MIC705/6/7/8

Microprocessor Supervisory Circuit

Features

- Debounced Manual Reset Input is TTL/CMOS Compatible
- Reset Pulse Width: 200 ms
- Watchdog Timer: 1.6 sec. (MIC705/6)
- 4.65V or 4.40V Precision Voltage Monitor
- Early Power-Fail Warning or Low-Battery Detect

Applications

- Automotive Systems
- Intelligent Systems
- Critical Microprocessor Power Monitoring
- Battery-Powered Computers
- Computers
- Controllers

General Description

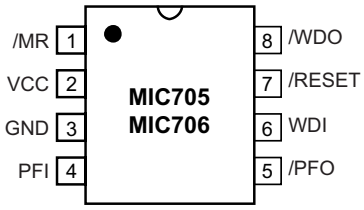
The MIC705, MIC706, MIC707, and MIC708 are inexpensive microprocessor supervisory circuits that monitor power supplies in microprocessor-based systems. The circuit functions include a watchdog timer, microprocessor reset, power-failure warning, and a debounced manual reset input.

The MIC705 and MIC706 offer a watchdog timer function, while the MIC707 and MIC708 have an active-high reset output in addition to the active-low reset output.

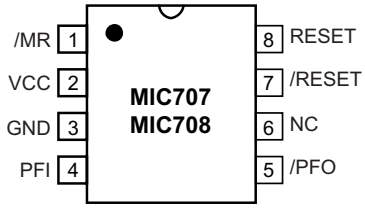
Supply voltage monitor levels of 4.65V and 4.4V are available. The MIC705 and MIC707 have a nominal reset threshold level of 4.65V while the MIC706 and MIC708 have a 4.4V nominal reset threshold level. When the supply voltage drops below the respective reset threshold level, /RESET is asserted.

Package Types

MIC705/MIC706
8-Lead SOIC (M)
(Top View)



MIC707/MIC708
8-Lead SOIC (M)
(Top View)



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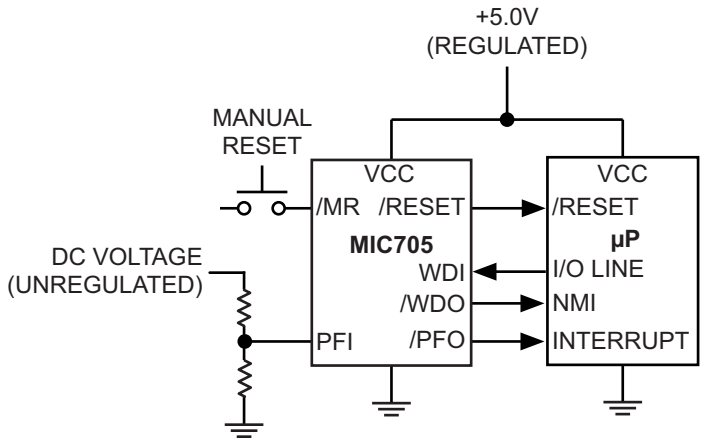
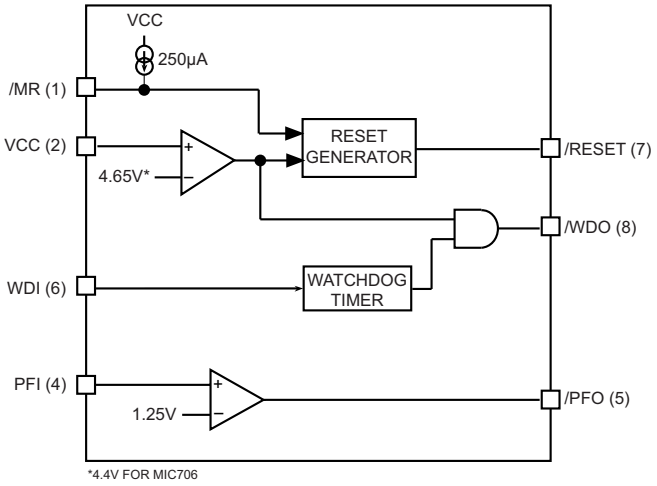
Typical Application Circuit

