



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	D	E	F	G	H
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.

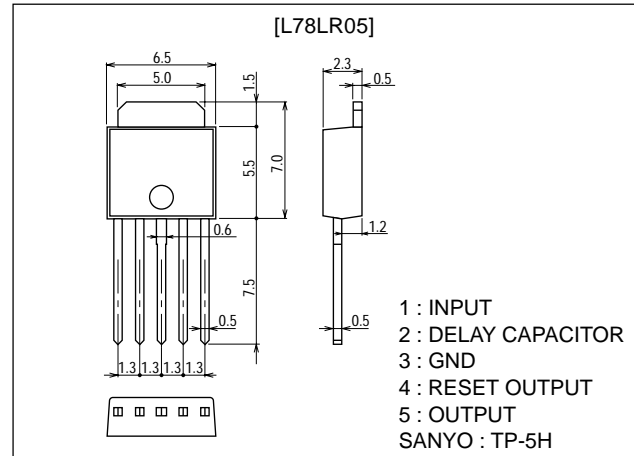
Features

- 5V, 150mA output.
- Capable of generating a microcomputer reset signal.
- No battery-regulator switching circuit required at the battery backup mode (Output leakage current : $2\mu\text{A}$ 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 methods because of various lead forming versions available.
- On-chip protectors (overcurrent limiter, ASO protector, thermal protector).

Package Dimensions

unit:mm

3103



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Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum Input Voltage	$V_{IN\text{ max}}$		25	V
Allowable Power Dissipation	$P_d\text{ max}$	(No fin)	1.0	W
Operating Temperature	T_{opr}		-30 to +80	$^\circ\text{C}$
Storage Temperature	T_{stg}		-55 to +150	$^\circ\text{C}$

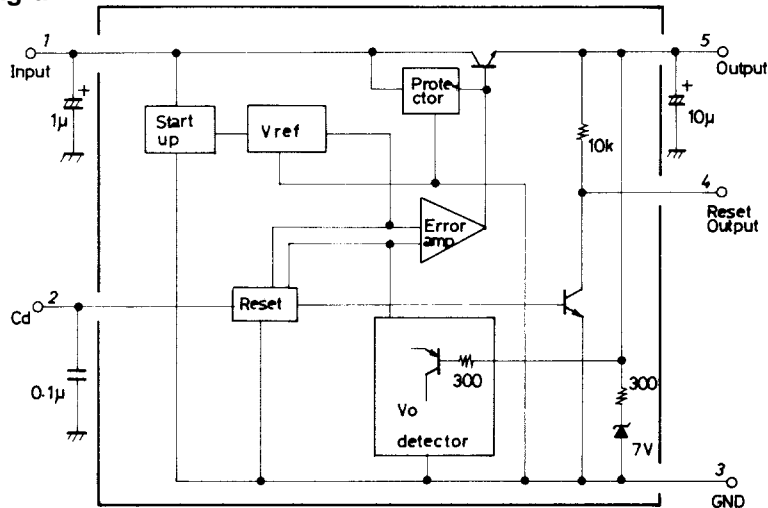
Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Input Voltage	V_{IN}		7.5 to 20	V
Output Current	I_{OUT}		1 to 150	mA

Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{IN}=10\text{V}$, $I_{OUT}=40\text{mA}$, $c_{in}=1\mu\text{F}$, $c_o=10\mu\text{F}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output Voltage	V_{OUT1}	$T_j=25^\circ\text{C}$	4.8	5.0	5.2	V
	V_{OUT2}	$7\text{V}\leq V_{IN}\leq 20\text{V}$, $1\text{mA}\leq I_{OUT}\leq 70\text{mA}$	4.75		5.25	V
Line Regulation	$\Delta V_o\text{ LINE1}$	$T_j=25^\circ\text{C}$, $7\text{V}\leq V_{IN}\leq 20\text{V}$		6.0	75	mV
	$\Delta V_o\text{ LINE2}$	$T_j=25^\circ\text{C}$, $8\text{V}\leq V_{IN}\leq 20\text{V}$		3.0	50	mV
Load Regulation	$\Delta V_o\text{ LOAD1}$	$T_j=25^\circ\text{C}$, $1\text{mA}\leq I_{OUT}\leq 100\text{mA}$		9.0	60	mV
	$\Delta V_o\text{ LOAD2}$	$T_j=25^\circ\text{C}$, $1\text{mA}\leq I_{OUT}\leq 40\text{mA}$		3.0	30	mV
Current Dissipation	I_{CC}	$T_j=25^\circ\text{C}$, $I_{OUT}=100\text{mA}$		1.4	3.4	mA
Current Dissipation Variation	$\Delta I_{CC}\text{ LINE}$	$8\text{V}\leq V_{IN}\leq 20\text{V}$		0.12	1.5	mA
	$\Delta I_{CC}\text{ LOAD}$	$1\text{mA}\leq I_{OUT}\leq 40\text{mA}$		0.01	0.1	mA
Output Noise Voltage	V_{NO}	$10\text{Hz}\leq f\leq 100\text{kHz}$, $I_o=1\text{mA}$		80		μV
Temperature Coefficient of Output Voltage	$\Delta V_{OUT}/\Delta T_j$	$I_{OUT}=1\text{mA}$, $T_j=25$ to 125°C		± 0.5		$\text{mV}/^\circ\text{C}$
Ripple Rejection	R_{rej}	$T_j=25^\circ\text{C}$, $f=120\text{Hz}$, $8\text{V}\leq V_{IN}\leq 18\text{V}$		79		dB
Dropout Voltage	V_{DROP}	$T_j=25^\circ\text{C}$		1.5	2.2	V
Output Short Current	I_{OSC}	$T_j=25^\circ\text{C}$	150	300	450	mA
"H"-Reset Output Voltage	V_{ORH}	$T_j=25^\circ\text{C}$	4.8	5.0	5.2	V
"L"-Reset Output Voltage	V_{ORL}	$T_j=25^\circ\text{C}$, $V_{IN}=3\text{V}$, $I_o=1\text{mA}$		10	200	mV
Reset Threshold Voltage	V_{RT}	B, $T_j=25^\circ\text{C}$	4.60	4.8	4.95	V
		C, $T_j=25^\circ\text{C}$	4.30	4.5	4.65	V
		D, $T_j=25^\circ\text{C}$	4.00	4.2	4.35	V
		E, $T_j=25^\circ\text{C}$	3.70	3.9	4.05	V
		F, $T_j=25^\circ\text{C}$	3.40	3.6	3.75	V
		G, $T_j=25^\circ\text{C}$	3.10	3.3	3.45	V
		H, $T_j=25^\circ\text{C}$	2.80	3.0	3.15	V
		Reset Threshold Hysteresis Voltage	V_{RTH}		50	100
Reset Output Delay Time	t_d	$c_d=0.1\mu\text{F}$	7.5	10	12.5	ms
Output Pin Leakage Current	$I_{O\text{ LEAK}}$	$V_{IN}=0$, $V_o=6\text{V}$		0.001	2	μA
Reset Output Pin Leakage Current	$I_{OR\text{ LEAK}}$	$V_{IN}=0$, $V_{OR}=6\text{V}$		0.001	2	A

