IMISC402   *SYSTEM CLOCK CHIP*

CMOS LSI
PLL FREQUENCY SYNTHESIZER

PRODUCT FEATURES

- Generates all Essential Clock Signals for the Motherboards.
- 3V to 7V Operating Supply Range.
- Supports 80286, 80386 and 80486 based designs.
- Integrates TURBO Driver, CPU Clocks and Buffered 14.318 MHz output.
- Wide Range of Selectable Output Frequencies Including 88, 80, 66.6, 50, 40, 32, 24, 16 and 8 MHz.
- Single Low Cost Crystal (14.318 MHz) Used as Reference Frequency.
- Two Independent Clock Generators.
- Glitch Free Switching for both Clock Generators.
- 50% Duty Cycle
- Power Down Mode for Low Power Consumption.
- Two Turbo Modes with Turbo output.
- TTL or CMOS compatible outputs with 12 mA drive capability
- Low, Short and Long Term Jitter
- 20 PDIP and 20SO(209 Mil Body) Package Options.

PRODUCT DESCRIPTION

The IMISC402 is a Clock chip for Motherboards. The IMISC402 includes two independent VCO's and uses a single 14.318 MHz external crystal to generate all essential clock signals. The IMISC402 is designed to generate CPU clock options of 88 MHz, 80 MHz, 66.6 MHz, 50 MHz, 40 MHz, 32 MHz, 24 MHz, 16 MHz and 8 MHz, giving flexibility to the user. The frequency selection on the CPU clock outputs is determined by the S0-S3 and Turbo pins. The user can use the 32 MHz and 16 MHz as fixed frequencies and select the variable frequencies using S0-S3 pins for the CPU clock. S3 pin selects single or double frequency on the MCLK2 output determined by S0-S2. Turbo pins allow the user to easily switch CPU clock frequencies. When TURBO1 pin goes low the MCLK2 output goes to 16 or 8 MHz depending on the status of S3 pin. When TURBO2 pin goes low the output frequency stepped down to the next lower frequency selected by S0-S2.

Both VCO's can be turned off in the stand by mode, reducing the current consumption to a few micro amperes. In the stand by mode all outputs except 14.318 MHz output are low and both Phase Detectors are Tri-Stated.
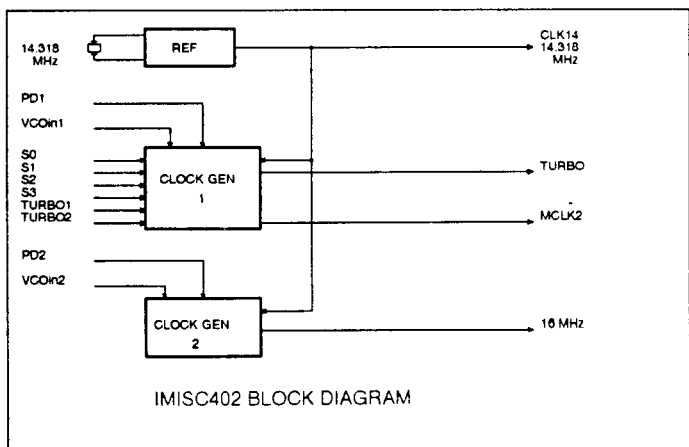
APPLICATIONS

IMISC402 eliminates the need for multiple oscillators, and generates all the essential clock signals for the Personal Computer Motherboards. Supports 8086, 80286, 80386SX, 80386DX and 80486 based designs. IMISC402 can be used with Laptop or Notebook computers to save power by running the system slower then normal CPU speeds or completely disabling the clocks in stand by mode.

IMISC402 BLOCK DIAGRAM

PIN DESCRIPTION

Xin, Xout - These pins form an on-chip reference oscillator when connected to terminals of an external parallel resonant crystal (nominally 14.31818 MHz). Xin may also serve as input for an externally generated reference signal.

S0, S1, S2, and S3 - Frequency select inputs. These inputs control the MCLK2 frequency selection. S0-S2 inputs control the CPU clock frequencies. S3 selects single or double frequency determined by S0-S2. All these inputs have internal pull-ups.

Table 1 shows the output frequency selection conditions.