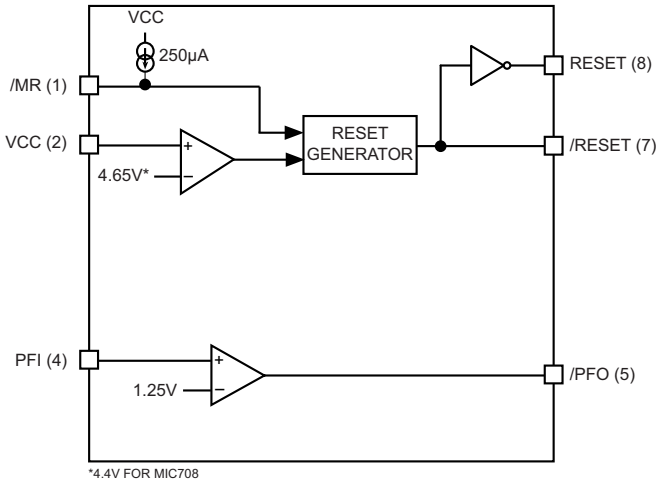


Functional Block Diagrams

MIC705/MIC706



MIC707/MIC708



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1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

Terminal Voltage (V_{CC}) ..... –0.3V to +6.0V
Terminal Voltage (All Other Inputs) ..... –0.3V to (V_{CC} + 0.3V)
Input Current (V_{CC}, GND) ..... 25 mA
Output Current (All) ..... 20 mA

Operating Ratings ‡

Power Dissipation (SOP) ..... 400 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.

ELECTRICAL CHARACTERISTICS

Electrical Characteristics: V_{CC} = 4.75V to 5.5V for MIC705/707; V_{CC} = 4.5V to 5.5V for MIC706/708; TA = Operating Temperature Range, **bold** values valid for –40°C ≤ T_A ≤ +85°C, unless noted. (Note 1)

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Operating Voltage Range	V_{CC}	1.4	—	5.5	V	—
Supply Current	I_{CC}	—	—	60	µA	—
Reset Voltage Threshold	V_{RST}	4.50	4.65	4.75	V	MIC705, MIC707
		4.25	4.40	4.50		MIC706, MIC708
Reset Threshold Hysteresis	V_{RST_HYS}	—	40	—	mV	—
Reset Pulse Width	t_{RS}	140	200	280	ms	—
/RESET Output Voltage		V_{CC} – 1.5	—	—	V	I_{SOURCE} = 800 µA
		—	—	0.4		I_{SINK} = 3.2 mA
RESET Output Voltage		V_{CC} – 1.5	—	—	V	I_{SOURCE} = 800 µA
		—	—	0.4		I_{SINK} = 1.2 mA
Watchdog Timeout Period	t_{WD}	1.0	1.6	2.25	sec	—
WDI Minimum Input Pulse	t_{WP}	50	—	—	ns	V_{IL} = 0.4V, V_{IH} = 80% of V_{CC}
WDI Threshold Voltage		3.5	—	—	V	V_{IH}, V_{CC} = 5V
		—	—	0.8		V_{IL}, V_{CC} = 5V
WDI Input Current		–150	–50	—	µA	WDI = 0V
		—	50	150		WDI = V_{CC}
WDO Output Voltage		V_{CC} – 1.5	—	—	V	I_{SOURCE} = 800 µA
		—	—	0.4		I_{SINK} = 1.2 mA
/MR Pull-Up Current		100	250	600	µA	/MR = 0V
/MR Pulse Width	t_{MR}	150	—	—	ns	—
/MR Input Threshold	V_{IL}	—	—	0.8	V	—
	V_{IH}	2.0	—	—		—

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ELECTRICAL CHARACTERISTICS (CONTINUED)

Electrical Characteristics: V_{CC} = 4.75V to 5.5V for MIC705/707; V_{CC} = 4.5V to 5.5V for MIC706/708; TA = Operating Temperature Range, **bold** values valid for –40°C ≤ T_A ≤ +85°C, unless noted. (Note 1)

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
/MR-to-Reset Output Delay	t_{MD}	—	—	250	ns	—
PFI Input Threshold		1.2	1.25	1.3	V	V_{CC} = 5V
PFI Input Current		–25	0.01	25	nA	—
/PFO Output Voltage		—	—	0.4	V	I_{SINK} = 3.2 mA
		V_{CC} – 1.5	—	—		V_{CC} = 5V, I_{SOURCE} = 800 µA

Note 1: Specification for packaged product only.

