

**MNLM1575-X-12 REV 0B0**

Original Creation Date: 08/29/95

Last Update Date: 09/29/95

Last Major Revision Date: 08/29/95

**SIMPLE SWITCHER(TM) 1A STEP-DOWN VOLTAGE REGULATOR**
**General Description**

The LM1575 regulator is a monolithic integrated circuit that provides all the active functions from a step-down (buck) switching regulator, capable of driving a 1A load with excellent line and load regulation.

Requiring a minimum number of external components, this regulator is simple to use and includes internal frequency compensation and a fixed-frequency oscillator.

The LM1575 offers a high-efficiency replacement for popular three-terminal linear regulators. It substantially reduces the size of the heat sink, and in many cases no heat sink is required.

A standard series of inductors optimized for use with the LM1575 are available from several different manufacturers. This feature greatly simplifies the design of switch-mode power supplies.

Other features include a guaranteed  $\pm 4\%$  tolerance on output voltage within specified input voltage and output load conditions, and  $\pm 10\%$  on the oscillator frequency. External shutdown is included, featuring 50uA (typical) standby current. The output switch includes cycle-by-cycle current limiting, as well as thermal shutdown for full protection under fault conditions.

**Industry Part Number**

LM1575-12

**NS Part Numbers**

LM1575J-12-QML

LM1575K-12-QML

**Prime Die**

LM1575-12

**Controlling Document**

5962-9167301QEA, QXA

**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

**Features**

- Adjustable version output voltage range, 1.23V to 37V  $\pm 4\%$  max over line and load conditions
- Guaranteed 1A output current
- Requires only 4 external components
- 52KHz fixed frequency internal oscillator
- TTL shutdown capability, low power standby mode
- High efficiency
- Uses readily available standard inductors
- Thermal shutdown and current limit protection

**Applications**

- Simple high-efficiency step-down (buck) regulator
- Efficient pre-regulator for linear regulators
- On-card switching regulators
- Positive to negative converted (Buck-Boost)

**(Absolute Maximum Ratings)**

(Note 1)

Maximum Supply Voltage	45V
$\overline{\text{ON}}$ /OFF Pin Input Voltage	$-0.3\text{V} \leq V \leq +V_{\text{in}}$
Output Voltage to Ground (Steady State)	-1V
Power Dissipation	Internally Limited
Storage Temperature Range	-65 C to +150 C
Minimum ESD Rating (C = 100pF, R = 1.5K Ohms)	3KV
Lead Temperature (Soldering, 10 Sec.)	
CERDIP	260 C
TO3	300 C
Maximum Junction Temperature	150 C
Thermal Resistance	
ThetaJA	
Metal Can (Still Air)	45 C/W
Metal Can (500LF/Min Air flow)	10 C/W
CERDIP (Still Air)	70 C/W
CERDIP (500LF/Min Air flow)	33 C/W
ThetaJC	
Metal Can	3.3 C/W
CERDIP	2.0 C/W

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but do not guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics.

**Recommended Operating Conditions**

Temperature Range	$-55\text{ C} \leq T_A \leq +125\text{ C}$
Supply Voltage	40V

## Electrical Characteristics

### ELECTRICAL CHARACTERISTICS: SYSTEM PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)  
DC:  $V_{in} = 25V$ , and  $I_{load} = 200mA$ .

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vout	Output Voltage		1		11.88	12.12	V	1
		$0.2A \leq I_{load} \leq 1A$ , $15V \leq V_{in} \leq 40V$	1		11.64	12.36	V	1
		$0.2A \leq I_{load} \leq 1A$ , $15V \leq V_{in} \leq 40V$	1		11.52	12.48	V	2, 3

### ELECTRICAL CHARACTERISTICS: DEVICE PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)  
DC:  $V_{in} = 25V$ , and  $I_{load} = 200mA$ .

Vsat	Saturation Voltage	$I_{out} = 1A$	2			1.2	V	1
			2			1.4	V	2, 3
Icl	Current Limit	Peak Current, $t_{ON} \leq 3\mu S$	2		1.7	3.0	A	1
		Peak Current, $t_{ON} \leq 3\mu S$	2		1.3	3.2	A	2, 3
Il	Output Leakage Current	$V_{in} = 35V$ , Output = 0V	4			2	mA	1
		$V_{in} = 35V$ , Output = -1V	4			30	mA	1
Iq	Quiescent Current		4			10	mA	1
			4			12	mA	2, 3
Istby	Standby Quiescent Current	$\overline{ON}/OFF$ Pin = 5V (OFF)				200	uA	1
		$\overline{ON}/OFF$ Pin = 5V (OFF)				500	uA	2, 3

### AC ELECTRICAL CHARACTERISTICS: DEVICE PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)  
AC:  $V_{in} = 25V$ , and  $I_{load} = 200mA$ .

fo	Oscillator Frequency				47	58	KHz	4
					43	62	KHz	5, 6
Dc	Max Duty Cycle (ON)		3		93		%	9

## Electrical Characteristics

### ELECTRICAL CHARACTERISTICS: ON/OFF CONTROL

(The following conditions apply to all the following parameters, unless otherwise specified.)  
DC:  $V_{in} = 25V$ , and  $I_{load} = 200mA$ .

