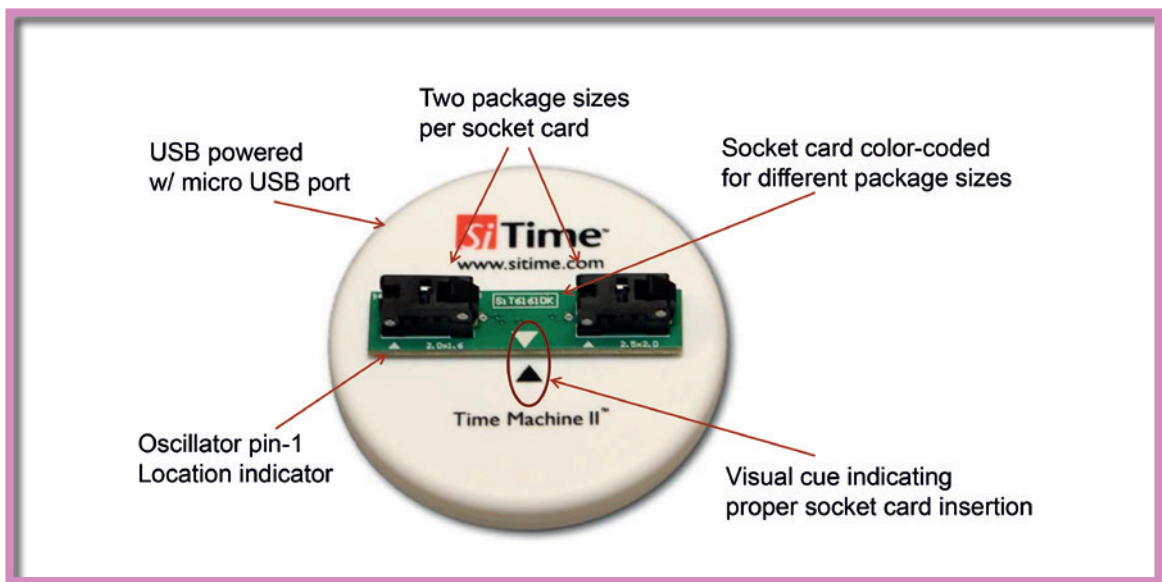


# endrich news

www.endrich.com

## Our Product of the Month Time Machine II™ – MEMS-Oscillator- Programming-Kit



No Need to Waste Time Searching or Waiting For Samples because:

- User-friendly, innovative Time Machine II™ allows quick programming of custom MEMS oscillators with any frequency, voltage or stability
- Starter kit includes three socket cards for the 6 possible MEMS oscillator packages from 2.0 mm×1.6 mm to 7 mm×5 mm

**SiTime™**

MEMS Field Programmable Oscillators

# SMD POWER INDUCTORS WITH FERRITE POWDER SHIELDING



## AVAILABLE SAMPLE SETS:

- » Set 1:  
containing each 6 values of TPI3015CT, TPI4018CT and TPI5040T (lower Inductance values)
- » Set 2:  
containing each 6 values of TPI3015CT, TPI4018CT and TPI5040T (higher Inductance values)
- » Set 3:  
containing each 6 values of TPI2515CT, TPI3010CT and TPI4018CT (low profile box)
- » Set 4:  
containing each 6 values of TPI3010CT, TPI3015CT and TPI4025T (medium sizes)
- » Set 5:  
containing each 6 values of TPI6045CT, RN8040-L and RN1060-L (large sizes)

Please contact us for availability and pricing!

## APPLICATIONS

- » For small DC/DC converters
- » Portable devices, smart card readers
- » Industrial and automotive applications, etc.

**TPI/RN/SN** series of ABC are shielded SMD power inductors which use a mix of ferrite-powder and epoxy for shielding. To achieve this, a ferrite material with low permeability (Ni-Zn) is grinded to very fine particles and is evenly mixed with a curing epoxy. After the copper wire is wound around the ferrite core, and the terminals are welded to it in a fully automated process, this ferrite-powder-epoxy mix is applied on top of the winding. This process results in a significantly better shielding against electromagnetic emission and interference compared to unshielded inductors.