TEMPERATURE SPECIFICATIONS

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Operating Temperature Range	T_A	–40	—	+85	°C	—
Storage Temperature	T_S	–65	—	+150	°C	—
Lead Temperature	T_{LEAD}	—	—	+300	°C	Soldering, 10 sec.

Timing Diagram

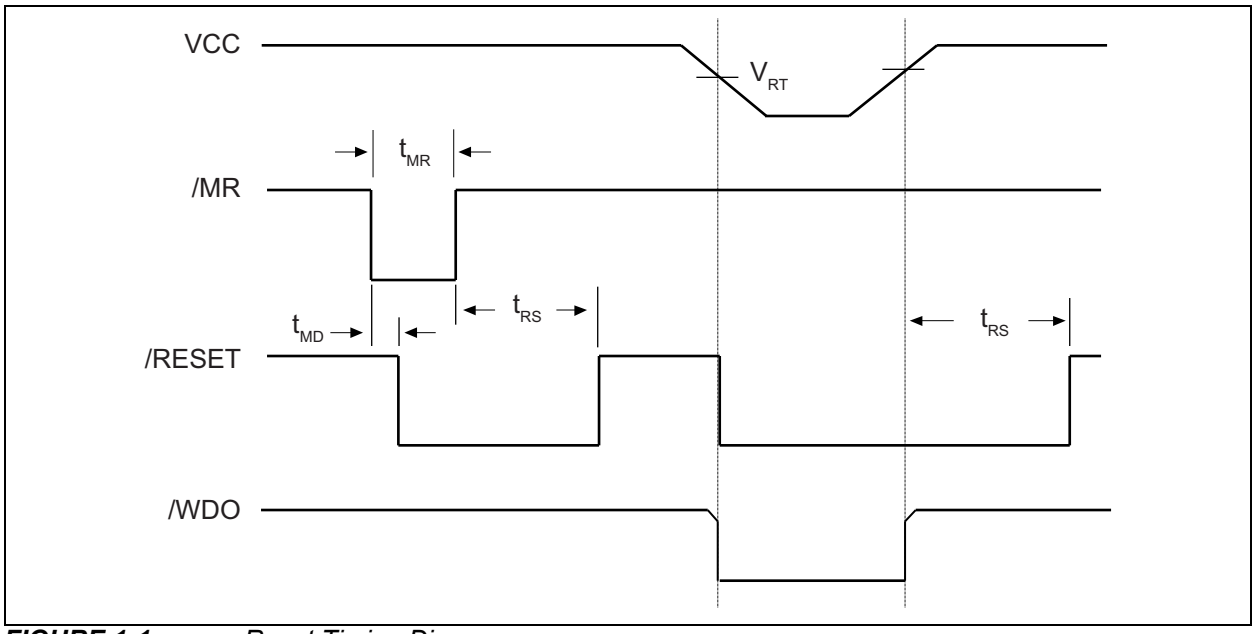

FIGURE 1-1: *Reset Timing Diagram.*

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2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

TABLE 2-1: PIN FUNCTION TABLE

Pin Number MIC705/6	Pin Number MIC707/8	Pin Name	Description
1	1	/MR	Manual reset input forces /RESET to assert when pulled below 0.8V. An internal pull-up current of 250 µA on this input forces it high when left floating. This input can also be driven from TTL or CMOS logic.
2	2	VCC	Primary supply input, +5V.
3	3	GND	IC ground pin, 0V reference.
4	4	PFI	Power-Fail Input: Internally connected to the power-fail comparator which is referenced to 1.25V. The power-fail output (/PFO) remains high if PFI is above 1.25V. PFI should be connected to GND or VCC if the power-fail comparator is not used.
5	5	/PFO	Power-Fail Output: The power-fail comparator is independent of all other function on this device.
6	N/A	WDI	Watchdog Input. The WDI input monitors microprocessor activity; an internal watchdog timer resets itself with each transition on the watchdog input. If the WDI pin is held high or low for longer than the watchdog timeout period, /WDO is forced to active low. The watchdog function can be disabled by floating the WDI pin.
N/A	6	NC	Not internally connected.
7	7	/RESET	/RESET is asserted if either V_{CC} goes below the reset threshold voltage or by low signal on the manual reset input (/MR). /RESET remains asserted for one reset timeout period (200 ms) after V_{CC} exceeds the reset threshold voltage or after the manual reset pin transition from low to high. The watchdog timer will not assert /RESET unless /WDO is connected to /MR.
8	N/A	/WDO	Output for the watchdog timer. The watchdog timer resets itself with each transition to the watchdog input. If the WDI pin is held high or low for longer than the watchdog timeout period, /WDO is forced low. /WDO will also be forced low if V_{CC} is below the reset threshold voltage and will remain low until V_{CC} returns to a valid level.
N/A	8	RESET	RESET is the compliment of /RESET and is asserted if either V_{CC} goes below the reset threshold voltage or by a low signal on the manual reset input (/MR). RESET is suitable for microprocessor systems that use active high reset.

