# MIC2775

## Micropower Low Voltage Supervisor

### Features

- Monitors Power Supply for Undervoltage Conditions
- Choice of Factory-Programmed Thresholds
- Generates 140 ms (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, 3.5 µA Typical
- Rejects Brief Input Transients
- No External Components
- Available in 5-Lead SOT-23 Package

### Applications

- Monitoring Processor Core and Input/Output Voltages
- Computer Systems
- PDAs/Handheld PCs
- Embedded Controllers
- Telecommunications Systems
- Power Supplies

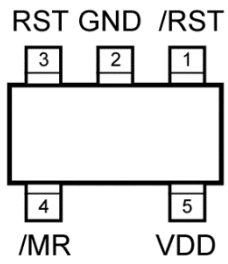
### General Description

The MIC2775 is a power supply supervisor that provides undervoltage monitoring, manual reset capability, and power-on reset generation in a compact 5-lead SOT-23 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.

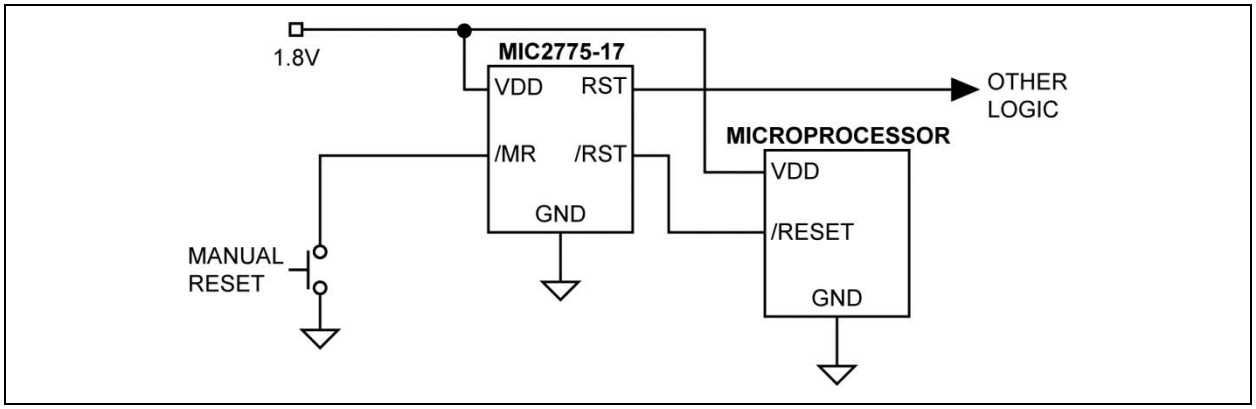
The reset outputs are asserted for no less than 140 ms at power-on and any time the input voltage drops below the reference voltage. It remains asserted for the timeout period after the input voltage subsequently rises back above the threshold boundary. A reset can be generated at any time by asserting the manual reset input, /MR. This reset output will remain active at least 140 ms 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 supply current is an ultra-low 3.5 µA.

### Package Type

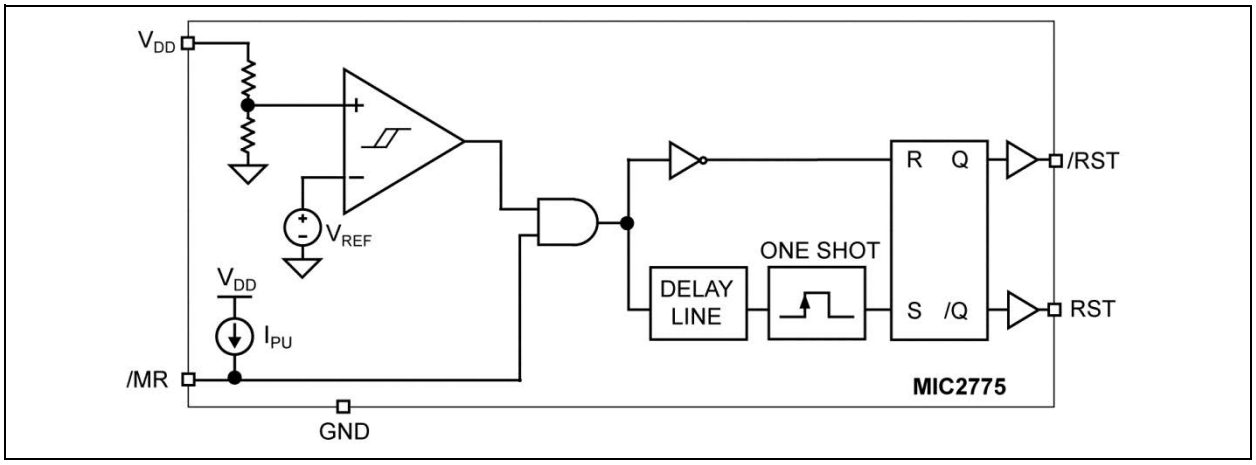
**MIC2775**
5-Lead SOT-23 (M5)
(Top View)