MCLK2 FREQUENCY SELECTION							
INPUTS				MCLK2 (MHz)			
				TURBO2=1		TURBO2=0	
TURBO1	S2	S1	S0	S3=0	S3=1	S3=0	S3=1
0	X	X	X	8	16	8	16
1	0	0	0	12	24	8	16
1	0	0	1	16	32	12	24
1	0	1	0	20	40	16	32
1	0	1	1	25	50	20	40
1	1	0	0	33.3	66.6	25	50
1	1	0	1	40	80	33.3	66.6
1	1	1	0	44	88	40	80
1	1	1	1	Power Down	TEST	44	88

TABLE 1: When Power Down address is selected, all VCO's are turned off and the device goes to stand-by mode. All outputs except 14.318 MHz output are set to low. Phase detectors are in tri-state mode.

TURBO1 and TURBO2 - Turbo function select inputs. These inputs are used to slow down the System Clock. When TURBO1 goes low, MCLK2 output is set to 16 MHz or 8 MHz depending on the state of S3 pin. When TURBO2 goes low, MCLK2 output is stepped down to next lower frequency selected by S0-S2. Both of these inputs have internal Pull-ups.

MCLK2 - Master clock output. Programmable output frequencies can be selected using S0-S3 and TURBO1 and TURBO2 inputs shown on Table 1.

16 MHz - 16 MHz AT Bus Clock output.

14.318 MHz - 14.31818 MHz output. Buffered output of on-chip reference oscillator or externally provided reference.

TURBO - Turbo output pin. This is an open drain output. If either TURBO1 or TURBO2 is low the output will be in Tri-State. When both TURBO1 and TURBO2 are high, output goes low as shown on Table 2. This pin can be used to drive the TURBO LED. It can sink 12 mA.

PD1 and PD2 - These are the phase detector outputs for the clock generators. They are single-ended, tri-state outputs for use as loop error signal. A 0.1uF capacitor to Ground should be connected from each pin to form the loop filter.

VCOin1 and VCOin2 - VCO inputs for the internal VCO's. For typical applications, these inputs are shorted to the respective PD outputs to form the Loop filters.
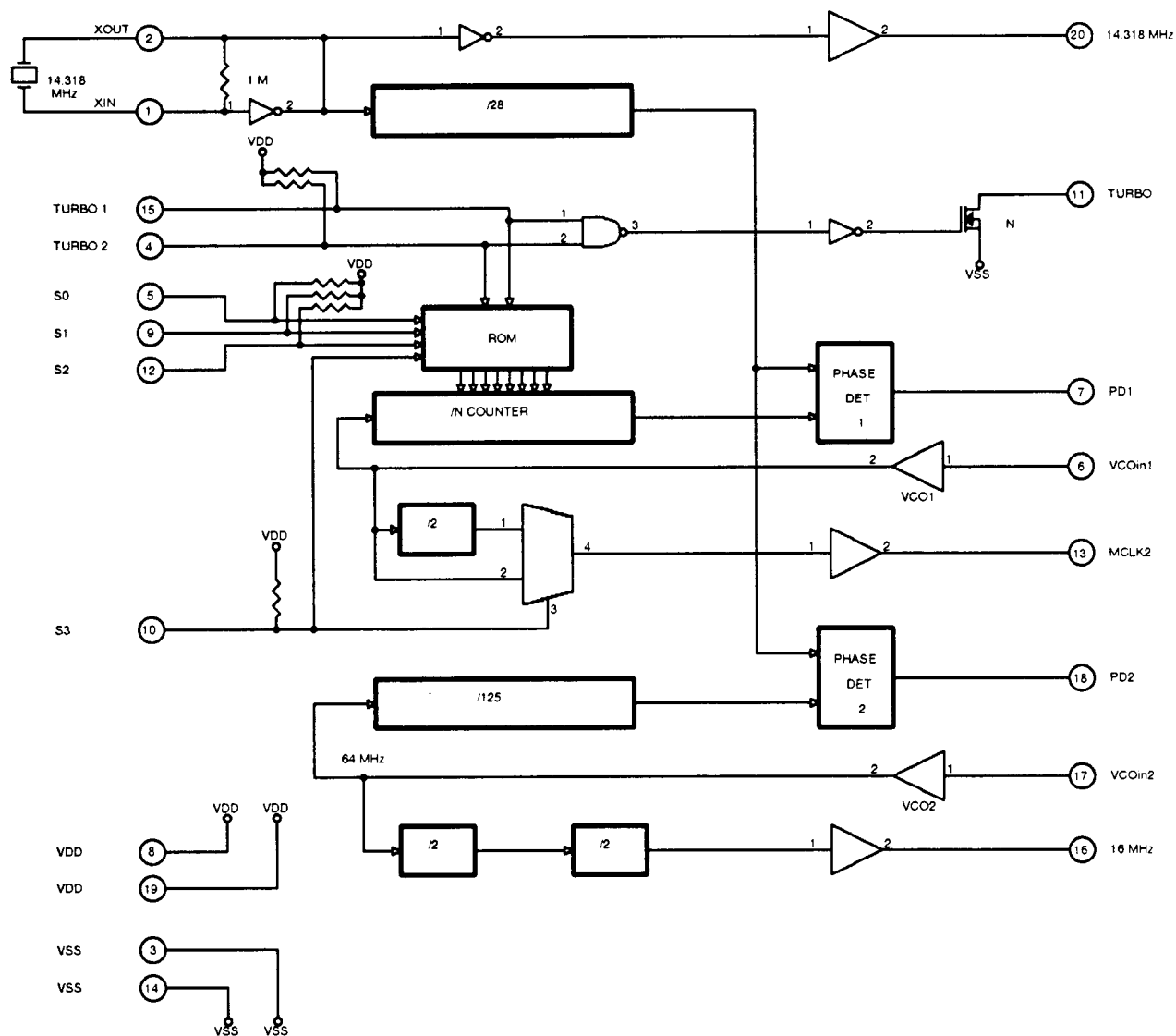
VSS - Circuit ground.