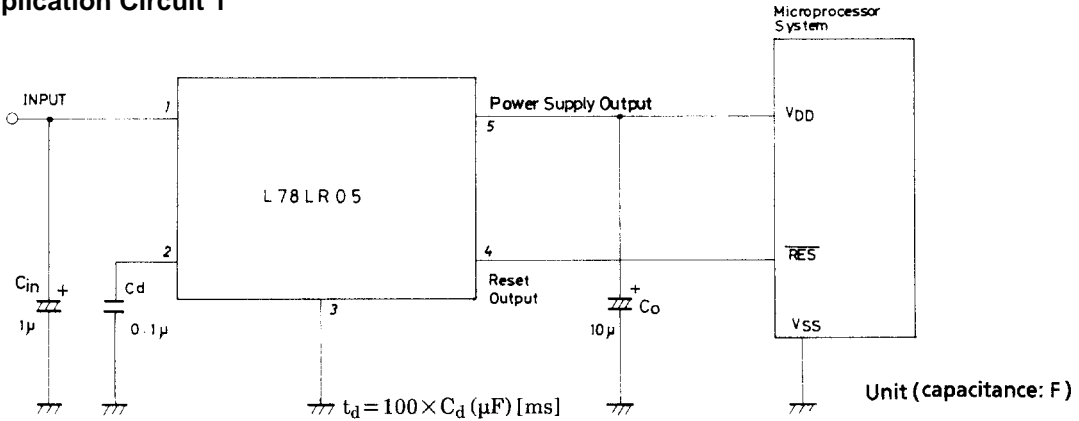
Equivalent Circuit Block Diagram



Unit (resistance: Ω , capacitance: F)

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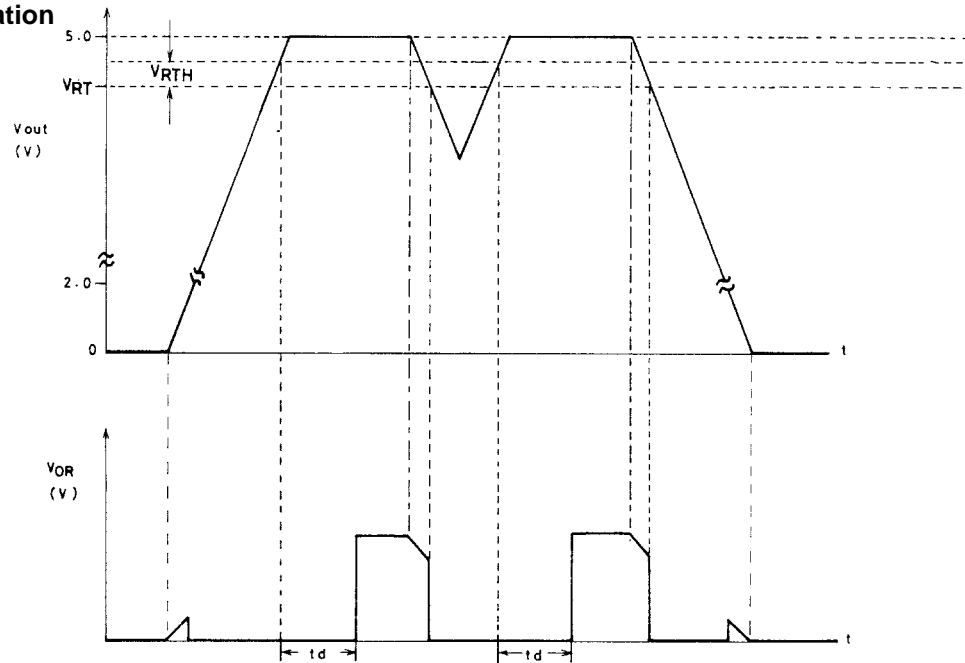
Sample Application Circuit 1