## Typical Application Circuit




## Functional Block Diagram



# 1.0 ELECTRICAL CHARACTERISTICS

## Absolute Maximum Ratings †

Supply Voltage ($V_{DD}$) ..... –0.3V to +7V
Output Voltage ($V_{/MR}$) ..... –0.3V to +7V
RST, /RST Current ..... 20 mA
ESD Rating (Note 1) ..... 1.5 kV

## Operating Ratings ‡

Supply Voltage ($V_{DD}$) ..... +1.5V to +5.5V
Input Voltage ($V_{/MR}$) ..... –0.3V to +6.0V

**† 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 recommended. Human body model, 1.5 kΩ in series with 100 pF.

## ELECTRICAL CHARACTERISTICS

**Electrical Characteristics:** $T_A$ = +25°C, **bold** values valid for –40°C ≤ $T_A$ ≤ +85°C, unless noted. Note 1

| Parameter | Symbol | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| Supply Current | $I_{DD}$ | — | 3.5 | — | µA | $V_{DD}$ = $V_{TH}$ + 1.6%, /MR, RST, /RST open |
| **$V_{DD}$ Voltage Threshold** | | | | | | |
| Undervoltage Threshold on VDD Pin | $V_{REF}$ | **$V_{TH}$ – 1.5%** | $V_{TH}$ | **$V_{TH}$ + 1.5%** | V | — |
| Hysteresis Voltage | $V_{HYST}$ | — | 1 | — | % | — |
| **Reset Outputs (/RST, RST)** | | | | | | |
| Propagation Delay | $t_{PROP}$ | — | 20 | — | µs | $V_{DD}$ = $V_{TH}$ + 1.5% + 100 mV to $V_{DD}$ = $V_{TH}$ – 1.5% – 100 mV |
| Reset Pulse Width | $t_{RST}$ | **140** | — | **280** | ms | — |
| RST or /RST Output Voltage Low | $V_{OL}$ | — | — | **0.3** | V | $I_{SINK}$ = 1.6 mA; $V_{DD}$ ≥ 1.6V |
| | | — | — | **0.3** | | $I_{SINK}$ = 100 µA; $V_{DD}$ ≥ 1.2V, Note 2 |
| RST or /RST Output Voltage High (H & L Versions Only) | $V_{OH}$ | **$0.8V_{DD}$** | — | — | V | $I_{SOURCE}$ = 500 µA; $V_{DD}$ ≥ 1.5V |
| | | **$0.8V_{DD}$** | — | — | | $I_{SOURCE}$ = 10 µA; $V_{DD}$ ≥ 1.2V, Note 2 |
| **Manual Reset Inputs (/MR)** | | | | | | |
| Input High Voltage | $V_{IH}$ | **$0.7V_{DD}$** | — | — | V | — |
| Input Low Voltage | $V_{IL}$ | — | — | **$0.3V_{DD}$** | V | — |
| Propagation Delay | $t_{PROP}$ | — | 5 | — | µs | From $V_{/MR}$ < ($V_{IL}$ – 100 mV) |
| Minimum Input Pulse Width | $t_{MIN}$ | — | 33 | — | ns | Reset occurs, $V_{/MR}$ < $V_{IL}$ |
| Internal Pull-Up Current | $I_{PU}$ | — | 100 | — | nA | — |
| Input Current, /MR | $I_{IN}$ | — | 100 | — | nA | $V_{/MR}$ < $V_{IL}$ |

**Note 1:** Specification for packaged product only.
**2:** $V_{DD}$ operating range is 1.5V to 5.5V. Output is ensured to be asserted down to $V_{DD}$ = 1.2V.