VDD - Positive power supply.

TURBO		
INPUT		OUTPUT
TURBO1	TURBO2	TURBO
0	0	Hi-Z
0	1	Hi-Z
1	0	Hi-Z
1	1	0

TABLE 2

BLOCK DIAGRAM

XOUT ②
14.318 MHz ⑳
14.318 MHz
XIN ①
1 M
/28
VDD
TURBO 1 ⑮
TURBO 2 ④
TURBO ⑪
N
VSS
S0 ⑤
VDD
S1 ⑨
ROM
S2 ⑫
/N COUNTER
PHASE DET 1
PD1 ⑦
VCOin1 ⑥
VCO1
VDD
/2
MCLK2 ⑬
S3 ⑩
PHASE DET 2
PD2 ⑱
/125
64 MHz
VCOin2 ⑰
VCO2
VDD VDD
VDD ⑧
VDD ⑲
/2
/2
16 MHz ⑯
VSS ③
VSS ⑭
VSS VSS

IMI SC402 BLOCK DIAGRAM

1/17/92

MAXIMUM RATINGS

Voltage relative to VSS : . -0.3V TO 7 V

Voltage relative to VDD : 0.3V

Storage temperature : -65°C TO 150°C

Ambient temperature : -55°C TO 125°C

Recommended Operating Range: 3V - 7V

This device contains circuitry to protect the inputs against damage due to high static voltages or electric field; however, precautions should be taken to avoid application of any voltage higher than the maximum rated voltages to this circuit. For proper operation, V_{in} and V_{out} should be constrained to the range:

$$VSS < (V_{in} \text{ or } V_{out}) < VDD$$

Unused inputs must always be tied to an appropriate logic voltage level (either V_{SS} or V_{DD}).

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Units
Input Low Voltage	V_{IL}	-	-	0.8	Vdc
Input High Voltage	V_{IH}	2.0	-	-	Vdc
Input Low Current With Pul-up or Pull-down	I_{IL}	-	-	5 / ±50	uA
Input High Current With pull-up or pull-down	I_{IH}	-	-	5 / ±50	uA
Output Low Voltage $I_{OL} = 12mA$	VOL	-	-	0.4	Vdc
Output High Voltage $I_{OH} = 12mA$	VOH	2.4	-	-	Vdc
Tri-State Leakage Current	I_{oz}	-	-	10	uA
Static Supply Current	I_{DD}	-	-	10	uA
Dynamic Supply Current	I_{CC}	-	-	0.3 mA/MHz/VCO	mA
Short Circuit Current	I_{SC}	25		-	mA
VDD = 5V ±10%, TA = -55°C to 125°C, CL = 50 pF					

SWITCHING CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Units
Output Rise and Fall Time	t_{TLH}, t_{THL}	-		5	ns
Output Enable TS to All Outputs	t_z			35	ns
Duty Cycle All Outputs		48/52	50/50	48/52	%
Jitter one sigma				100	ps
Input Rise and Fall Times OSCIN	t_{TLH}, t_{THL}	-	3	1	us
VDD = 5V ±10%, TA = -55°C to 125°C, CL = 50 pF					

