
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 μ A 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

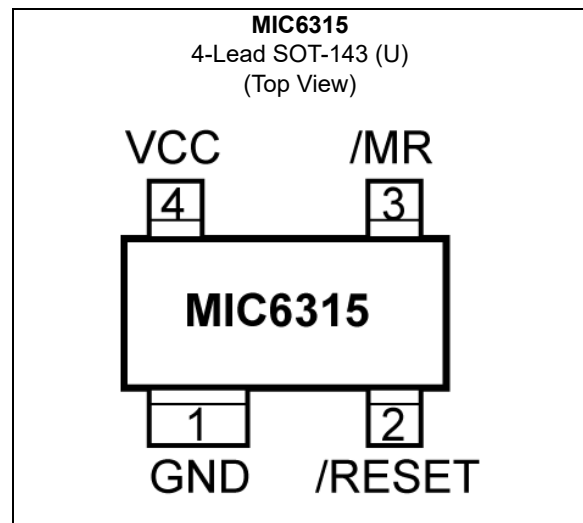
General Description

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.

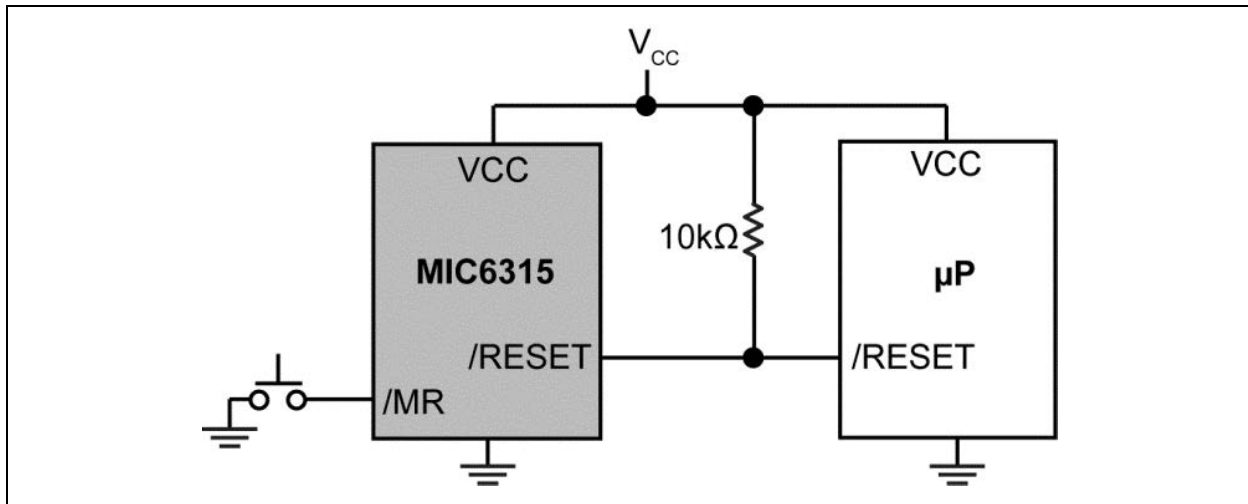
The MIC6315 has an active low, open-drain /RESET output. The reset output remains asserted for a minimum of either 20 ms, 140 ms, or 1100 ms after V_{CC} has risen above the designed reset threshold level. The MIC6315 is available in a 4-pin SOT-143 package.

