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MIC2775

Micro-Power Voltage Supervisor

IttyBitty®

General Description

The MIC2775 is a power supply supervisor that provides undervoltage monitoring, manual reset capability, and power-on reset generation in a compact 5-pin SOT package. Features include an undervoltage detector, a delay generator, a manual reset input, and both active-high and active-low reset outputs. The undervoltage detector compares V_{DD} against a fixed threshold. Ten factory-programmed thresholds are available.

The reset outputs are asserted for no less than 140ms at power-on and any time the input voltage drops below the reference voltage. It remains asserted for the timeout period after the input voltage subsequently rises back above the threshold boundary. A reset can be generated at any time by asserting the manual reset input, /MR. This reset output will remain active at least 140ms after the release of /MR. The /MR input can also be used to daisy-chain the MIC2775 onto existing power monitoring circuitry or other supervisors. Hysteresis is included to prevent chattering due to noise. Typical suppy current is an ultra-low 3.5µA.

Datasheets and support documentation are available on Micrel's website at: www.micrel.com.

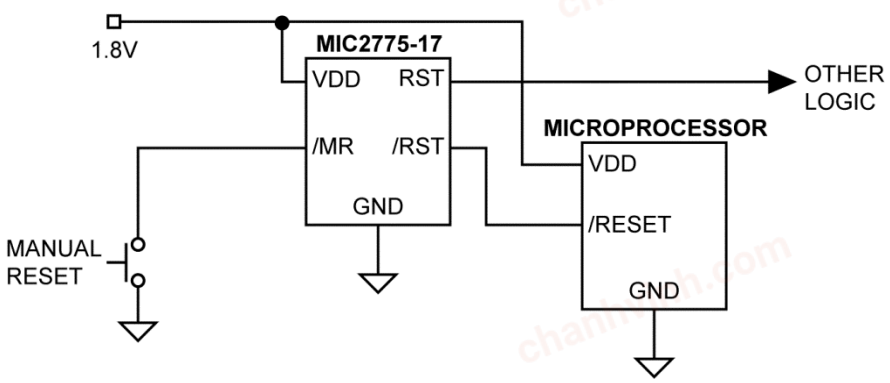
Features

- Monitors power supply for undervoltage conditions
- Choice of factory-programmed thresholds
- Generates 140ms (minimum) power-on reset pulse
- Manual reset capability
- Both active-high and active-low reset outputs
- /RST output valid down to 1.2V
- Ultra-low supply current, 3.5µA typical
- Rejects brief input transients
- No external components
- For extended temperature range see Micrel's MAX825
- IttyBitty® 5-pin SOT-23 package

Applications

- Monitoring processor core and input/output voltages
- Computer systems
- PDAs, handheld PCs
- Embedded controllers
- Telecommunications systems
- Power supplies