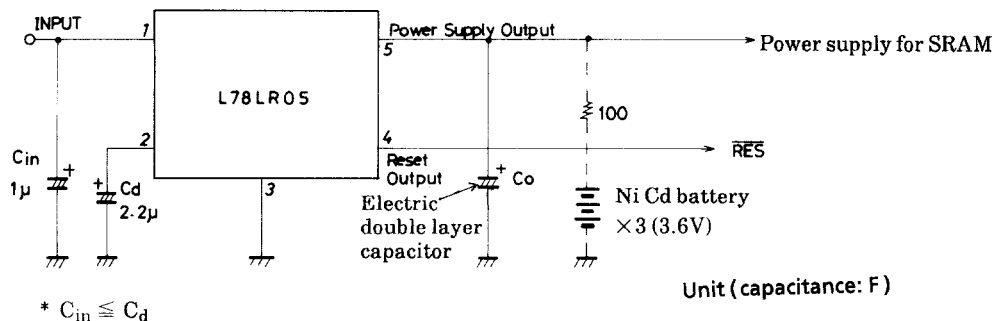
Note 1 : When the capacitance of C_d is large, the capacitor may not discharge completely, causing t_d to be made shorter than a set value. If this is a problem, either connect a high speed diode (DS442) between pin2 (anode side) and pin5 (cathode side) or ensure an adequate discharge time by using values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

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.

Reset Operation



Sample Application Circuit 2 (Direct battery backup)



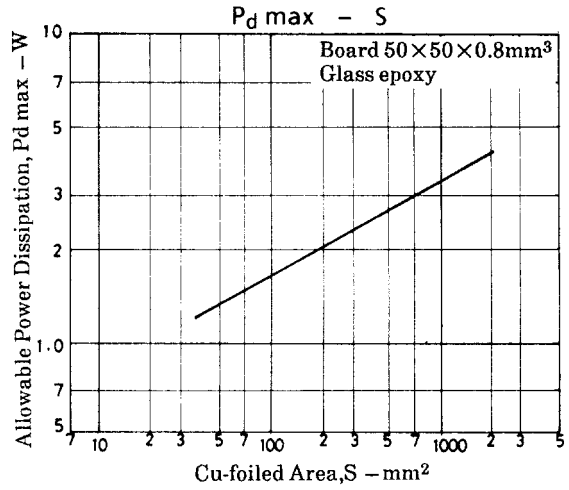
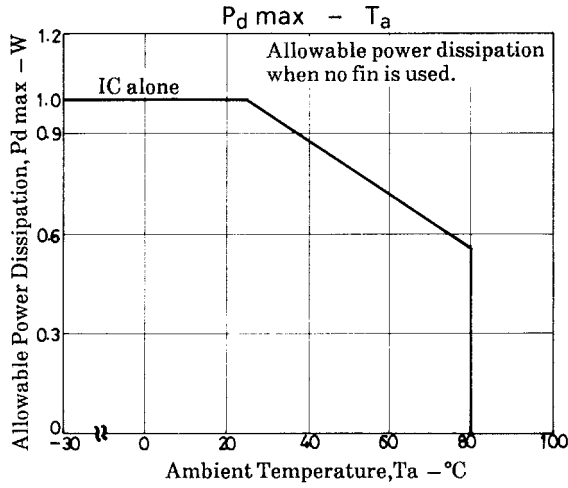
Since the leakage current at the output pin (pin5) of the L78LR05 is so low as $2\mu\text{A}$ or less, a backup circuit can be implemented by connecting an electric double layer capacitor (super capacitor : NEC, gold capacitor : Matsushita Electric) or a Ni Cd battery direct to the output pin. Since 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).

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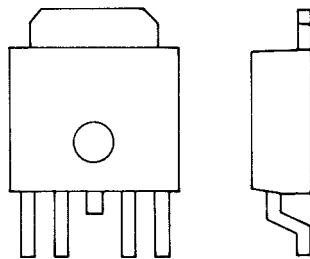
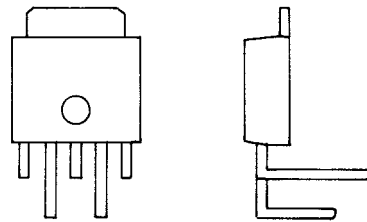
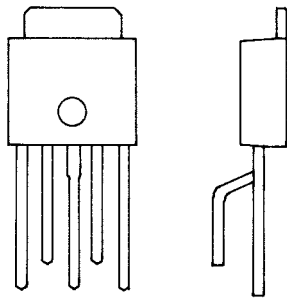
Allowable Power Dissipation

The allowable power dissipation is 1.0W ($T_a=25^\circ\text{C}$) 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 board ($50\times 50\times 0.8\text{mm}^3$).

