L78LR05



150mA, 5V 5-Pin Voltage Regulator with Reset Function

Overview

The L78LR05 is voltage regulator IC that performs the reset signal generating function when the power supply of a microcomputer system is turned ON/OFF. The L78LR05 is convenient for battery backup system at the time of power failure. The reset threshold voltage V_{RT} is ranked as shown below.

V _{RT} rank	=B=	_ C	=	E	= F =	=G=	#
V _{RT} (V)	-4.8-	-4.5-	-4.2 -	3.9	-3.6-	-3.3-	-3.0-

Applications

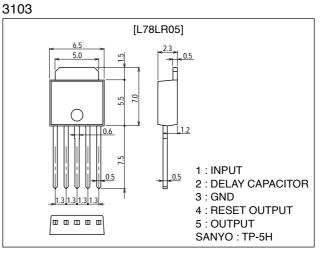
- Prevention of malfunction that may occur when the power supply of a microcomputer is turned ON/OFF.
- Measures taken against abnormal operations that may occur at the time of instantaneous break of power supply.
- Direct battery backup for SRAM.

Features

- 5V, 150mA output.
- Capable of generating a microcomputer reset signal.
- No battery-regulator switching circuit required at the battery backup mode (Output leakage current : 2µA or less).
- An external capacitor can be used to set the reset output delay time.
- Applicable to the power supply of CMOS, NMOS microcomputers.
- Especially suited for use as an on-board regulator for a microcomputer system.
- Small-sized power package TP-5H permitting the equipment to be made compact.
- The allowable power dissipation can be increased by being surface-mounted on the board.
- Capable of being mounted in a variety of methodes because of various lead forming versions available.
- On-chip protectors (overcurrent limiter, ASO protector, thermal protector).

Package Dimensions

unit:mm



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Specifications

Maximum Ratings at $Ta = 25^{\circ}C$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum Input Voltage	V _{IN} max		25	V
Allowable Power Dissipation	Pd max	(No fin)	1.0	W
Operating Temperature	Topr		-30 to +80	°C
Storage Temperature	Tstg		-55 to +150	°C

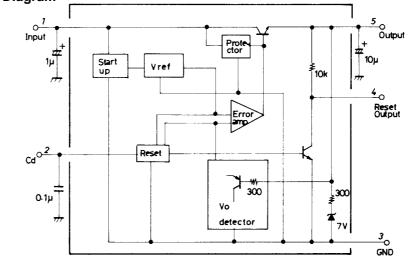
Operating Conditions at $Ta = 25^{\circ}C$

Parameter	Symbol	Conditions	Ratings	Unit	
Input Voltage	VIN		7.5 to 20	V	
Output Current	IOUT		1 to 150	mA	

Operating Characteristics at Ta = 25°C, V_{IN}=10V, I_{OUT}=40mA, c_{in}=1µF, c_o=10µF