TIMING DIAGRAMS

t : Current cycle time

t1: time to first positive edge after address change

t2: Output high time. t3 = 4t

t3: Lock time. 7ms max
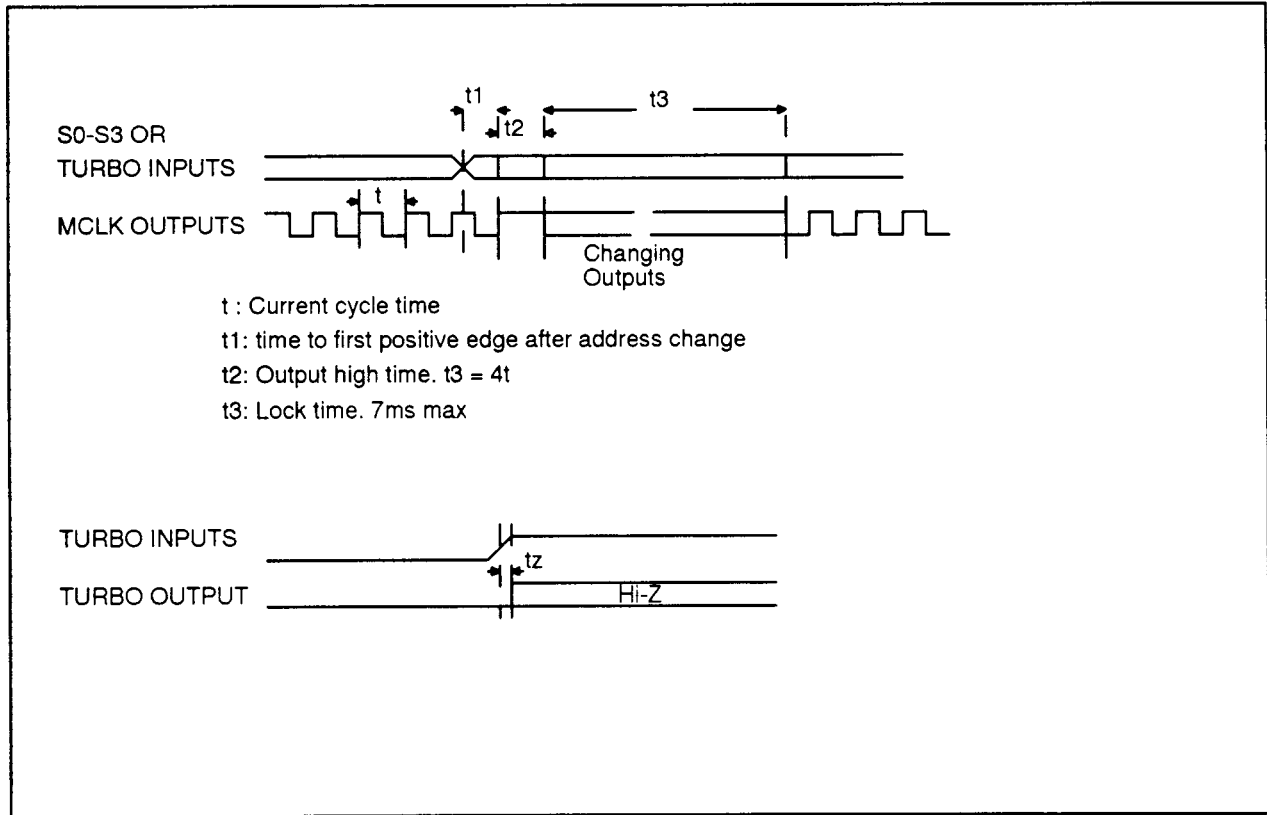
CONNECTION DIAGRAMS

PLASTIC DIP PACKAGE

	Pin		Pin	
Xin	1		20	14.318 MHz
Xout	2		19	VDD
VSS	3		18	PD2
TURBO 2	4		17	VCOin 2
S0	5		16	16 MHz
VCOin 1	6		15	TURBO 1
PD1	7		14	VSS
VDD	8		13	MCLK 2
S1	9		12	S2
S3	10		11	TURBO