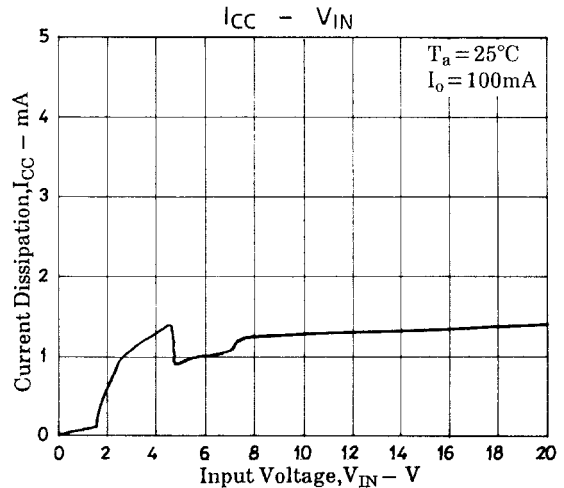
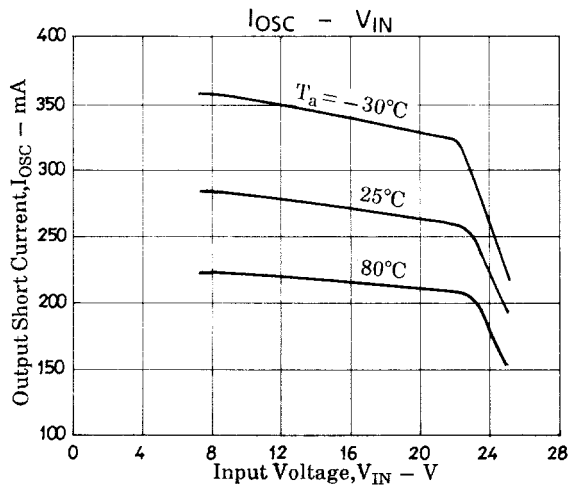
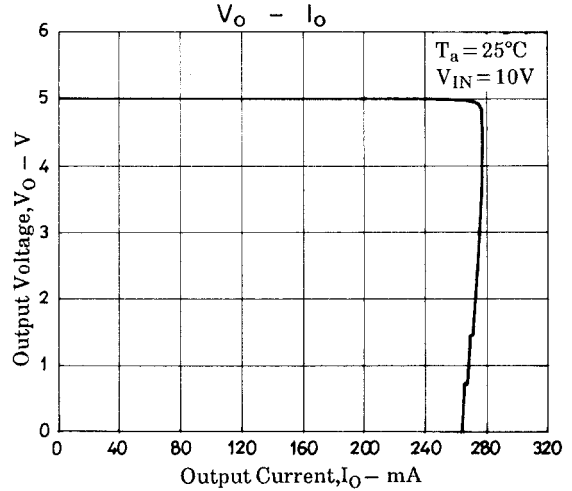
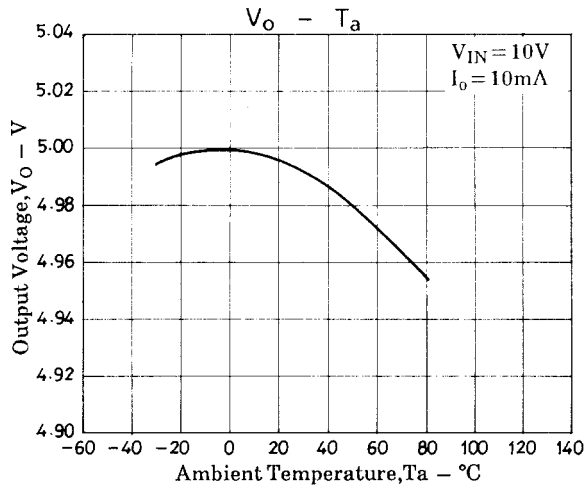