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3.0 APPLICATION INFORMATION

3.1 Microprocessor Reset

The /RESET pin is asserted whenever V_{CC} falls below the reset threshold voltage or when /MR goes low. The reset pin remains asserted for a period of 200 ms after V_{CC} has risen above the reset threshold voltage and /MR goes high. The reset function ensures the microprocessor is properly reset and powers up into a known condition after a power failure. /RESET will remain valid with VCC as low as 1.4V.

3.2 Power-Fail Warning

An additional comparator that is independent of the other functions on the MIC705/6/7/8 is provided for early warning of power failure. An external voltage divider can be used to compare unregulated DC to an internal 1.25V reference. The voltage divider ratio on the input of the power-fail comparator (PFI) can be chosen so as to trip the power-fail comparator a few milliseconds before V_{CC} falls below the maximum reset threshold voltage. The output of the power-fail comparator (/PFO) can be used to interrupt the microprocessor when used in this mode and execute shutdown procedures prior to power loss. Hysteresis can be added to this comparator with external resistors, as is commonly done with any comparator.

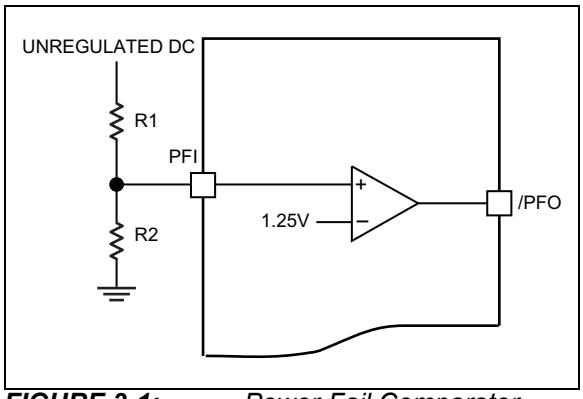

FIGURE 3-1: *Power-Fail Comparator.*

3.3 Watchdog Timer

The microprocessor can be monitored by connecting the WDI pin (watchdog input) to a bus line or an I/O line. If a transition doesn't occur on the WDI pin within the watchdog timeout period, then /WDO will go low. A minimum pulse of 50 ns or any transition low-to-high or high-to-low on the WDI pin will reset the watchdog timer. The output of the watchdog timer (/WDO) will remain high if WDI left floating. If V_{CC} falls below the reset threshold voltage, then /WDO goes low immediately regardless of WDI.

