MIC2785

Dual Supply Voltage Monitor with Manual Reset

General Description

The MIC2785 is a micropower voltage monitor that provides undervoltage monitoring and manual reset capability in a tiny 1.2mm × 1.2mm QFN package. The MIC2785 provides a monitored voltage input (V_{IN}) separate from the supply input (V_{DD}). This insures that the reset (/RST) output maintains a valid output state when the voltage being monitored ramps up or down. The device also includes a manual reset input (/MR). The /RST output is an active low push-pull output.

The undervoltage detector compares the VIN pin voltage against the factory-programmed threshold of 1.62V. The reset output is asserted any time the input voltage drops below the programmed threshold voltage. A reset can be generated at any time by asserting the manual reset input, /MR. This reset output will remain active until the release of /MR. The /MR input can also be used to daisy-chain the MIC2785 onto existing power monitoring circuitry or other supervisors. Hysteresis is included to prevent chattering due to noise.

The MIC2785 consumes a minimum of quiescent current, only 5µA, 1.5µA from the main supply pin and 3.5µA from the input pin. Offered in a tiny space saving 6-pin QFN 1.2mm × 1.2mm package.

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

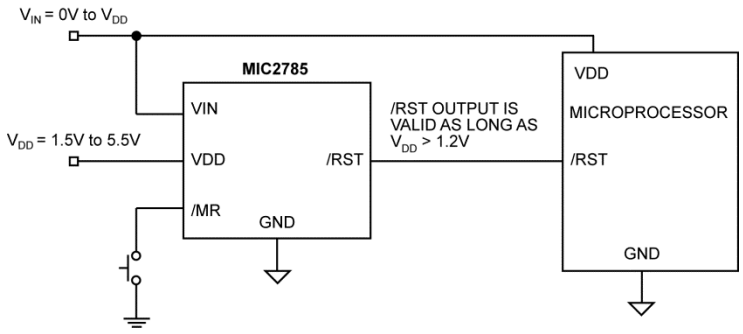
Features

- No external components
- Monitors input voltage for under-voltage condition
- Separate inputs for supply (VDD) and monitor (VIN)
- +1.5% VIN threshold voltage accuracy
- Valid /RST state with VIN down to 0.0V
- Valid /RST state with VDD down to 1.20V
- Factory-programmed 1.62V reference
- Manual reset input (/MR)
- Active low RESET (/RST) output
- Ultra-low input current – 5µA total (VIN and VDD)
- Rejects brief input transients
- –40°C to 85°C operating temperature range
- RoHS lead-free compliant
- Available in 6-pin 1.2mm × 1.2mm Thin QFN package

Applications

- Mobile phones
- PDAs
- GPS Receivers

Typical Application



Memory or Microprocessor Voltage Monitor

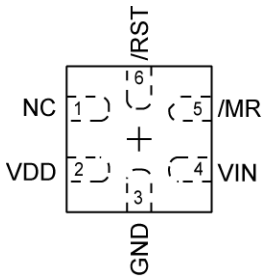
Ordering Information

Part Number[1]	Marking	Typical Application Voltage	Junction Temperature Range	Package
MIC2785-16YFT	U1C	1.8V+10%	–40°C to +85°C	6–Pin 1.2mm × 1.2mm Thin QFN Pb-Free

Note:

1. Other voltages are available. Contact Micrel for details.

Pin Configuration



6-Pin (1.2mm × 1.2mm) Thin QFN (FT)

Pin Description

Pin Number	Pin Name	Pin Function
1	NC	Not Internally Connected.
2	VDD	Analog (Input). Independent supply input for internal circuitry.
3	GND	Ground.
4	VIN	Analog (Input). Monitored input voltage. An under-voltage condition will trigger a reset sequence.
5	/MR	Digital (Input): Asserting this pin low initiates an immediate and unconditional reset. Assuming VIN is above the threshold when /MR is released (returns high), the reset output will be de-asserted. /MR may be driven by a logic signal or a mechanical switch. /MR has an internal pull-up to VDD and may be left floating if unused.
6	/RST	Digital (Output): Asserted low whenever the VIN pin voltage falls below the reference voltage or Manual Reset pin (/MR) is asserted. It will remain asserted until VIN voltage rises above the threshold voltage and the /MR pin is released. The maximum output voltage of the /RST pin is VIN. /RST is a push-pull output.