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vih	$\overline{ON}/OFF$ Pin Logic Input Level	Vout = 0V			2.2		V	1
Vih	$\overline{ON}/OFF$ Pin Logic Input Level	Vout = 0V			2.4		V	2, 3
Vil	$\overline{ON}/OFF$ Pin Logic Input Level	Vout = 12V				1.0	V	1
Vil	$\overline{ON}/OFF$ Pin Logic Input Level	Vout = 12V				.8	V	2, 3
Iih	$\overline{ON}/OFF$ Pin Input Current	$\overline{ON}/OFF$ Pin = 5V (OFF)				30	uA	1
Iil	$\overline{ON}/OFF$ Pin Input Current	$\overline{ON}/OFF$ Pin = 0V (ON)				10	uA	1

Note 1: External components such as the catch diode, inductor, input and output capacitors can affect switching regulator system performance.

Note 2: Output sourcing current. No diode, inductor or capacitor connected to output.

Note 3: Feedback removed from output and connected to 0V.

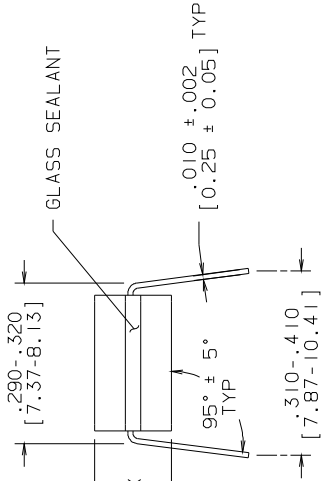
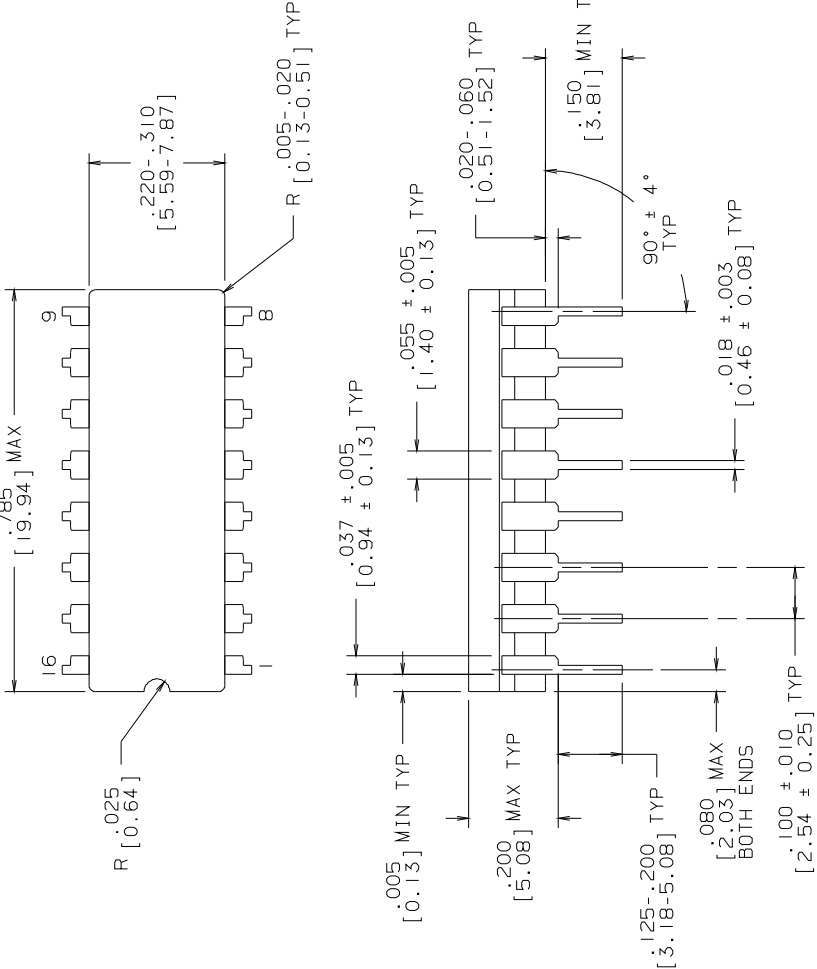
Note 4: Feedback removed from output and connected to 25V to force the output transistor OFF.

## Graphics and Diagrams


GRAPHICS#	DESCRIPTION
J16ARL	CERDIP (J), 16 LEAD (P/P DWG)
KA04BRA	METAL CAN, TO-3, 4 LEAD, LOW PROFILE (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
L	REVISE PER CURRENT STD; REDRAW	09996	09/15/93	TL/



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

CONTROLLING DIMENSION: INCH				
APPROVALS	DATE	NATIONAL SEMICONDUCTOR CORPORATION		
DRAWN <b>LEQUANG</b>	09/15/93	2900 Semiconductor Drive, Santa Clara, CA 95052-8090		
DFTG. CHK.				
ENGR. CHK.				
APPROVAL				
PROJECTION 		SCALE N/A	SIZE B	DRAWING NUMBER MKT-J16A
		DO NOT SCALE	DRAWING	SHEET 1 OF 1

- 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 M0-036, VARIATION AD, DATED 04/1981.

CERDIP (J) ,  
 16 LEAD

