



## MIC2785

### Dual Supply Voltage Monitor with Manual Reset

#### General Description

The MIC2785 is a micropower voltage monitor that provides under-voltage monitoring and manual reset capability in a tiny 1.2mm x 1.2mm MLF<sup>®</sup> 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 under-voltage detector compares the  $V_{IN}$  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 5 $\mu$ A, 1.5 $\mu$ A from the main supply pin and 3.5 $\mu$ A from the input pin. Offered in a tiny, space saving 6-pin MLF<sup>®</sup> (1.2mm x 1.2mm), package. (RoHS lead-free compliant).

Datasheets and support documentation can be found on Micrel's web site at: [www.micrel.com](http://www.micrel.com).

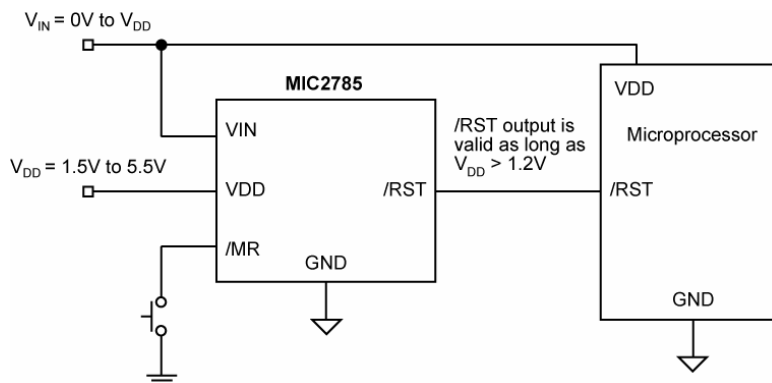
#### Features

- No external components
- Monitors input voltage for under-voltage condition
- Separate inputs for supply ( $V_{DD}$ ) and monitor ( $V_{IN}$ )
- $\pm 1.5\%$   $V_{IN}$  threshold voltage accuracy
- Valid /RST state with  $V_{IN}$  down to 0.0V
- Valid /RST state with  $V_{DD}$  down to 1.20V
- Factory-programmed 1.62V reference
- Manual reset input (/MR)
- Active low RESET (/RST) output
- Ultra-low input current – 5 $\mu$ A total ( $V_{IN}$  and  $V_{DD}$ )
- Rejects brief input transients
- -25°C to 85°C operating temperature range
- RoHS lead-free compliant
- Available in tiny 6-pin 1.2mm x 1.2mm Thin MLF<sup>®</sup> package

#### Applications

- Mobile phones
- PDAs
- GPS receivers

#### Typical Application



Memory or Microprocessor Voltage Monitor

MicroLeadFrame and MLF are registered trademark of Amkor Technology, Inc.

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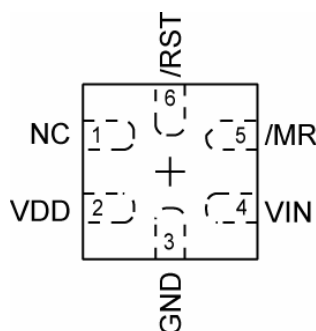
## Ordering Information<sup>(1)</sup>

Part Number	Typical Application Voltage	Nominal Threshold Voltage	Package
MIC2785-16YFT	1.8V +10%	1.62V	6-Pin (1.2mm x 1.2mm) Thin MLF <sup>®</sup>

**Note:**

- Other voltage thresholds available. Contact Micrel for details.

## Pin Configuration



6-Pin (1.2mm x 1.2mm) Thin MLF<sup>®</sup> (FL)

## 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<sup>(1)</sup>**

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	$\pm 20\text{mA}$
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 <sup>(3)</sup> (Human Body Model)	$\pm 1.5\text{kV}$

**Operating Ratings<sup>(2)</sup>**

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	
MLF <sup>®</sup> ( $\theta_{JA}$ )	140.7°C/W

