

# LM3710/LM3711 Microprocessor Supervisory Circuits with Power Fail Input, Low Line Output, Manual Reset and Watchdog Timer

Check for Samples: LM3710, LM3711

#### **FEATURES**

- Standard Reset Threshold Voltage: 3.08V
- Custom Reset Threshold Voltages: For other voltages between 2.2V and 5.0V in 10mV increments, contact TI
- No External Components Required
- Manual-Reset Input
- RESET (LM3710) or RESET (LM3711) Outputs
- Precision Supply Voltage Monitor
- Factory Programmable Reset and Watchdog Timeout Delays
- Separate Power Fail Comparator
- Available in DSBGA Package for Minimum Footprint
- ±0.5% Reset Threshold Accuracy at Room Temperature
- ±2% Reset Threshold Accuracy Over Temperature Extremes
- Reset Assertion Down to 1V V<sub>CC</sub> (RESET Option Only)
- 28 μA V<sub>CC</sub> Supply Current

#### **APPLICATIONS**

- Embedded Controllers and Processors
- Intelligent Instruments
- Automotive Systems
- Critical µP Power Monitoring

# **Typical Application**

# DESCRIPTION

The LM3710/LM3711 series of microprocessor supervisory circuits provide the maximum flexibility for monitoring power supplies and battery controlled functions in systems without backup batteries. The LM3710/LM3711 series are available in VSSOP-10 and 9-bump DSBGA packages.

Built-in features include the following:

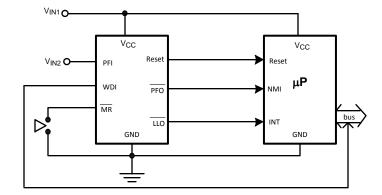
Reset: Reset is asserted during <u>power-up</u>, power-down, and brownout conditions. RESET is ensured down to  $V_{CC}$  of 1.0V.

Manual Reset Input: An input that asserts reset when pulled low.

Power-Fail Input: A 1.225V threshold detector for power fail warning, or to monitor a power supply other than  $V_{CC}$ .

Low Line Output: This early power failure warning indicator goes low when the supply voltage drops to a value which is 2% higher than the reset threshold voltage.

Watchdog Timer: The WDI (Watchdog Input) monitors one of the  $\mu P$ 's output lines for activity. If no output transition occurs during the watchdog timeout period, reset is activated.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

All trademarks are the property of their respective owners.