Typical Application



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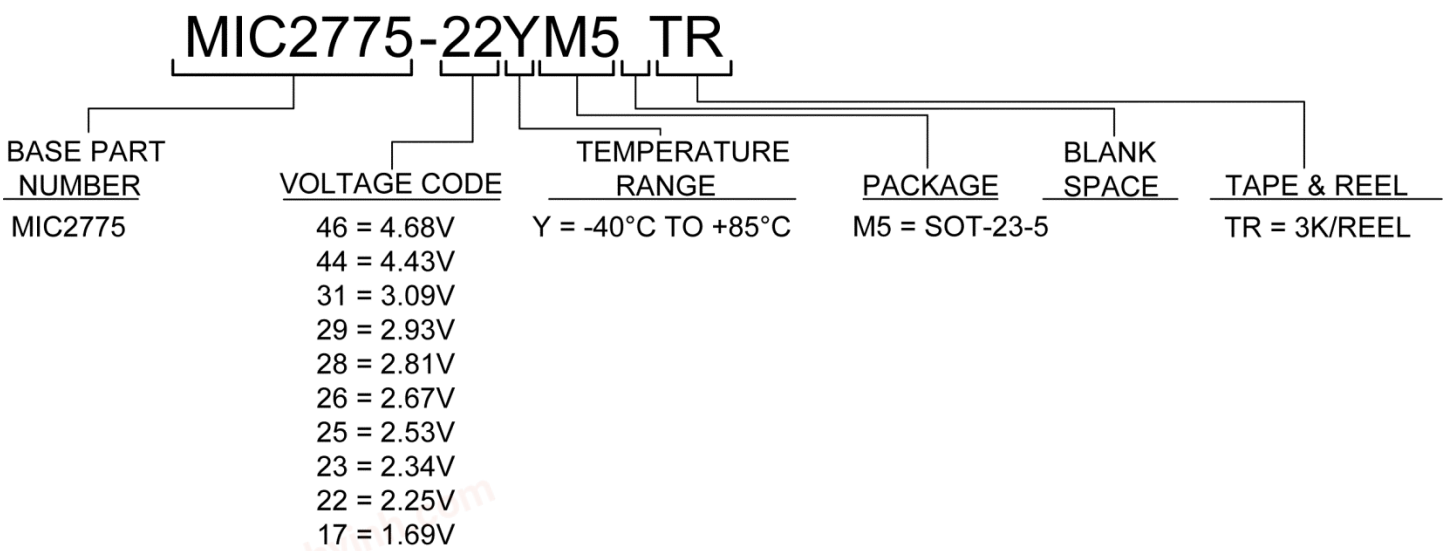
Ordering Information

Part Number[1,2]	Marking[1,3]	Junction Temperature Range	Package[4]
MIC2775-XXYM5	UJXX	–40°C to +85°C	SOT-23-5

Note:

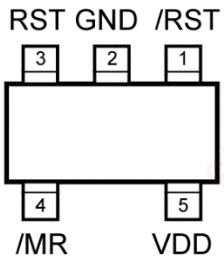
1. XX = Voltage Code, see *Part Numbering Conventions* below. There are ten standard versions available with an order increment of 3,000 pieces. Samples of standard versions are normally available from stock. Contact factory for information on non-standard versions. Available in tape-and-reel only.
2. Order entry part number add a space, then TR. Example: MIC2775-22YM5 TR.
3. Underbar (__) symbol may not be to scale.
4. Standard reel SOT-23: Reel diameter is 7 inches, hub diameter is 2 inches, width is 8mm.

Part Numbering Conventions



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Pin Configuration



SOT-23-5 (M5)
(Top View)

Pin Description

Pin Number	Pin Name	Pin Function
1	/RST	Digital (Output): Asserted low whenever V_{DD} falls below the reference voltage. It will remain asserted for no less than 140ms after V_{DD} returns above the threshold limit.
2	GND	Ground.
3	RST	Digital (Output): Asserted high whenever V_{DD} falls below the reference voltage. It will remain asserted for no less than 140ms after V_{DD} returns above the threshold limit.
4	/MR	Digital (Input): Driving this pin low initiates an immediate and unconditional reset. Assuming V_{DD} is above the threshold when /MR is released (returns high), the reset output will be de-asserted no less than 140ms later. /MR has an internal pull-up to V_{DD} and may be left open if unused.
5	VDD	Analog (Input): Power supply input and the voltage being monitored.

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Absolute Maximum Ratings[5]

Supply Voltage (V_{DD}) ..... –0.3V to +7.0V
Output Voltage ($V_{/MR}$) ..... –0.3V to +7.0V
RST, (/RST) Current 20mA
Storage Temperature (Ts) ..... –65°C to +150°C
ESD Rating[7] 1.5kV

Operating Ratings[6]

Supply Voltage (V_{DD}) ..... +1.5V to +5.5V
Input Voltage ($V_{/MR}$) ..... –0.3V to +6.0V
Ambient Temperature (T_A) ..... –40°C to +85°C
Package Thermal Resistance (θ_{JA}) ..... 256°C/W

Electrical Characteristics[8]

T_A = 25°C, **bold** values indicate –40°C≤ T_A ≤ +85°C, unless noted.