Due to the evenly spread air gaps the shielding is effective in horizontal and vertical direction. While the shielding effect reaches about 60-70% compared with „full“ shielded inductors, this series offer space and cost savings.

These so-called „semi shielded“ inductors are optimized for use as power and filter chokes in DC/DC converters and offer low copper losses as well as high saturation currents.

## FEATURES

- » Small and low profile inductors
- » It corresponds to high current
- » Simple and original magnetic shield structure
- » Temperature rise: 40°C typ.
- » Operating temperature range: -25°C ... +120°C
- » RoHS compliant

## PRODUCT SERIES – AVAILABLE FROM MASS PRODUCTION

SHAPE	SERIES	SIZE [mm]	INDUCTANCE [µH]	IDC 1 [A]**	IDC 2 [A]***	DCR [mΩ]*
	<b>SN3015-L</b>	3.00 × 3.00 × 1.50	1.00 ... 100.0	0.27 ... 2.35	0.29 ... 2.35	40 ... 2433
	<b>TPI2410CT</b>	2.40 × 2.40 × 1.00	0.68 ... 22.0	0.40 ... 2.60	0.40 ... 2.50	60 ... 1470
	<b>TPI2510CT</b>	2.50 × 2.00 × 1.00	0.47 ... 10.0	0.56 ... 2.50	0.55 ... 2.65	38 ... 712

# SMD POWER INDUCTORS WITH FERRITE POWDER SHIELDING

SHAPE	SERIES	SIZE [mm]	INDUCTANCE [ $\mu$ H]	IDC 1 [A]**	IDC 2 [A]**	DCR [ $m\Omega$ ]*
	<b>TPI2512CT</b>	2.50 × 2.00 × 1.20	0.47 ... 10.0	0.73 ... 2.75	0.59 ... 2.15	47 ... 630
	<b>TPI2515CT</b>	2.50 × 2.00 × 1.50	0.47 ... 10.0	0.80 ... 3.30	0.75 ... 2.80	38 ... 712
	<b>TPI3010CT</b>	3.00 × 3.00 × 1.00	1.00 ... 100.0	0.15 ... 2.30	0.18 ... 2.30	63 ... 5000
	<b>TPI3012CT</b>	3.00 × 3.00 × 1.20	1.00 ... 47.0	0.23 ... 1.90	0.35 ... 1.71	45 ... 1250
	<b>TPI3015CT</b>	3.00 × 3.00 × 1.50	1.00 ... 100.0	0.25 ... 2.30	0.30 ... 2.30	28 ... 2100
	<b>TPI4018CT</b>	4.00 × 4.00 × 1.30	0.82 ... 220.0	0.30 ... 4.20	0.28 ... 4.00	16 ... 2960
	<b>TPI4025CT</b>	4.00 × 4.00 × 2.50	1.00 ... 220.0	0.20 ... 3.00	0.20 ... 3.00	12 ... 2300
	<b>TPI5020CT</b>	5.00 × 5.00 × 2.00	1.00 ... 33.0	0.80 ... 4.00	0.90 ... 3.60	21 ... 430
	<b>TPI5040CT</b>	5.00 × 5.00 × 4.00	1.50 ... 47.0	1.10 ... 6.00	0.90 ... 3.60	15 ... 270
	<b>TPI6020CT</b>	6.00 × 6.00 × 2.00	0.50 ... 47.0	0.80 ... 7.00	0.80 ... 5.20	9 ... 370
	<b>TPI6028CT</b>	6.00 × 6.00 × 2.80	0.90 ... 100.0	0.65 ... 6.70	0.66 ... 4.60	13 ... 600
	<b>TPI6045CT</b>	6.00 × 6.00 × 4.50	1.00 ... 220.0	0.55 ... 8.60	0.50 ... 6.50	10 ... 920
	<b>RN6045-F</b>	6.00 × 6.00 × 4.50	1.00 ... 100.0	0.80 ... 8.50	0.70 ... 4.20	13.9 ... 494
	<b>RN8040-L</b>	8.00 × 8.00 × 4.00	0.50 ... 100.0	1.00 ... 12.0	1.00 ... 10.00	5.7 ... 310
	<b>RN1060-L</b>	9.80 × 10.00 × 6.00	1.50 ... 470.0	0.80 ... 13.0	0.80 ... 10.0	7.6 ... 731