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4.0 PACKAGING INFORMATION

4.1 Package Marking Information

8-Lead SOIC*

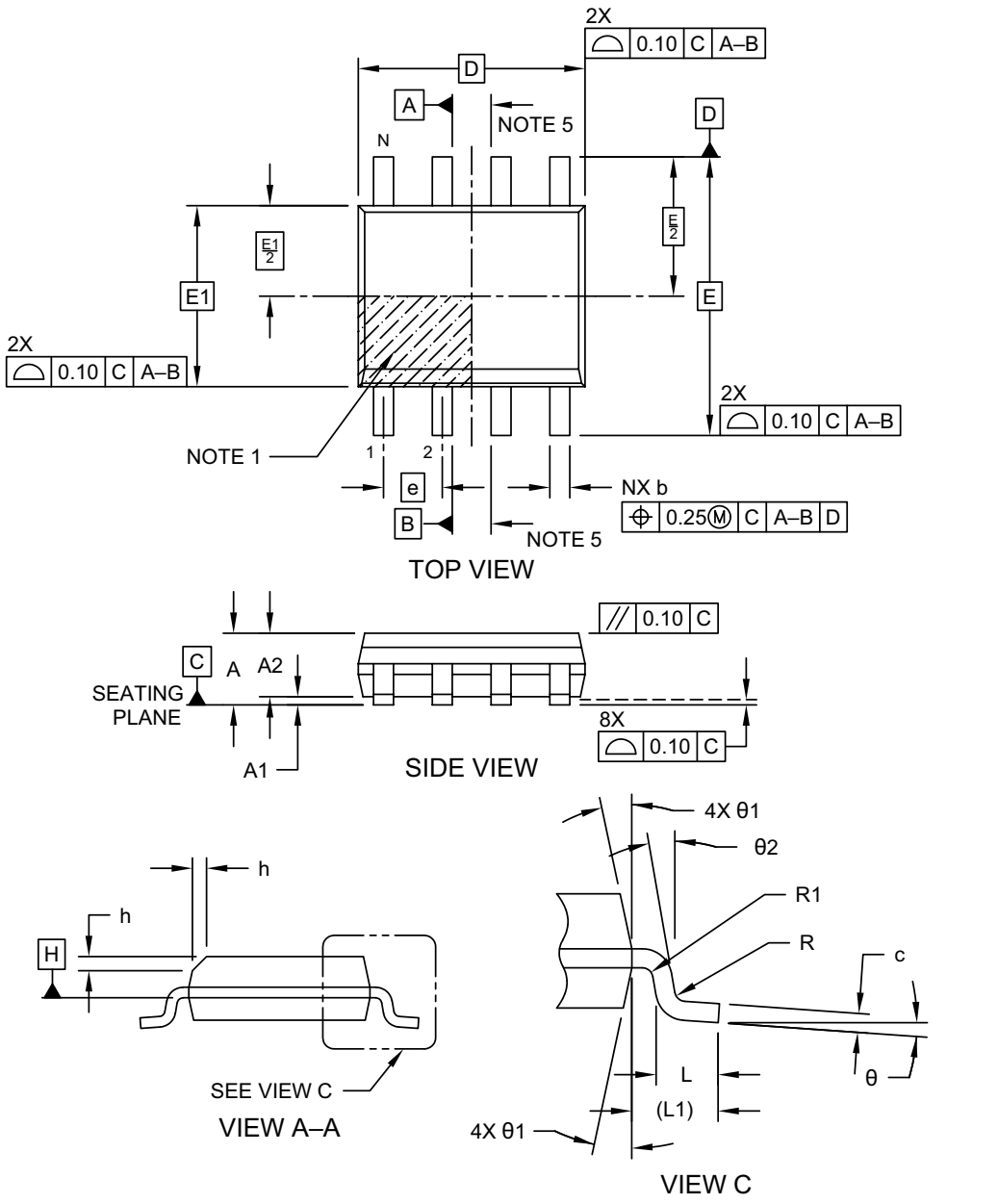
Example

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 (_) 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

8-Lead Plastic Small Outline (3BX) - Narrow, 3.90 mm (.150 In.) Body [SOIC]
Atmel Legacy Global Package Code SWB

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



Microchip Technology Drawing No. C04-057-3BX Rev J Sheet 1 of 2

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Atmel Legacy Global Package Code SWB

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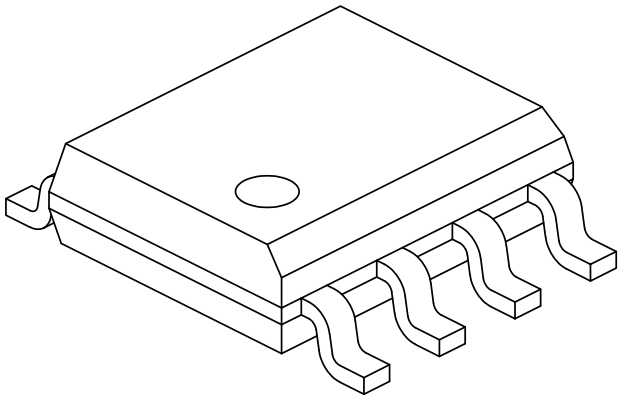

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		8	
Pitch	e		1.27 BSC	
Overall Height	A	–	–	1.75
Molded Package Thickness	A2	1.25	–	-
Standoff §	A1	0.10	–	0.25
Overall Width	E		6.00 BSC	
Molded Package Width	E1		3.90 BSC	
Overall Length	D		4.90 BSC	
Chamfer (Optional)	h	0.25	–	0.50
Foot Length	L	0.40	–	1.27
Footprint	L1		1.04 REF	
Lead Thickness	c	0.17	–	0.25
Lead Width	b	0.31	–	0.51
Lead Bend Radius	R	0.07	–	–
Lead Bend Radius	R1	0.07	–	–
Foot Angle	θ	0°	–	8°
Mold Draft Angle	θ1	5°	–	15°
Lead Angle	θ2	0°	–	8°

Notes:

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. § Significant Characteristic
3. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15mm per side.
4. 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.
5. Datums A & B to be determined at Datum H.