Package Type

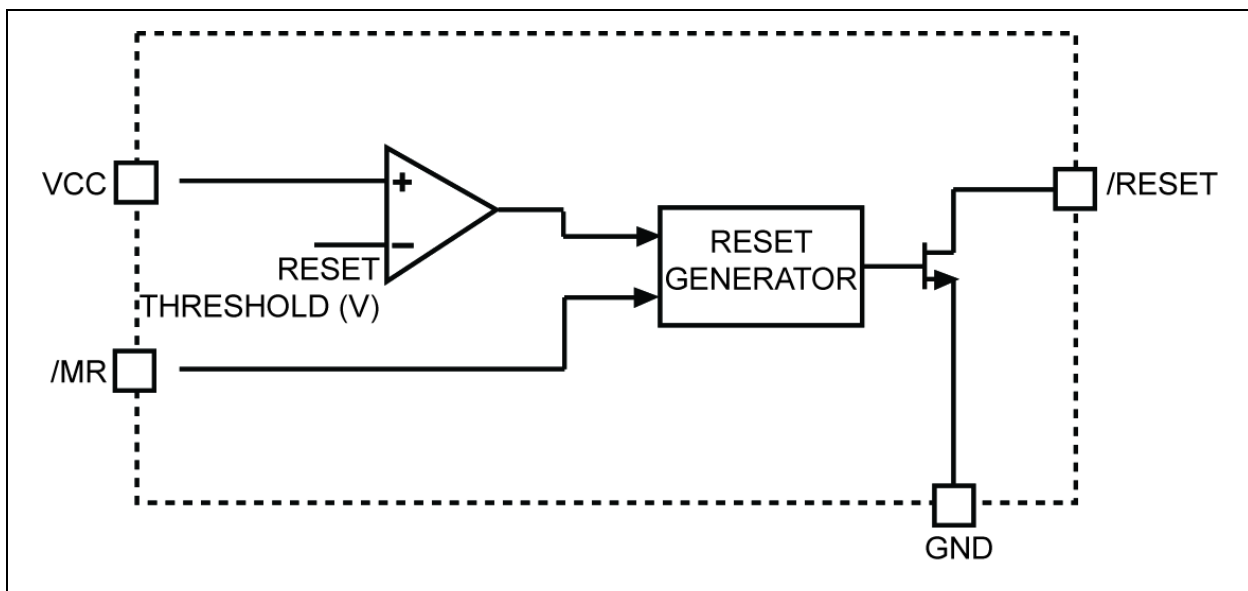


MIC6315

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 (VCC + 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 (TA = +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, VCC = 2.5V to 5.5V; TA = +25°C, **bold** values valid for -40°C ≤ TA ≤ +85°C, unless noted.

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Operating Voltage Range	VCC	1	—	5.5	V	—
Supply Current	ICC	—	5	15	μA	VCC = 5.5V, no load
		—	5	10		VCC = 3.6V, no load
Reset Voltage Threshold	VTH	VTH - 2.5%	VTH	VTH + 2.5%	V	Note 1
Reset Timeout Period	tRST	20	28	44	ms	D2U
		140	200	320		D3U
		1100	1500	2500		D4U
/RESET Output Voltage	VOL	—	—	0.4	V	VCC ≥ 4.0V, ISNK = 3.2 mA
		—	—	0.3		VCC ≥ 2.5V, ISNK = 1.2 mA
		—	—	0.3		VCC ≥ 1.0V, ISNK = 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	VIH	2.3	—	—	V	VTH > 4.0V
		0.7 x VCC	—	—		VTH < 4.0V

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

MIC6315

ELECTRICAL CHARACTERISTICS (CONTINUED)

Electrical Characteristics: For typical values, $V_{CC} = 2.5V$ to $5.5V$; $T_A = +25^\circ C$, **bold** values valid for $-40^\circ C \leq T_A \leq +85^\circ C$, unless noted.

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

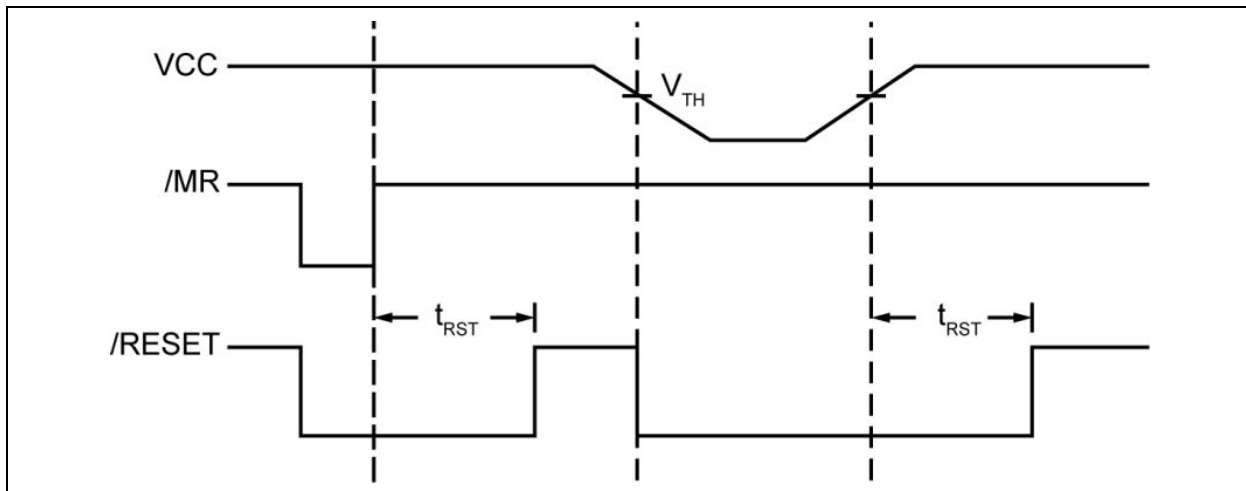
Note 1: Various reset thresholds available. See the Product Identification System section or contact Microchip.