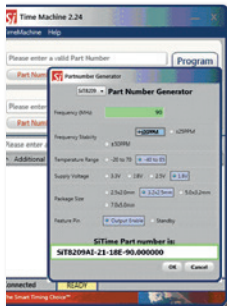
\* typ., except for RN6045 = DCR max.

\*\* IDC1 based on inductance change  $\Delta L/L$

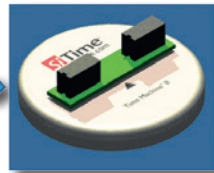
\*\*\* IDC2 based on temperature rise  $\Delta T$  40°C max.

# TIME MACHINE II – MEMS-OSCILLATOR-PROGRAMMING-KIT

## SiT6100DK Software



### Time Machine II Programming Kit



### Programmed Unit



The starter kit includes three adapter cards for the reception of the 6 possible MEMS oscillator housing types, as well as some samples of field-programmable oscillators. Via the supplied USB cable, the Time Machine II™ can connect to a computer. The Windows compatible software is available by included USB Flash Drive or can be downloaded from SiTime Website.

The **Time Machine II™** from manufacturer SiTime is a complete MEMS-Oscillator-Programming-Kit. It allows you easily to configure SiTime's field programmable oscillators to your exact specification and to create drop-in replacements for legacy quartz devices in seconds.

Thus, the development time can be reduced and system performance can be optimized with custom frequencies adjustable frequency tolerance and temperature range. In addition, from standby or output enable function can be selected.

For larger loads or to obtain the optimum EMI performance is also the driving strength and slew rate selectable for most types.

## TIME MACHINE II – SOFTWARE

When creating the oscillator specification the unique part number will be generated simultaneously and the program history is recorded by the software.

From	To	Operation	Operation Result	Tracking ID	PartNumber
Select a date 15	Select a date 15	All	All	All	
DateTime	Operation	Operation Result	TrackingID	Part No.	
6/26/2014 4:15:06 PM	Program	Pass	Tracking ID was not set.	SiT8920AM-23-33E-29.997000	
6/26/2014 4:14:28 PM	Verify	Pass	Tracking ID was not set.	SiT8920AM-23-33E-29.997000	
6/26/2014 4:14:26 PM	Program	Pass	Tracking ID was not set.	SiT8920AM-23-33E-29.997000	
6/26/2014 4:13:14 PM	Verify	Pass	Tracking ID was not set.	SiT8920AM-23-33E-29.997000	
6/26/2014 4:13:13 PM	Program	Pass	Tracking ID was not set.	SiT8920AM-23-33E-29.997000	
6/26/2014 4:12:53 PM	Verify	Pass	Tracking ID was not set.	SiT8920AM-23-33E-29.997000	

## PROGRAMMABLE OSCILLATORS

With Time Machine II™ the most common oscillators can be programmed, eg.:

- » Ultra Performance Oscillators: SiT8208, SiT8209
- » Differential Oscillators: SiT9120, SiT9121, SiT9122 (1-625 MHz , <1ps jitter)
- » Low Power Oscillators: SiT8008, SiT8009, SiT1602 (1-137 MHz)
- » High Temp Oscillators: SiT8918, SiT8919, SiT8920, SiT8921, SiT1618 (1-110 MHz)
- » VCXOs: SiT3807, SiT3808, SiT3809 (1-220 MHz , <1ps jitter)
- » Differential VCXOs: SiT3821, SiT3822 (1-625 MHz , <0,75ps jitter)
- » Digitally Controlled Oscillators (DCXOs): SiT3907 (1-220 MHz)