Microchip Technology Drawing No. C04-057-3BX Rev J Sheet 2 of 2

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8-Lead Plastic Small Outline (3BX) - Narrow, 3.90 mm (.150 In.) Body [SOIC]

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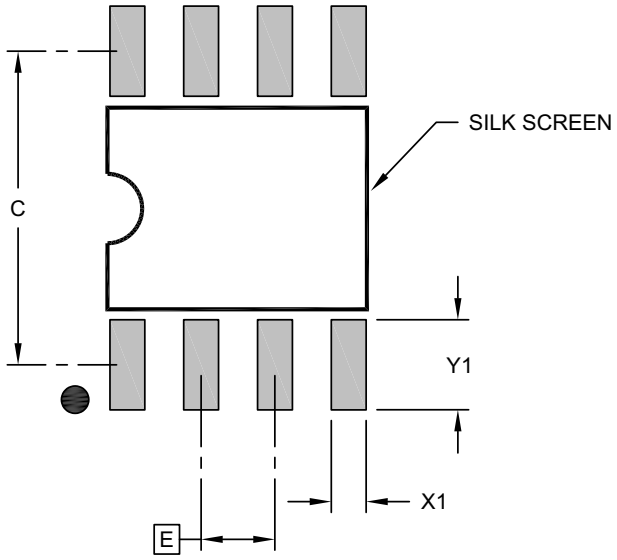

RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E		1.27 BSC	
Contact Pad Spacing	C		5.40	
Contact Pad Width (X8)	X1			0.60
Contact Pad Length (X8)	Y1			1.55

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

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

Microchip Technology Drawing C04-2057-3BX Rev J

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APPENDIX A: REVISION HISTORY

Revision A (October 2022)

- Converted Micrel document MIC705/6/7/8 to Microchip data sheet DS20006743A.
- Minor text changes throughout.
- Updated package outline drawing to current standard.

NOTES:

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PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

Part Number	X	X	-XX
Device	Package	Temperature Range	Media Type

Device:	MIC705: MIC706: MIC707: MIC708:		Microprocessor Supervisory Circuit (Note 1) Microprocessor Supervisory Circuit (Note 2) Microprocessor Supervisory Circuit (Note 3) Microprocessor Supervisory Circuit (Note 4)
Package:	M	=	8-Lead SOIC
Temperature Range:	Y	=	–40°C to +85°C
Media Type:	<blank> TR	= =	95/Tube 2,500/Reel

Note 1: The MIC705MY has a 4.65V threshold, active-low reset, and watchdog timer.

2: The MIC706MY has a 4.40V threshold, active-low reset, and watchdog timer.

3: The MIC707MY has a 4.65V threshold, active-low reset, active-high reset, and watchdog timer.

4: The MIC708MY has a 4.40V threshold, active-low reset, active-high reset, and watchdog timer.

Examples:

a) MIC705MY:	MIC705, 8-Lead SOIC, –40°C to +85°C Temperature Range, 95/Tube
b) MIC706MY-TR:	MIC706, 8-Lead SOIC, –40°C to +85°C Temperature Range, 2,500/Reel
c) MIC707MY-TR:	MIC707, 8-Lead SOIC, –40°C to +85°C Temperature Range, 2,500/Reel
d) MIC708MY:	MIC708, 8-Lead SOIC, –40°C to +85°C Temperature Range, 95/Tube
e) MIC705MY-TR:	MIC705, 8-Lead SOIC, –40°C to +85°C Temperature Range, 2,500/Reel
f) MIC706MY:	MIC706, 8-Lead SOIC, –40°C to +85°C Temperature Range, 95/Tube
g) MIC707MY:	MIC707, 8-Lead SOIC, –40°C to +85°C Temperature Range, 95/Tube
h) MIC708MY-TR:	MIC708, 8-Lead SOIC, –40°C to +85°C Temperature Range, 2,500/Reel

Note: 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.

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