Rochester Electronics

Datasheet

PART NUMBER

LM1578AH883-ROCS

Rochester Electronics Manufactured Components

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All re-creations are done with the approval of the Original Component Manufacturer. (OCM)

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceeds the OCM data sheet.

Quality Overview

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-38535
    - Class Q Military
    - Class V Space Level

Qualified Suppliers List of Distributors (QSLD)

- Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OCM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.

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MILITARY DATA SHEET

MNLM1578-X REV 0A0

Original Creation Date: 04/24/95
Last Update Date: 04/24/95
Last Major Revision Date: 04/24/95

SWITCHING REGULATOR

General Description

The LM1578 is a switching regulator which can easily be set up for such DC-to-DC voltage conversion circuits as the buck, boost, and inverting configurations. The LM1578 features a unique comparator input stage which not only has separate pins for both the inverting and non-inverting inputs, but also provides an internal 1.0V reference to each input, thereby simplifying circuit design and p.c. board layout. The output can switch up to 750mA and has output pins for its collector and emitter to promote design flexibility. An external current limit terminal may be referenced to either the ground or the Vin terminal, depending upon the application. In addition, the LM1578 has an on board oscillator, which sets the switching frequency with a single external capacitor from < 1Hz to 100kHz (typical).

Industry Part Number

LM1578

NS Part Numbers

LM1578H/883

Prime Die

LM1578

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (^{O}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

- Inverting and non-inverting feedback inputs
- 1.0V reference at inputs
- Operates from supply voltages of 2V to 40V
- Output current up to 750mA, saturation less than 0.9V
- Current limit and thermal shut down
- Duty cycle up to 90%

Applications

- Switching regulators in buck, boost, inverting, and single-ended transformer configuration
- Motor speed control
- Lamp flasher

(Absolute Maximum Ratings)
(Note 1)

Total Supply Voltage	40V
Collector Output to Ground	-0.3V to +40V
Emitter Output to Ground (Note 2)	-1V to +40V
Power Dissipation (Note 3)	Internally Limited
Output Current	750mA
Storage Temperature	-65 C to +150 C
Lead Temperature (Soldering, 10 seconds)	300 C
Maximum Junction Temperature	150 C
ESD Tolerance (Note 4)	4kV

Note 1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. DC and AC electrical specifications do not apply when operating the device beyond its rated operating conditions.
Note 2: For Tj $\geq$ 100 C, the Emitter pin voltage should not be driven more than 0.6V below ground (see Application Information).
Note 3: At elevated temperatures, devices must be derated based on package thermal resistance. The device in the TO-99 package must be derated at 150 C/W, junction to ambient, or 45 C/W junction to case. The device in the 8-pin DIP must be derated at 95 C/W, junction to ambient.
Note 4: Human body model, 1.5k Ohm in series with 100pF.

Recommended Operating Conditions

Ambient Temperature Range	-55 C $\leq$ Ta $\leq$ +125 C
Junction Temperature Range	-55 C $\leq$ Tj $\leq$ +150 C

Electrical Characteristics

DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vin = Voltage at Pin number 8, CT = 4000pF

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Fosc	Oscillator Frequency	Vin = 2.0V			17.6	22.4	Khz	1
					13.2	26.9	Khz	2
		Vin = 2.2V			13.2	26.9	Khz	3
		Vin = 40V			17.6	22.4	Khz	1
					13.2	26.9	Khz	2, 3
Vr	Input Reference Voltage	25% Duty Cycle: I1=I2=0mA, Vin=2.0V	1, 2, 3		0.965	1.035	V	1
			1, 2, 3		0.95	1.05	V	2
		25% Duty Cycle: I1=I2=0mA, Vin=2.2V	1, 2, 3		0.95	1.05	V	3
		25% Duty Cycle: I1=I2=0mA $\pm$1%, Vin=2.0V	1, 2, 3		0.965	1.035	V	1
		25% Duty Cycle: I1=I2=0mA $\pm$1%, Vin=2.0V	1, 2, 3		0.95	1.05	V	2
		25% Duty Cycle: I1=I2=1mA $\pm$1%, Vin=2.2V	1, 2, 3		0.95	1.05	V	3
		75% Duty Cycle: I1=I2=0mA, Vin=2.0V	1, 2, 3		0.965	1.035	V	1
			1, 2, 3		0.95	1.05	V	2
		75% Duty Cycle: I1=I2=0mA, Vin=2.2V	1, 2, 3		0.95	1.05	V	3
		75% Duty Cycle: I1=I2=1mA $\pm$1%, Vin=2.0V	1, 2, 3		0.965	1.035	V	1
		75% Duty Cycle: I1=I2=1mA $\pm$1%, Vin=2.0V	1, 2, 3		0.95	1.05	V	2
		75% Duty Cycle: I1=I2=1mA $\pm$1%, Vin=2.2V	1, 2, 3		0.95	1.05	V	3
		25% Duty Cycle: I1=I2=0mA, Vin=40V	1, 2, 3		0.965	1.035	V	1
			1, 2, 3		0.95	1.05	V	2, 3
		25% Duty Cycle: I1=I2=1mA $\pm$1%, Vin=40V	1, 2, 3		0.965	1.035	V	1

Electrical Characteristics

DC PARAMETERS(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vin = Voltage at Pin number 8, CT = 4000pF