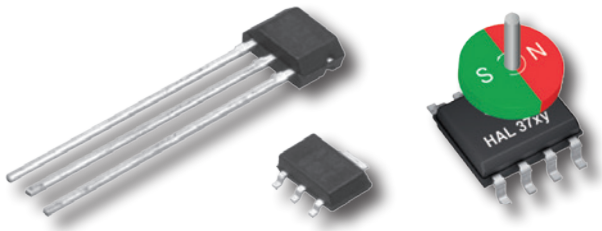
- » Differential DCXOs: SiT3921, SiT3922 (1-625 MHz)
- » Spread Spectrum Oscillators: SiT9001, SiT9003 (1-220 MHz)
- » Spread Spectrum Differential Oscillators: SiT9002 (1-220 MHz)

## KIT CONTENTS/DELIVERY

- » SiT6100DK MEMS oscillator programmer & installation software (USB drive)
- » 3 socket cards, USB cable, tweezers
- » Sample field programmable device packs
- » For support you'll find 2 video tutorials below:  
[http://www.sitime.com/support/time-machine-oscillator-programmer#magictabs\\_M82U8\\_5](http://www.sitime.com/support/time-machine-oscillator-programmer#magictabs_M82U8_5)

For more support and information please contact us!

# HALL-EFFECT SENSORS – SELECTION GUIDE FOR AUTOMOTIVE APPLICATIONS



Micronas offers a variety of Hall sensors for automotive and industrial applications.

In automotive electronics, Micronas is focusing on sensor systems for a wide range of applications. They require on one hand rather simple Hall switches to detect a position and on the other hand quite complex linear Hall-effect sensors for the measurement of distances or rotational movements.

Below you'll find the selection guide of linear and multi-axis hall-effect sensors for automotive applications.

## 1. SELECTION BY APPLICATION

		Recommended Solution	Comment	Alternative
Accelerator Pedal		HAL 835	Smallest error by pedal idle position (0°)	HAL 3725
Adaptive Frontlight System		HAL 835	High immunity against temperature variation	–
Adaptive Suspension System / Chassis Position		HAL 3715	Flexible and easy assembly thanks to Modulo 90 feature	HAL 2850
Brake Pedal Position		HAL 2455	Smallest error for small angles or linear movement / with digital output / version with redundancy function available soon	HAL 3736/ HAL 3737
Clutch Cylinder		HAL 37xy	Application requires measurement of 40 mm movement, highest accuracy achievable with HAL 37xy	HAL 855
EGR / Cut-Off Valve / Waste Gate Actuator		HAL 37xy	1% full-scale error required by application	HAL 835
Fuel Level Detection		HAL 835	Price-sensitive application & analog output standard interface for this application	HAL 3725
Gear Shift Selector		HAL 37xy	Usual angular range is above 120°, highest accuracy achievable with HAL 37xy	HAL 2425
Steering Angle		HAL 3735	360° application & digital output	–
Steering Torque		HAL 283x	Small-angle application & SENT protocol / version with redundancy function available soon	–
Throttle Position		HAL 37xy	Highest angle accuracy for 120° & simple magnetic circuit	HAL 83x
Transmission	Neutral Detection Sensor	HAL 835	High temperature stability and output signal flexibility (analog and PWM)	HAL 24xy
	Dual-Clutch Transmission Position with Integrated ECU	HAL 18xy	All compensation (sensitivity / offset, etc.) will be done by ECU software. Low-end linear sensor is required.	HAL 83x
	Dual-Clutch Transmission Position without Integrated ECU	HAL 373x	Application requires measurement of 40 mm movement, highest accuracy achievable with HAL 37xy	HAL 387x
	Transmission Range Sensor	HAL 373x	Application requires measurement of 40 mm movement, highest accuracy achievable with HAL 37xy	HAL 387x
Neutral Gear Position		HAL 373x	2D required, because usual detection angle is >180°. Next step will be full gear detection.	HAL 835
Turbo Charger Actuator		HAL 37xy	1% full-scale error required by application	HAL 835