TEMPERATURE SPECIFICATIONS

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Junction Temperature Range	T_J	-40	—	+125	$^\circ C$	Note 1
Operating Temperature Range	T_A	-40	—	+85	$^\circ C$	—
Storage Temperature Range	T_S	-65	—	+150	$^\circ C$	—
Lead Temperature	—	—	—	+300	$^\circ C$	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 $+125^\circ C$ rating. Sustained junction temperatures above $+125^\circ C$ 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.

MIC6315

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. I

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 μ s or less will not cause an unwanted reset. If additional transient immunity is needed, a bypass capacitor can be placed as close as possible to the MIC6315.

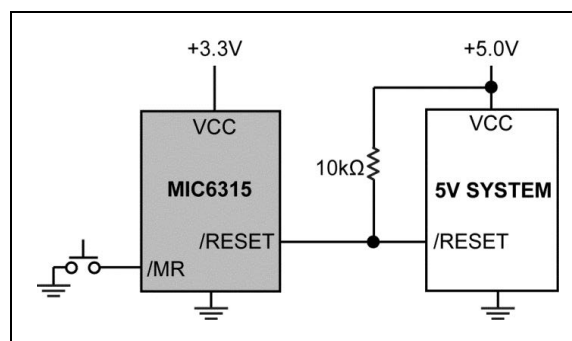
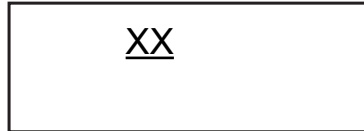


FIGURE 3-1: MIC6315 as Used in a Multiple Supply System.

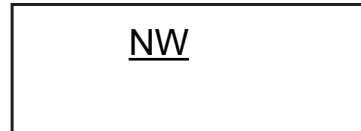
4.0 PACKAGING INFORMATION

4.1 Package Marking Information

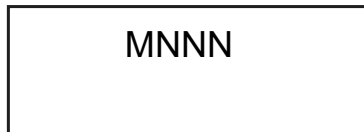
4-Lead SOT-143* (front)



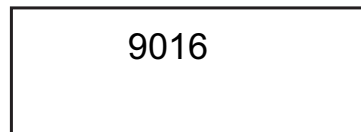
Example



4-Lead SOT-143* (back)



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.	

Note: If the full seven-character YYWWNNN code cannot fit on the package, the following truncated codes are used based on the available marking space:
 6 Characters = YWWNNN; 5 Characters = WWNNN; 4 Characters = WNNN; 3 Characters = NNN;
 2 Characters = NN; 1 Character = N

