rev 1.7

Low Power Peak EMI Reducing Solution

Features

- Generates an EMI optimized clock signal at the output.
- Integrated loop filter components.
- Operates with a 3.3V / 2.5V Supply.
- Operating current less than 4mA.
- Low power CMOS design.
- Input frequency range: 6MHz to 12MHz for 2.5V.
  : 6MHz to 13MHz for 3.3V.
- Generates a 1X low EMI spread spectrum clock of the input frequency.
- Frequency deviation: ±0.65% @ 8MHz
- Available in 6-pin TSOT-23, 8-pin SOIC and 8-pin TSSOP packages.

Product Description

The ASM3P2760A is a versatile spread spectrum frequency modulator designed specifically for a wide range of clock frequencies. The ASM3P2760A reduces electromagnetic interference (EMI) at the clock source, allowing system wide reduction of EMI of all clock dependent signals. The ASM3P2760A allows significant system cost savings by reducing the number of circuit board layers ferrite beads, shielding that are traditionally required to pass EMI regulations.

The ASM3P2760A uses the most efficient and optimized modulation profile approved by the FCC and is implemented by using a proprietary all digital method.

The ASM3P2760A modulates the output of a single PLL in order to "spread" the bandwidth of a synthesized clock, and more importantly, decreases the peak amplitudes of its harmonics. This results in significantly lower system EMI compared to the typical narrow band signal produced by oscillators and most frequency generators. Lowering EMI by increasing a signal's bandwidth is called 'spread spectrum clock generation'.

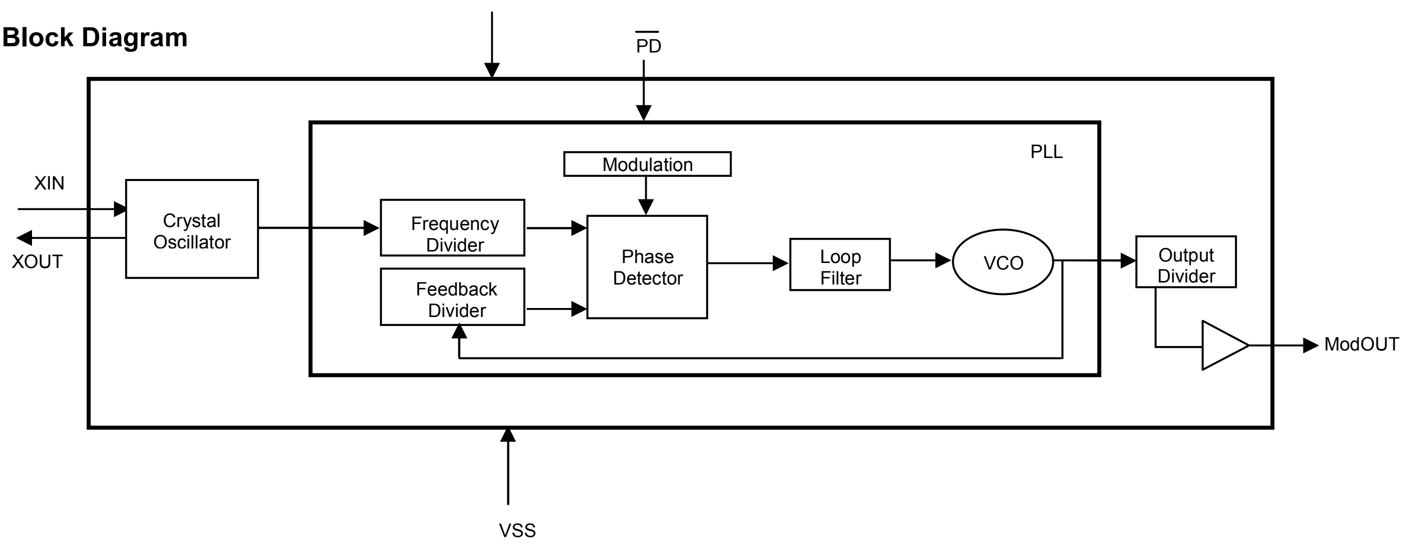
Applications

The ASM3P2760A is targeted towards all portable devices with very low power requirements like MP3 players and digital still cameras.

