



MILITARY DATA SHEET

MNLMF60CM-100-X REV 0AL

Original Creation Date: 08/21/95
Last Update Date: 08/21/95
Last Major Revision Date: 08/21/95

6th ORDER SWITCHED CAPACITOR BUTTERWORTH LOWPASS FILTER

Industry Part Number

LMF60CM-100

NS Part Numbers

LMF60CMJ100/883

Prime Die

LMF60B-100

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (°C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)

DC: $V_+ = 5V$, $V_- = -5V$, $f_{CLK} = 500KHz$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
fclk	Clock Frequency Range		1			1.5	MHz	1, 2, 3
$I_{s\pm}$	Supply Current				-7.0	7.0	mA	1
$I_{s\pm}$	Supply Current				-12	7.0	mA	2, 3
Ho	DC Gain	Resource $\leq 2K$ Ohms			-0.26	0.10	dB	1
		Resource $\leq 2K$ Ohms			-0.30	0.10	dB	2, 3
fclk/fc	Clock to Cutoff Frequency Ratio				97.315	98.885		1
					97.119	99.081		2, 3
Amin	Stopband Attenuation	@ 2 X fc			36		dB	1, 2, 3
Vos	DC Offset Voltage				-150	150	mV	1, 2, 3
Vo	Output Voltage Swing				-4.2	3.9	V	1
					-4.0	3.7	V	2, 3
	Additional Magnitude Response Test Points	$f_{in} = 6KHz$			-9.76	-8.84	dB	1
					-9.80	-8.80	dB	2, 3
		$f_{in} = 4.5KHz$			-1.03	-0.71	dB	1
					-1.07	-0.67	dB	2, 3
fclk	Clock Frequency Range		1, 2			750	KHz	1, 2, 3
$I_{s\pm}$	Supply Current		2		-5.0	5.0	mA	1
$I_{s\pm}$	Supply Current		2		-6.5	6.5	mA	2, 3
Ho	DC Gain	Resource $\leq 2K$ Ohm	2		-0.26	0.10	dB	1
		Resource $\leq 2K$ Ohm	2		-0.30	0.10	dB	2, 3
fclk/fc	Clock to Cutoff Frequency Ratio		2		97.315	98.885		1
			2		97.119	99.081		2, 3
Amin	Stopband Attenuation	@ 2 X fc	2		36		dB	1, 2, 3
Vos	DC Offset Voltage		2		-90	90	mV	1, 2, 3
Vo	Output Voltage Swing		2		-2.0	1.4	V	1
			2		-1.8	1.2	V	2, 3

Electrical Characteristics

DC PARAMETERS(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)

DC: $V_+ = 5V$, $V_- = -5V$, $f_{CLK} = 500KHz$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
	Additional Magnitude Response Test Points	$f_{in} = 3KHz$	2		-9.76	-8.84	dB	1
			2		-9.80	-8.80	dB	2, 3
		$f_{in} = 2.25KHz$	2		-1.03	-0.71	dB	1
			2		-1.07	-0.67	dB	2, 3

DC: OP AMP PARAMETERS

Vos	Input Offset Voltage	$V_+ = +5V$, $V_- = -5V$			-20	20	mV	1, 2, 3
		$V_+ = 2.5V$, $V_- = -2.5V$			-20	20	mV	1, 2, 3
CMRR	CMRR Op Amp 2 Only	Test Input Range: -2.2V to 1.8V, $V_+ = +5V$, $V_- = -5V$				55	dB	1, 2, 3
CMRR	CMRR Op Amp 2 Only	Test Input Range: -2.2V to 1.8V, $V_+ = 2.5V$, $V_- = -2.5V$				55	dB	1, 2, 3
Vo-	Output Voltage Swing	$R_l = 5K \Omega$, $V_+ = +5V$, $V_- = -5V$				-4.2	V	1
						-4.0	V	2, 3
		$R_l = 5K \Omega$, $V_+ = 2.5V$, $V_- = -2.5V$				-1.8	V	1
						-1.6	V	2, 3
Vo+	Output Voltage Swing	$R_l = 5K \Omega$, $V_+ = +5V$, $V_- = -5V$			3.8		V	1
					3.6		V	2, 3
		$R_l = 5K \Omega$, $V_+ = 2.5V$, $V_- = -2.5V$			1.3		V	1
					1.1		V	2, 3

Electrical Characteristics

DC LOGIC INPUT-OUTPUT PARAMETERS: SCHMITT TRIGGER

(The following conditions apply to all the following parameters, unless otherwise specified.)