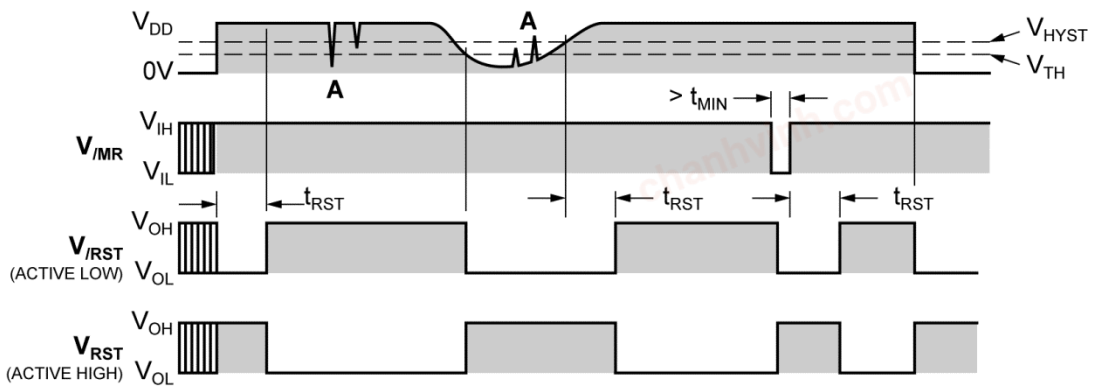
Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
I_{DD}	Supply Current	$V_{DD} = V_{TH}$ + 1.6%, /MR, RST, /RST open,		3.5		µA
VDD Voltage Threshold						
	Undervoltage Threshold on VDD		**V_{TH}- 1.5%**	V_{TH}	**V_{TH}+ 1.5%**	V
V_{HYST}	Hysteresis Voltage			1		%
RST, /RST Outputs						
t_{PROP}	Propagation Delay	$V_{DD} = V_{TH}$ + 1.5% + 100mV to $V_{DD} = V_{TH}$ – 1.5% - 100mV		20		µs
t_{RST}	Reset Pulse Width		**140**		**280**	ms
V_{OL}	RST or /RST Output Voltage Low	I_{SINK} = 1.6mA; V_{DD} ≥ 1.6V			**0.3**	V
		I_{SINK} = 100µA; V_{DD} ≥ 1.2V; Note 9			**0.3**	V
V_{OH}	RST or /RST Output Voltage High	I_{SOURCE} = 500µA; V_{DD} ≥ 1.5V	**$0.8V_{DD}$**			V
		I_{SOURCE} = 10µA; V_{DD} ≥ 1.2V; Note 9	**$0.8V_{DD}$**			V
/MR Input						
V_{IH}	Input High Voltage		**$0.7V_{DD}$**			V
V_{IL}	Input Low Voltage				**$0.3V_{DD}$**	V
t_{PROP}	Propagation Delay	From $V_{/MR}$ < (V_{IL} – 100mV)		5		µs
t_{MIN}	Minimum Input Pulse Width	Reset occurs, $V_{/MR} < V_{IL}$		33		ns
I_{PU}	Internal Pull-up Current			100		nA
I_{IN}	Input Current, /MR	$V_{/MR} < V_{IL}$		100		nA

Notes:

5. Exceeding the absolute maximum ratings may damage the device.
6. The device is not guaranteed to function outside its operating ratings.
7. Devices are ESD sensitive. Handling precautions are recommended. Human body model, 1.5kΩ in series with 100pF.
8. Specification for packaged product only.
9. V_{DD} operating range is 1.5V to 5.5V. Output is guaranteed to be asserted down to V_{DD} = 1.2V.