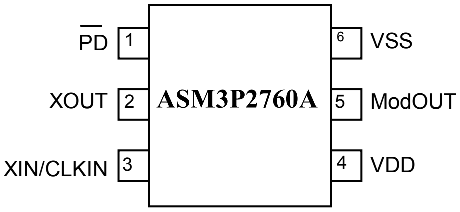
Key Specifications

Description	Specification
Supply voltages	V_{DD} = 3.3V / 2.5V
Cycle-to-Cycle Jitter	200 pS (Max)
Output Duty Cycle	45/55% (worst case)
Modulation Rate Equation	$F_{IN}/256$
Frequency Deviation	±0.65% @ 8MHz

Block Diagram

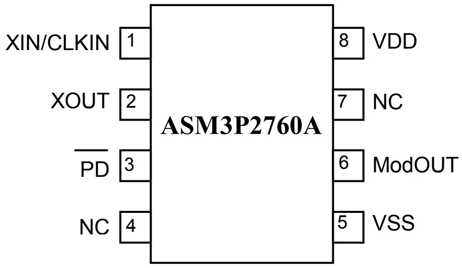


Pin Configuration (6-pin TSOT-23)



Pin#	Pin Name	Type	Description
1	$\overline{PD}$	I	Power-down control pin. Pull low to enable power-down mode. Connect to VDD if not used.
2	XOUT	O	Crystal connection. If using an external reference, this pin must be left unconnected.
3	XIN/CLKIN	I	Crystal connection or external reference frequency input. This pin has dual functions. It can be connected either to an external crystal or an external reference clock.
4	VDD	P	Power supply for the entire chip
5	ModOUT	O	Spread spectrum clock output.
6	VSS	P	Ground connection.

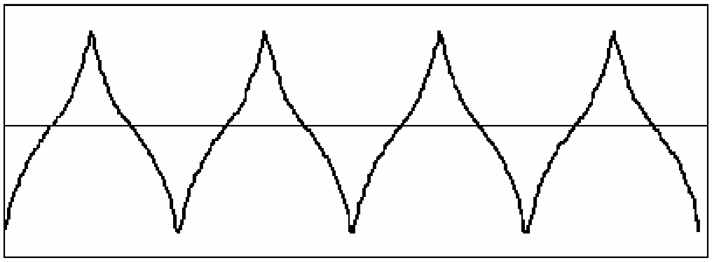
Pin Configuration (8-pin SOIC and TSSOP Packages)



Pin Description

Pin#	Pin Name	Type	Description
1	XIN/CLKIN	I	Crystal connection or external reference frequency input. This pin has dual functions. It can be connected either to an external crystal or an external reference clock.
2	XOUT	O	Crystal connection. If using an external reference, this pin must be left unconnected.
3	$\overline{PD}$	I	Power-down control pin. Pull low to enable power-down mode. Connect to VDD if not used.
4	NC	–	No connect.
5	VSS	P	Ground connection.
6	ModOUT	O	Spread spectrum clock output.
7	NC	–	No connect.
8	VDD	P	Power supply for the entire chip

Modulation Profile



Specification

Description		Specification
Frequency Range	For 2.5V Supply	6MHz < CLKIN < 12MHz
	For 3.3V Supply	6MHz < CLKIN < 13MHz
Modulation Equation		$F_{IN}/256$
Frequency Deviation		±0.65% @ 8MHz

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V_{DD}, V_{IN}	Voltage on any pin with respect to Ground	0.5 to +7.0	V
T_{STG}	Storage temperature	-65 to +125	°C
T_A	Operating temperature	0 to 70	°C
T_s	Max. Soldering Temperature (10 sec)	260	°C
T_J	Junction Temperature	150	°C
T_{DV}	Static Discharge Voltage (As per MIL-STD-883, Method 3015)	2	KV

Note: These are stress ratings only and are not implied for functional use. Exposure to absolute maximum ratings for prolonged periods of time may affect device reliability.

