

**SANYO****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	<del>E</del>	F	G	H
$V_{RT}$ (V)	4.8	4.5	4.2	<del>3.9</del>	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.

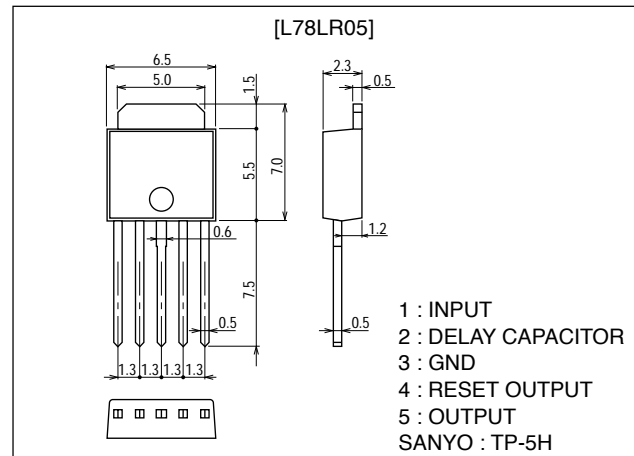
**Features**

- 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 $\mu$ 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	$V_{IN}$ max		25	V
Allowable Power Dissipation	$P_d$ max	(No fin)	1.0	W
Operating Temperature	$T_{opr}$		–30 to +80	°C
Storage Temperature	$T_{stg}$		–55 to +150	°C

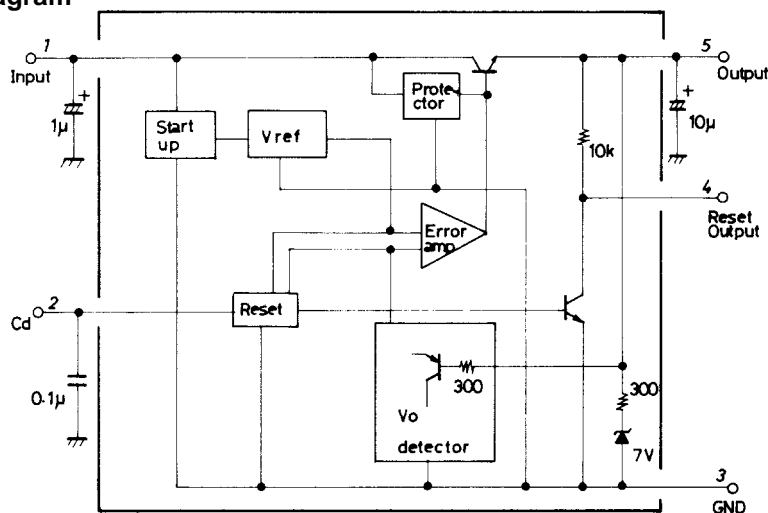
### Operating Conditions at $T_a = 25^\circ\text{C}$

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

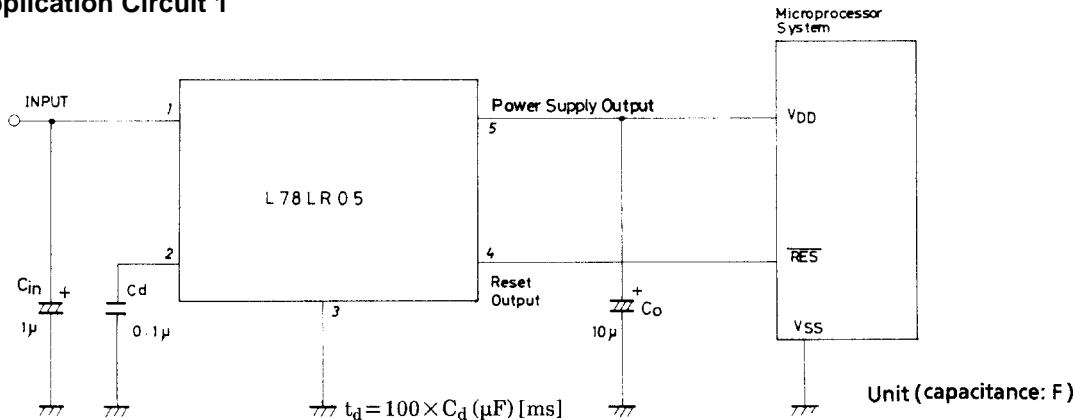
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output Voltage	V <sub>OUT1</sub>	T <sub>J</sub> =25°C	4.8	5.0	5.2	V
	V <sub>OUT2</sub>	7V≤V <sub>IN</sub> ≤20V, 1mA≤I <sub>OUT</sub> ≤70mA	4.75		5.25	V
Line Regulation	ΔV <sub>O</sub> LINE1	T <sub>J</sub> =25°C, 7V≤V <sub>IN</sub> ≤20V		6.0	75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

