

# PCS3I8504A

## General Purpose Peak EMI Reduction IC

### Functional Description

PCS3I8504A is a versatile, 3.3 V Timing-Safe™ Peak EMI reduction IC. PCS3I8504A accepts an input clock either from a fundamental Crystal or from an external reference (AC or DC coupled to XIN/CLKIN) and locks on to it delivering a 1x modulated clock output. PCS3I8504A has a SSON pin for enabling and disabling Spread Spectrum function.

PCS3I8504A has an SSEXTR pin to select different deviations depending upon the value of an external resistor connected between SSEXTR and GND. Modulation Rate (MR) control selects one of the two different Modulation Rates.

PCS3I8504A operates from a 3.3 V supply, and is available in an 8-pin, WDFN(2 mm x 2 mm) package.

### General Features

- 1x, LVCMOS Peak EMI Reduction
- Input frequency:
  - ♦ 15 MHz – 50 MHz
- Output frequency:
  - ♦ 15 MHz – 50 MHz
- Analog Deviation Selection
- ModRate selection option
- Spread Spectrum Enable/Disable
- Supply Voltage: 3.3 V  $\pm$  0.3 V
- 8-pin, WDFN 2 mm x 2 mm (TDFN) Package
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

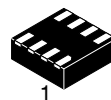
### Application

- PCS3I8504A is targeted for consumer electronics application like DPF, MFP.



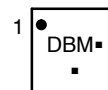
**ON Semiconductor®**

<http://onsemi.com>



**WDFN8  
CASE 511AQ**

### MARKING DIAGRAMS



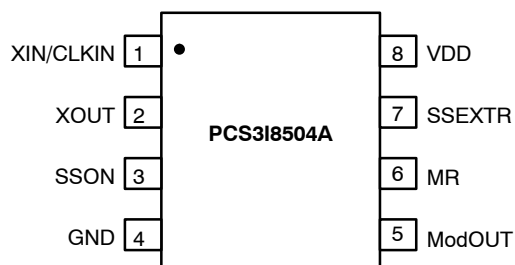
DB = Specific Device Code

M = Date Code

▪ = Pb-Free Device

(Note: Microdot may be in either location)

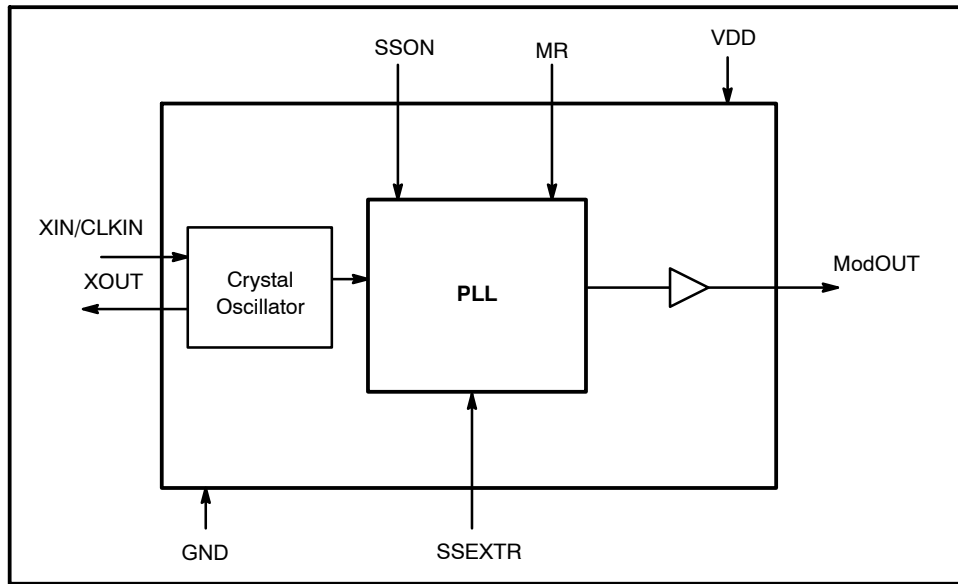
### PIN CONFIGURATION



### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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**Figure 1. Block Diagram**

**Table 1. PIN DESCRIPTION**

Pin#	Pin Name	Type	Description
1	XIN / CLKIN	I	Crystal connection or External reference clock input.
2	XOUT	O	Crystal connection. If using an external reference, this pin should be left open.
3	SSON	I	Spread Spectrum ON/OFF. Spread Spectrum function enabled when HIGH, disabled when LOW. Has an internal pull-up resistor.
4	GND	P	Ground
5	ModOUT	O	Modulated clock output
6	MR	I	Modulation Rate Select. When LOW selects Low Modulation Rate. Selects High Modulation Rate when pulled HIGH. Has an internal pull-up resistor.
7	SSEXTR	I	Analog Deviation Selection through external resistor to GND.
8	V <sub>DD</sub>	P	3.3 V supply Voltage.