DC Electrical Characteristics for 2.5V Supply

(Test condition: All parameters are measured at room temperature (+25°C) unless otherwise stated)

Symbol	Parameter	Min	Typ	Max	Unit
V_{IL}	Input low voltage	GND-0.3	–	0.8	V
V_{IH}	Input high voltage	2.0	–	VDD+0.3	V
I_{IL}	Input low current	–	–	-35	µA
I_{IH}	Input high current	–	–	35	µA
I_{XOL}	XOUT output low current (@0.5V, V_{DD}=2.5V)	–	3	–	mA
I_{XOH}	XOUT output high current (@1.8V, V_{DD}=2.5V)	–	3	–	mA
V_{OL}	Output low voltage (V_{DD} = 2.5 V, I_{OL} = 8 mA)	–	–	0.6	V
V_{OH}	Output high voltage (V_{DD} = 2.5 V, I_{OH} = 8 mA)	1.8	–	–	V
I_{DD}	Static supply current*	–	–	10	µA
I_{CC}	Dynamic supply current (2.5V, 8MHz and no load)	–	2.5	–	mA
V_{DD}	Operating voltage	2.375	2.5	2.625	V
t_{ON}	Power-up time (first locked cycle after power-up)**	–	–	5	mS
Z_{OUT}	Output impedance	–	50	–	Ω

* XIN/CLKIN pin and $\overline{PD}$ pin are pulled low
** V_{DD} and XIN/CLKIN input are stable, PD pin is made high from low.

AC Electrical Characteristics for 2.5V Supply

Symbol	Parameter		Min	Typ	Max	Unit
CLKIN	Input frequency		6	–	12	MHz
ModOUT	Output frequency		6	–	12	MHz
f_d	Frequency Deviation	Input Frequency = 6MHz	–	–	±0.96	%
		Input Frequency = 12MHz	–	–	±0.45	
t_{LH}*	Output rise time (measured from 0.7V to 1.7V)		0.4	1.2	1.4	nS
t_{HL}*	Output fall time (measured from 1.7V to 0.7V)		0.4	0.9	1.1	nS
t_{JC}	Jitter (cycle to cycle)		–	–	200	pS
t_D	Output duty cycle		45	50	55	%

* t_{LH} and t_{HL} are measured into a capacitive load of 15pF

DC Electrical Characteristics for 3.3V Supply

(Test condition: All parameters are measured at room temperature (+25°C) unless otherwise stated.)

Symbol	Parameter	Min	Typ	Max	Unit
V_{IL}	Input low voltage	GND - 0.3	–	0.8	V
V_{IH}	Input high voltage	2.0	–	V_{DD} + 0.3	V
I_{IL}	Input low current	–	–	-35	µA
I_{IH}	Input high current	–	–	35	µA
I_{XOL}	XOUT output low current (@0.4V, V_{DD}=3.3V)	–	3	–	mA
I_{XOH}	XOUT output high current (@2.5V, V_{DD}=3.3V)	–	3	–	mA
V_{OL}	Output low voltage (V_{DD} = 3.3 V, I_{OL} = 8 mA)	–	–	0.4	V
V_{OH}	Output high voltage (V_{DD} = 3.3 V, I_{OH} = 8 mA)	2.5	–	–	V
I_{DD}	Static supply current*	–	–	10	µA
I_{CC}	Dynamic supply current (3.3V, 8MHz and no load)	–	3.0	–	mA
V_{DD}	Operating voltage	2.7	3.3	3.6	V
t_{ON}	Power-up time(first locked cycle after power up)**	–	–	5	mS
Z_{OUT}	Output impedance	–	45	–	Ω

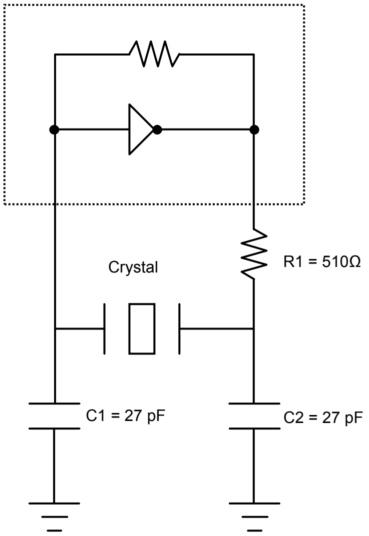
* XIN/CLKIN pin and $\overline{PD}$ pin are pulled low
**V_{DD} and XIN/CLKIN input are stable; $\overline{PD}$ pin is made high from low.