### Equivalent Circuit Block Diagram

Unit (resistance:  $\Omega$ , capacitance: F)

## L78LR05

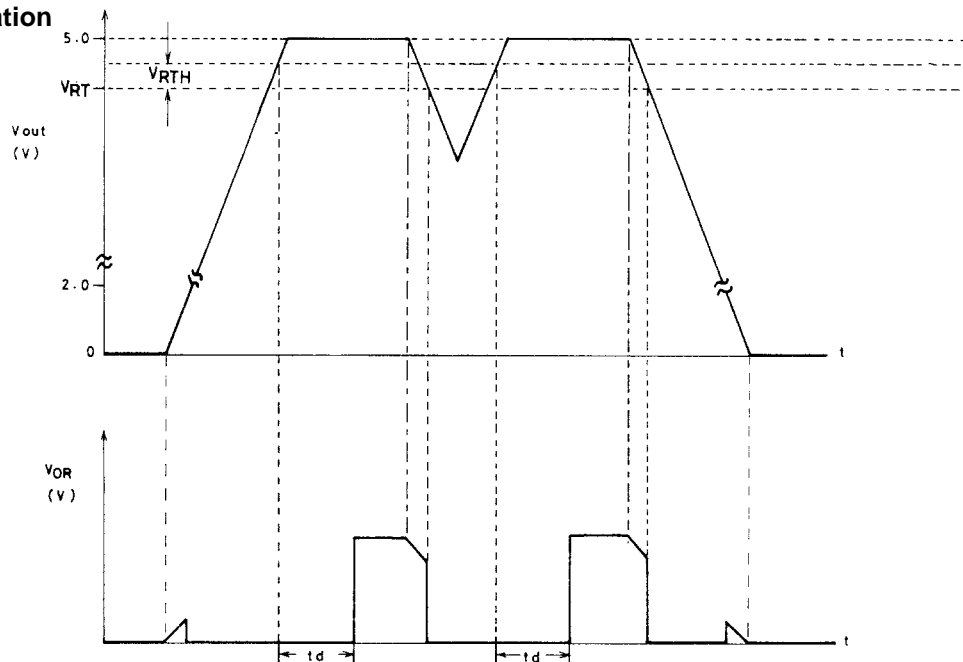
## Sample Application Circuit 1



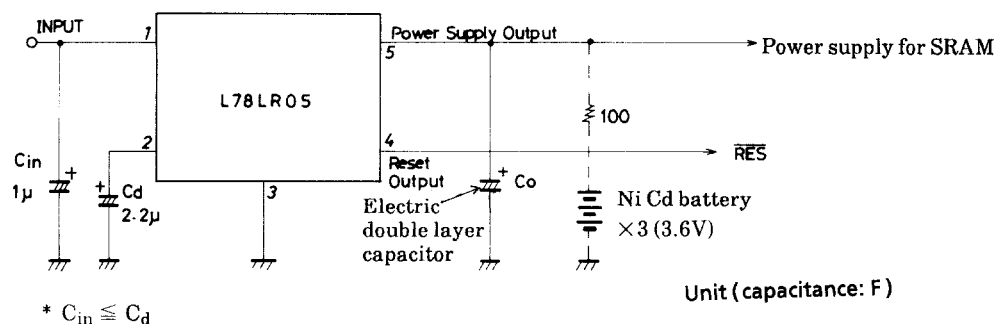
Note 1 : When the capacitance of  $C_d$  is large, the capacitor may not discharge completely, causing  $t_d$  to be made shorter than a set value. If this is a problem, either connect a high speed diode (DS442) between pin2 (anode side) and pin5 (cathode side) or ensure an adequate discharge time by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

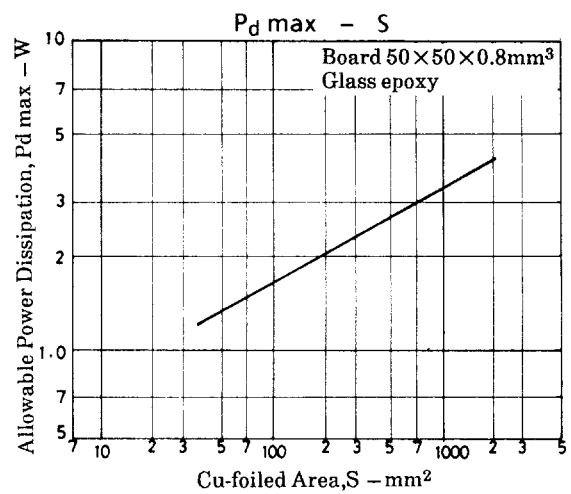
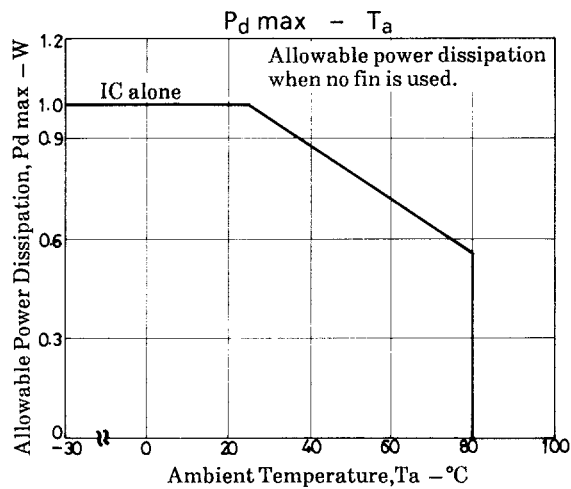


Since the leakage current at the output pin (pin5) of the L78LR05 is so low as 2μA or less, a backup circuit can be implemented by connecting an electric double layer capacitor (super capacitor : NEC, gold capacitor : Matsushita Electric) or a Ni Cd battery direct to the output pin. Since a reverse blocking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

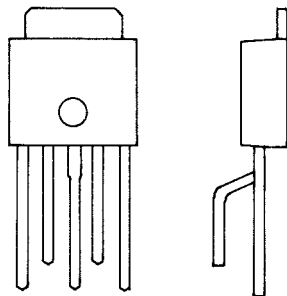
### Allowable Power Dissipation

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 ( $50\times 50\times 0.8\text{mm}^3$ ).

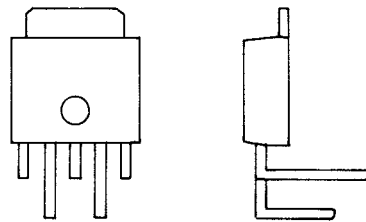


\* The measured values of  $P_d$  represent the values measured when solder on the Cu-foiled area is all wet.