## TEMPERATURE SPECIFICATIONS

| Parameters | Sym. | Min. | Typ. | Max. | Units | Conditions |
|---|---|---|---|---|---|---|
| **Temperature Ranges** | | | | | | |
| Storage Temperature Range | $T_S$ | –65 | — | +150 | °C | — |
| Ambient Temperature Range | $T_A$ | –40 | — | +85 | °C | — |
| **Package Thermal Resistances** | | | | | | |
| Thermal Resistance, SOT-23 5-Ld | $\theta_{JA}$ | — | 256 | — | °C/W | — |

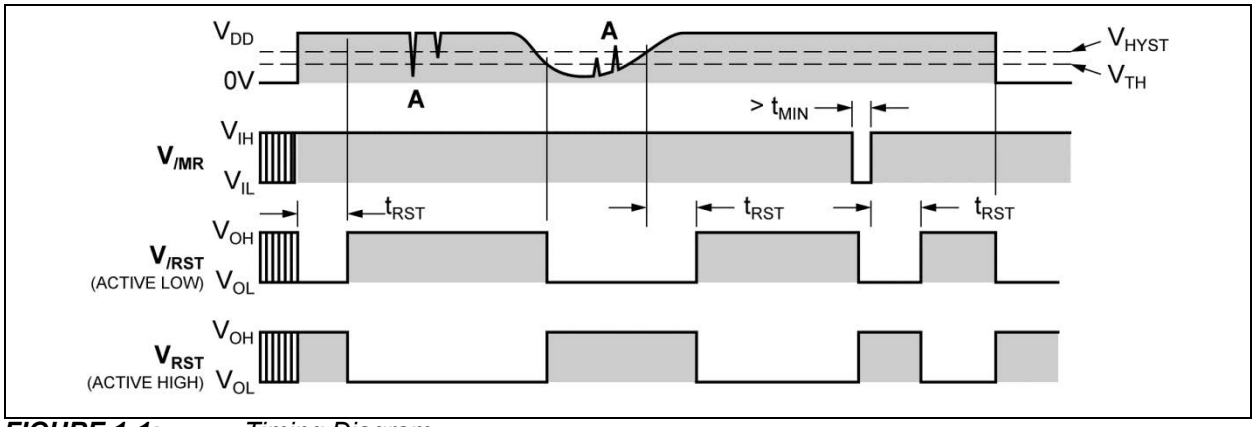



***FIGURE 1-1:*** *Timing Diagram.*

**Note:** Propagation delays not shown for clarity. A = The MIC2775 ignores very brief transients. See the Application Information section for details.

## 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 | /RST | Digital (Output): Asserted low whenever $V_{DD}$ falls below the reference voltage. It will remain asserted for no less than 140 ms after $V_{DD}$ returns above the threshold limit. |
| 2 | GND | Ground. |
| 3 | RST | Digital (Output): Asserted high whenever VDD falls below the reference voltage. It will remain asserted for no less than 140ms after VDD 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 140 ms 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. |

# 3.0 FUNCTIONAL DESCRIPTION

## 3.1 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.

## 3.2 RST, /RST Reset Output

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 microcontroller or microprocessor, 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.

## 3.3 /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 100 nA pull-up current to VDD and may be left open if unused.

# 4.0 APPLICATION INFORMATION

## 4.1 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 of 100 kΩ 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 4-1.

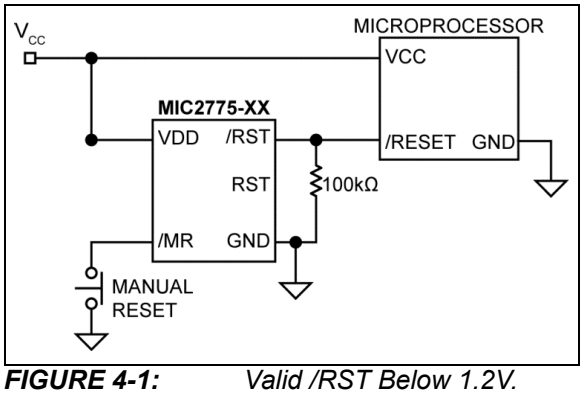



***FIGURE 4-1:*** *Valid /RST Below 1.2V.*

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 of 100 kΩ is typical for this application, as well. See Figure 4-2.