# **Connection Diagram**

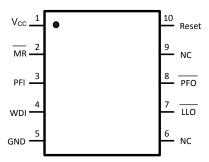


Figure 1. VSSOP-10

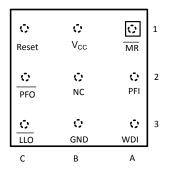


Figure 2. Top View (looking from the coating side) DSBGA 9 Bump Package

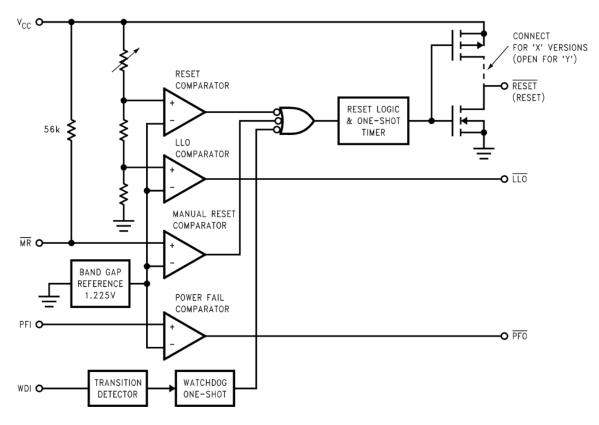
# **PIN DESCRIPTIONS**

Pin	Pin No.		Function					
DSBGA	VSSOP	Name	Function					
A1	2	MR	Manual-Reset input. When $\overline{\text{MR}}$ is less than $V_{\text{MRT}}$ (Manual Reset Threshold) $\overline{\text{RESET}}/\text{RESET}$ is engaged.					
B1	1	V <sub>CC</sub>	Power Supply input.					
C1	10	RESET	Reset Logic Output. Pulses low for $t_{RP}$ (Reset Timeout Period) when triggered, and stays low whenever $V_{CC}$ is below the reset threshold or when $\overline{MR}$ is below $V_{MRT}$ . It remains low for $t_{RP}$ after either $V_{CC}$ rises above the reset threshold, or after $\overline{MR}$ input rises above $V_{MRT}$ (LM3710 only).					
		RESET	Reset Logic Output. RESET is the inverse of RESET (LM3711 only).					
C2	8	PFO	Power-Fail Logic Output. When PFI is below V <sub>PFT</sub> , PFO goes low; otherwise, PFO remains high.					
C3	7	LLO	Low-Line Logic Output. Early Power-Fail warning output. Low when $V_{CC}$ falls below $V_{LLOT}$ (Low-Line Output Threshold). This output can be used to generate an NMI (Non-Maskable Interrupt) to provide an early warning of imminent power-failure.					
В3	5	GND	Ground reference for all signals.					
А3	4	WDI	Watchdog Input Transition Monitor: If no transition activity occurs for a period exceeding t <sub>WD</sub> (Watchdog Timeout Period), reset is engaged.					
A2	3	PFI	Power-Fail Comparator Input. When PFI is less than V <sub>PFT</sub> (Power-Fail Reset Threshold), the PFO goes low; otherwise, PFO remains high.					
B2	6, 9	NC	No Connect. Test input used at factory only. Leave floating.					

Submit Documentation Feedback



# **Block Diagram**



# **Table Of Functions**

Part Number	Active Low Reset	Active High Reset	Output (X = totem-pole) (Y = open-drain)	Reset Watchdog Timeout Timeout Period Period		Manual Reset	Power Fail Comparator	Low Line Output
LM3710	х		X, Y <sup>(1)</sup>	Customized	Customized	Х	x	х
LM3711		х	X	Customized	Customized	x	х	х

(1) Available upon request. Contact TI.



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.



# Absolute Maximum Ratings<sup>(1)(2)</sup>

Supply Voltage (V <sub>CC</sub> )	-0.3V to 6.0V
All Other Inputs	-0.3V to V <sub>CC</sub> + $0.3$ V
ESD Ratings <sup>(3)</sup> Human Body Model Machine Model	1.5kV 150V
Power Dissipation	(4)

- Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but do not ensure specific performance limits. For ensured specifications and test conditions, see the Electrical Characteristics. The ensured specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed conditions.
- (2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/Distributors for availability and specifications.
- The Human Body model is a 100 pF capacitor discharged through a 1.5 kΩ resistor into each pin. The machine model is a 200pF capacitor discharged directly into each pin.
- The maximum allowable power dissipation is a function of the maximum junction temperature, T<sub>J</sub>(MAX), the junction-to-ambient thermal resistance,  $\theta_{J-A}$ , and the ambient temperature,  $T_A$ . The maximum allowable power dissipation at any ambient temperature is calculated  $\begin{array}{l} \text{using:} \\ \text{P}\left(\text{MAX}\right) \ = \ \text{T}_{\text{J}}(\text{MAX}) \ - \ \text{T}_{\text{A}} \end{array}$

Where the value of  $\theta_{J-A}$  for the VSSOP-10 package is 195°C/W in a typical PC board mounting and the DSBGA package is 220°C/W.

# Operating Ratings<sup>(1)</sup>

Temperature Range
-------------------

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but do not ensure specific performance limits. For ensured specifications and test conditions, see the Electrical Characteristics. The ensured specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed conditions.

# LM3710/LM3711 Series Electrical Characteristics

Limits in the standard typeface are for  $T_J = 25^{\circ}$ C and limits in **boldface type** apply over full operating range. Unless otherwise specified:  $V_{co} = +2.2 \text{V}$  to 5.5 V