Absolute Maximum Ratings[2]

Supply Voltage (V_{DD}) ..... -0.3V to +6V
Monitor Input (V_{IN}) ..... -0.3V to +6V
Input Voltage ($V_{/MR}$) ..... -0.3V to +6V
/RST Current ..... ±20mA
Lead Temperature (soldering, 20sec.) ..... 260°C
Junction Temperature (T_J) ..... -40°C to +125°C
Storage Temperature (T_S) ..... -65°C to +150°C
ESD Rating[4] (Human Body Model) ..... ±1.5kV

Operating Ratings[3]

Supply Voltage (V_{DD}) ..... +1.5V to +5.5V
Monitor Input (V_{IN}) ..... –0.3V to + V_{DD}
Input Voltage ($V_{/MR}$) ..... –0.3V to + 5.5V
Ambient Temperature (T_A) ..... –40°C to +85°C
Junction Thermal Resistance
6–pin 1.2mm × 1.2mm Thin QFN (θ_{JA}) ..... 140.7°C/W

Electrical Characteristics[5]

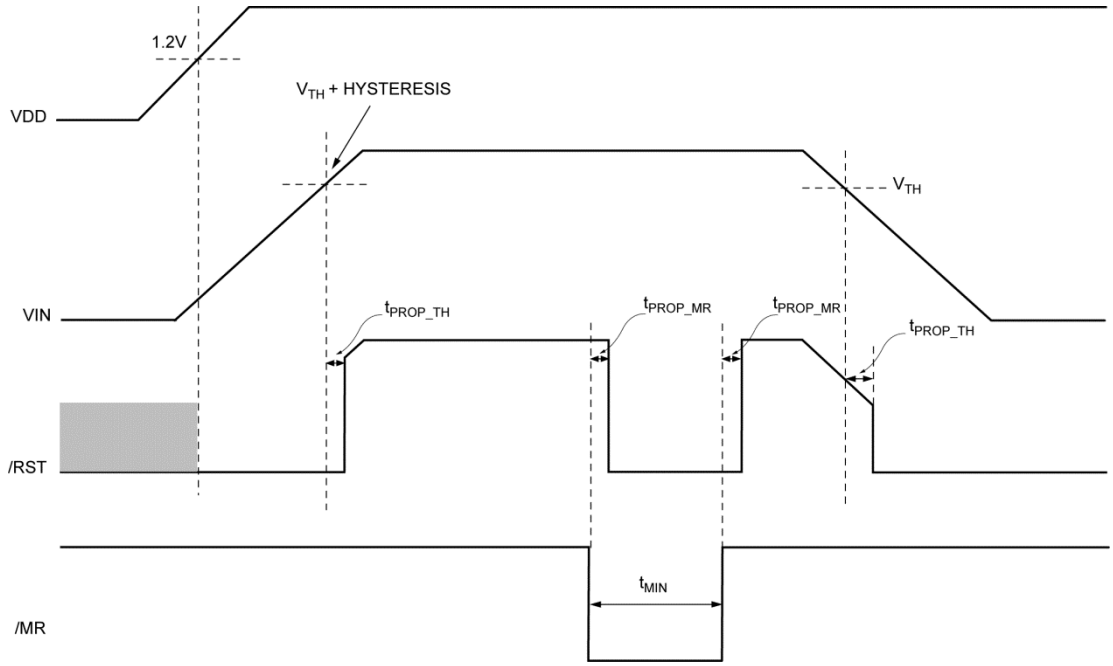
V_{DD} = 3.1V; V_{IN} = V_{DD} = 3.1V; T_A = 25°C, **bold** values indicate –40°C< TA < +85°C, unless noted.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
I_{DD}	Supply Current (V_{DD})	V_{IN} = V_{TH} +1.6%, /MR & /RST open		1.0		µA
I_{IN}	Supply Current (V_{IN})	V_{IN} = V_{TH} +1.6%, /MR & /RST open		3.5		µA
	V_{TH} Accuracy		-1.5		+1.5	%
V_{HYST}	Hysteresis Voltage			1.5		%
t_{PROP_TH}	Propagation Delay	V_{IN} = V_{TH} ±1 .5%, ±100mV		5	25	µs
V_{OL}	Output Voltage Low	V_{IN} ≤ V_{TH} -1.5%, I_{SINK} = 100µA, V_{DD} > 1.2V			0.3	V
V_{OH}	Output Voltage High	V_{IN} > V_{TH} +1.5%, I_{SOURCE} = 500µA	0.8 * V_{IN}			V
/MR Input						
V_{IH}	Input High Voltage	V_{DD} = 3.1V	**1.7**			V
V_{IL}	Input Low Voltage	V_{DD} = 3.1V			**0.4**	V
t_{PROP_MR}	Propagation Delay	$V_{/MR}$ < (V_{IL} –100mV)		0.5	**25**	µs
t_{MIN}	Minimum Input Pulse Width	$V_{/MR}$ < V_{IL} reset occurs		33		ns
I_{PU}	Internal Pull-up Current			100		nA