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Timing Diagram

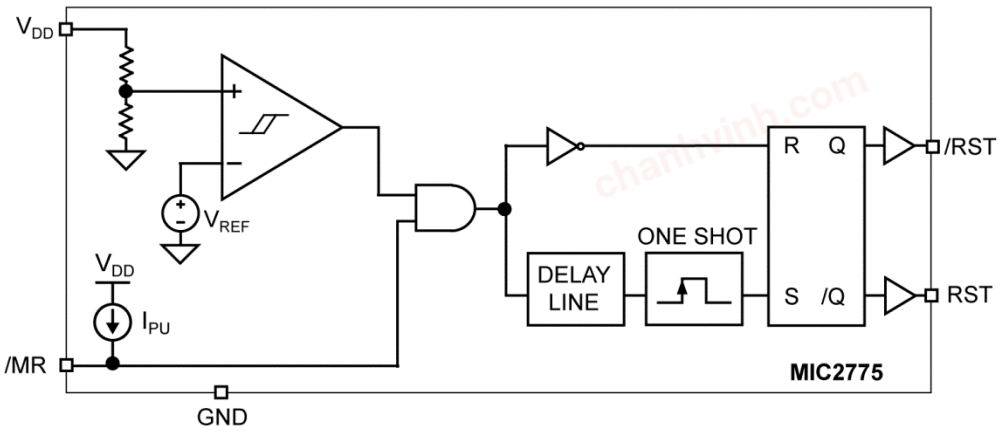


Note: Propagation delays not shown for clarity.

A = The MIC2775 ignores very brief transients. See the *Application Information* section for details.

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Functional Diagram



Functional Description

VDD Input

The VDD pin is both the power supply terminal and a monitored input voltage. The voltage at this pin is continually compared against the internal reference. The trip-point at which a reset occurs is factory-programmed. A reset is triggered if and when V_{DD} falls below the trip-point. Hysteresis is employed to prevent chattering due to noise. The comparator on the VDD input is relatively immune to very brief negative-going transients.

RST, /RST Reset Outputs

Typically, the MIC2775 is used to monitor the power supply of intelligent circuits such as microcontrollers and microprocessors. By connecting the appropriate reset output of an MIC2775 to the reset input of a µC or µP, the processor will be properly reset at power-on, power-down, and brown-out conditions. In addition, asserting /MR, the manual reset input, will activate the reset function.

The reset outputs are asserted any time /MR is asserted or if V_{DD} drops below the threshold voltage. The reset outputs remain asserted for $t_{RST(min)}$ after V_{DD} subsequently returns above the threshold boundary and/or /MR is released. A reset pulse is also generated at power-on. Hysteresis is included in the comparator to prevent chattering of the outputs due to noise.

/MR, Manual Reset Input

The ability to initiate a reset via external logic or a manual switch is provided in addition to the MIC2775's automatic supervisory functions. Driving the /MR input to a logic-low causes an immediate and unconditional reset to occur. Assuming V_{DD} is within tolerance when /MR is released (returns high), the reset outputs will be de-asserted no less than t_{RST} later. /MR may be driven by a logic signal or mechanical switch. Typically, a momentary push-button switch is connected such that /MR is shorted to ground when the switch contact close. The switch may be connected directly between /MR and GND. /MR has an internal 100nA pull-up current to VDD and may be left open if unused.

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Application Information

Ensuring Proper Operation at Low Supply

At V_{DD} levels below 1.2V, the MIC2775's /RST output cannot turn on sufficiently to produce a valid logic-low on /RST. In this situation, circuits driven by /RST could be allowed to float, causing undesired operation. In most cases, however, it is expected that the circuits driven by the MIC2775 will be similarly inoperative at $V_{DD} \leq 1.2V$.

If a given application requires that /RST be valid below $V_{DD} = 1.2V$, this can be accomplished by adding a pull-down resistor to the /RST output. A value or 100kΩ is recommended as this is usually an acceptable compromise of quiescent current and pull-down current. The resistor's value is not critical, however. See Figure 1.