Symbol	Parameter	Conditions	Min	Тур	Max	Units
POWER SU	JPPLY		1	1		
V <sub>CC</sub>	Operating Voltage	LM3710	1.0		5.5	V
	Range: V <sub>CC</sub>	LM3711	1.2		5.5	7 V
I <sub>CC</sub>	V <sub>CC</sub> Supply Current	All inputs = V <sub>CC</sub> ; all outputs floating		28	50	μA
RESET THI	RESHOLD					
V <sub>RST</sub>	Reset Threshold	V <sub>CC</sub> falling	-0.5 - <b>2</b>	V <sub>RST</sub>	+0.5 <b>+2</b>	%
		V <sub>CC</sub> falling: T <sub>A</sub> = 0°C to 70°C	-1.5		+1.5	
V <sub>RSTH</sub>	Reset Threshold Hysteresis			0.0032•V <sub>RST</sub>		mV
t <sub>RP</sub>	Reset Timeout Period	Reset Timeout Period = E, J, N, S Reset Timeout Period = F, K, P, T Reset Timeout Period = G, L, Q, U Reset Timeout Period = H, M, R, V	1 20 140 1120	1.4 28 200 1600	2 40 280 2240	ms
t <sub>RD</sub>	V <sub>CC</sub> to Reset Delay	V <sub>CC</sub> falling at 1mV/μs		20		μs
RESET (LN	13711)					
$V_{OL}$	RESET	$V_{CC} > 2.25V$ , $I_{SINK} = 900\mu A$			0.3	
		$V_{CC} > 2.7V$ , $I_{SINK} = 1.2mA$			0.3	V
		V <sub>CC</sub> > 4.5V, I <sub>SINK</sub> = 3.2mA			0.4	
$V_{OH}$	RESET	$V_{CC} > 1.2V$ , $I_{SOURCE} = 50\mu$ A	0.8 V <sub>CC</sub>			
		$V_{CC} > 1.8V$ , $I_{SOURCE} = 150\mu A$	0.8 V <sub>CC</sub>			
		$V_{CC} > 2.25V$ , $I_{SOURCE} = 300\mu A$	0.8 V <sub>CC</sub>			V
		$V_{CC} > 2.7V$ , $I_{SOURCE} = 500\mu A$	0.8 V <sub>CC</sub>			
		$V_{CC} > 4.5V$ , $I_{SOURCE} = 800\mu A$	V <sub>CC</sub> - 1.5V			

Submit Documentation Feedback

Copyright © 2000-2013, Texas Instruments Incorporated



# LM3710/LM3711 Series Electrical Characteristics (continued)

Limits in the standard typeface are for  $T_J = 25^{\circ}\text{C}$  and limits in **boldface type** apply over full operating range. Unless otherwise specified:  $V_{CC} = +2.2\text{V}$  to 5.5V.

