National Semiconductor

LM96550 PRODUCT BRIEF

PRELIMINARY
September 3, 2010

Ultrasound Transmit Pulser

General Description

The LM96550 is an eight-channel monolithic high-voltage, high-speed pulse generator for multi-channel medical ultrasound applications. It is well-suited for use with National's LM965XX series chipset which offers a complete medical ultrasound solution targeted towards low-power, portable systems.

The LM96550 contains eight high-voltage pulsers with integrated diodes generating ±50V bipolar pulses with peak currents of up to 2A and pulse rates of up to 15 MHz. Advanced features include low-jitter and low-phase-noise output pulses ideal for continuous-wave (CW) modes of operation. Active clamp circuitry is integrated for ensuring low harmonic distortion of the output signal waveform.

The LM96550 also featuers a low-power operation mode and over-temperature protection (OTP) which are enabled by on-chip temperature sensing and power-down logic.

Applications

- Ultrasound Imaging

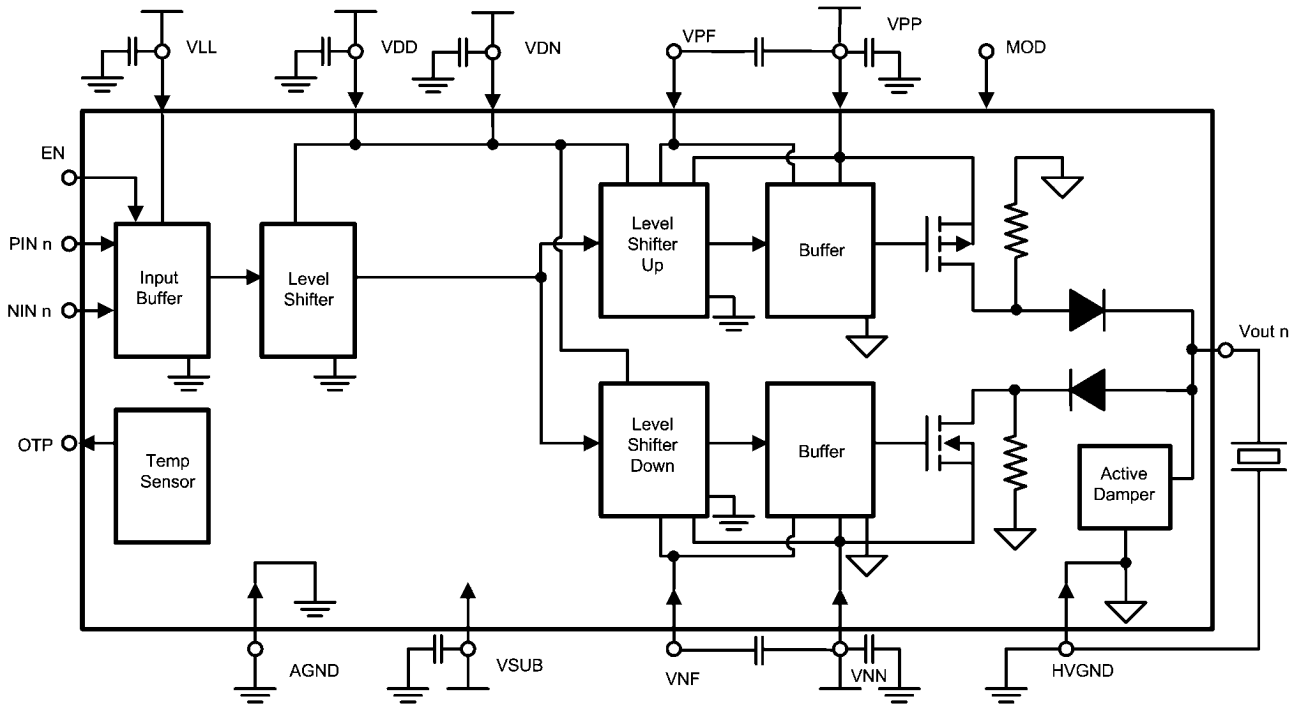
Features

- 8-channel high-voltage CMOS pulse generator
- Output pulses with ±50V and 2A peak current
- Active damper with built-in blocking diodes
- Built-in floating supply voltages for output stage
- Up to 15 MHz operating frequency
- Matched delays for rising and falling edges
- Harmonic performance enables harmonic imaging
- Continuous-wave (CW) operation down to ±3.3V
- Low Phase noise enables Doppler measurements
- Output state over-temperature protection
- Blocking diodes for direct interface to transducer
- 2.5V to 5.0V CMOS logic interface
- Low-power consumption per channel
- Over Temperature Protection