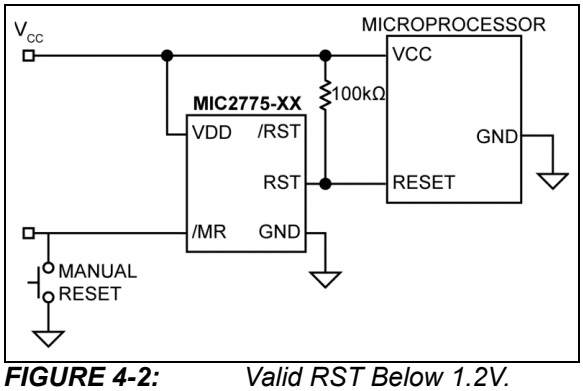



***FIGURE 4-2:*** *Valid RST Below 1.2V.*

## 4.2 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 4-3, 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.

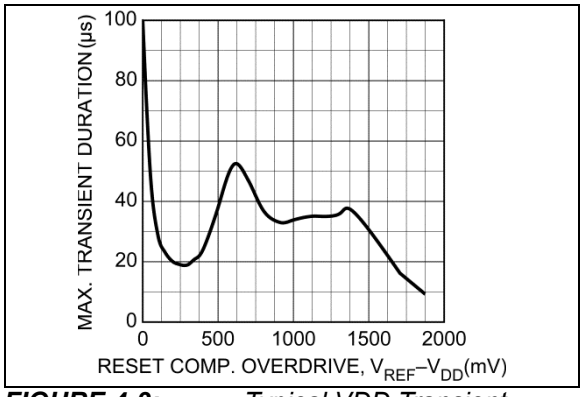
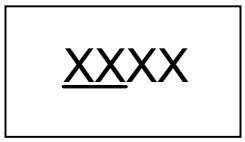



***FIGURE 4-3:*** *Typical VDD Transient Response.*

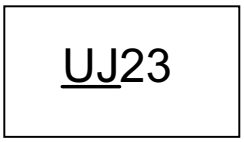
## 5.0 PACKAGING INFORMATION

### 5.1 Package Marking Information

5-Lead SOT-23* (Front)




Example




5-Lead SOT-23* (Back)


Example


**TABLE 5-1: MARKING CODES**

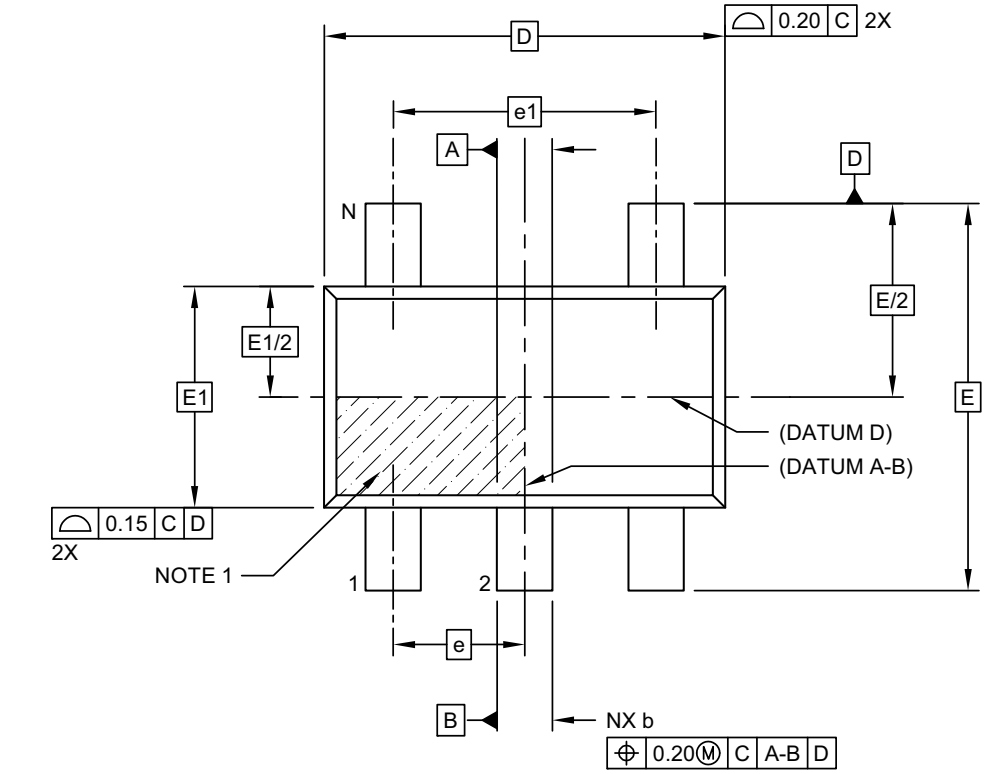
| Part Number | Marking Code | Voltage |
|---|---|---|
| MIC2775-17YM5 | UJ17 | 1.69V |
| MIC2775-22YM5 | UJ22 | 2.25V |
| MIC2775-23YM5 | UJ23 | 2.34V |
| MIC2775-25YM5 | UJ25 | 2.53V |
| MIC2775-26YM5 | UJ26 | 2.67V |
| MIC2775-28YM5 | UJ28 | 2.81V |
| MIC2775-29YM5 | UJ29 | 2.93V |
| MIC2775-31YM5 | UJ31 | 3.09V |
| MIC2775-44YM5 | UJ44 | 4.43V |
| MIC2775-46YM5 | UJ46 | 4.68V |