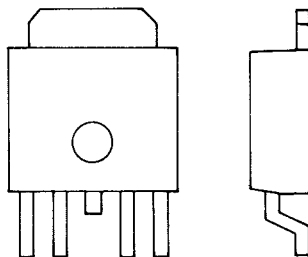
### Lead Forming



MA forming

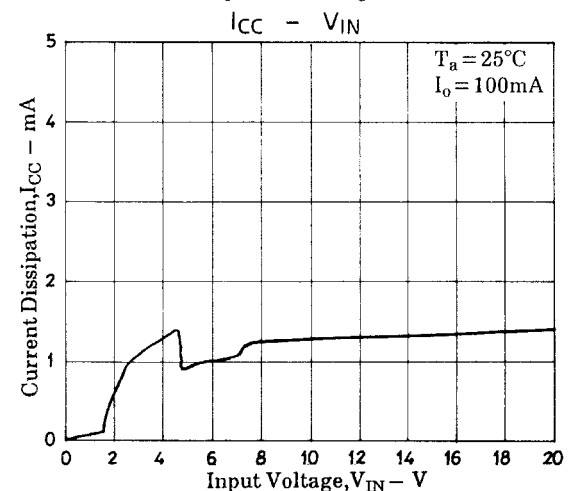
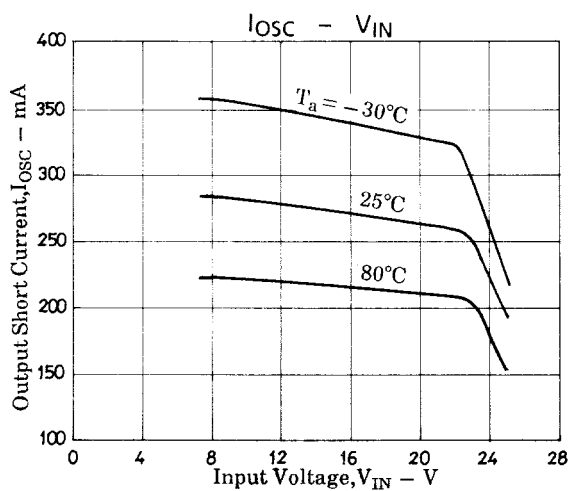
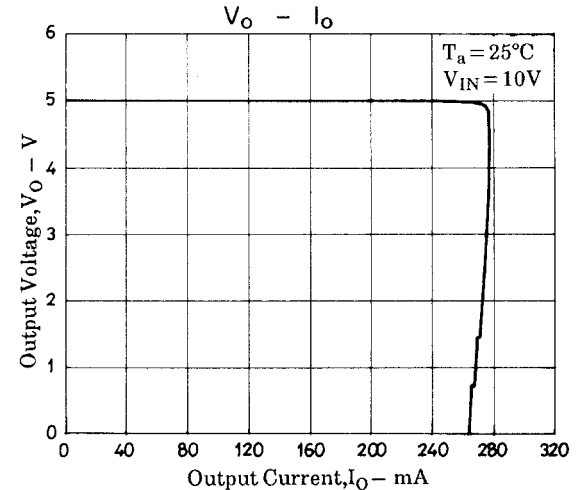