AC Electrical Characteristics for 3.3V Supply

Symbol	Parameter		Min	Typ	Max	Unit
CLKIN	Input frequency		6	–	13	MHz
ModOUT	Output frequency		6	–	13	MHz
f_d	Frequency Deviation	Input Frequency = 6MHz	–	–	±0.96	%
		Input Frequency = 13MHz	–	–	±0.43	
t_{LH}*	Output rise time (measured at 0.8V to 2.0V)		0.5	1.3	1.5	nS
t_{HL}*	Output fall time (measured at 2.0V to 0.8V)		0.4	1.0	1.2	nS
t_{JC}	Jitter (cycle to cycle)		–	–	200	pS
t_D	Output duty cycle		45	50	55	%

*t_{LH} and t_{HL} are measured into a capacitive load of 15pF

Typical Crystal Oscillator Circuit

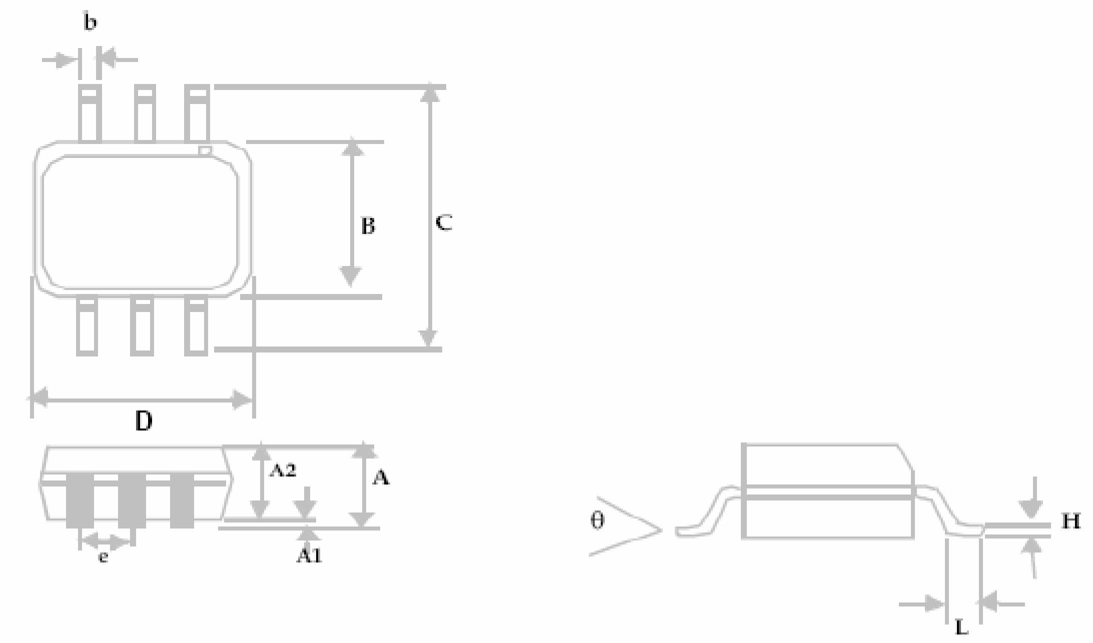


Typical Crystal Specifications

Fundamental AT cut parallel resonant crystal	
Nominal frequency	8.000 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	18pF
Shunt capacitance	7pF maximum
ESR	25 Ω