# HALL-EFFECT SENSORS – SELECTION GUIDE FOR AUTOMOTIVE APPLICATIONS

## 2. SELECTION OF SENSOR TYPE

	PRODUCT FAMILY	PRODUCT TYPE	FIELD COMPONENT	SETPOINTS	LINEAR MEASUREMENT			PACKAGE	OUTPUT			
					ANGULAR MEASUREMENT							
					End of Shaft	Off-Axis						
				up to 60°	up to 180°	up to 360°	Leaded	SMD	Analog	PWM	Sent SAE J 2716V 2010	
<b>HAL 8xy</b>	HAL 830	Z	2	•	•	•		T092UT		•		
	HAL 835	Z	2	•		•				•	•	
	HAL 85x <sup>1)</sup>	Z	32	•		•					•	
<b>HAL 18xy</b>	HAL 1820	Z	2	•		•		T092UA	SOT89	•		
<b>HAL 24xy</b>	HAL 2420	Z	2	•		•		T092UT	SOIC8	•		
	HAL 2425	Z	16	•		•				•		
	HAL 2455	Z	16	•		•					•	
<b>HAL 28xy</b>	HAL 283x	Z	2	•		•		T092UT				•
	HAL 2850	Z	2	•		•					•	
<b>HAL 36xy</b>	HAL 3625	X-Y	32		•			T092UP	SOIC8	•		
	HAL 3675	X-Y	32		•						•	
<b>HAL 37xy</b>	HAL 3725	X-Y	33		•			T092UP	SOIC8	•		
	HAL 3726	X-Z	33	•			•			•		
	HAL 3727	X-Z	33	•			•			•		
	HAL 3735	X-Y	33		•						•	•
	HAL 3736	Y-Z	33	•			•				•	•
	HAL 3737	X-Z	33	•			•				•	•
<b>HAL 38xy</b>	HAL 3855	Y-Z	32	•			•	T092UP	SOIC8	•		
	HAL 3856	X-Z	32	•			•			•		
	HAL 3875	Y-Z	32	•			•				•	
	HAL 3876	X-Z	32	•			•				•	

<sup>1)</sup> -2-wire version available

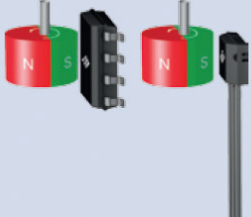
### License Note

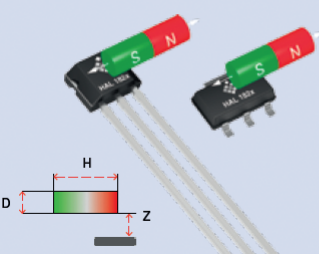
HAL 36xy/38xy use licenses of Fraunhofer Institute for Integrated Circuits IIS

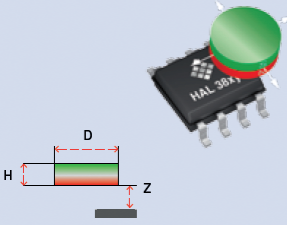
# HALL-EFFECT SENSORS – SELECTION GUIDE FOR AUTOMOTIVE APPLICATIONS

## 3. SELECTION OF MAGNET

End of Shaft	Type	Direct Angle 360°
	HAL 36xy HAL 3725 HAL 3735	D= 10, H=2.5, Z=4 NL <±0.25% RT