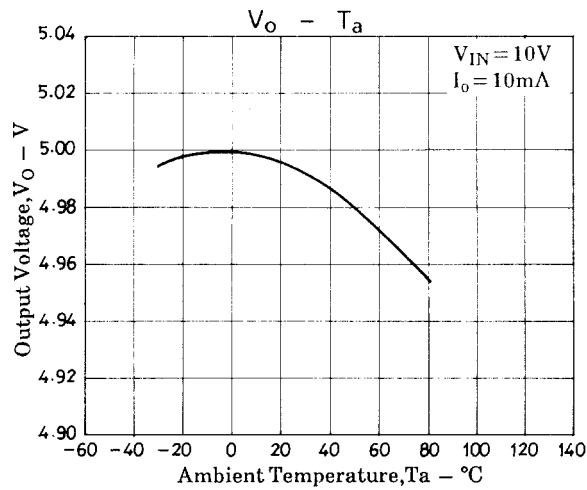
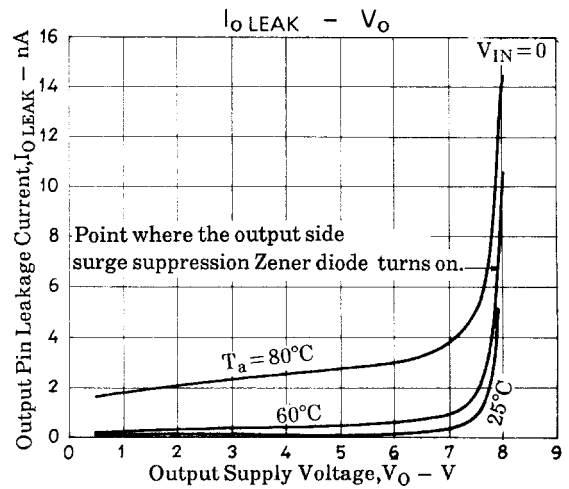
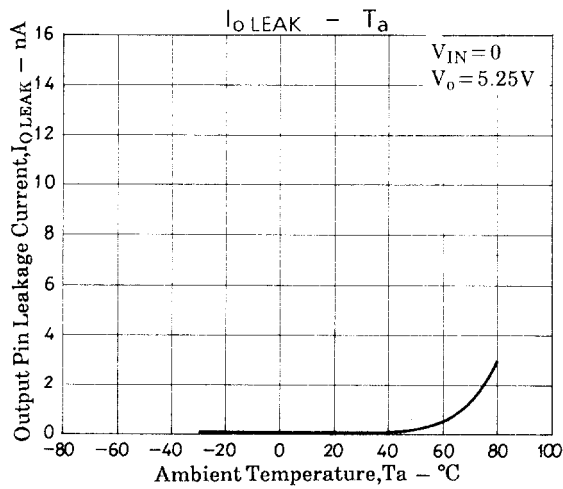
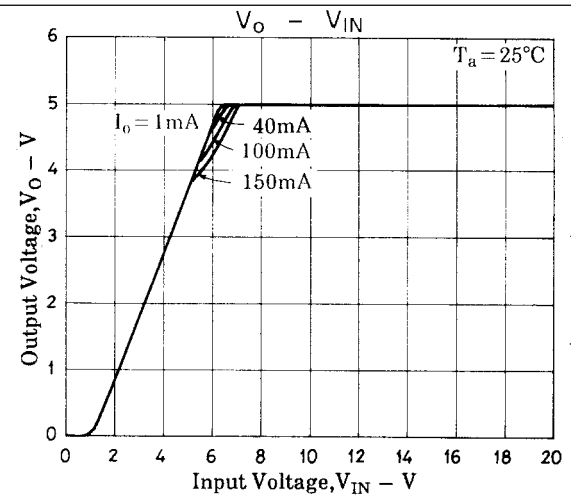
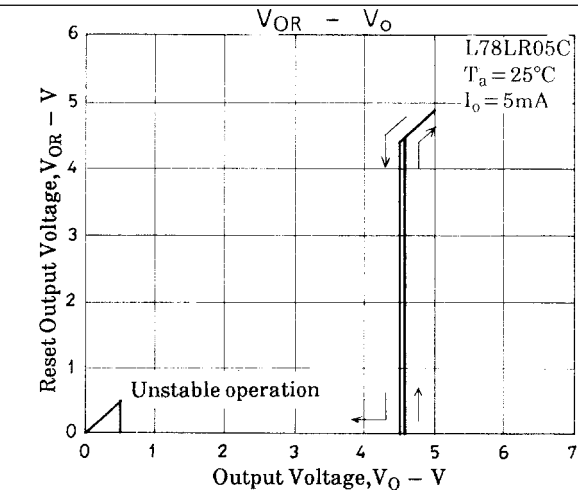