**Table 2. OPERATING CONDITIONS**

Symbol	Parameter	Min	Max	Unit
V <sub>DD</sub>	Supply Voltage	3	3.6	V
T <sub>A</sub>	Operating TemperatureIndustrial	−40	85	°C
C <sub>L</sub>	Load Capacitance		10	pF
C <sub>IN</sub>	Input Capacitance		7	pF

**Table 3. ABSOLUTE MAXIMUM RATING**

Symbol	Parameter	Rating	Unit
V <sub>DD</sub> , V <sub>IN</sub>	Voltage on any input pin with respect to Ground	-0.5 to +4.6	V
T <sub>STG</sub>	Storage Temperature	-65 to +125	°C
T <sub>s</sub>	Max. Soldering Temperature (10 sec)	260	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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**Table 3. ABSOLUTE MAXIMUM RATING**

Symbol	Parameter	Rating	Unit
$T_J$	Junction Temperature	150	°C
$T_{DV}$	Static Discharge Voltage (As per JEDEC STD22- A114-B)	1500	V

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

**Table 4. DC ELECTRICAL CHARACTERISTICS**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
VDD	Supply Voltage		3.0	3.3	3.6	V
$V_{IL}$	Input LOW Voltage				0.8	V
$V_{IH}$	Input HIGH Voltage		2.0			V
$I_{IL}$	Input LOW Current	$V_{IN} = 0\text{ V}$			25	$\mu\text{A}$
$I_{IH}$	Input HIGH Current	$V_{IN} = V_{DD}$			25	$\mu\text{A}$
$V_{OL}$	Output LOW Voltage	$I_{OL} = 8\text{ mA}$			0.4	V
$V_{OH}$	Output HIGH Voltage	$I_{OH} = -8\text{ mA}$	2.4			V
$I_{CC}$	Static Supply Current	XIN / CLKIN pulled low			50	$\mu\text{A}$
$I_{DD}$	Dynamic Supply Current	Unloaded Output			20	mA
$Z_o$	Output Impedance			30		$\Omega$

**Table 5. SWITCHING CHARACTERISTICS**

Parameter	Test Conditions	Min	Typ	Max	Unit
Input Frequency* / ModOUT		15		50	MHz
Duty Cycle (Notes 1 and 2)	Measured at $V_{DD} / 2$	45	50	55	%
Output Rise Time (Notes 1 and 2)	Measured between 20% to 80%			1.8	ns
Output Fall Time (Notes 1 and 2)	Measured between 80% to 20%			1.6	ns
Cycle-to-Cycle Jitter (Note 2)	Unloaded output with SSEXTR OPEN @ 27 MHz		$\pm 150$	$\pm 250$	ps
PLL Lock Time (Note 2)	Stable power supply, valid clock presented on XIN / CLKIN			3	ms

\*Functionality with Crystal is guaranteed by design and characterization. Not tested in production.

1. All parameters are specified with 10 pF loaded outputs.

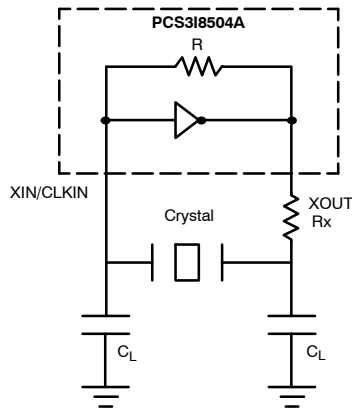
2. Parameter is guaranteed by design and characterization. Not tested in production.

## TYPICAL CRYSTAL SPECIFICATIONS

### FUNDAMENTAL AT CUT PARALLEL RESONANT CRYSTAL

Nominal frequency	27 MHz
Frequency tolerance	± 50 ppm or better at 25°C
Operating temperature range	-25°C to +85°C
Storage temperature	-40°C to +85°C
Load capacitance ( $C_P$ )	18 pF
Shunt capacitance	7 pF maximum
ESR	25 $\Omega$

NOTE:  $C_L$  is the Load Capacitance and Rx is used to prevent oscillations at overtone frequency of the Fundamental frequency.



$$C_L = 2 * (C_P - C_S),$$

Where  $C_P$  = Load capacitance of crystal from crystal vendor datasheet

$C_S$  = Stray capacitance due to  $C_{IN}$ , PCB, Trace etc.