DC: $V_- = 0V$, $V_{Lsh} = 0V$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vt+	Positive Going Threshold Voltage Clock In Pin	V+ = 10V	3		6.1	8.8	V	1
			3		6.0	8.9	V	2, 3
		V- = 5V	3		3.0	4.3	V	1
			3		2.9	4.4	V	2, 3
Vt-	Negative Going Threshold Voltage Clock In Pin	V+ = 10V	3		1.4	3.8	V	1
			3		1.3	3.9	V	2, 3
		V- = 5V	3		0.7	1.9	V	1
			3		0.6	2.0	V	2, 3
Vt+	Hysteresis Clock In Pin	V+ = 10V	4		2.3	7.4	V	1
			4		2.1	7.6	V	2, 3
Vt-	Hysteresis Clock In Pin	V- = 5V	4		1.1	3.6	V	1
			4		0.9	3.8	V	2, 3
Voh	Logical "1" Output Voltage Clock R Pin	Io = -10uA, V+ = 10V			9.1		V	1
					9.0		V	2, 3
		Io = -10uA, V+ = 5V			4.6		V	1
					4.5		V	2, 3
Vol	Logical "0" Output Voltage Clock R Pin	Io = 10uA, V+ = 10V				0.9	V	1
						1.0	V	2, 3
		Io = 10uA, V+ = 5V				0.4	V	1
						0.5	V	2, 3
Isource	Output Source Current Clock R Pin	CLK R Shorted to V-, V+ = 10V			4.9		mA	1
					3.7		mA	2, 3
		CLK R Shorted to V-, V+ = 5V			1.6		mA	1
					1.2		mA	2, 3
Isink	Output Sink Current Clock R Pin	CLK R Shorted to V+, V+ = 10V			4.9		mA	1
					3.7		mA	2, 3
		CLK R Shorted to V+, V+ = 5V			1.6		mA	1
					1.2		mA	2, 3

Electrical Characteristics

DC LOGIC INPUT-OUTPUT PARAMETERS: TTL CLOCK INPUT, CLK R PIN

(The following conditions apply to all the following parameters, unless otherwise specified.)

DC: $V_- = 0V$, $V_{Lsh} = 0V$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vih	Logical "1" TTL Clock R Pin Input Voltage	$V_+ = +5V$, $V_- = -5V$	3		2.0		V	1, 2, 3
		$V_+ = 2.5V$, $V_- = -2.5V$	3		2.0		V	1, 2, 3
Vil	Logical "0" TTL Clock R Pin Input Voltage	$V_+ = +5V$, $V_- = -5V$	3			0.8	V	1, 2, 3
		$V_+ = +2.5V$, $V_- = -2.5V$	3			0.6	V	1
			3			0.4	V	2, 3

Note 1: Inversely tested.

Note 2: $V_+ = 2.5V$, $V_- = -2.5V$, $f_{CLK} = 250KHz$.

Note 3: Parameter tested go-no-go only.