Symbol	Parameter	Conditions	Min	Тур	Max	Units
$I_{LKG}$	Output Leakage Current	$V_{RESET} = 5.5V$			1.0	μA
RESET (LM	3710)					
V <sub>OL</sub>	RESET	$V_{CC} > 1.0V$ , $I_{SINK} = 50\mu A$			0.3	
		V <sub>CC</sub> > 1.2V, I <sub>SINK</sub> = 100μA			0.3	
		V <sub>CC</sub> > 2.25V, I <sub>SINK</sub> = 900μA			0.3	
		V <sub>CC</sub> > 2.7V, I <sub>SINK</sub> = 1.2mA			0.3	
		V <sub>CC</sub> > 4.5V, I <sub>SINK</sub> = 3.2mA			0.4	V
V <sub>OH</sub>	RESET	V <sub>CC</sub> > 2.25V, I <sub>SOURCE</sub> = 300μA	0.8 V <sub>CC</sub>			
011		$V_{CC} > 2.7V$ , $I_{SOURCE} = 500\mu A$	0.8 V <sub>CC</sub>			
		$V_{CC} > 4.5V$ , $I_{SOURCE} = 800\mu A$	V <sub>CC</sub> - 1.5V			
WDI		CO - 7 COUNCE F	00			
WDI	Watchdog Input Current		-1		+1	μA
WDI <sub>T</sub>	Watchdog Input Threshold		0.2•V <sub>CC</sub>	1.225	0.8•V <sub>CC</sub>	V
t <sub>WD</sub>	Watchdog Timeout Period	Watchdog Timeout Period = E, F, G, H Watchdog Timeout Period = J, K, L, M Watchdog Timeout Period = N, P, Q, R Watchdog Timeout Period = S, T, U, V	4.3 71 1120 17900	6.2 102 1600 25600	9.3 153 2400 38400	ms
PFI/MR		2, , 2,				
V <sub>PFT</sub>	PFI Input Threshold		1.200	1.225	1.250	V
V <sub>MRT</sub>	MR Input Threshold	MR, Low		5	0.8	-
- IVIIX I		MR, High	2.0			V
V <sub>PFTH</sub> / V <sub>MRTH</sub>	PFI/MR Threshold Hysteresis	PFI/MR falling: V <sub>CC</sub> = V <sub>RST MAX</sub> to 5.5V		0.0032•V <sub>RST</sub>		mV
I <sub>PFI</sub>	Input Current (PFI only)		-75		75	nA
$R_{MR}$	MR Pull-up Resistance		35	56	75	kΩ
t <sub>MD</sub>	MR to Reset Delay			12		μS
t <sub>MR</sub>	MR Pulse Width		25			μS
PFO, LLO	•		1	1		Į.
V <sub>OL</sub>	PFO, LLO Output	V <sub>CC</sub> > 2.25V, I <sub>SINK</sub> = 900µA			0.3	
	Voltage	V <sub>CC</sub> > 2.7V, I <sub>SINK</sub> = 1.2mA			0.3	
		V <sub>CC</sub> > 4.5V, I <sub>SINK</sub> = 3.2mA			0.4	
V <sub>OH</sub>		V <sub>CC</sub> > 2.25V, I <sub>SOURCE</sub> = 300μA	0.8 V <sub>CC</sub>			V
<b>5</b>		$V_{CC} > 2.7V$ , $I_{SOURCE} = 500\mu A$	0.8 V <sub>CC</sub>			
		$V_{CC} > 4.5V$ , $I_{SOURCE} = 800\mu A$	V <sub>CC</sub> - 1.5V			
LLO OUTPL	JT	7 000102				
V <sub>LLOT</sub>	LLO Output Threshold (V <sub>LLO</sub> - V <sub>RST</sub> , V <sub>CC</sub> falling)		1.01•V <sub>RST</sub>	1.02•V <sub>RST</sub>	1.03•V <sub>RST</sub>	V
V <sub>LLOTH</sub>	Low-Line Comparator Hysteresis			0.0032•V <sub>RST</sub>		mV
t <sub>CD</sub>	Low-Line Comparator Delay	V <sub>CC</sub> falling at 1mV/μs		20		μs



# **Typical Performance Characteristics**

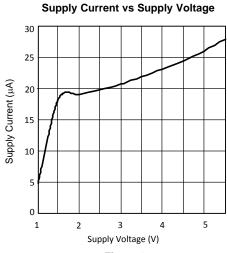


Figure 3.

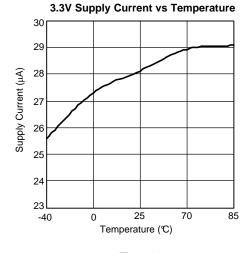
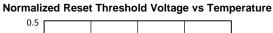


Figure 4.



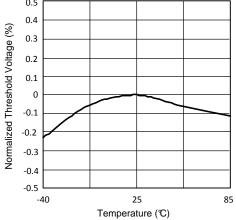


Figure 5.

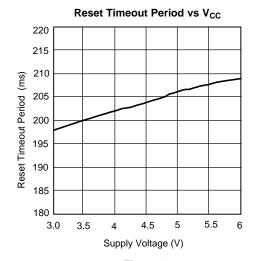


Figure 6.

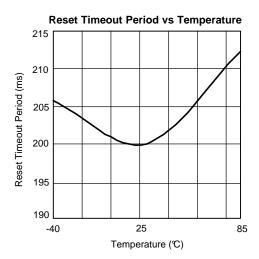
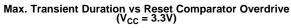


Figure 7.



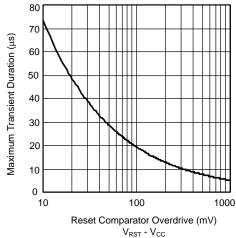


Figure 8.



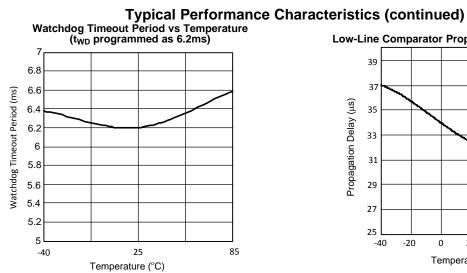


Figure 9.