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vr	Input Reference Voltage	25% Duty Cycle: I1=I2=1mA ±1%, Vin=40V	1, 2, 3		0.95	1.05	V	2, 3
		75% Duty Cycle: I1=I2=0mA, Vin=40V	1, 2, 3		0.965	1.035	V	1
			1, 2, 3		0.95	1.05	V	2, 3
		75% Duty Cycle: I1=I2=1mA ±1%, Vin=40V	1, 2, 3		0.965	1.035	V	1
		75% Duty Cycle: I1=I2=1mA ±1%, Vin=40V	1, 2, 3		0.95	1.05	V	2, 3
Delta Vr/ Delta Vin	Input Reference Voltage Line Regulation	25% Duty Cycle: I1=I2=0mA, 2.0V ≤ Vin ≤ 40V	1, 2		-3.8	3.8	mV	1
		25% Duty Cycle: I1=I2=0mA, 2.0V ≤ Vin ≤ 40V	1, 2		-7.6	7.6	mV	2
		25% Duty Cycle: I1=I2=0mA, 2.2V ≤ Vin ≤ 40V	1, 2		-7.6	7.6	mV	3
		25% Duty Cycle: I1=I2=1mA ±1%, 2V ≤ Vin ≤ 40V	1, 2		-3.8	3.8	mV	1
		25% Duty Cycle: I1=I2=1mA ±1%, 2V ≤ Vin ≤ 40V	1, 2		-7.6	7.6	mV	2
		25% Duty Cycle: I1=I2=1mA ±1%, 2.2V ≤ Vin ≤ 40V	1, 2		-7.6	7.6	mV	3
		75% Duty Cycle: I1=I2=0mA, 2.0V ≤ Vin ≤ 40V			-3.8	3.8	mV	1
		75% Duty Cycle: I1=I2=0mA, 2.0V ≤ Vin ≤ 40V			-7.6	7.6	mV	2
		75% Duty Cycle: I1=I2=0mA, 2.2V ≤ Vin ≤ 40V			-7.6	7.6	mV	3
		75% Duty Cycle: I1=I2=1mA ±1%, 2V ≤ Vin ≤ 40V			-3.8	3.8	mV	1
		75% Duty Cycle: I1=I2=1mA ±1%, 2V ≤ Vin ≤ 40V			-7.6	7.6	mV	2
		75% Duty Cycle: I1=I2=1mA ±1%, 2.2V ≤ Vin ≤ 40V			-7.6	7.6	mV	3

Electrical Characteristics

DC PARAMETERS(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: Vin = Voltage at Pin number 8, CT = 4000pF

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
LSA	Level Shift Accuracy	25% Duty Cycle: I1=I2=1mA, Vin=2V	2		-75	75	mV	1
			2		-105	105	mV	2
		25% Duty Cycle: I1=I2=1mA, Vin=2.2V	2		-105	105	mV	3
		25% Duty Cycle: I1=I2=1mA, Vin=40V	2		-75	75	mv	1
			2		-105	105	mV	2, 3
		75% Duty Cycle: I1=I2=1mA, Vin=2V			-75	75	mV	1
					-105	105	mV	2
		75% Duty Cycle: I1=I2=1mA, Vin=2.2V			-105	105	mV	3
		75% Duty Cycle: I1=I2=1mA, Vin=40V			-75	75	mV	1
					-105	105	mV	2, 3
Vc(sat)	Collector Saturation Voltage	Ic=750mA, Vin=2V, Emitter Grounded				0.85	V	1
						1.2	V	2
		Ic=750mA, Vin=2.2V, Emitter Grounded				1.2	V	3
		Ic=750mA, Vin=40V, Emitter Grounded				0.85	V	1
						1.2	V	2, 3
Ve(sat)	Emitter Saturation Voltage	Ie = 80mA, Collector at Vin = 40V				1.6	V	1
						2.1	V	2, 3
Ices	Collector Leakage Current	Collector at Vin = 40V, Output Off, Emitter Grounded				50	uA	1
						100	uA	2, 3
Vcl	Sense Voltage Shutdown Level	Vin = 40V, Reference to Vin	4, 5		95	160	mV	1, 2, 3
		Vin = 40V, Reference to Ground	4, 5		95	160	mV	1, 2, 3
Is	Supply Current	Output Off, Vin = 2.0V	6			3.0	mA	1
			6			3.3	mA	2
		Output Off, Vin = 2.2V	6			3.3	mA	3
		Output Off, Vin = 40V	6			3.0	mA	1
			6			3.3	mA	2, 3

Note 1: I1 and I2 are the external sink currents at the inputs.
Note 2: Input terminals are protected from accidental shorts to ground, but if external voltages higher than the reference voltage is applied, excessive current will flow and should be limited to less than 5mA.
Note 3: The input reference voltage is that voltage which, (Measured with respect to ground) when applied to either the inverting or non-inverting inputs, will cause the output to switch on or off.

(Continued)

Note 4: Functional test.
Note 5: Connection of a 10K Ohm resistor from pin 1 to pin 4 establishes the duty cycle at it's max of 90% with a max voltage swing on the output collector of 40V. Applying the min current sense voltage will not reduce the duty cycle to less than 50%. Applying the max current limit sense voltage is certain to reduce the duty cycle below 50%. An additional 15mV above the sense voltage may be required to reduce the duty cycle to 0% (See current limit of the typical performance characteristics).
Note 6: The IC power supply current excluding the output transistor collector current, with oscillator operating.

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
H08CRE	(blank)

See attached graphics following this page.