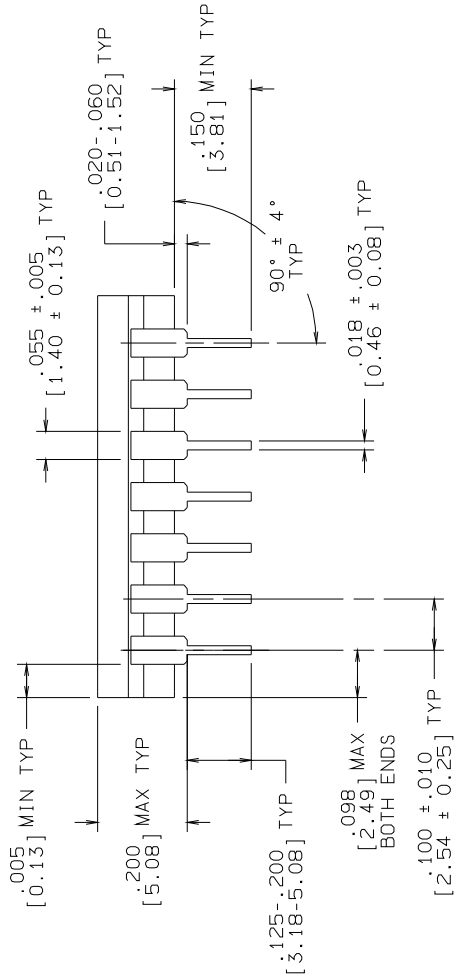
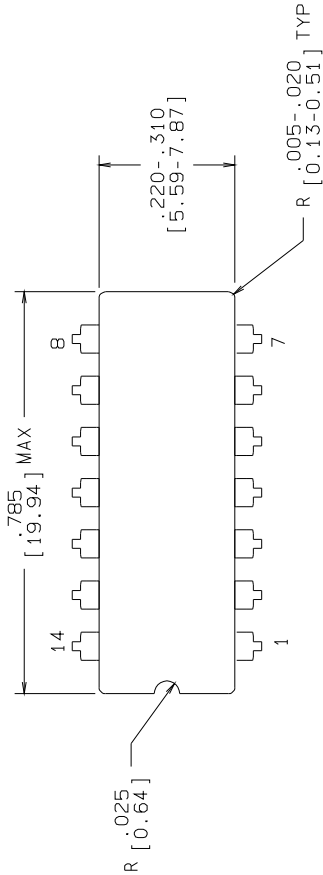
Note 4: Guaranteed by V_+ and V_- .

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
06093HR	(blank)
J14ARH	CERDIP (J), 14 LEAD (P/P DWG)

See attached graphics following this page.

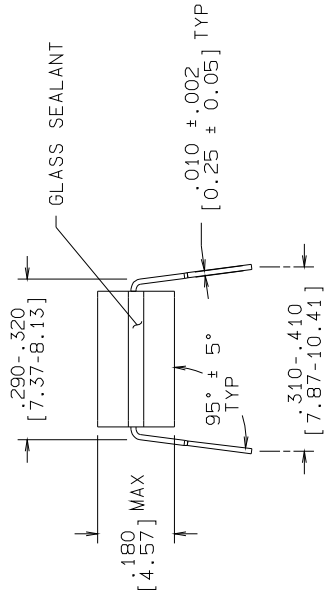
R E V I S I O N S				
LTR	DESCRIPTION	E.C.N.	DATE	BY/APP'D
H	REVISE PER CURRENT STD; REDRAW	10001	09/15/93	TL/



CONTROLLING DIMENSION: INCH

NOTES: UNLESS OTHERWISE SPECIFIED

1. LEAD FINISH TO BE 200 MICRONS / 5.08 MICROMETERS MINIMUM SOLDER MEASURED AT THE CREST OF THE MAJOR FLATS.
2. JEDEC REGISTRATION MO-036, VARIATION AB, DATED 04/1981.



MIL/AERO CONFIGURATION CONTROL MIL-M-38510 CONFIGURATION CONTROL

APPROVALS	DATE	NATIONAL SEMICONDUCTOR CORPORATION	
DRAWN LEQUANG	09/15/93	2900 Semiconductor Drive, Santa Clara, CA 95052-8090	
DFTG. CHK.			
ENGR. CHK.			
APPROVAL		CERDIP (J) , 14 LEAD,	
 PROJECTION INCH [MM]	SCALE	SIZE	DRAWING NUMBER
	N/A	B	MKT-J14A
DO NOT SCALE DRAWING		SHEET	1 OF 1
		REV	H