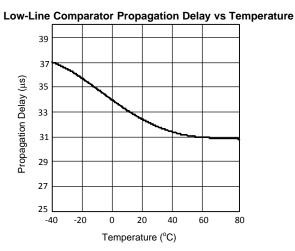


Figure 10.



#### CIRCUIT INFORMATION

#### **RESET OUTPUT**

The Reset input of a  $\mu$ P initializes the device into a known state. The LM3710/LM3711 microprocessor supervisory circuits assert a forced reset output to prevent code execution errors during power-up, power-down, and brownout conditions.

 $\overline{\text{RESET}}$  is ensured valid for  $V_{CC} > 1V$ . Once  $V_{CC}$  exceeds the reset threshold, an internal timer maintains the output for the reset timeout period. After this interval, reset goes high. The LM3710 offers an active-low  $\overline{\text{RESET}}$ ; The LM3711 offers an active-high RESET.

Any time  $V_{CC}$  drops below the reset threshold (such as during a brownout), the reset activates. When  $V_{CC}$  again rises above the reset threshold, the internal timer starts. Reset holds until  $V_{CC}$  exceeds the reset threshold for longer than the reset timeout period. After this time, reset releases.

The Manual Reset input (MR) will initiate a forced reset also. See the MANUAL RESET INPUT (MR) section.

# **RESET THRESHOLD**

The LM3710/LM3711 family is available with a reset voltage of 3.08V. Other reset thresholds in the 2.20V to 5.0V range, in steps of 10 mV, are available; contact Texas Instruments for details.

# MANUAL RESET INPUT (MR)

Many  $\mu P$ -based products require a manual reset capability, allowing the operator to initiate a reset. The  $\overline{MR}$  input is fully debounced and provides an internal 56 k $\Omega$  pull-up. When the  $\overline{MR}$  input is pulled below  $V_{\underline{MRT}}$  (1.225V) for more than 25  $\mu s$ , reset is asserted after a typical delay of 12  $\mu s$ . Reset remains active as long as  $\overline{MR}$  is held low, and releases after the reset timeout period expires after  $\overline{MR}$  rises above  $V_{\underline{MRT}}$ . Use  $\overline{MR}$  with digital logic to assert or to daisy chain supervisory circuits. It may be used as another low-line comparator by adding a buffer.

# POWER-FAIL COMPARATOR (PFI/PFO)

The PFI is compared to a 1.225V internal reference,  $V_{PFT}$ . If PFI is less than  $V_{PFT}$ , the Power Fail Output  $\overline{PFO}$  drops low. The power-fail comparator signals a falling power supply, and is driven typically by an external voltage divider that senses either the unregulated supply or another system supply voltage. The voltage divider generally is chosen so the voltage at PFI drops below  $V_{PFT}$  several milliseconds before the main supply voltage drops below the reset threshold, providing advanced warning of a brownout.

The voltage threshold is set by R<sub>1</sub> and R<sub>2</sub> and is calculated as follows:

$$V_{PFT} = \left(\frac{R1 + R2}{R2}\right) \times 1.225V$$
 (1)

Note this comparator is completely separate from the rest of the circuitry, and may be employed for other functions as needed.

# **LOW-LINE OUTPUT (LLO)**

The low-line output comparator is typically used to provide a non-maskable interrupt to a  $\mu P$  when  $V_{CC}$  begins falling.  $\overline{LLO}$  monitors  $V_{CC}$  and goes low when  $V_{CC}$  falls below  $V_{LLOT}$  (typically 1.02 •  $V_{RST}$ ) with hysteresis of 0.0032 •  $V_{RST}$ .

#### WATCHDOG TIMER INPUT (WDI)

The watchdog timer input monitors one of the microprocessor's output lines for activity. Each time a transition occurs on this monitored line, the watchdog counter is reset. However, if no transition occurs and the timeout period is reached, the LM3710/LM3711 assumes that the microprocessor has locked up and the reset output is activated.

WDI is a high impedance input.