LR forming

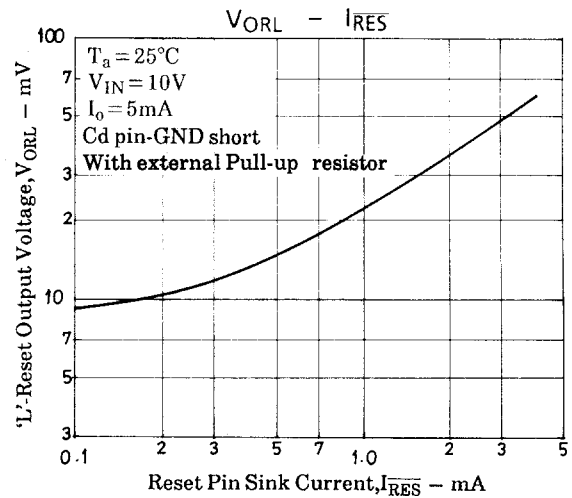
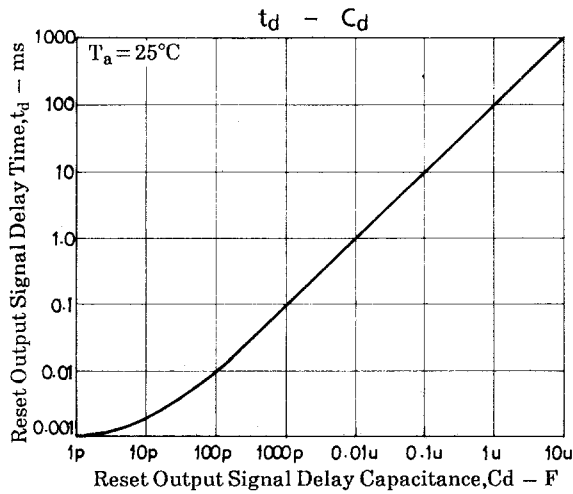
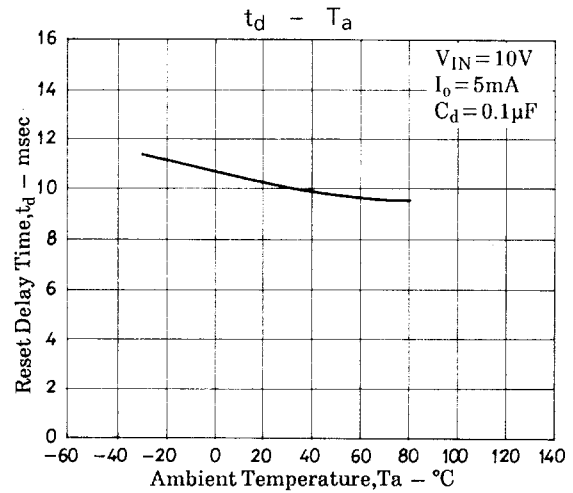
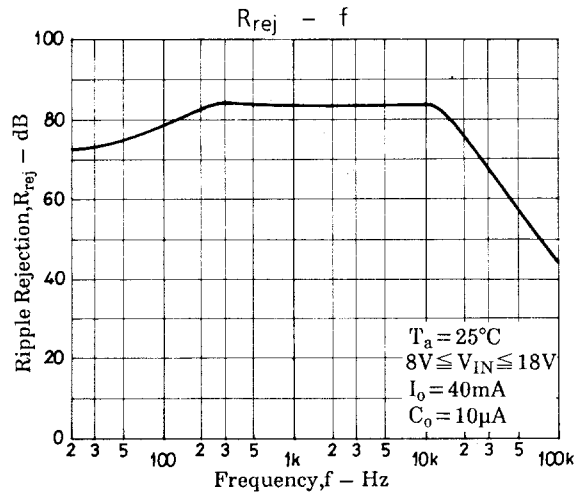


FA forming

# L78LR05



# L78LR05



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