MIC6315

TABLE 4-1: MARKING CODES

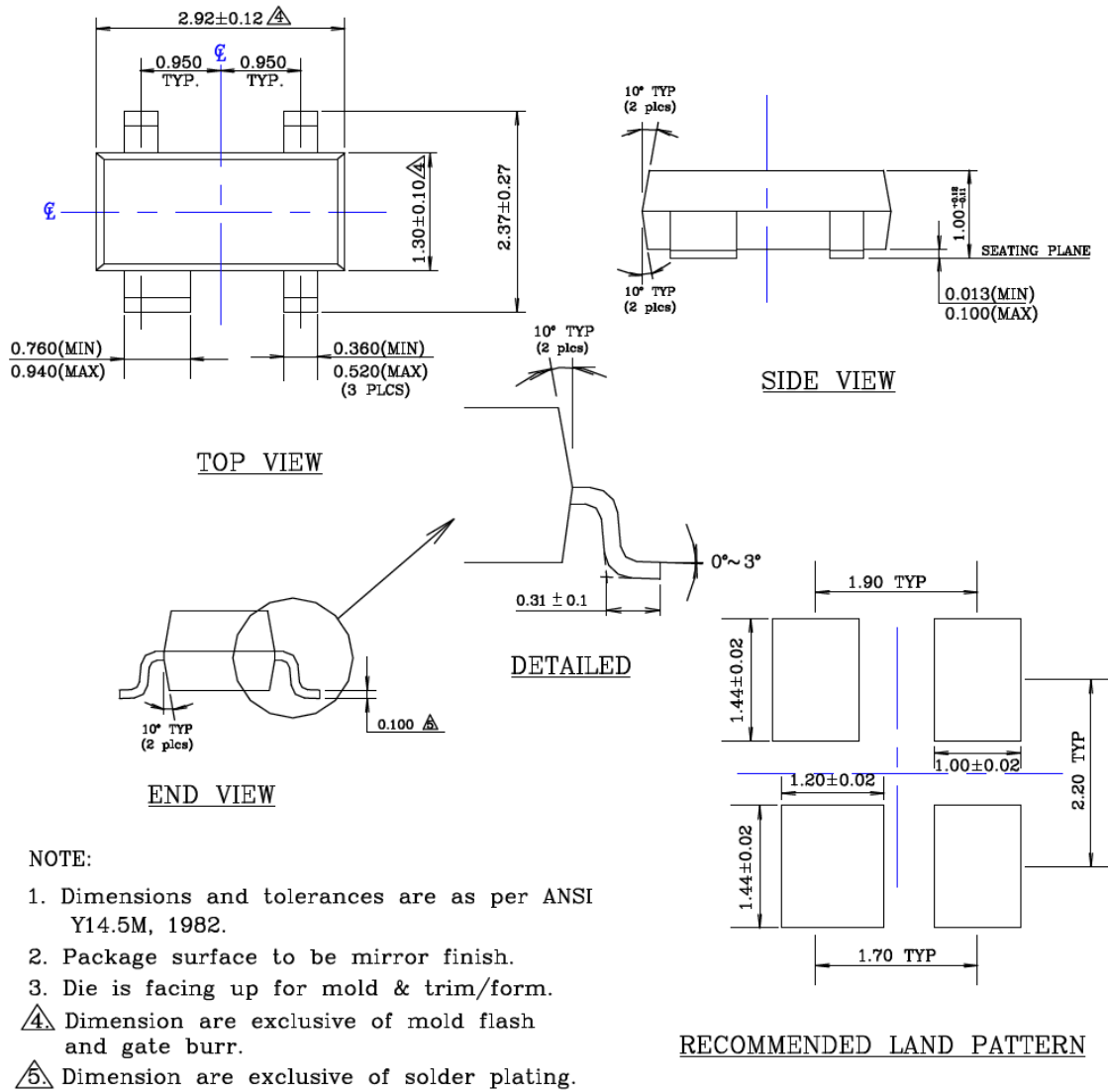
Part Number	Marking Code	Nominal V_{TH}	Minimum t_{RST}
MIC6315-26D2UY	<u>NY</u>	2.63V	20 ms
MIC6315-29D2UY	<u>NM</u>	2.93V	20 ms
MIC6315-30D2UY	<u>N2</u>	3.00V	20 ms
MIC6315-31D2UY	<u>NE</u>	3.08V	20 ms
MIC6315-40D2UY	<u>NW</u>	4.00V	20 ms
MIC6315-41D2UY	<u>N6</u>	4.10V	20 ms
MIC6315-44D2UY	<u>NG</u>	4.38V	20 ms
MIC6315-46D2UY	<u>NQ</u>	4.63V	20 ms
MIC6315-26D3UY	<u>NR</u>	2.63V	140 ms
MIC6315-26D3UY	<u>NP</u>	2.93V	140 ms
MIC6315-30D3UY	<u>N3</u>	3.00V	140 ms
MIC6315-31D3UY	<u>NU</u>	3.08V	140 ms
MIC6315-40D3UY	<u>N8</u>	4.00V	140 ms
MIC6315-41D3UY	<u>N5</u>	4.10V	140 ms
MIC6315-42D3UY	<u>05</u>	4.20V	140 ms
MIC6315-44D3UY	<u>NH</u>	4.38V	140 ms
MIC6315-46D3UY	<u>NX</u>	4.63V	140 ms
MIC6315-26D4UY	<u>NS</u>	2.63V	1100 ms
MIC6315-29D4UY	<u>NN</u>	2.93V	1100 ms
MIC6315-30D4UY	<u>N4</u>	3.00V	1100 ms
MIC6315-31D4UY	<u>2N</u>	3.08V	1100 ms
MIC6315-40D4UY	<u>M9</u>	4.00V	1100 ms
MIC6315-41D4UY	<u>M7</u>	4.10V	1100 ms
MIC6315-44D4UY	<u>NJ</u>	4.38V	1100 ms
MIC6315-46D4UY	<u>NZ</u>	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: For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>.