Key Specifications

Output voltage	±50	V
Output peak current	±2.0	A
Output pulse rate	Up to 15	MHz
Rise/fall delay matching	< 1.5	ns
Pulser jitter	15	ps (rms)
Pulser HD2 (5 MHz)	-40	dB
Operating Temp.	0 to +70	°C

Block Diagram



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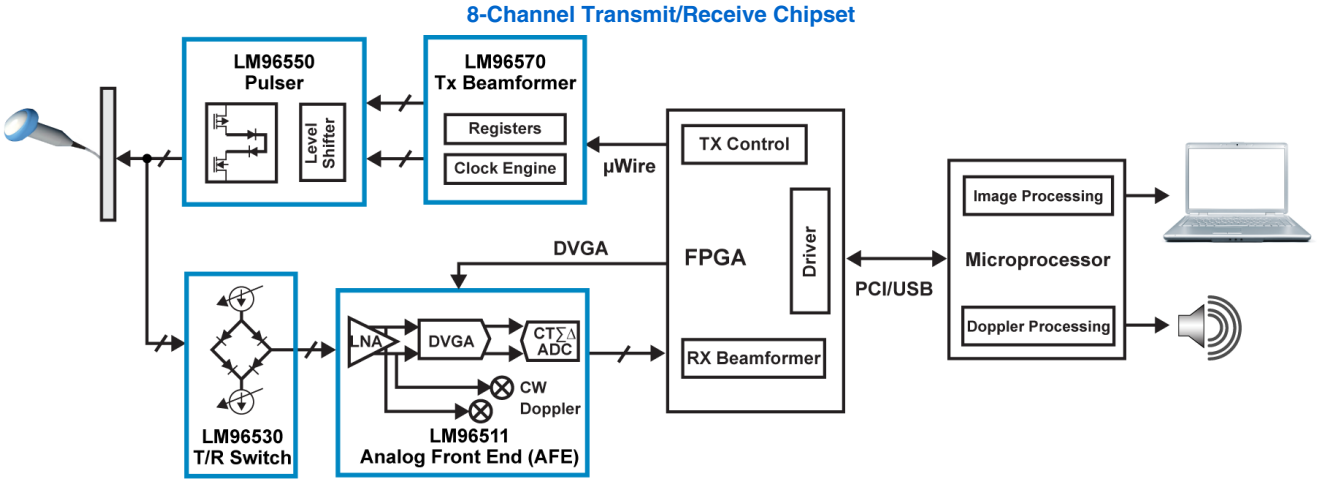
Typical Application



