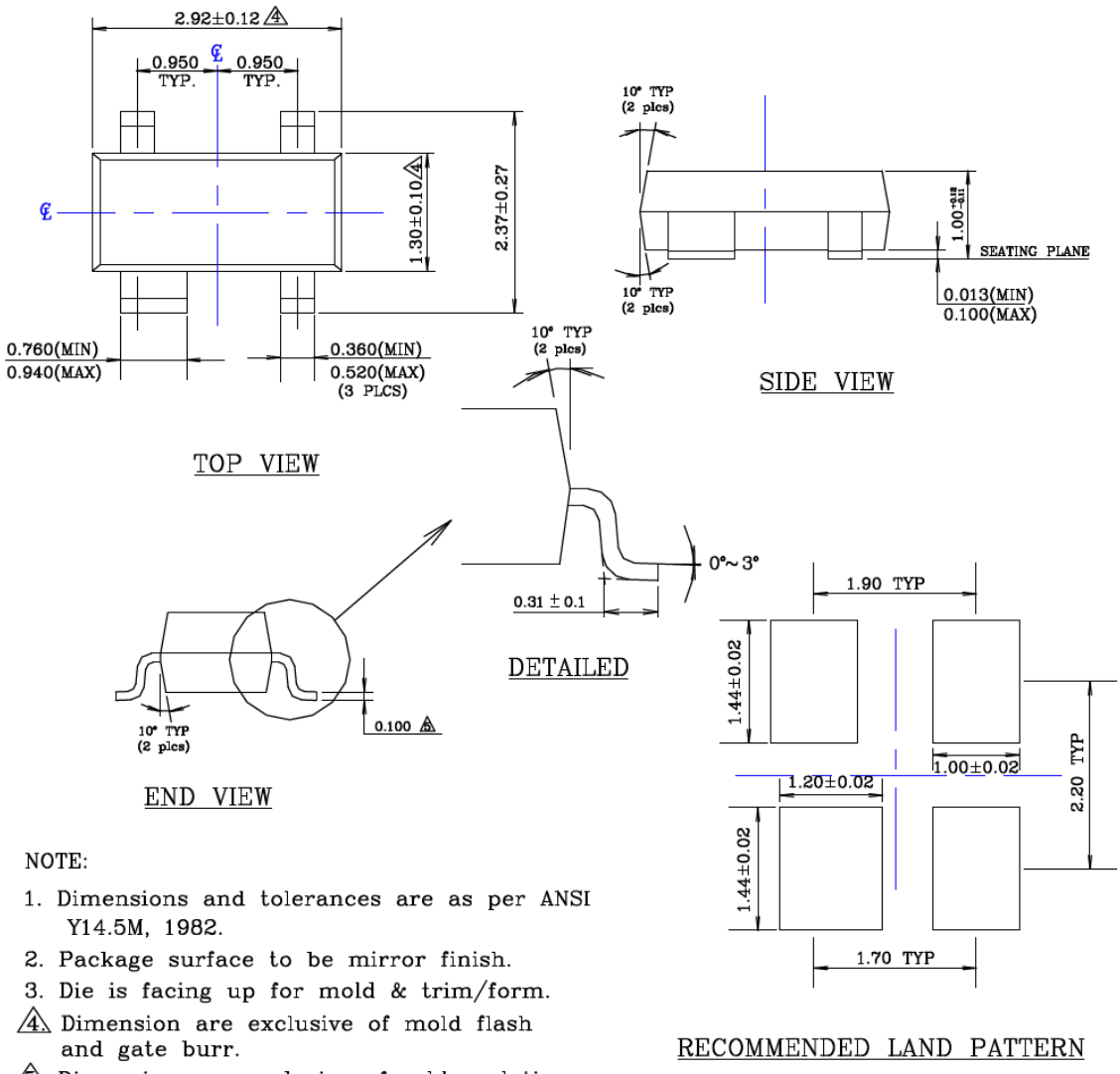
TABLE 4-1: MARKING CODES

Part Number	Marking Code	Nominal V_{TH}	Minimum t_{RST}
MIC6315-26D2UY	NY	2.63V	20 ms
MIC6315-29D2UY	NM	2.93V	20 ms
MIC6315-30D2UY	N2	3.00V	20 ms
MIC6315-31D2UY	NF	3.08V	20 ms
MIC6315-40D2UY	NW	4.00V	20 ms
MIC6315-41D2UY	N6	4.10V	20 ms
MIC6315-44D2UY	NG	4.38V	20 ms
MIC6315-46D2UY	NQ	4.63V	20 ms
MIC6315-26D3UY	NR	2.63V	140 ms
MIC6315-26D3UY	NP	2.93V	140 ms
MIC6315-30D3UY	N3	3.00V	140 ms
MIC6315-31D3UY	NU	3.08V	140 ms
MIC6315-40D3UY	N8	4.00V	140 ms
MIC6315-41D3UY	N5	4.10V	140 ms
MIC6315-42D3UY	05	4.20V	140 ms
MIC6315-44D3UY	NH	4.38V	140 ms
MIC6315-46D3UY	NX	4.63V	140 ms
MIC6315-26D4UY	NS	2.63V	1100 ms
MIC6315-29D4UY	NN	2.93V	1100 ms
MIC6315-30D4UY	N4	3.00V	1100 ms
MIC6315-31D4UY	2N	3.08V	1100 ms
MIC6315-40D4UY	M9	4.00V	1100 ms
MIC6315-41D4UY	M7	4.10V	1100 ms
MIC6315-44D4UY	NJ	4.38V	1100 ms
MIC6315-46D4UY	NZ	4.63V	1100 ms

4-Lead SOT-143 Package Outline and Recommended Land Pattern

TITLE
4 LEAD SOT143 PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

DRAWING #	SOT143-4LD-PL-1	UNIT	MM



NOTE:

1. Dimensions and tolerances are as per ANSI Y14.5M, 1982.
2. Package surface to be mirror finish.
3. Die is facing up for mold & trim/form.
4. Dimension are exclusive of mold flash and gate burr.
5. Dimension are exclusive of solder plating.

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging.

NOTES:

APPENDIX A: REVISION HISTORY

Revision A (February 2021)