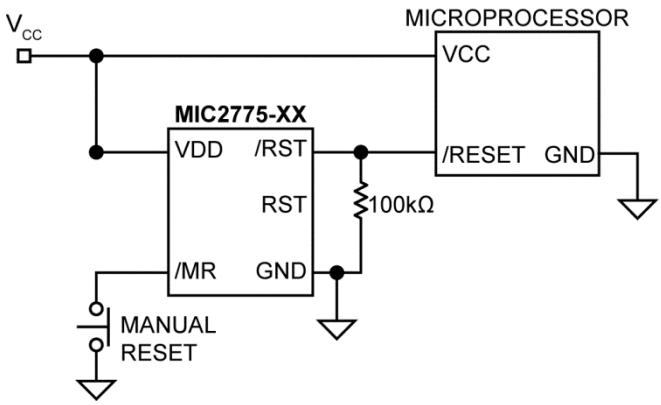


Figure 1. MIC2775 Valid /RST Below 1.2V

The statements above also apply to the MIC2775's RST output. That is, to ensure valid RST signal levels when $V_{DD} < 1.2V$, a pull-up resistor (as opposed to a pull-down) should be added to the RST output. A value or 100kΩ is typical for this application, as well. See Figure 2.

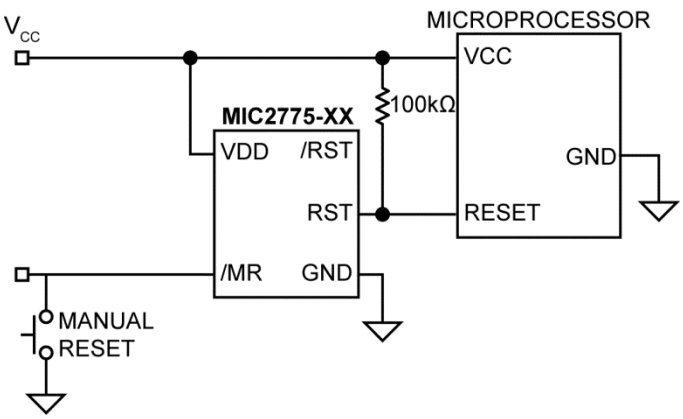


Figure 2. MIC2775 Valid RST Below 1.2V

Transient Response

The MIC2775 is inherently immune to very short negative-going glitches. Very brief transients may exceed the voltage threshold without tripping the output.

In general, as shown in Figure 3, the narrower the transient, the deeper the threshold overdrive that will be ignored by the MIC2775. The graph represents the typical allowable transient duration for a given amount of threshold overdrive that will not generate a reset.