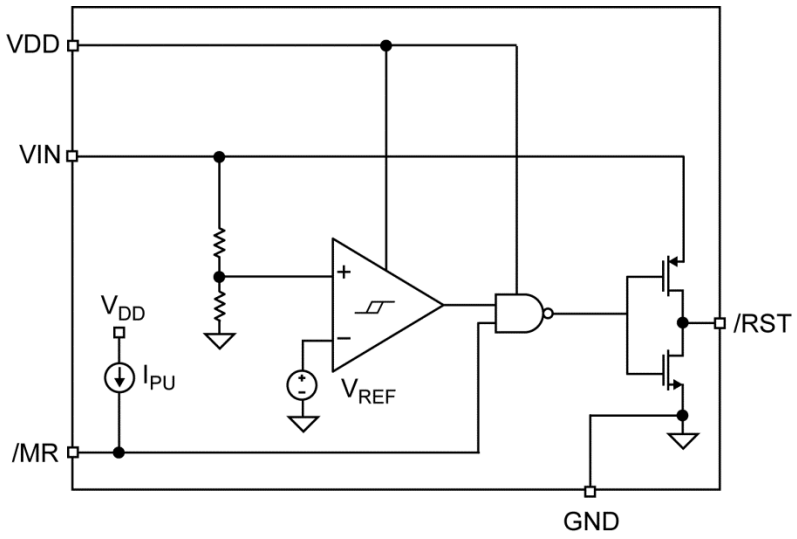
Notes:

2. Exceeding the absolute maximum ratings may damage the device.
3. The device is not guaranteed to function outside its operating ratings.
4. Devices are ESD sensitive. Handling precautions are recommended. Human body model, 1.5kΩ in series with 100pF.
5. Specification for packaged product only.

Timing Diagram



Functional Diagram



Application Information

Design and Product Advantages

The MIC2785's tiny 1.2mm × 1.2mm Thin QFN package combined with no external components offers several advantages compared to conventional voltage supervisors.

Tremendous savings are captured with decreased board size, reduced circuit complexity, and decreased bill of material (BOM) cost.

Power Supply Input (VDD)

The VDD pin provides a stable input power for the internal circuitry. This insures that the reference circuitry and monitoring circuitry have a stable voltage over the entire operating voltage range.

Supply bypassing is not required. However, bypassing may be valuable depending on the quality of the system voltage to which the VDD pin is connected. If bypassing is added, connect the capacitor(s) as closely as possible to the VDD pin. Place the lowest value capacitors closest to the VDD pin.