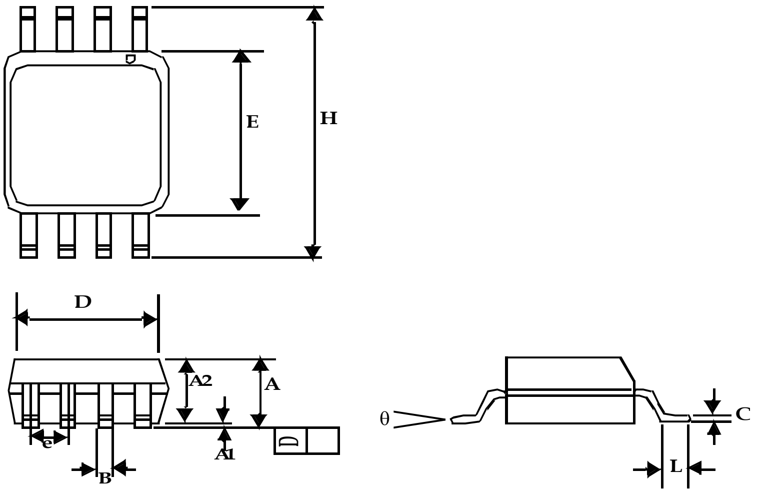
Package Information

6-pin TSOT-23 Package



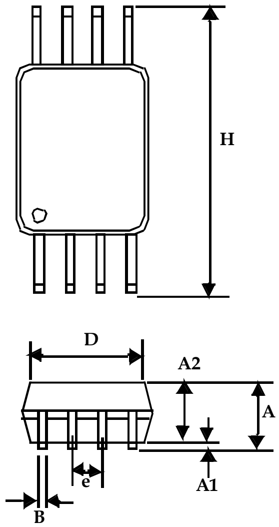
Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A		0.04		1.00
A1	0.00	0.004	0.00	0.10
A2	0.033	0.036	0.84	0.90
b	0.012	0.02	0.30	0.50
H	0.005 BSC		0.127 BSC	
D	0.114 BSC		2.90 BSC	
B	0.06 BSC		1.60 BSC	
e	0.0374 BSC		0.950 BSC	
C	0.11 BSC		2.80 BSC	
L	0.0118	0.02	0.30	0.50
θ	0°	4°	0°	4°

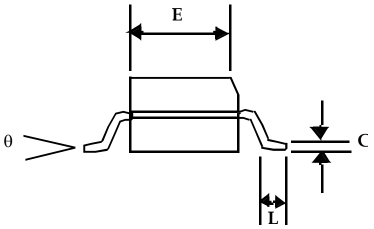
8-Pin SOIC Package



Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A1	0.004	0.010	0.10	0.25
A	0.053	0.069	1.35	1.75
A2	0.049	0.059	1.25	1.50
B	0.012	0.020	0.31	0.51
C	0.007	0.010	0.18	0.25
D	0.193 BSC		4.90 BSC	
E	0.154 BSC		3.91 BSC	
e	0.050 BSC		1.27 BSC	
H	0.236 BSC		6.00 BSC	
L	0.016	0.050	0.41	1.27
θ	0°	8°	0°	8°