| | | |
|---|---|---|
| **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 (_) symbol may not be to scale. | |

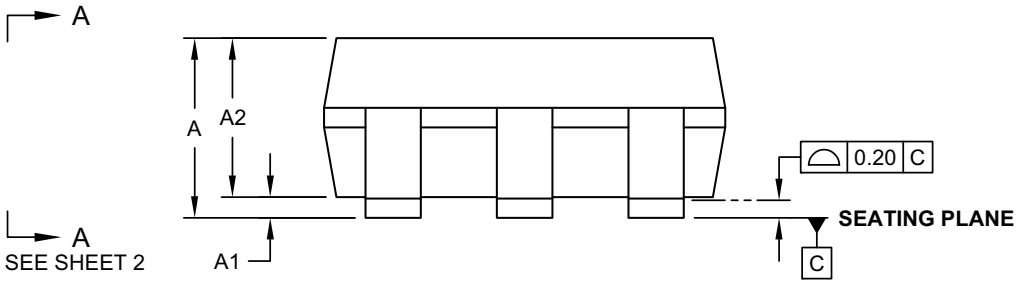
**Note:** If the full seven-character YYWWNNN code cannot fit on the package, the following truncated codes are used based on the available marking space:
6 Characters = YWWNNN; 5 Characters = WWNNN; 4 Characters = WNNN; 3 Characters = NNN;
2 Characters = NN; 1 Character = N

**5-Lead Plastic Small Outline Transistor (6BX) [SOT23]**

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




TOP VIEW

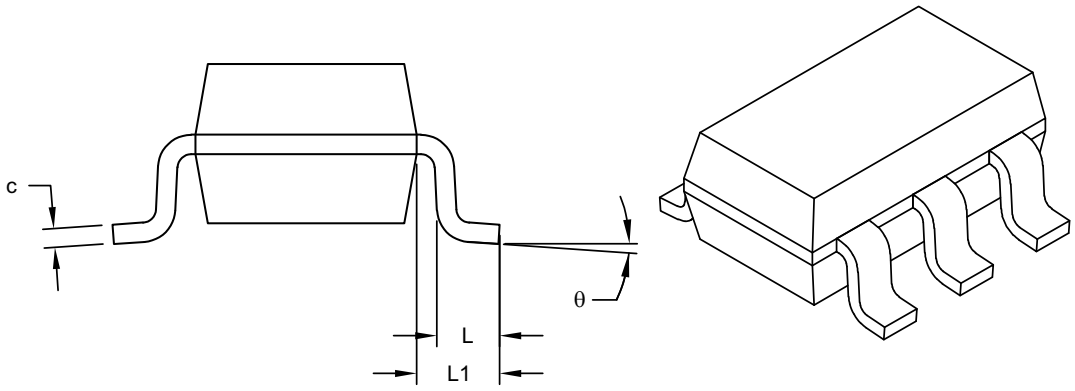



SIDE VIEW

Microchip Technology Drawing C04-091-6BX Rev G Sheet 1 of 2

### 5-Lead Plastic Small Outline Transistor (6BX) [SOT23]

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




VIEW A-A
SHEET 1

| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Number of Pins | N | | 5 | |
| Pitch | e | | 0.95 BSC | |
| Outside lead pitch | e1 | | 1.90 BSC | |
| Overall Height | A | 0.90 | - | 1.45 |
| Molded Package Thickness | A2 | 0.89 | - | 1.30 |
| Standoff | A1 | - | - | 0.15 |
| Overall Width | E | | 2.80 BSC | |
| Molded Package Width | E1 | | 1.60 BSC | |
| Overall Length | D | | 2.90 BSC | |
| Foot Length | L | 0.30 | - | 0.60 |
| Footprint | L1 | | 0.60 REF | |
| Foot Angle | ϕ | 0° | - | 10° |
| Lead Thickness | c | 0.08 | - | 0.26 |
| Lead Width | b | 0.20 | - | 0.51 |