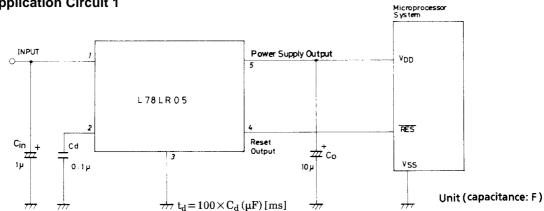
_		Conditions	Ratings			
Parameter	Symbol		min	typ	max	Unit
Output Maltana	V _{OUT1}	Tj=25°C	4.8	5.0	5.2	V
Output Voltage	VOUT2	7V≤V _{IN} ≤20V, 1mA≤I _{OUT} ≤70mA	4.75		5.25	V
Line Regulation	ΔV _o LINE1	Tj=25°C, 7V≤VIN≤20V		6.0	75	mV
		Tj=25°C, 8V≤V _{IN} ≤20V		3.0	50	mV
Load Regulation	ΔV _o LOAD1	Tj=25°C, 1mA≤lOUT≤100mA		9.0	60	mV
	ΔV _o LOAD2	Tj=25°C, 1mA≤l _{OUT} ≤40mA		3.0	30	mV
Current Dissipation	ICC	Tj=25°C, IOUT=100mA		1.4	3.4	mA
Current Dissipation Variation	^{∆I} CC LINE	8V≤V _{IN} ≤20V		0.12	1.5	mA
	^{∆I} CC LOAD	1mA≤I _{OUT} ≤40mA		0.01	0.1	mA
Output Noise Voltage	V _{NO}	10Hz≤f≤100kHz, I ₀ =1mA		80		μV
Temperature Coefficient of Output Voltage	ΔV _{OUT} /ΔTj	IOUT=1mA, Tj=25 to 125°C		±0.5		mV/°C
Ripple Rejection	Rrej	Tj=25°C, f=120Hz, 8V≤V _{IN} ≤18V		79		dB
Dropout Voltage	VDROP	Tj=25°C		1.5	2.2	V
Output Short Current	IOSC	Tj=25°C	150	300	450	mA
"H "-Reset Output Voltage	VORH	Tj=25°C	4.8	5.0	5.2	V
"L"-Reset Output Voltage	VORL	Tj=25°C, VIN=3V, I ₀ =1mA		10	200	mV
	V _{RT}	B, Tj=25°C	4.60	4.8	4.95	V
Reset Threshold Voltage		C, Tj=25°C	4.30	4.5	4.65	V
		D, Tj=25°C	4.00	4.2	4.35	
		E, Tj=25°C	3.70	3.9	4.05	V
		F, Tj=25°C	3.40	3.6	3.75	V
		G, Tj=25°C	3.10	3.3	3.45	V
		H, Tj=25°C	2.80	3.0	3.15	V
Reset Threshold Hysteresis Voltage	V _{RTH}		50	100	200	mV
Reset Output Dely Time	td	c _d =0.1µF	7.5	10	12.5	ms
Output Pin Leakage Current	IO LEAK	V _{IN} =0, V ₀ =6V		0.001	2	μA
Reset Output Pin Leakage Current	IOR LEAK	V _{IN} =0, V _{OR} =6V		0.001	2	A

Equivalent Circuit Block Diagram



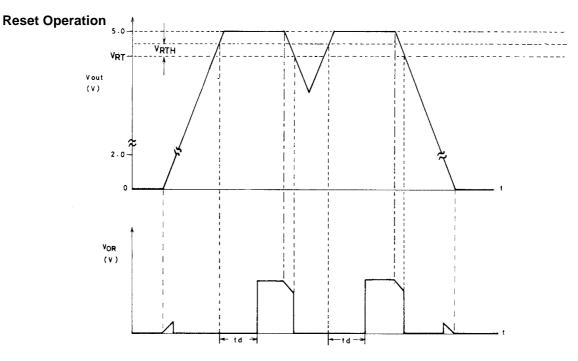
Unit (resistance: Ω , capacitance: F)

Sample Application Circuit 1

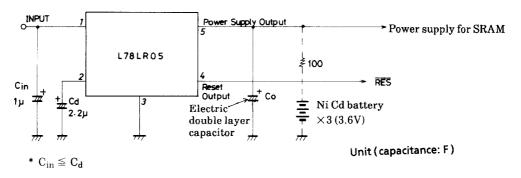


Note 1 : When the capacitance of Cd is large, the capacitor may not discharge completely, causing t_d to be made shorter than a set value. If this is a problem, either connect a high speed diode (DS442) between pin2 (anode side) and pin5 (cathode side) or ensure an adequate discharge time by using values for capacitors Cin and Cd such that Cin>Cd.

Note 2 : If a pull-up resistor is connected to the reset output pin externally, it is possible to cause a sink current up to 4mA to flow.



Sample Application Circuit 2 (Direct battery backup)

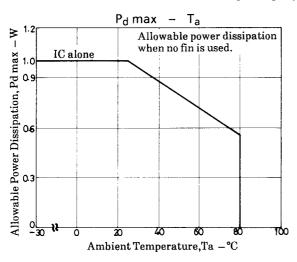


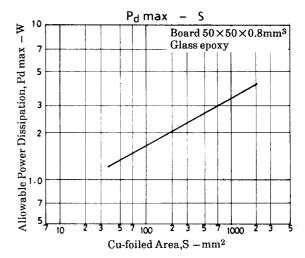
Since the leakage current at the output pin (pin5) of the L78LR05 is so low as 2μ A or less, a backup circuit can be implemented by connectiong an electric double layer capacitor (super capacitor : NEC, gold capacitor : Matsushita Electric) or a Ni Cd battery direct to the output pin. Since a reverse blocking diode, which has been so far connected to the output pin, is not required, a regulated power-supply voltage can be supplied to a load during the steady-state operation, without voltage drop caused by the diode and effects of temperature characteristics, current characteristics of the diode. No battery-regulator switching circuit is required at the battery backup start mode.