SOIC PACKAGE

	Pin		Pin	
Xin	1		20	14.318 MHz
Xout	2		19	VDD
VSS	3		18	PD2
TURBO 2	4		17	VCOin 2
S0	5		16	16 MHz
VCOin 1	6		15	TURBO 1
PD1	7		14	VSS
VDD	8		13	MCLK 2
S1	9		12	S2
S3	10		11	TURBO
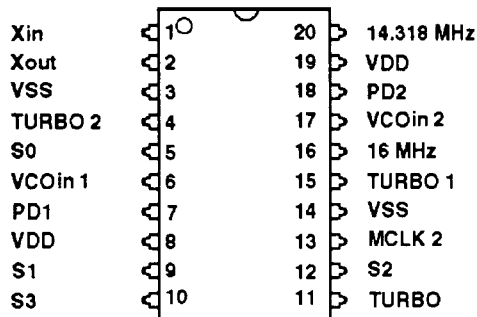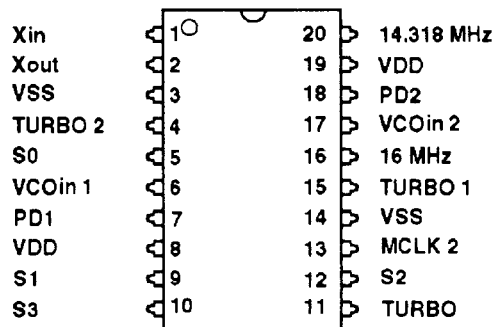
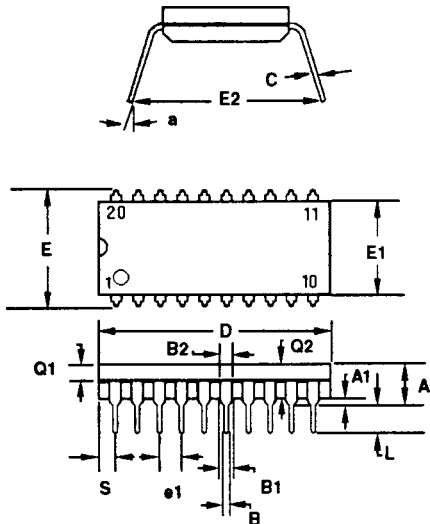## EXTERNAL CONNECTIONS

IMISC402
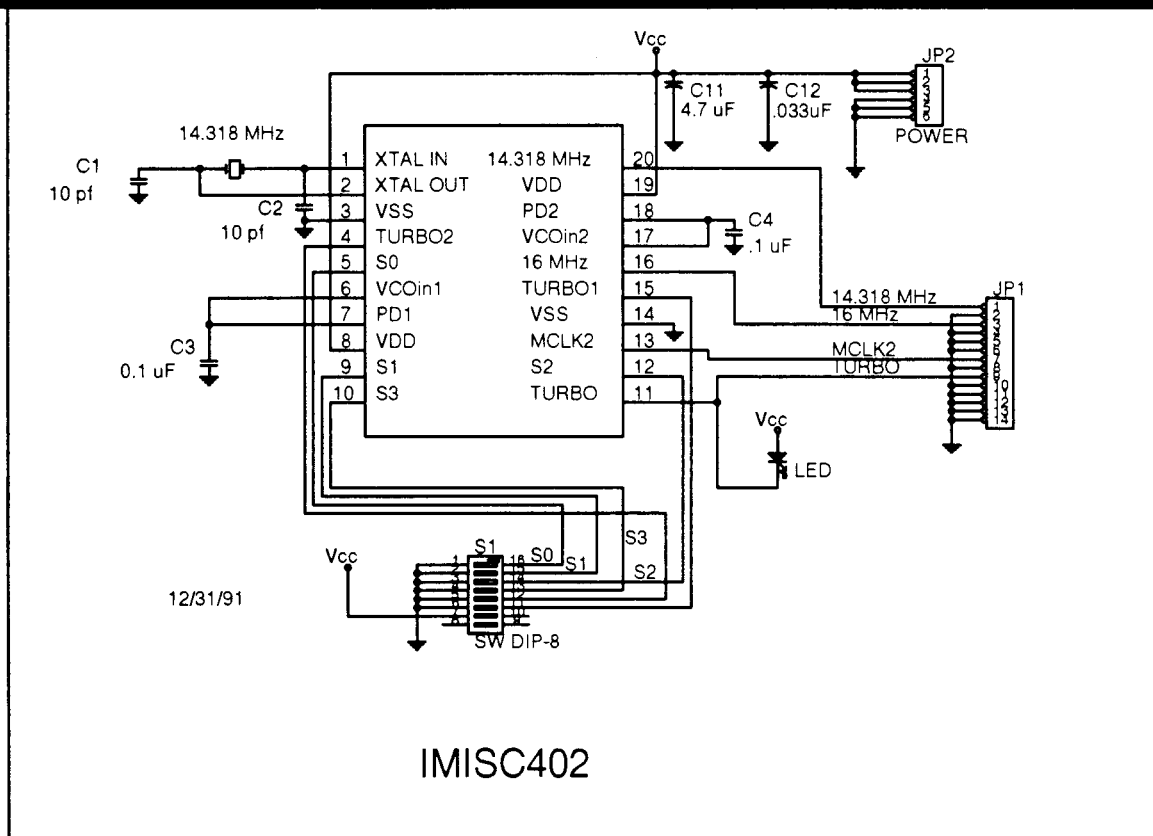
PACKAGE DRAWINGS AND DIMENSIONS