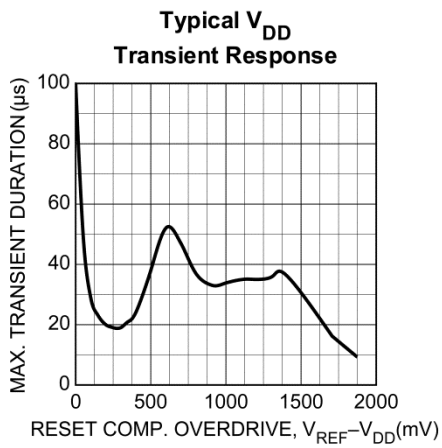
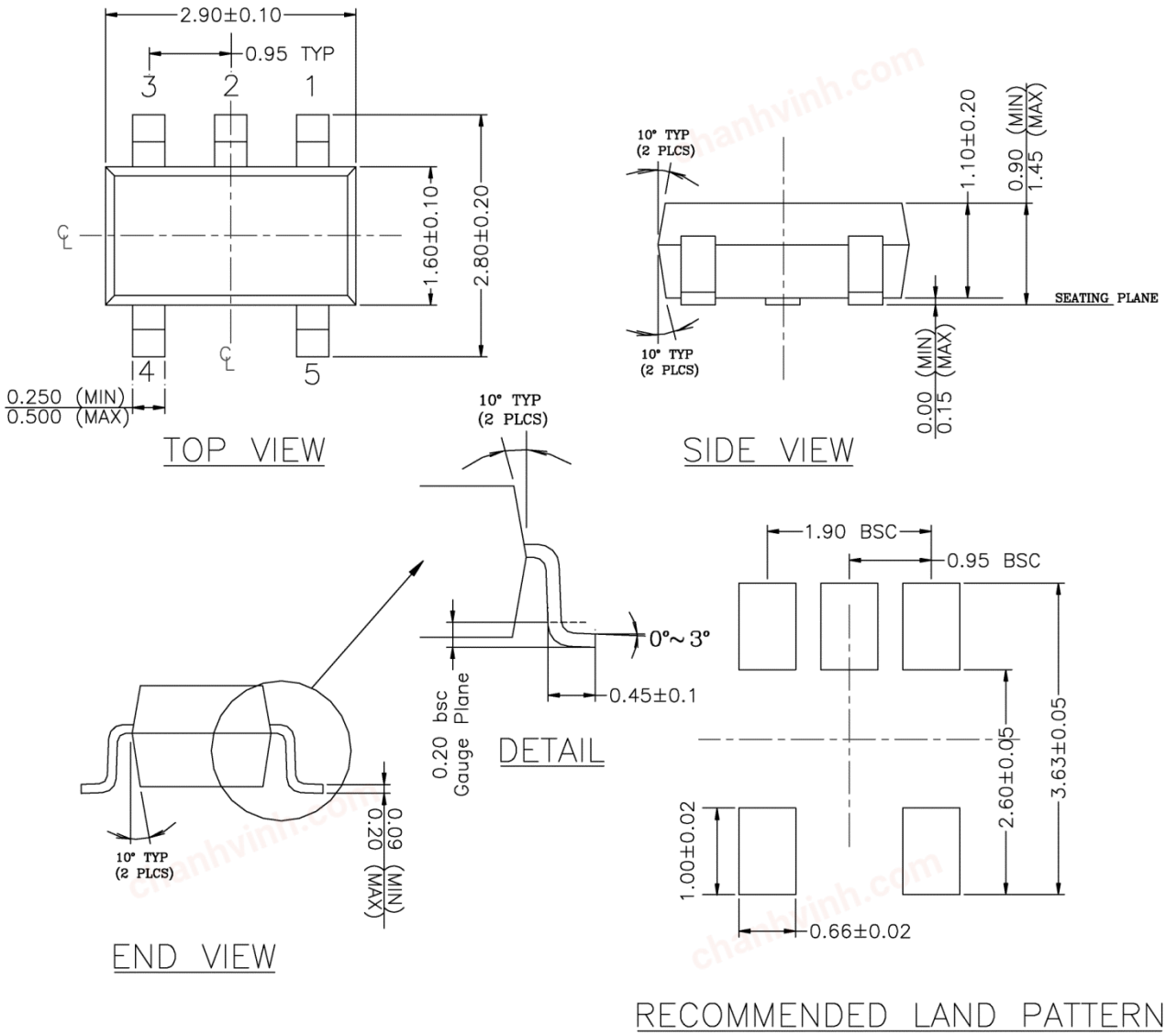


Figure 3. Typical VDD Transient Response

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Package Information and Recommended Landing Pattern[10]



NOTE:
1. PACKAGE OUTLINE EXCLUSIVE OF MOLD FLASH & BURR.
2. PACKAGE OUTLINE INCLUSIVE OF SOLER PLATING.
3. DIMENSION AND TOLERANCE PER ANSI Y14.5M, 1982.
4. FOOT LENGTH MEASUREMENT BASED ON GAUGE PLANE METHOD.
5. DIE FACES UP FOR MOLD, AND FACES DOWN FOR TRIM/FORM.
6. ALL DIMENSIONS ARE IN MILLIMETERS.

SOT-23-5 (M5)

Note:

10. Package information is correct as of the publication date. For updates and most current information, go to www.micrel.com.

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