Off-Axis	Type	Angle	Magnet
	HAL 8xy	<70°	D=15, H=6, Z=2.5 NL <±1% RT
	HAL 24xy	<180°	D=15, H=6, Z=2.5 NL <±0.15% RT
	HAL 38xy HAL 37x6 HAL 37x7	360°	D=15, H=6, Z=2.5 NL <±0.15% RT

Parallel	Type	12 mm Distance	20 mm Distance	40 mm Distance
	HAL 8xy	D=8, H=26, Z=4 NL <±1% RT	D=8, H=43, Z=4 NL <±1% RT	D=8, H=86, Z=4 NL <±1% RT
	HAL 24xy	D=8, H=12, Z=4 NL <±0.15% RT	D=8, H=20, Z=4 NL <±0.15% RT	D=8, H=40, Z=4 NL <±0.15% RT
	HAL 38xy HAL 37x6 HAL 37x7	D=6, H=4, Z=4 NL <±0.15% RT	D=12, H=4, Z=4 NL <±0.15% RT	D=16, H=8, Z=4 NL <±0.15% RT

Orthogonal	Type	12 mm Distance	20 mm Distance	40 mm Distance
	HAL 8xy	D=31, H=6, Z=4 NL <±1% RT	D=52, H=6, Z=4 NL <±1% RT	D=103, H=6, Z=4 NL <±1% RT
	HAL 24xy	D=12, H=6, Z=4 NL <±0.2% RT	D=20, H=6, Z=4 NL <±0.2% RT	D=40, H=6, Z=4 NL <±0.2% RT
	HAL 38xy HAL 37x6 HAL 37x7	D=6, H=3, Z=4 NL <±0.2% RT	D=20, H=6, Z=4 NL <±0.2% RT	D=25, H=6, Z=4 NL <±0.2% RT

Magnets SmCo, NeFeB, AlNiCo – Br = 900 mT ... 1300 mT

All dimensions are given in mm.

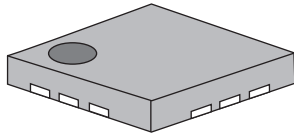
D: Diameter, H: Height, Z: Distance between magnet and Hall sensor,

NL: Non-linearity, RT: Room temperature

## 4. PROGRAMMING-TOOLS

Programming-Tools for all programmable hall-effect sensors are available. Please contact us for more information!