**Electrical Characteristics<sup>(4)</sup>**

$V_{DD} = 3.1\text{V}$ ;  $V_{IN} = V_{DD} = 3.1\text{V}$   $T_A = 25^\circ\text{C}$ , bold values indicate  $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ , 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		$\mu\text{A}$
$I_{IN}$	Supply Current ( $V_{IN}$ )	$V_{IN} = V_{TH} + 1.6\%$ , /MR & /RST open		3.5		$\mu\text{A}$
	$V_{TH}$ Accuracy		-1.5		+1.5	%
$V_{HYST}$	Hysteresis Voltage			1.5		%
$t_{PROP\_TH}$	Propagation Delay	$V_{IN} = V_{TH} \pm 1.5\%$ , $\pm 100\text{mV}$		5	25	$\mu\text{s}$
$V_{OL}$	Output Voltage Low	$V_{IN} \leq V_{TH} - 1.5\%$ , $I_{SINK} = 100\mu\text{A}$ , $V_{DD} > 1.2\text{V}$			0.3	V
$V_{OH}$	Output Voltage High	$V_{IN} > V_{TH} + 1.5\%$ , $I_{SOURCE} = 500\mu\text{A}$	$0.8 * V_{IN}$			V

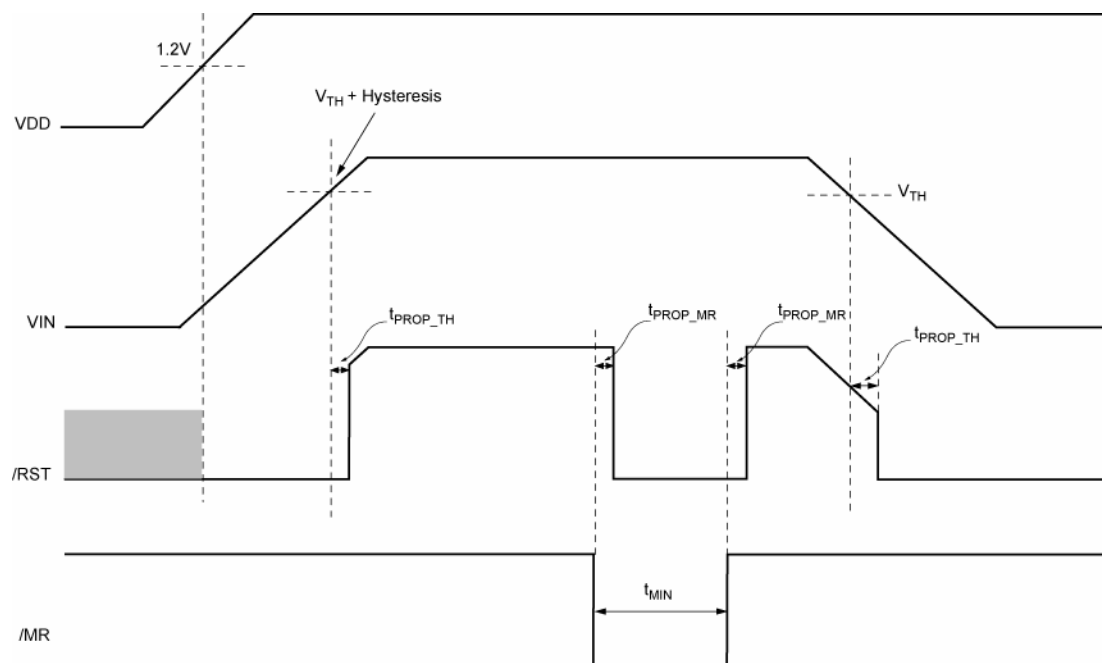
**/MR Input**

$V_{IH}$	Input High Voltage	$V_{DD} = 3.1\text{V}$	<b>1.7</b>			V
$V_{IL}$	Input Low Voltage	$V_{DD} = 3.1\text{V}$			<b>0.4</b>	V
$t_{PROP\_MR}$	Propagation Delay	$V_{/MR} < (V_{IL} - 100\text{mV})$		0.5	<b>25</b>	$\mu\text{s}$
$t_{MIN}$	Minimum Input Pulse Width	$V_{/MR} < V_{IL}$ reset occurs		33		ns
$I_{PU}$	Internal Pull-up Current			100		nA