20 PLASTIC SKINNY DIP
(300 mil narrow body)

20 PIN SKINNY PLASTIC DIP DIMENSIONS						
SYMBOL	**INCHES**			**MILLIMETERS**		
	MIN	**NOM**	**MAX**	**MIN**	**NOM**	**MAX**
A	0.145	-	0.155	3.68	-	3.93
A1	0.020	-	-	0.51	-	-
B	0.016	0.018	0.020	0.40	0.45	0.50
B1	0.056	0.059	0.062	1.47	1.52	1.57
B2	0.046	0.049	0.052	1.17	1.24	1.32
C	0.008	0.010	0.012	0.20	0.25	0.30
D	1.028	1.030	1.032	26.11	26.16	26.21
E	0.298	-	0.302	7.57	-	7.67
E1	0.248	0.250	0.252	6.30	6.35	6.40
E2	0.335	0.345	0.355	8.51	8.76	9.01
e1	0.100 BSC			2.54 BSC		
L	0.128	0.130	0.132	3.25	3.30	3.35
a	0 °	7 °	15 °	0 °	7 °	15 °
Q1	0.059	0.060	0.061	1.50	1.53	1.55
Q2	0.128	0.130	0.132	3.25	3.30	3.35
S	0.063	0.065	0.067	1.60	1.65	1.70
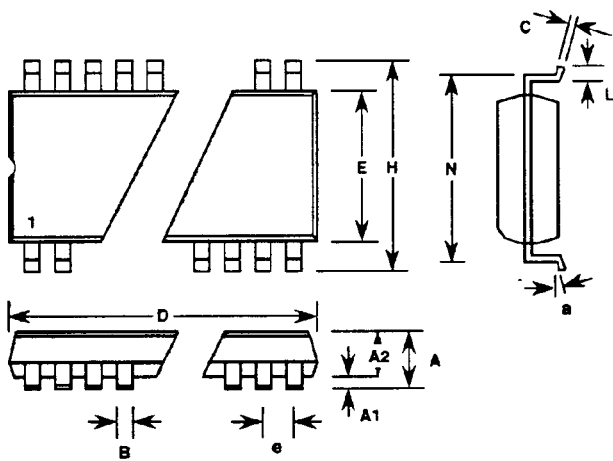
SOIC PACKAGE

20 PIN SOIC OUTLINE DIMENSIONS						
SYMBOL	**INCHES**			**MILLIMETERS**		
	MIN	**NOM**	**MAX**	**MIN**	**NOM**	**MAX**
A	0.068	0.073	0.078	1.73	1.86	1.99
A1	0.002	0.005	0.008	0.05	0.13	0.21
A2	0.066	0.068	0.070	1.68	1.73	1.78
B	0.010	0.012	0.015	0.25	0.30	0.38
C	0.005	0.006	0.009	0.13	0.15	0.22
D	0.278	0.284	0.289	7.07	7.20	7.33
E	0.205	0.209	0.212	5.20	5.30	5.38
e	0.0256 BSC			0.65 BSC		
H	0.301	0.307	0.311	7.65	7.80	7.90
a	0 °	4 °	8 °	0 °	4 °	8 °
L	0.022	0.030	0.037	0.55	0.75	0.95

ORDERING INFORMATION

Part Number	Package Type	Production Flow
IMISC402APB	Plastic DIP	Commercial, -40 °C to +85 °C
IMISC402AXB	SOIC	Commercial, -40 °C to +85 °C
IMISC402ACT	CERDIP	Military Operating Range, -55 °C to +125 °C
IMISC402ACK	CERDIP	Military Screening, -55 °C to +125 °C

Marking:

Example: IMISC402APB

Date Code, Lot #

INTERNATIONAL MICROCIRCUITS INC. 525 LOS COCHES ST.

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