# DRIVER NJU72501 WITH MULTI-MODE CHARGE PUMP FOR PIEZO SOUNDERS



## FEATURES

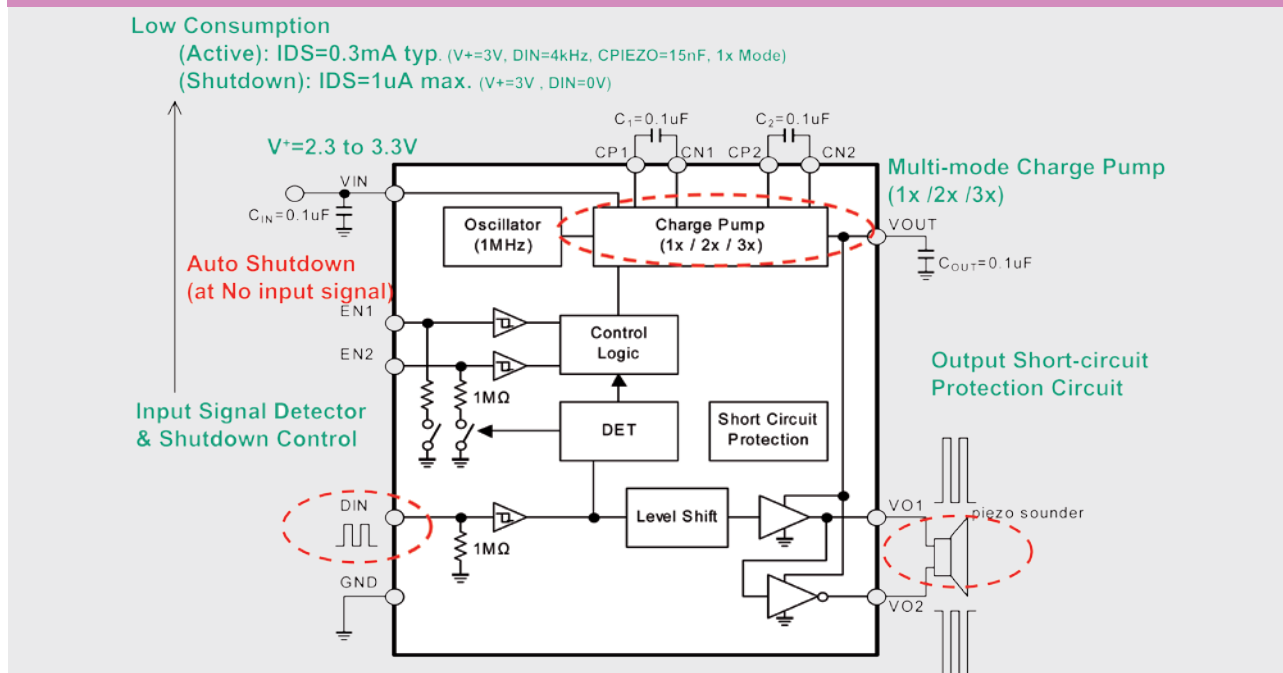
- » Operating Voltage: 2.3 to 3.4V
- » Consumption current: Active:  $I_{DS}=0.3\text{ mA typ.}$  ( $V+=3V$ ,  $DIN=4\text{ kHz}$ ,  $C_{PIEZO}=15\text{ nF}$ , 1x mode)  
Shutdown:  $I_{DS}=1\mu\text{A max.}$  ( $V+=3V$ ,  $DIN=0V$ )
- » Multi-Mode Charge Pump (1x/2x/3x)
- » Input Signal Detector & Shutdown Control
- » Output Short-circuit Protection Circuit
- » C-MOS Technology
- » Operating temperature:  $-40^{\circ}\text{C} \dots +85^{\circ}\text{C}$
- » Package Outline: QFN12

The NJU72501 is a switching driver with multi mode charge pump for piezo-sounder. It can drive outputs up to 18Vpp from 3V supply. For adjusting the piezoelectric sounder sound volume, the charge pump can operate in either of a 1x, 2x or 3x mode. Because NJU72501 has the shutdown function, it is suitable for the battery application.

## APPLICATIONS

- » Healthcare
- » Wrist watches
- » Alarm clocks
- » Handheld GPS devices
- » PDAs
- » applicable for all piezo transducers, for example our SMD or PIN-types of our supplier CHINASOUND: CSPT13A03/CSPT12A03/ CSPT16B03/ CPT17D12

## BLOCK DIAGRAM NJU72501



Contact for information: Mr. Kinn · Tel. +49(0)7452-6007-21 · e-mail: d.kinn@endrich.com

## HEADQUARTERS

ENDRICH Bauelemente Vertriebs GmbH · P.O.Box 1251 · D-72192 Nagold  
T +49 (0) 7452 6007-0 · F +49 (0) 7452 6007-70  
endrich@endrich.com · www.endrich.com

## SALES OFFICES IN EUROPE

### France:

Angers: T +33/2 41 80 33 54 · v.rousseau@endrich.com  
Paris: T +33/1 46 05 99 13 · e.cosperec@endrich.com

### Austria & Slovenia

Vienna: T +43/1 66 52 52 521 · a.schwaha@endrich.com



### Hungary:

Budapest: T +361 / 2 97 41 91 · z.kiss@endrich.com

### Bulgaria:

Sofia: T +359/2 874 30 49 · bulgaria@endrich.com

### Switzerland – Novitronic:

Zurich: T +41/44 306 91 91 · info@novitronic.ch

### Spain:

Barcelona: T +34/93 217 31 44 · spain@endrich.com