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Pin Diagram

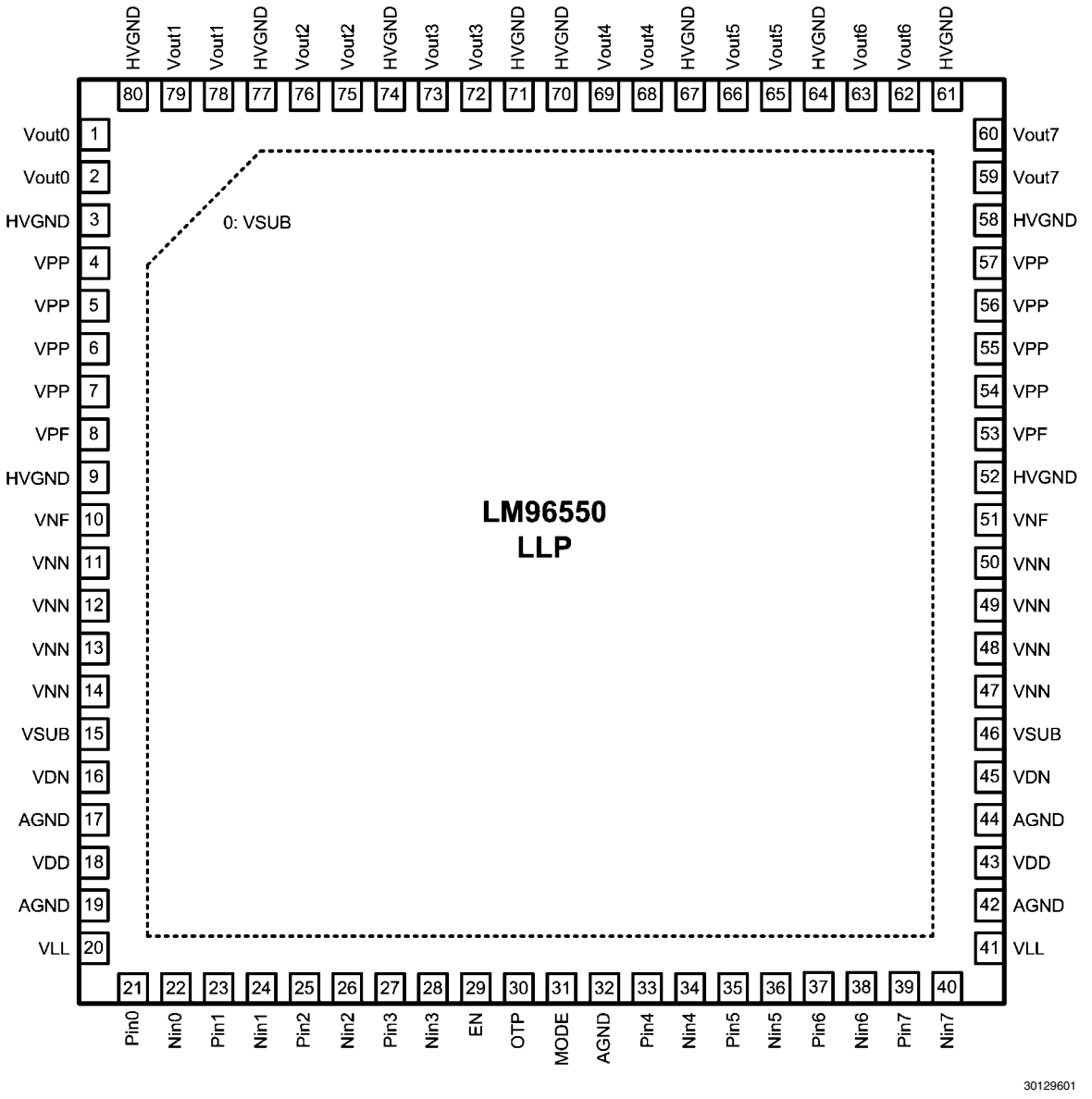
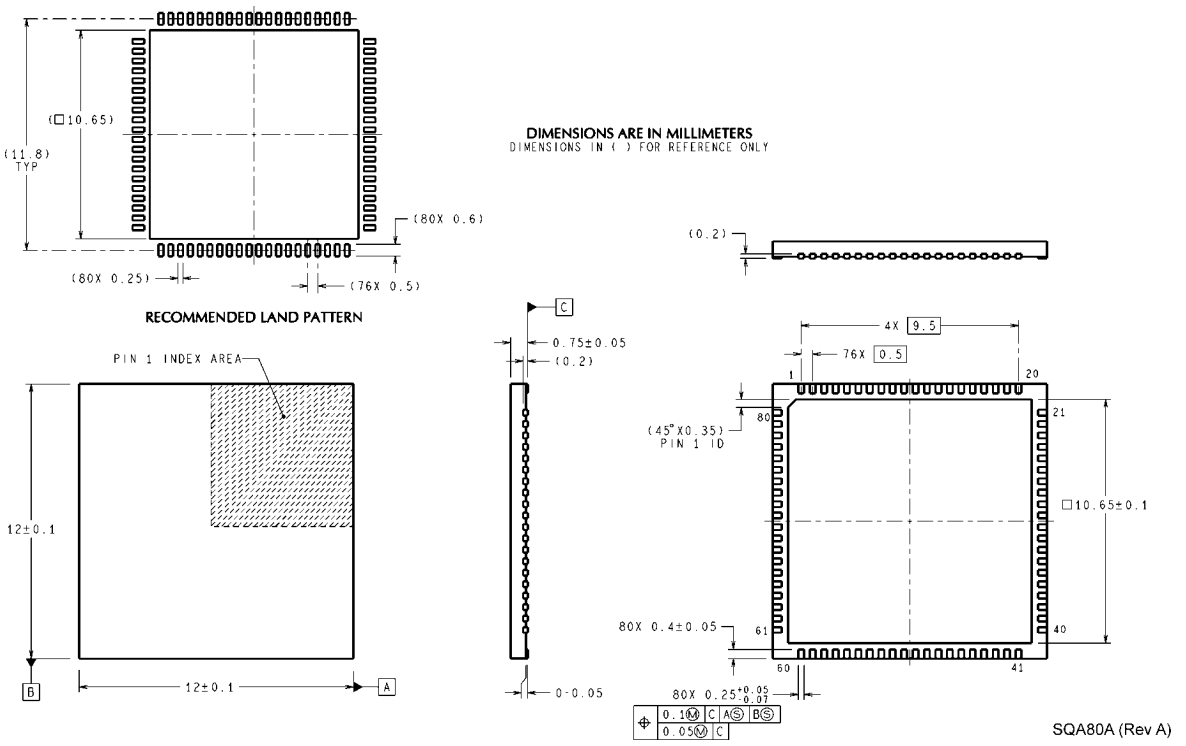