Note 3 : The capacitance of reset output signal delay capacitor C_d must exceed that of input capacitor C_{in} . If the capacitance of C_d is small, a reset pulse signal may be generated once when the main power source is turned off (at the battery backup start mode).

Allowable Power Dissipation

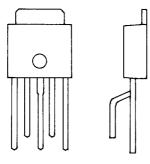
The allowable power dissipation is 1.0V (Ta= 25° C) with fin attached. When the L78LR05 is surface-mounted on a hybrid IC board or printed circuit board, a high allowable power dissipation can be obtained, though it is placed in a small-sized package. Shown below is the relationship between the Cu-foiled area the allowable power dissipation when the L78LR05 is surface-mounted on a glass epoxy boad ($50 \times 50 \times 0.8$ mm³).



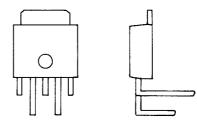


* The measured values of Pd represent the values measured when solder on the Cu-foiled area is all wet.

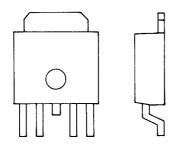
Lead Forming



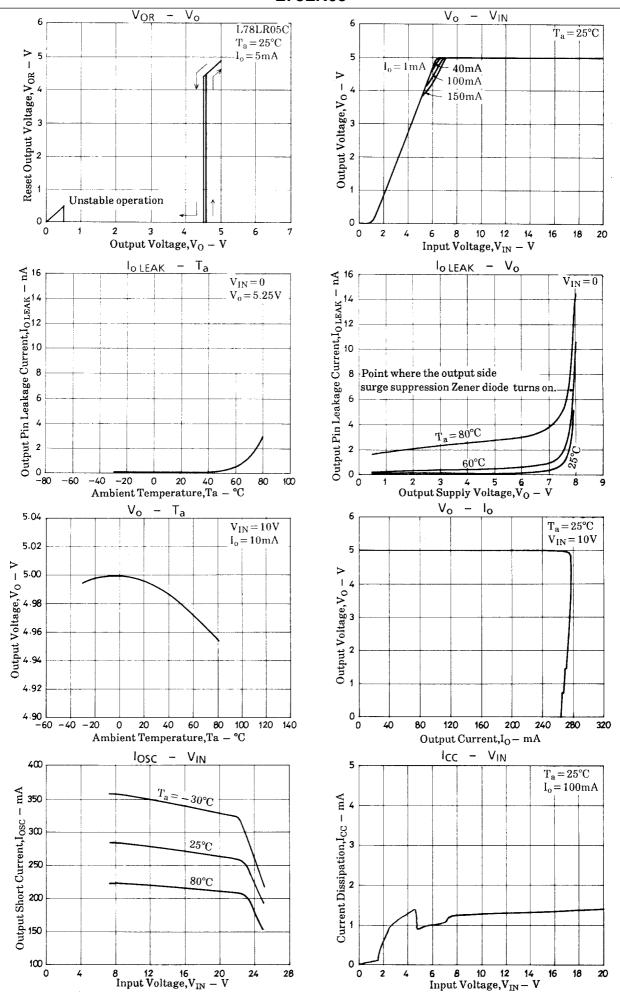
MA forming

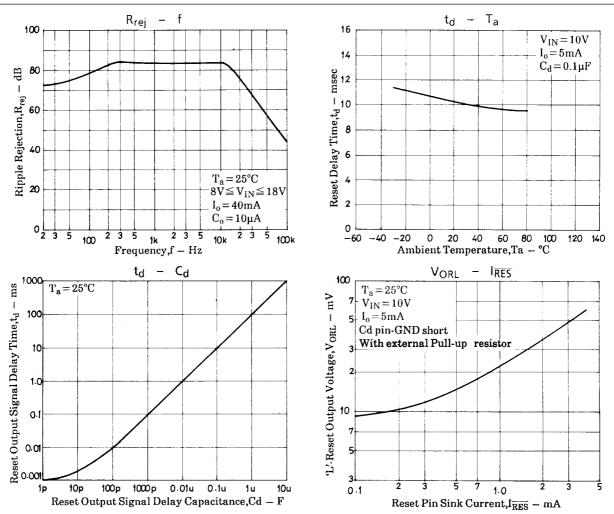


LR forming



FA forming





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