Figure 2. Typical Crystal Interface Circuit

## SWITCHING WAVEFORMS

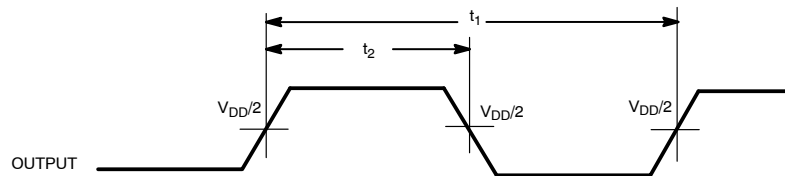


Figure 3. Duty Cycle Timing

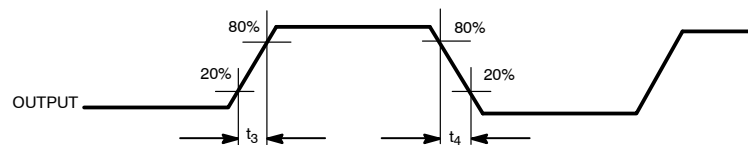
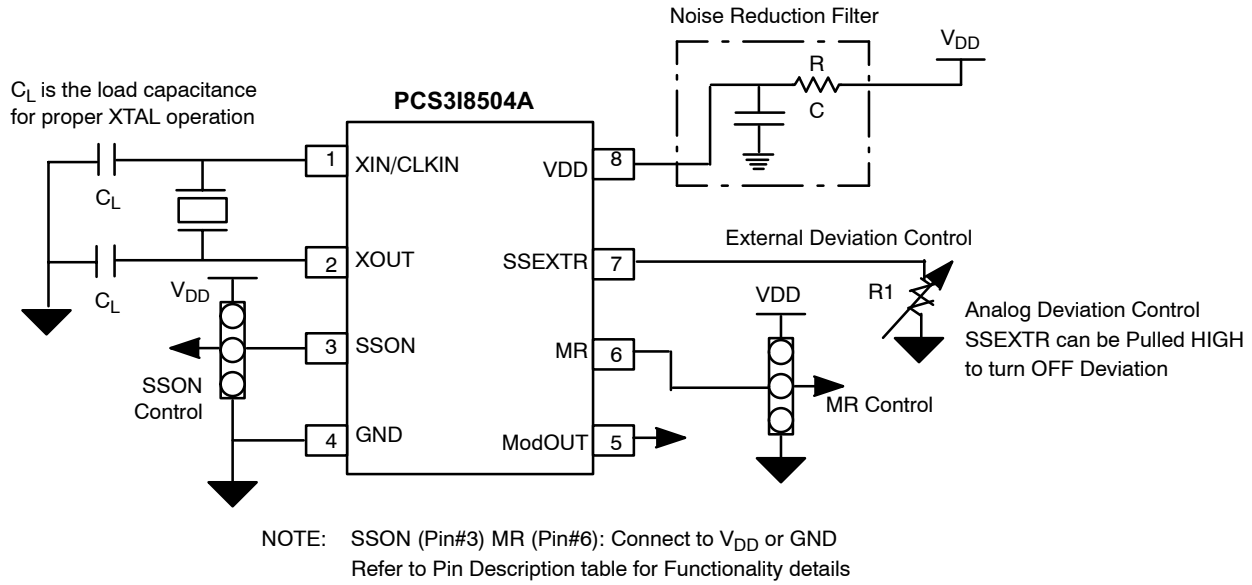
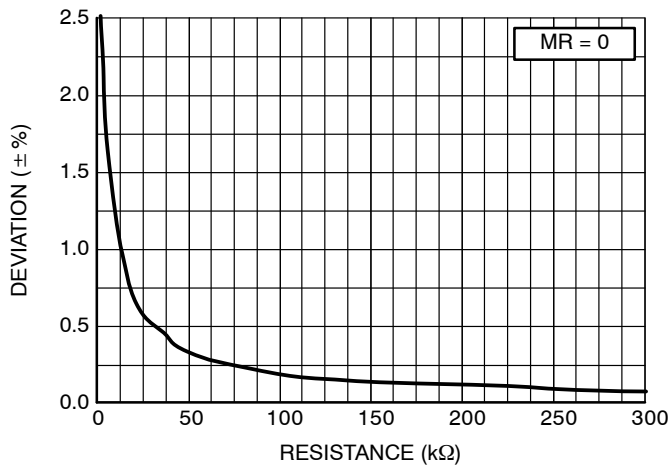


