

MNLM78S40-X REV 0BL

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

Switching Regulator

Industry Part Number

LM78S40

NS Part Numbers

LM78S40J/883*

Prime Die

LM78S

Controlling Document

5962-8876101EA*

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: General Characteristics

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: $V_{in} = 5V$, $V_{OPAMP} = 5V$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Icc	Supply Current	$V_{in} = 5V$, Without OP AMP			0.5	3.5	mA	1, 2, 3
		$V_{in} = 40V$, Without OP AMP			0.5	5.0	mA	1, 2, 3
		$V_{in} = 5V$, With OP AMP			0.5	4.0	mA	1, 2, 3
		$V_{in} = 40V$, With OP AMP			0.5	5.5	mA	1, 2, 3

DC PARAMETERS: Reference Section

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: $V_{in} = 5V$, $V_{OPAMP} = 5V$

Vref	Reference Voltage	$V_{in} = 5V$, $I_l = 1mA$			1.180	1.310	V	1, 2, 3
Vld	Load Regulation	$V_{in} = 5V$, $1mA \leq I_l \leq 10mA$			-4.5	4.5	mV	1
Vln	Line Regulation	$3V \leq V_{in} \leq 40V$, $I_l = 1mA$			-7.4	7.4	mV	1

DC PARAMETERS: Oscillator Section

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: $V_{in} = 5V$, $V_{OPAMP} = 5V$

Ichg	Osc. I Charge	$V_{in} = 5V$, $V_{ct} = 0.8V$			-50	-20	uA	1
		$V_{in} = 40V$, $V_{ct} = 0.8V$			-70	-20	uA	1
Idis	Osc. I Discharge	$V_{in} = 5V$, $V_{ct} = 0.8V$			150	250	uA	1
		$V_{in} = 40V$, $V_{ct} = 0.8V$			150	350	uA	1

DC PARAMETERS: Current Limit Section

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: $V_{in} = 5V$, $V_{OPAMP} = 5V$

Vcls	ILimit Sense Volt	$V_{in} = 5V$, $I_{ct} = 200uA$			-350	-250	mV	1
Vthl	Osc. Lower Vth	$V_{in} = 5V$	1		548	800	mV	1
Vthu	Osc. Upper Vth	$V_{in} = 5V$	1		800	1402	mV	1

Electrical Characteristics

DC PARAMETERS: Output Switching Section

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

DC: $V_{in} = 5V$, $V_{OPAMP} = 5V$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vsat2	Saturation Volt Q1	$I_c = 500mA$, $V_{12} = 0.3V$, $I_{15} = 100mA$	1			0.7	V	1, 2, 3
		$I_c = 1A$, $V_{12} = 0.3V$, $I_{15} = 100mA$, $V_3 = 0$, $V_{cc} = V_{13} = 5V$				0.7	V	1, 2, 3
Vsat1	Sat. Volt Q1 + Q2	$I_c = 5mA$, $V_{12} = 0.3V$, Darlington	1			1.3	V	1, 2, 3
		$I_c = 500mA$, $V_{12} = 0.3V$, Darlington	1			1.3	V	1, 2, 3
		$I_c = 1A$, $V_{12} = 0.3V$, Darlington				1.3	V	1, 2, 3
Vsat	Sat. Volt Q1 + Q2	$I_c = 500mA$, Emitter Follower	1		-2.10	-0.5	V	1
		$I_c = 1A$, Emitter Follower	1		-3.10	-0.5	V	1
Ileak	Leakage Current Q1	$V_{16} = 40V$				10	μA	1
Ileak	Leakage Current Q2	$V_{16} = 40V$				10	μA	1

DC PARAMETERS: Power Diode

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

DC: $V_{in} = 5V$, $V_{OPAMP} = 5V$

Vfwd	Diode Forward Volt	$I_d = 500mA$				1.5	V	1, 2, 3
		$I_d = 1A$				1.5	V	1, 2, 3
Ileak	Diode Leak Current	$V_d = 40V$				10	μA	1