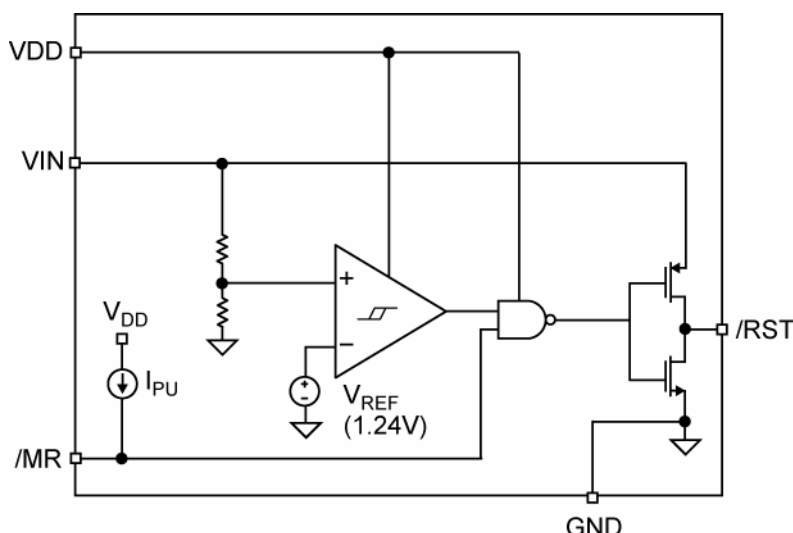
**Notes:**

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

## Timing Diagram



## Functional Diagram



## Application Information

### Design and Product Advantages

The MIC2785's tiny 1.2mm x 1.2mm Thin MLF<sup>®</sup> 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

$V_{REF}$ . 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)

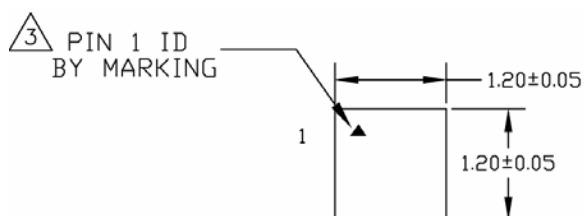
The /RST pin is a complementary push-pull output, which source and sink current. The reset output is asserted any time the VIN pin voltage is less than the threshold voltage ( $V_{IN} < V_{TH}$ ) or the /MR pin is asserted. The /RST pin responds very quickly to reset conditions, typically asserting within 5 $\mu$ s of  $V_{IN} < V_{TH}$ .

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

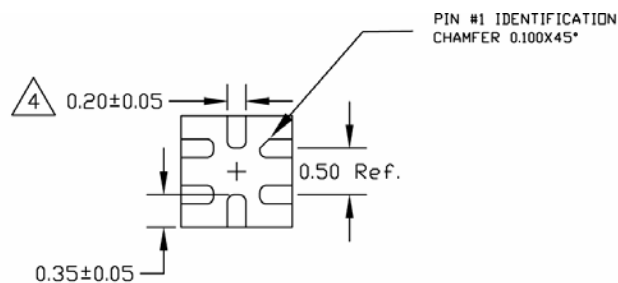
### Manual Reset Input (/MR)

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.

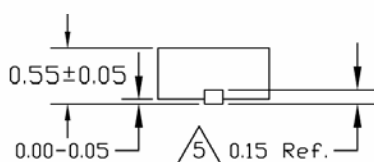
## Package Information



TOP VIEW



BOTTOM VIEW



SIDE VIEW

### NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS, ANGLES ARE IN DEGREES. N IS THE TOTAL NUMBER OF TERMINALS.
2. MAX PACKAGE WARPAGE IS 0.05mm, MAX ALLOWABLE BURRS IS 0.076 mm IN ALL DIRECTIONS.

(3) PIN #1 ID ON TOP WILL BE LASER/INK MARKED.

(4) DIMENSION APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.20 AND 0.25mm FROM TERMINAL TIP.

(5) APPLIED FOR EXPOSED PAD AND TERMINALS.

### 6-Pin (1.2mm x 1.2mm) Thin MLF® (FL)

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