Under-Voltage Detector Input (VIN)

The largest portion of the monitoring circuitry is the VIN comparator. The VIN pin is connected to the non-inverting terminal of the comparator. The internal reference is connected to the inverting terminal of the comparator. A reset is triggered when VIN falls below VREF. The VIN pin circuitry includes hysteresis to prevent /RST pin chattering due to noise. The VIN pin is relatively immune to very brief negative-going transients.

Reset Output (/RST)

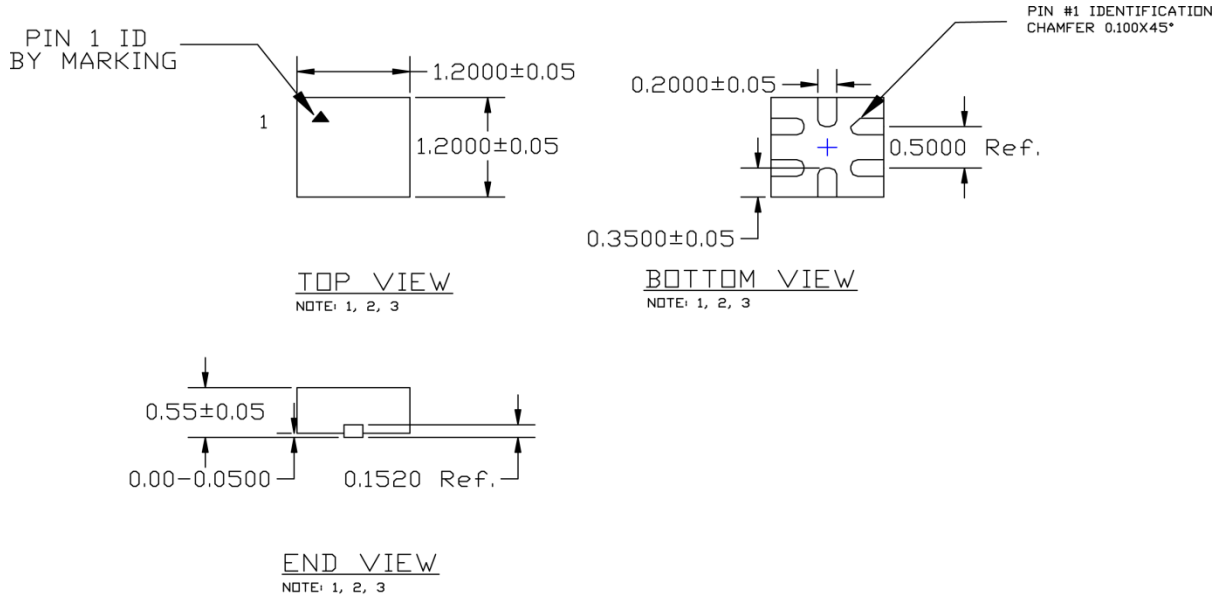
The /RST pin is a complementary push-pull output, which source and sink current. The reset output is asserted any time the VIN pin voltage is less than the threshold voltage (VIN < VTH) or the /MR pin is asserted. The /RST pin responds very quickly to reset conditions, typically asserting within 5µs of VIN < VTH.

The MIC2785 securely monitors the supply voltage of critical components like microcontrollers and microprocessors. With the MIC2785's /RST pin connected to the µP's reset pin, the processor will be properly reset at power on and during power-down and brown-out conditions.

Manual Reset Input (/MR)

The /MR pin provides the ability to initiate a reset via external logic or a manual switch. This is in addition to the MIC2785's automatic voltage monitoring function. Asserting the /MR input to a logic low causes an immediate and unconditional reset. Assuming the VIN pin voltage is within tolerance when /MR is released (returns high), the reset output will be de-asserted. /MR is internally pulled-up to VDD and may be left floating/ open if unused.