#### SPECIAL PRECAUTIONS FOR THE DSBGA PACKAGE

As with most integrated circuits, the LM3710 and LM3711 are sensitive to exposure from visible and infrared (IR) light radiation. Unlike a plastic encapsulated IC, the DSBGA package has very limited shielding from light, and some sensitivity to light reflected from the surface of the PC board or long wavelength IR entering the die from the side may be experienced. This light could have an unpredictable affect on the electrical performance of the IC. Care should be taken to shield the device from direct exposure to bright visible or IR light during operation.

#### **DSBGA MOUNTING**

The DSBGA package requires specific mounting techniques which are detailed in TI Application Note AN-1112 (SNVA009). Referring to the section *Surface Mount Assembly Considerations*, it should be noted that the pad style which must be used with the 9-pin package is the NSMD (non-solder mask defined) type.

For best results during assembly, alignment ordinals on the PC board may be used to facilitate placement of the DSBGA device.

# **Timing Diagrams**

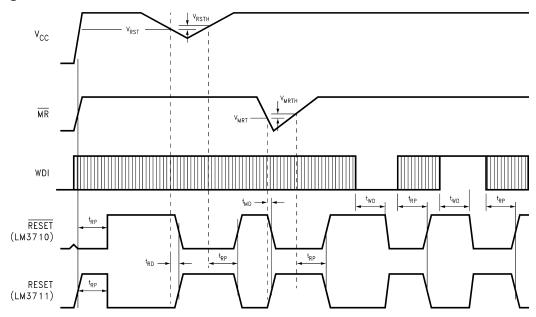


Figure 11. LM3710/LM3711 Reset Time with MR and WDI

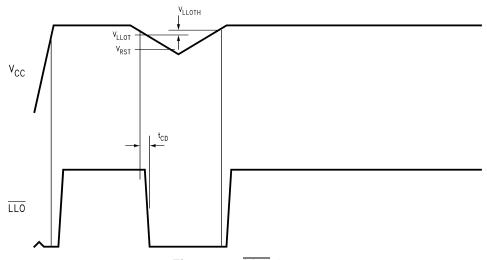


Figure 12. LLO Output



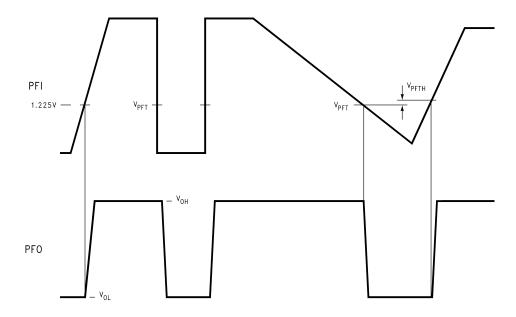


Figure 13. PFI Comparator Timing Diagram

# **Typical Application Circuits**

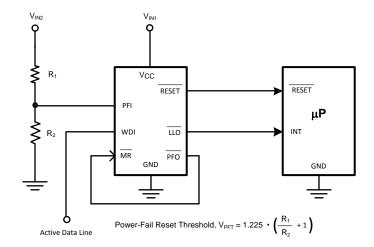


Figure 14. Monitoring Two Critical Supplies And Dataline



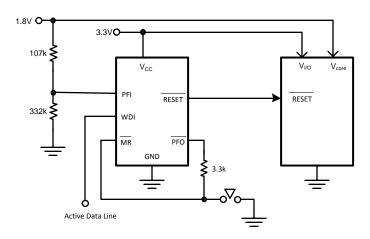


Figure 15. Monitoring Two Supplies plus Manual Reset And Dataline

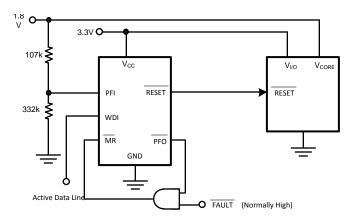
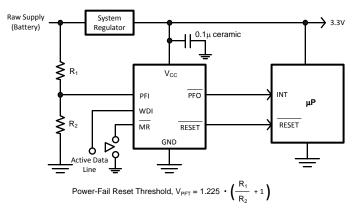


Figure 16. Monitoring Dual Supplies plus External Fault Input And Dataline



Note:  $\overline{MR}$  input with its 1.225V nominal threshold, may monitor an additional supply voltage. An internal 56 k $\Omega$  pull-up resistor is included on this input.