MIC6315

NOTES:

APPENDIX A: REVISION HISTORY

Revision A (February 2021)

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

Revision B (February 2022)

- Corrected the device marking specification in [4.1](#) “**Package Marking Information**” and added note below the legend there.

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			
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.					

MIC6315

NOTES:

Note the following details of the code protection feature on Microchip products:

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is secure when used in the intended manner, within operating specifications, and under normal conditions.
- Microchip values and aggressively protects its intellectual property rights. Attempts to breach the code protection features of Microchip product is strictly prohibited and may violate the Digital Millennium Copyright Act.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of its code. Code protection does not mean that we are guaranteeing the product is “unbreakable”. Code protection is constantly evolving. Microchip is committed to continuously improving the code protection features of our products.

This publication and the information herein may be used only with Microchip products, including to design, test, and integrate Microchip products with your application. Use of this information in any other manner violates these terms. Information regarding device applications is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. Contact your local Microchip sales office for additional support or, obtain additional support at <https://www.microchip.com/en-us/support/design-help/client-support-services>.

THIS INFORMATION IS PROVIDED BY MICROCHIP "AS IS". MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTIES RELATED TO ITS CONDITION, QUALITY, OR PERFORMANCE.

IN NO EVENT WILL MICROCHIP BE LIABLE FOR ANY INDIRECT, SPECIAL, PUNITIVE, INCIDENTAL, OR CONSEQUENTIAL LOSS, DAMAGE, COST, OR EXPENSE OF ANY KIND WHATSOEVER RELATED TO THE INFORMATION OR ITS USE, HOWEVER CAUSED, EVEN IF MICROCHIP HAS BEEN ADVISED OF THE POSSIBILITY OR THE DAMAGES ARE FORESEEABLE. TO THE FULLEST EXTENT ALLOWED BY LAW, MICROCHIP'S TOTAL LIABILITY ON ALL CLAIMS IN ANY WAY RELATED TO THE INFORMATION OR ITS USE WILL NOT EXCEED THE AMOUNT OF FEES, IF ANY, THAT YOU HAVE PAID DIRECTLY TO MICROCHIP FOR THE INFORMATION.

Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

For information regarding Microchip's Quality Management Systems, please visit www.microchip.com/quality.