Figure 4. Output Rise/Fall Time

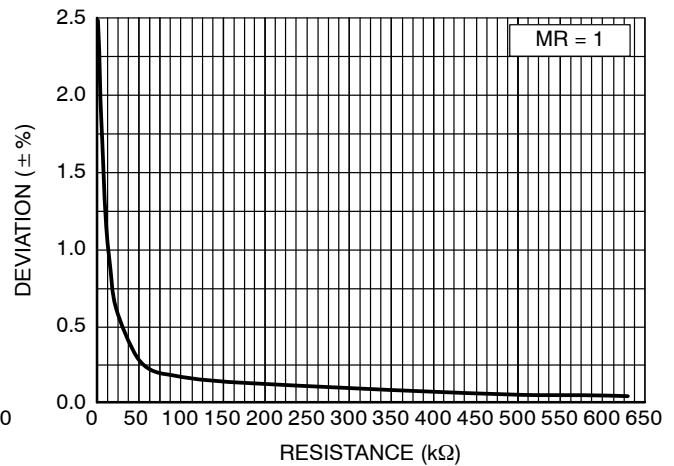
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**Figure 5. Application Schematic**



**Figure 6. Deviation vs SSEXTR Resistance Chart at 27 MHz**



**Figure 7. Deviation vs SSEXTR Resistance Chart at 27 MHz**

NOTE: Device to Device variation of Deviation is  $\pm 10\%$  (Commercial Temperature Range) and  $\pm 25\%$  (Industrial Temperature Range)

## ORDERING INFORMATION

Part Number	Top Marking	Temperature	Package Type	Shipping <sup>†</sup>
PCS3I8504AG-08CR	DB	-40°C to +85°C	8-Pin (2 mm x 2 mm) WDFN(TDFN) (Pb-Free)	3000 / Tape & Reel

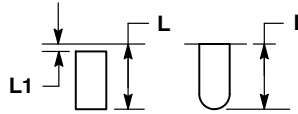
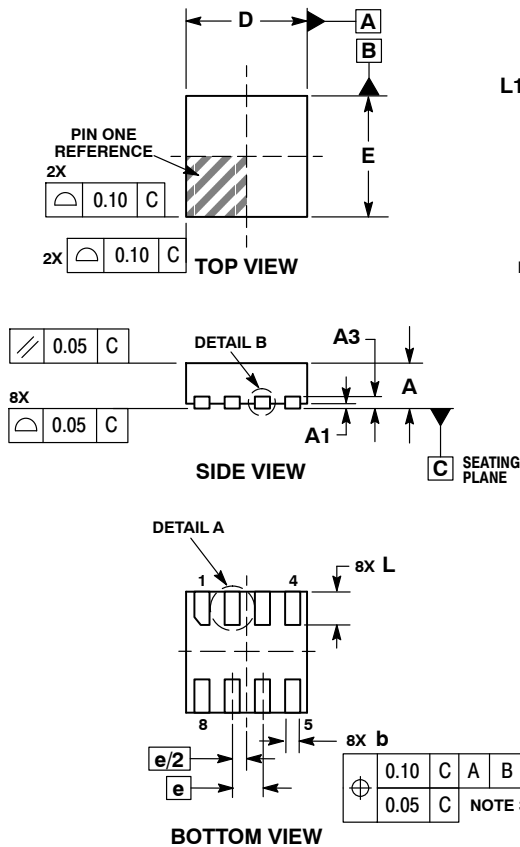
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*A "microdot" placed at the end of last row of marking or just below the last row toward the center of package indicates Pb-Free.

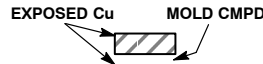
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## PACKAGE DIMENSIONS

### WDFN8 2x2, 0.5P CASE 511AQ ISSUE A



**DETAIL A**  
OPTIONAL CONSTRUCTIONS

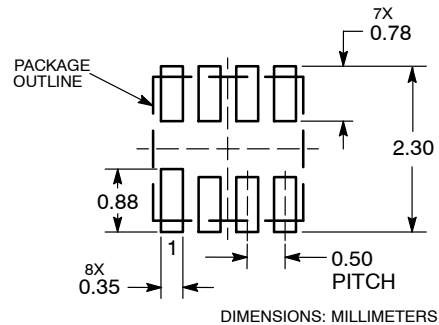


**DETAIL B**  
OPTIONAL CONSTRUCTION

- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30mm FROM TERMINAL.


DIM	MILLIMETERS	
	MIN	MAX
A	0.70	0.80
A1	0.00	0.05
A3	0.20 REF	
b	0.20	0.30
D	2.00 BSC	
E	2.00 BSC	
e	0.50 BSC	
L	0.50	0.60
L1	---	0.15

### RECOMMENDED SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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