Figure 17. Microprocessor Supervisor with Early Warning Detector



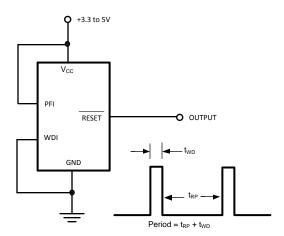


Figure 18. LM3710 Long Period oscillator





# **REVISION HISTORY**

Cł	hanges from Revision D (March 2013) to Revision E	Pa	ge
•	Changed layout of National Data Sheet to TI format		12

www.ti.com 1-Nov-2025

#### PACKAGING INFORMATION

Orderable part number	Status	Material type	Package   Pins	Package qty   Carrier	RoHS	Lead finish/ Ball material	MSL rating/ Peak reflow	Op temp (°C)	Part marking
	(1)	(2)			(3)	(4)	(5)		(6)
LM3710XKMM-463/NO.A	Active	Production	VSSOP (DGS)   10	1000   SMALL T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 85	R74B
LM3710XKMM-463/NOPB	Active	Production	VSSOP (DGS)   10	1000   SMALL T&R	Yes	SN	Level-1-260C-UNLIM	-	R74B
LM3710XQMM-308/NO.A	Active	Production	VSSOP (DGS)   10	1000   SMALL T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 85	R37B
LM3710XQMM-308/NO.B	Active	Production	VSSOP (DGS)   10	1000   SMALL T&R	-	Call TI	Call TI	-40 to 85	
LM3710XQMM-308/NOPB	Active	Production	VSSOP (DGS)   10	1000   SMALL T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 85	R37B
LM3710YQMM-232/NO.A	Active	Production	VSSOP (DGS)   10	1000   SMALL T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 85	R77B
LM3710YQMM-232/NO.B	Active	Production	VSSOP (DGS)   10	1000   SMALL T&R	-	Call TI	Call TI	-40 to 85	
LM3710YQMM-232/NOPB	Active	Production	VSSOP (DGS)   10	1000   SMALL T&R	Yes	SN	Level-1-260C-UNLIM	-	R77B

<sup>(1)</sup> Status: For more details on status, see our product life cycle.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

<sup>(2)</sup> Material type: When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> RoHS values: Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

<sup>(4)</sup> Lead finish/Ball material: Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

<sup>(5)</sup> MSL rating/Peak reflow: The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

<sup>(6)</sup> Part marking: There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

# **PACKAGE OPTION ADDENDUM**

www.ti.com 1-Nov-2025

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

# **PACKAGE MATERIALS INFORMATION**

www.ti.com 31-Jul-2025

# TAPE AND REEL INFORMATION





	•
A0	Dimension designed to accommodate the component width
В0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

# QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



#### \*All dimensions are nominal

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
LM3710XKMM-463/NOPB	VSSOP	DGS	10	1000	177.8	12.4	5.3	3.4	1.4	8.0	12.0	Q1
LM3710XQMM-308/NOPB	VSSOP	DGS	10	1000	177.8	12.4	5.3	3.4	1.4	8.0	12.0	Q1
LM3710YQMM-232/NOPB	VSSOP	DGS	10	1000	177.8	12.4	5.3	3.4	1.4	8.0	12.0	Q1

www.ti.com 31-Jul-2025



# \*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM3710XKMM-463/NOPB	VSSOP	DGS	10	1000	208.0	191.0	35.0
LM3710XQMM-308/NOPB	VSSOP	DGS	10	1000	208.0	191.0	35.0
LM3710YQMM-232/NOPB	VSSOP	DGS	10	1000	208.0	191.0	35.0



SMALL OUTLINE PACKAGE



#### NOTES:

- 1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.

  2. This drawing is subject to change without notice.

  3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not
- exceed 0.15 mm per side.
- 4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
- 5. Reference JEDEC registration MO-187, variation BA.



SMALL OUTLINE PACKAGE



NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SMALL OUTLINE PACKAGE



NOTES: (continued)

- 8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
- 9. Board assembly site may have different recommendations for stencil design.



# IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale, TI's General Quality Guidelines, or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.

Copyright © 2025, Texas Instruments Incorporated

Last updated 10/2025