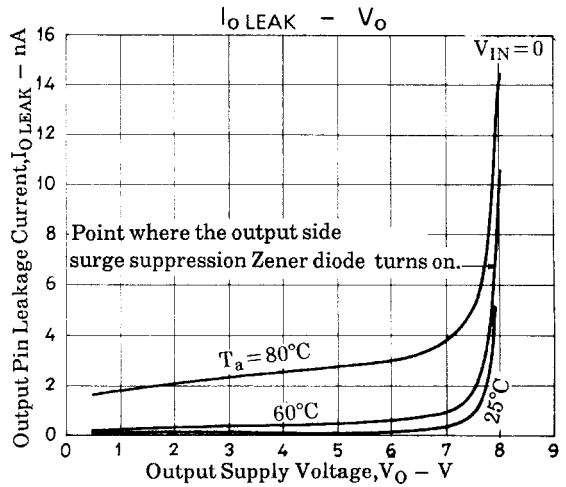
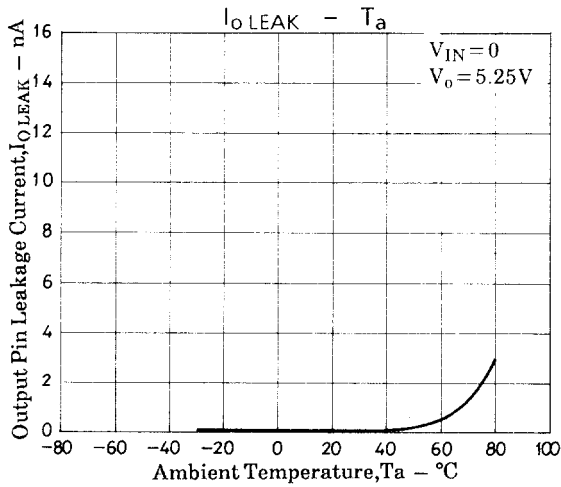
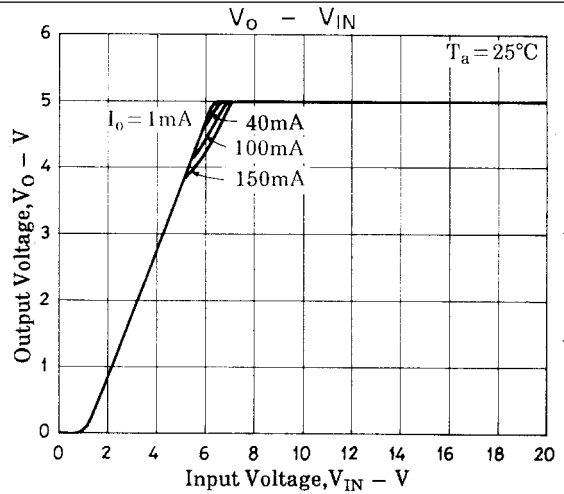
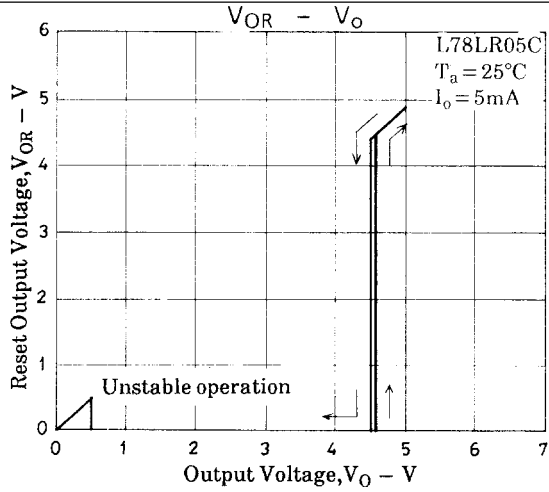