TSSOP Package



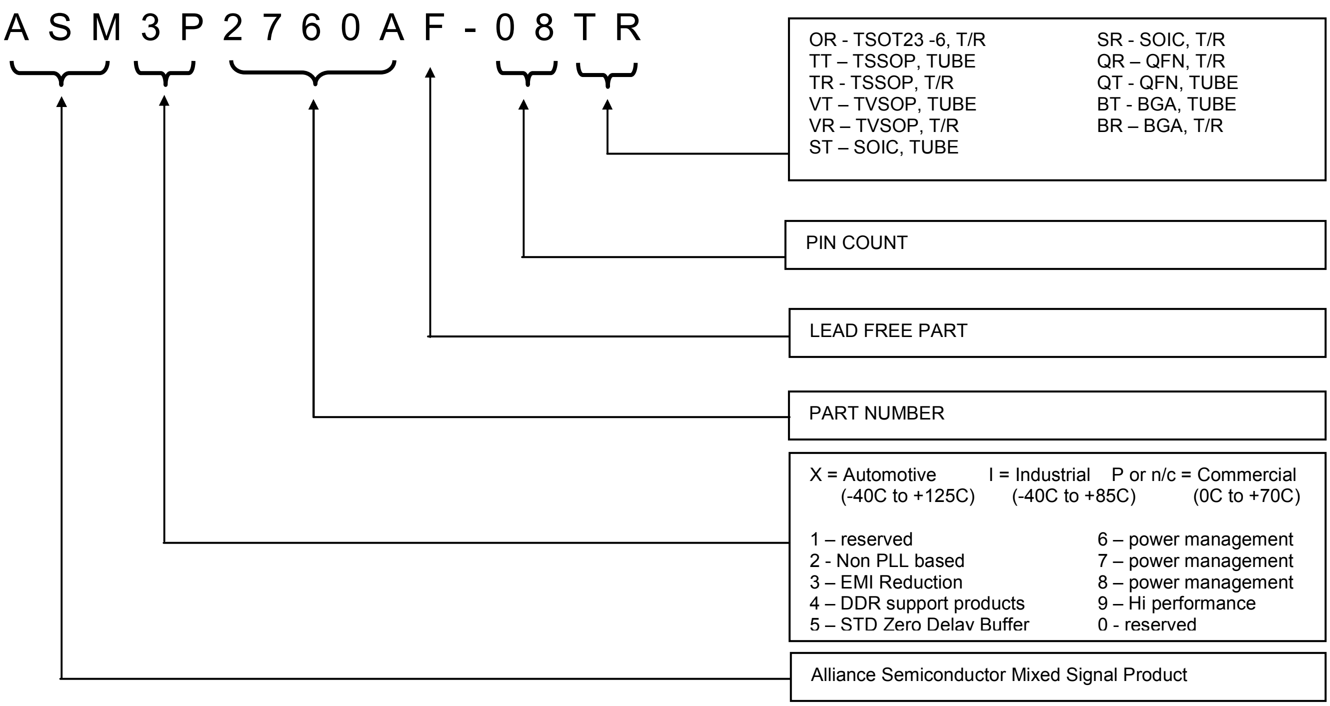


Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A		0.043		1.10
A1	0.002	0.006	0.05	0.15
A2	0.033	0.037	0.85	0.95
B	0.008	0.012	0.19	0.30
c	0.004	0.008	0.09	0.20
D	0.114	0.122	2.90	3.10
E	0.169	0.177	4.30	4.50
e	0.026 BSC		0.65 BSC	
H	0.252 BSC		6.40 BSC	
L	0.020	0.028	0.50	0.70
θ	0°	8°	0°	8°

Ordering Information

Part Number	Marking	Package Type	Temperature
ASM3P2760AF-06OR	E4LL	6-Pin TSOT-23, TAPE & REEL	0°C – 70°C
ASM3P2760AF-08TT	ASM3P2760AFT	8-Pin TSSOP, TUBE	0°C – 70°C
ASM3P2760AF-08TR	ASM3P2760AFT	8-Pin TSSOP, TAPE & REEL	0°C – 70°C
ASM3P2760AF-08ST	ASM3P2760AFS	8-Pin SOIC, TUBE	0°C – 70°C
ASM3P2760AF-08SR	ASM3P2760AFS	8-Pin SOIC, TAPE & REEL	0°C – 70°C
ASM3P2760A-06OR	E1LL	6-Pin TSOT-23, TAPE & REEL	0°C – 70°C
ASM3P2760A-08TT	ASM3P2760AT	8-Pin TSSOP, TUBE	0°C – 70°C
ASM3P2760A-08TR	ASM3P2760AT	8-Pin TSSOP, TAPE & REEL	0°C – 70°C
ASM3P2760A-08ST	ASM3P2760AS	8-Pin SOIC, TUBE	0°C – 70°C
ASM3P2760A-08SR	ASM3P2760AS	8-Pin SOIC, TAPE & REEL	0°C – 70°C

Device Ordering Information



OR - TSOT23 -6, T/R
TT – TSSOP, TUBE
TR - TSSOP, T/R
VT – TVSOP, TUBE
VR – TVSOP, T/R
ST – SOIC, TUBE
SR - SOIC, T/R
QR – QFN, T/R
QT - QFN, TUBE
BT - BGA, TUBE
BR – BGA, T/R

PIN COUNT

LEAD FREE PART

PART NUMBER

X = Automotive (-40C to +125C)
I = Industrial (-40C to +85C)
P or n/c = Commercial (0C to +70C)

1 – reserved
2 - Non PLL based
3 – EMI Reduction
4 – DDR support products
5 – STD Zero Delay Buffer
6 – power management
7 – power management
8 – power management
9 – Hi performance
0 - reserved

Alliance Semiconductor Mixed Signal Product

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Preliminary Information
Part Number: ASM3P2760A
Document Version: v1.7

Note: This product utilizes US Patent # 6,646,463 Impedance Emulator Patent issued to Alliance Semiconductor, dated 11-11-2003

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