Electrical Characteristics

DC PARAMETERS: Comparator

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

DC: $V_{in} = 5V$, $V_{OPAMP} = 5V$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Iio	Input Offset Current	$V_{mc} = V_{ref}$	3			75	nA	1, 2, 3
Vir	Input Voltage Range		4		0	$V_i - 2.0$	V	1
PSRR	Power Supply Rejection Ratio	$3.0V \leq V_i \leq 40V$	3			316	$\mu V/V$	1
Vos	Comparator Vos	$V_5 = V_{13} = V_{14} = 3V$, $V_{cm} = V_{ref} = 0V$, $(V_{in-}) - (V_{in+}) = 11mV$	2		2.5		V	1
		$V_5 = V_{13} = V_{14} = 3V$, $V_{cm} = V_{ref} = 0V$, $(V_{in-}) - (V_{in+}) = 15mV$	2		2.5		V	2, 3
		$V_5 = V_{13} = V_{14} = 3V$, $V_{cm} = V_{ref} = 0V$, $(V_{in-}) - (V_{in+}) = -10.5mV$	2			2.5	V	1
		$V_5 = V_{13} = V_{14} = 3V$, $V_{cm} = V_{ref} = 0V$, $(V_{in-}) - (V_{in+}) = -15mV$	2			2.5	V	2, 3
		$V_5 = V_{13} = V_{14} = 40V$, $V_{cm} = V_{ref} = 0V$, $(V_{in-}) - (V_{in+}) = 10.5mV$	2		2.5		V	1
		$V_5 = V_{13} = V_{14} = 40V$, $V_{cm} = V_{ref} = 0V$, $(V_{in-}) - (V_{in+}) = 15mV$	2		2.5		V	2, 3
		$V_5 = V_{13} = V_{14} = 40V$, $V_{cm} = V_{ref} = 0V$, $(V_{in-}) - (V_{in+}) = -10.5mV$	2			2.5	V	1
		$V_5 = V_{13} = V_{14} = 40V$, $V_{cm} = V_{ref} = 0V$, $(V_{in-}) - (V_{in+}) = -15mV$	2			2.5	V	2, 3
		$V_5 = V_{13} = V_{14} = 40V$, $V_{cm} = 38V$, $(V_{in-}) - (V_{in+}) = 10.5mV$	2		2.5		V	1
		$V_5 = V_{13} = V_{14} = 40V$, $V_{cm} = 38V$, $(V_{in-}) - (V_{in+}) = 15mV$	2		2.5		V	2, 3
		$V_5 = V_{13} = V_{14} = 40V$, $V_{cm} = 38V$, $(V_{in-}) - (V_{in+}) = -10.5V$	2			2.5	V	1
		$V_5 = V_{13} = V_{14} = 40V$, $V_{cm} = 38V$, $(V_{in-}) - (V_{in+}) = -15mV$	2			2.5	V	2, 3
Ibt	Total Bias Current	$V_5 = V_{13} = V_{14} = 3.75V$, $V_{11} = V_{12} = -1.25V$			-400		nA	1, 2, 3

Electrical Characteristics

DC PARAMETERS: Output Operational Amplifier

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: $V_{in} = 5V$, $V_{OPAMP} = 5V$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Voh	Output Volt High	V5=V13=V14 = 5V, V9=V11=V12 = 0V, I1=50mA, V6=5V			2		V	1
Vol	Output Volt Low	V5=V13=V14 = 5V, V9=V11=V12 = 0V, I1=5mA, V7=1V				1	V	1
Vos	Offset Voltage	V5=V13=V14=2.5V, V4=-0.75V, V9=V11=V12=-2.5V			-15	15	mV	1, 2, 3
Ios	Offset Current	V5=V13=V14=2.5V, V4=-0.75V, V9=V11=V12=-2.5V			-75	75	nA	1, 2, 3
Ib+	Bias Current	V5=V13=V14=2.5V, V4=-0.75V, V9=V11=V12=-2.5V, Rs+=10K, Rs-=Short, Rl=2K				200	nA	1, 2, 3
Ib-	Bias Current	V5=V13=V14=2.5V, V4=-0.75V, V9=V11=V12=-2.5V, Rs+=Short, Rl=2K			-200		nA	1, 2, 3
Isrc	Current Source	V5=V13=V14= 5V, V6=1.75V, V9=V11=V12=0V, V4 = 0V			-200	-75	mA	1
Isink	Current Sink	V5=V13=V14= 5V, V7=1.75V, V9=V11=V12=0V, V4 = 5V			10	80	mA	1
Vir	Input Volt Range		5		0	3.0	V	1
CMRR	Common Mode Rejection Ratio	V5=V13=V14=5V to 2V, V9=V11=V12=0V to -3V, V4=2.75V to -1.25V			76		dB	4
PSRR	Power Supply Rejection Ratio	V5=V13=V14=3V to 40V, V9=V11=V12=0V, V4 = 1V			76		dB	4
Avs-	Voltage Gain	V5=V13=V14=5V, V4=1V to 2.5V, V9=V11=V12 =0V, Rl=2K to V-			25K		V/V	4
Avs+	Voltage Gain	V5=V13=V14=5V, V4=1V to 2.5V, V9=V11=V12 =0V, Rl=2K to V-			25K		V/V	4

Note 1: Test not in Databook.

Note 2: Done as go-no-go test, This is an equivalent method to measure Vos.

Note 3: Guaranteed but not tested.

Note 4: Guaranteed by Vos test.

Note 5: Guaranteed by CMRR.

Revision History

Rev	ECN #	Rel Date	Originator	Changes
OBL	M0001706	11/12/98	Barbara Lopez	Changed: MNLM78S40-X Rev. 0AL to MNLM78S40-X Rev. OBL.