* The measured values of P_d represent the values measured when solder on the Cu-foiled area is all wet.

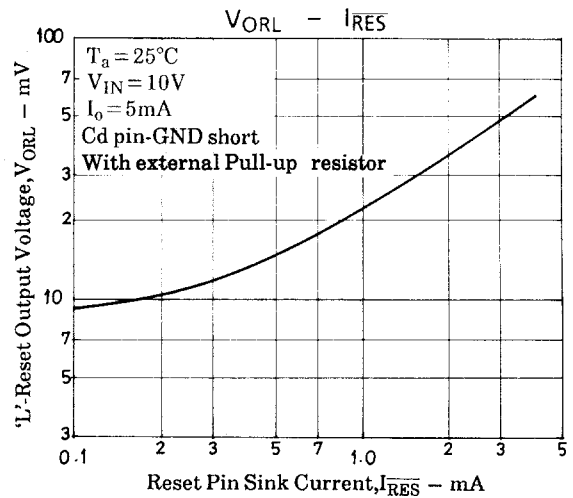
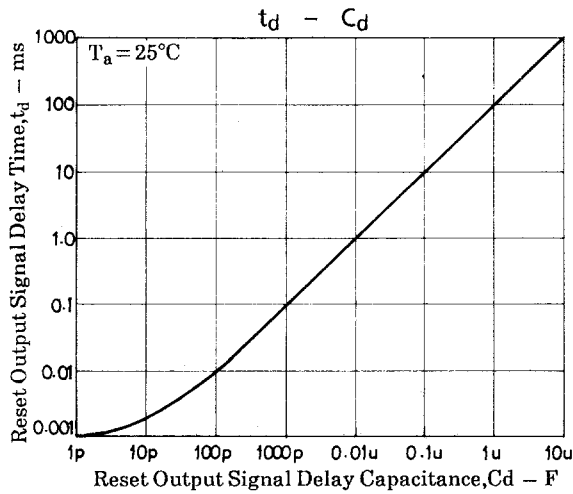
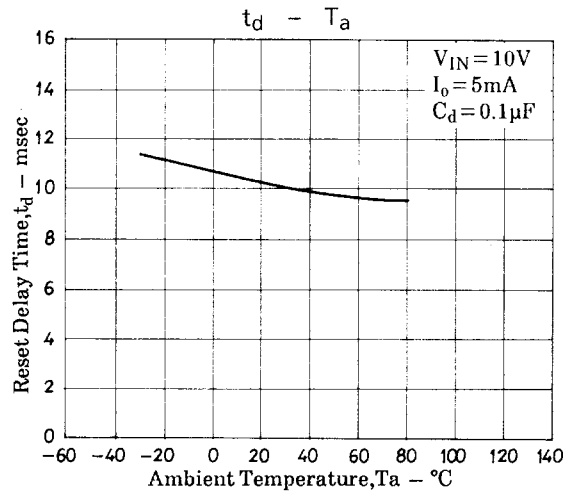
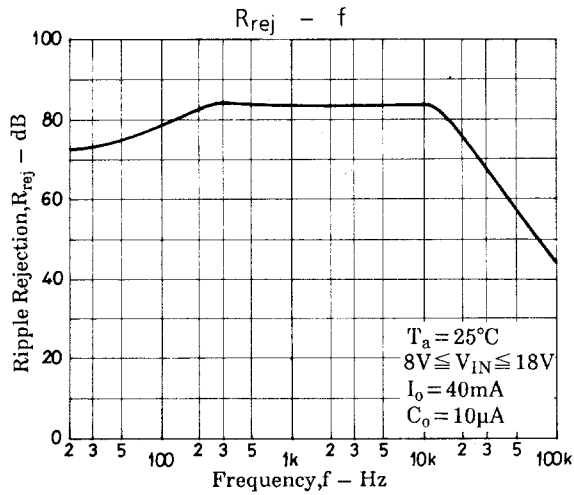
Lead Forming



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