Trademarks

The Microchip name and logo, the Microchip logo, Adaptec, AnyRate, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, CryptoMemory, CryptoRF, dsPIC, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Klear, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzzer, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

AgileSwitch, APT, ClockWorks, The Embedded Control Solutions Company, EtherSynch, Flashtec, Hyper Speed Control, HyperLight Load, IntelliMOS, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, QuietWire, SmartFusion, SyncWorld, Temux, TimeCesium, TimeHub, TimePictra, TimeProvider, TrueTime, WinPath, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, Augmented Switching, BlueSky, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, Espresso T1S, EtherGREEN, GridTime, IdealBridge, In-Circuit Serial Programming, ICSP, INICnet, Intelligent Paralleling, Inter-Chip Connectivity, JitterBlocker, Knob-on-Display, maxCrypto, maxView, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, NVM Express, NVMe, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, RTAX, RTG4, SAM-ICE, Serial Quad I/O, simpleMAP, SimpliPHY, SmartBuffer, SmartHLS, SMART-I.S., storClad, SQL, SuperSwitcher, SuperSwitcher II, Switchtec, SynchroPHY, Total Endurance, TSHARC, USBCheck, VariSense, VectorBlox, VeriPHY, ViewSpan, WiperLock, XpressConnect, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, Symmcom, and Trusted Time are registered trademarks of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2021 - 2022, Microchip Technology Incorporated and its subsidiaries.

All Rights Reserved.

ISBN: 978-1-5224-9771-4



MICROCHIP

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
<http://www.microchip.com/support>
Web Address:
www.microchip.com

Atlanta

Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Austin, TX

Tel: 512-257-3370

Boston

Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago

Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Dallas

Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit

Novi, MI
Tel: 248-848-4000

Houston, TX

Tel: 281-894-5983

Indianapolis

Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453
Tel: 317-536-2380

Los Angeles

Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC

Tel: 919-844-7510

New York, NY

Tel: 631-435-6000

San Jose, CA

Tel: 408-735-9110
Tel: 408-436-4270

Canada - Toronto

Tel: 905-695-1980
Fax: 905-695-2078

ASIA/PACIFIC

Australia - Sydney
Tel: 61-2-9868-6733

China - Beijing
Tel: 86-10-8569-7000

China - Chengdu
Tel: 86-28-8665-5511

China - Chongqing
Tel: 86-23-8980-9588

China - Dongguan
Tel: 86-769-8702-9880

China - Guangzhou
Tel: 86-20-8755-8029

China - Hangzhou
Tel: 86-571-8792-8115

China - Hong Kong SAR
Tel: 852-2943-5100

China - Nanjing
Tel: 86-25-8473-2460

China - Qingdao
Tel: 86-532-8502-7355

China - Shanghai
Tel: 86-21-3326-8000

China - Shenyang
Tel: 86-24-2334-2829

China - Shenzhen
Tel: 86-755-8864-2200

China - Suzhou
Tel: 86-186-6233-1526

China - Wuhan
Tel: 86-27-5980-5300

China - Xian
Tel: 86-29-8833-7252

China - Xiamen
Tel: 86-592-2388138

China - Zhuhai
Tel: 86-756-3210040

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444

India - New Delhi
Tel: 91-11-4160-8631

India - Pune
Tel: 91-20-4121-0141

Japan - Osaka
Tel: 81-6-6152-7160

Japan - Tokyo
Tel: 81-3-6880-3770

Korea - Daegu
Tel: 82-53-744-4301

Korea - Seoul
Tel: 82-2-554-7200

Malaysia - Kuala Lumpur
Tel: 60-3-7651-7906

Malaysia - Penang
Tel: 60-4-227-8870

Philippines - Manila
Tel: 63-2-634-9065

Singapore
Tel: 65-6334-8870

Taiwan - Hsin Chu
Tel: 886-3-577-8366

Taiwan - Kaohsiung
Tel: 886-7-213-7830

Taiwan - Taipei
Tel: 886-2-2508-8600

Thailand - Bangkok
Tel: 66-2-694-1351

Vietnam - Ho Chi Minh
Tel: 84-28-5448-2100

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4485-5910
Fax: 45-4485-2829

Finland - Espoo
Tel: 358-9-4520-820

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Garching
Tel: 49-8931-9700

Germany - Haan
Tel: 49-2129-3766400

Germany - Heilbronn
Tel: 49-7131-72400

Germany - Karlsruhe
Tel: 49-721-625370

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Germany - Rosenheim
Tel: 49-8031-354-560

Israel - Ra'anana
Tel: 972-9-744-7705

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Italy - Padova
Tel: 39-049-7625286

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Norway - Trondheim
Tel: 47-7288-4388

Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

Sweden - Gothenberg
Tel: 46-31-704-60-40

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820