Package Information and Recommended Landing Pattern[6]

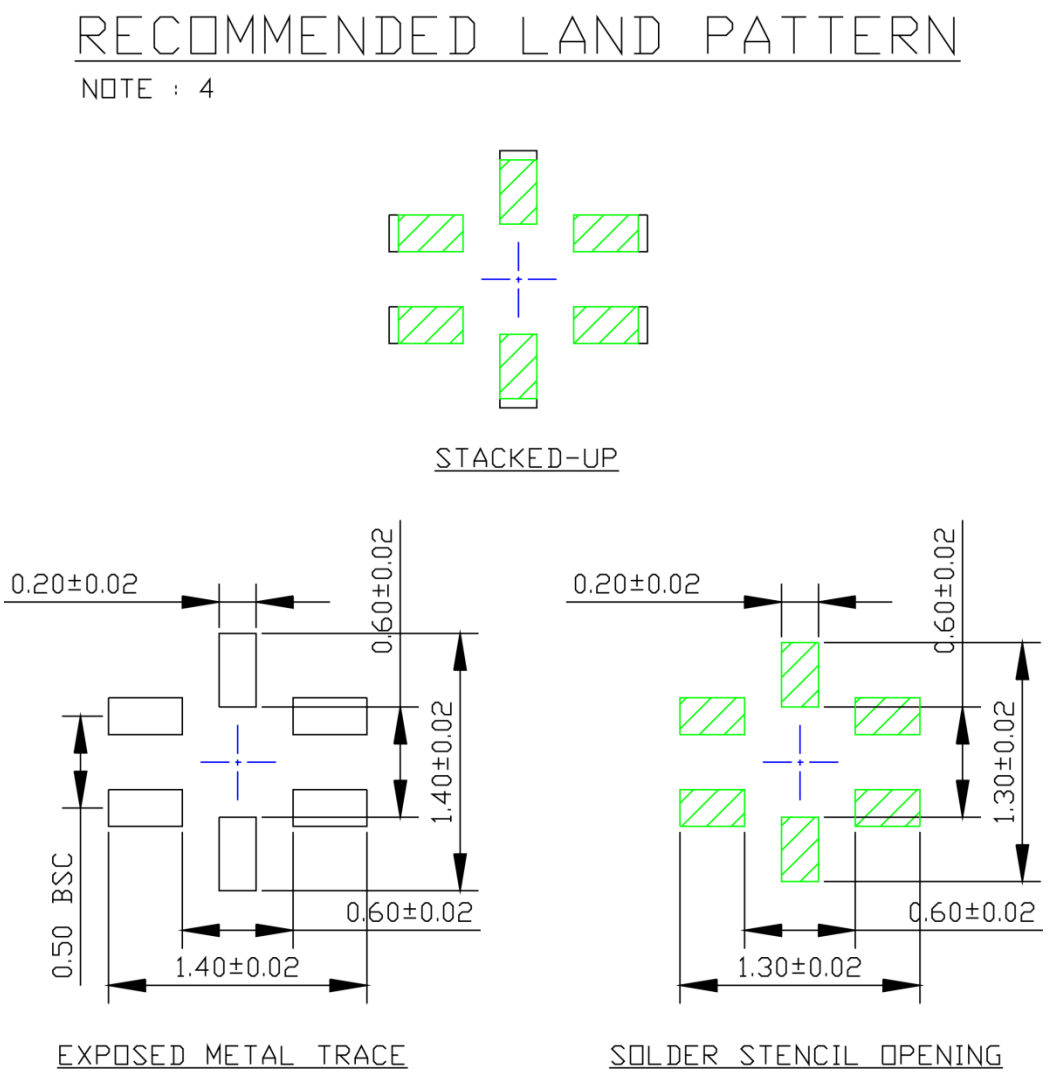


6-Pin (1.2mm × 1.2mm) Thin QFN (FT)

Note:

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

Package Information and Recommended Landing Pattern[6] (Continued)



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