- Converted Micrel document MIC6315 to Microchip data sheet template DS20006450A.
- Minor grammatical text changes throughout.

NOTES:

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

Device	-XX	XX	X	X	-XX
Part No.	Nominal V_{TH}	Min. Reset Time	Package	Temp. Range	Media Type

Device:	MIC6315:	Open-Drain Microprocessor Reset Circuit	
Nominal V_{TH}:	26	=	2.63V
	29	=	2.93V
	30	=	3.00V
	31	=	3.08V
	40	=	4.00V
	41	=	4.10V
	42	=	4.20V (D3 Reset Time Only)
	44	=	4.38V
	46	=	4.63V
Minimum Reset Time:	D2	=	20 ms
	D3	=	140 ms
	D4	=	1100 ms
Package:	U	=	4-Lead SOT-143
Operating Temp. Range:	Y	=	–40°C to +85°C
Media Type:	TR	=	3000/Reel

Examples:

a) MIC6315-26D2UY-TR: MIC6315, 2.63V Nominal V_{TH} 20 ms Min. Reset Time, 4-Lead SOT-143, –40°C to +85°C Range, 3000/Reel

b) MIC6315-30D3UY-TR: MIC6315, 3.00V Nominal V_{TH} 140 ms Min. Reset Time, 4-Lead SOT-143, –40°C to +85°C Range, 3000/Reel

c) MIC6315-44D4UY-TR: MIC6315, 4.38V Nominal V_{TH} 1100 ms Min. Reset Time, 4-Lead SOT-143, –40°C to +85°C Range, 3000/Reel

d) MIC6315-46D2UY-TR: MIC6315, 4.63V Nominal V_{TH} 20 ms Min. Reset Time, 4-Lead SOT-143, –40°C to +85°C Range, 3000/Reel

e) MIC6315-42D3UY-TR: MIC6315, 4.20V Nominal V_{TH} 140 ms Min. Reset Time, 4-Lead SOT-143, –40°C to +85°C Range, 3000/Reel

f) MIC6315-29D4UY-TR: MIC6315, 2.93V Nominal V_{TH} 1100 ms Min. Reset Time, 4-Lead SOT-143, –40°C to +85°C Range, 3000/Reel

Note 1: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

NOTES:

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