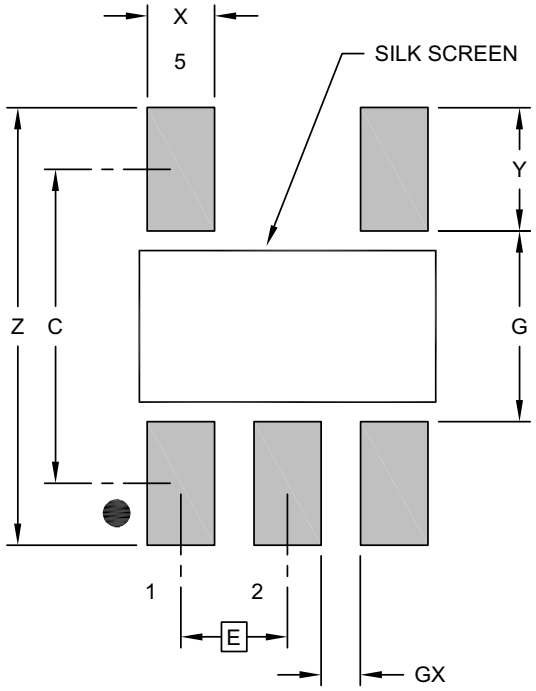
Notes:

1. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.25mm per side.
2. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
   REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-091-6BX Rev G Sheet 2 of 2

### 5-Lead Plastic Small Outline Transistor (6BX) [SOT23]

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




RECOMMENDED LAND PATTERN

| Units | | MILLIMETERS | | |
|---|---|---|---|---|
| Dimension Limits | | MIN | NOM | MAX |
| Contact Pitch | E | | 0.95 BSC | |
| Contact Pad Spacing | C | | 2.80 | |
| Contact Pad Width (X5) | X | | | 0.60 |
| Contact Pad Length (X5) | Y | | | 1.10 |
| Distance Between Pads | G | 1.70 | | |
| Distance Between Pads | GX | 0.35 | | |
| Overall Width | Z | | | 3.90 |

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing No. C04-2091-6BX Rev G

**NOTES:**

# APPENDIX A: REVISION HISTORY

## Revision A (August 2022)

- Converted Micrel document MIC2775 to Microchip data sheet DS20006716A.
- Minor 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.

| **Part Number** | **-XX** | **X** | **XX** | **-XX** |
|---|---|---|---|---|
| Device | Voltage Code | Temp. Range | Package | Media Type |

| | | |
|---|---|---|
| **Device:** | MIC2775: | Micropower Low Voltage Supervisor |
| **Voltage Code:** | 17 = 1.69V<br>22 = 2.25V<br>23 = 2.34V<br>25 = 2.53V<br>26 = 2.67V<br>28 = 2.81V<br>29 = 2.93V<br>31 = 3.09V<br>44 = 4.43V<br>46 = 4.68V | |
| **Temperature Range:** | Y = | –40°C to +85°C |
| **Package:** | M5 = | 5-Lead SOT-23 |
| **Media Type:** | TR =<br>TX = | 3,000/Reel<br>3,000/Reel Reversed (29 Voltage Code only) |

**Examples:**

a) MIC2775-22YM5-TR: MIC2775, 2.25V, –40°C to +85°C Temp. Range, 5-Lead SOT-23, 3,000/Reel

b) MIC2775-46YM5-TR: MIC2775, 4.68V, –40°C to +85°C Temp. Range, 5-Lead SOT-23, 3,000/Reel

c) MIC2775-26YM5-TR: MIC2775, 2.67V, –40°C to +85°C Temp. Range, 5-Lead SOT-23, 3,000/Reel

d) MIC2775-29YM5-TX: MIC2775, 2.93V, –40°C to +85°C Temp. Range, 5-Lead SOT-23, 3,000/Reel Reversed

e) MIC2775-31YM5-TR: MIC2775,3.09V, –40°C to +85°C Temp. Range, 5-Lead SOT-23, 3,000/Reel Reversed

**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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