FIGURE 1. Pin Diagram of LM96550

TABLE 1. Pin Descriptions

Pin No.	Name	Type	Function and Connection
21, 23, 25, 27, 33, 35, 37, 39	PIN n=0...7	Input	Logic control positive output channel P 1 = ON 0 = OFF
22, 24, 26, 28	NIN n=0...7	Input	Logic control negative output channel N 1 = ON 0 = OFF
59, 60	V_{OUT7}	Output	High voltage output of channels 0 to 7
62, 63	V_{OUT6}		
65, 66	V_{OUT5}		
68, 69	V_{OUT4}		
72, 73	V_{OUT3}		
75, 76	V_{OUT2}		
78, 79	V_{OUT1}		
1, 2	V_{OUT0}		
29	EN	Input	Chip power enable 1 = ON 0 = OFF
31	MODE	Input	Output current mode control 1 = Max Current 0 = Low Current
30	OTP	Output	Over-temperature indicating IC temp > OTP °C 0 = Over-temperature 1 = Normal temperature This pin is open-drain.
4, 5, 6, 7, 54, 55, 56, 57	VPP	Power	Positive high voltage power supply (+3.3V to +50V)
11, 12, 13, 14, 47, 48, 49, 50	VNN	Power	Negative high voltage power supply (-3.3V to -50V)
8, 53	VPF	Power	Positive internal floating power supply (VPP -12V)
10, 51	VNF	Power	Negative internal floating power supply (VNN +12V)
18, 43	VDD	Power	Positive level-shifter supply voltage (+10V)
16, 45	VDN	Power	Negative level-shifter supply voltage (-10V)
20, 41	VLL	Power	Logic supply voltage. Hi voltage reference input (+2.5 to +5V)
0, 15, 46	VSUB	Power	All VSUB pins must be connected to most negative potential of the IC. NOTE: The exposed thermal pad is connected to VSUB.
3, 9, 52, 58, 61, 64, 67, 70, 71, 74, 77, 80	HVGND	Ground	High voltage reference potential (0V)
17, 19, 32, 42, 44	AGND	Ground	Analog and Logic voltage reference input, logic ground (0V)

Physical Dimensions inches (millimeters) unless otherwise noted



80-Lead LLP Package
NS Package Number SQA80A

Notes

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Email: jpn.feedback@nsc.com