

SANYO

No.3222A

LA5601**Low Dropout Regulator with Reset****Overview**

The LA5601 is a voltage regulator with a low-voltage detector and reset controller for use in microprocessor-based systems. It generates a reset signal for low power supply voltage. It also features a low 0.25V (typ.) dropout voltage for reduced power dissipation and power supply size. Applications include microprocessor-controlled consumer electronic equipment such as CD players, tuners and receivers, and preamplifiers.

Functions

- Low dropout regulator with 250mA and 5.2V output
- Power supply reset generator function
- Supports on-off control of 5.2V using equipped enable pin (high active)
- Built-in Darlington driver (120mA)
- Built-in auxiliary regulator (5.2V, 250mA)

Features

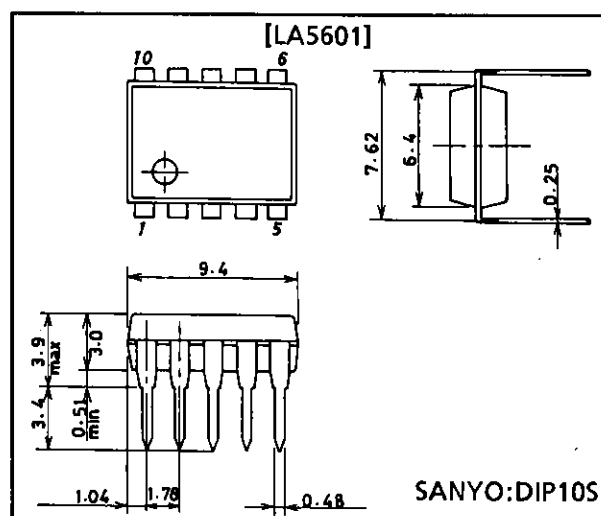
- Low minimum input-output voltage difference (0.3V typ.)
- Supports setting of reset output delay time using external capacitor
- Built-in fold-back current limiting circuit and excessive heat protection circuit.
- Reset output using active pull-up for simpler noise reduction and use with internal pull-down logic circuits
- Error amplifier noise filter pin
- Auxiliary regulator with reverse current protection

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

			unit
Input Voltage	V_{IN} max	15	V
Enable Pin Voltage	V_{EN} max	V_{IN} max	V
Reset Output Pin Voltage	V_{RES} max	15	V
Driver Output Voltage	V_{OD} max	15	V
Driver Input Voltage	V_{ID} max	15	V
Allowable Power Dissipation	P_d max	1	W
Operating Temperature	T_{opr}	-30 to +80	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +150	$^\circ\text{C}$

Package Dimensions

unit:mm

3098-DIP10S

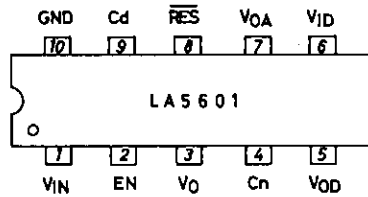
Operating Conditions at $T_a = 25^\circ\text{C}$

			unit
Input Voltage	V_{IN}	5.9 to 14	V
Output Current	I_{OUT}	0 to 250	mA
'H'-Level Reset Output Current	$I_{\overline{ORH}}$	0 to 200	μA
'L'-Level Reset Output Current	$I_{\overline{ORL}}$	0 to 2	mA
Auxiliary Regulator Output Current	I_{OA}	0 to 10	mA
Driver Output Voltage	$V_{OD\text{ max}}$	14	V
'L'-Level Driver Output Current	$I_{ODL\text{ max}}$	120	mA
'H'-Level Driver Input Voltage	V_{IDH}	$I_{ODL} = 120\text{mA}$	3 to 14
'L'-Level Driver Input Voltage	V_{IDL}	$I_{ODL} \leq 100\mu\text{A}$	-0.3 to +0.3

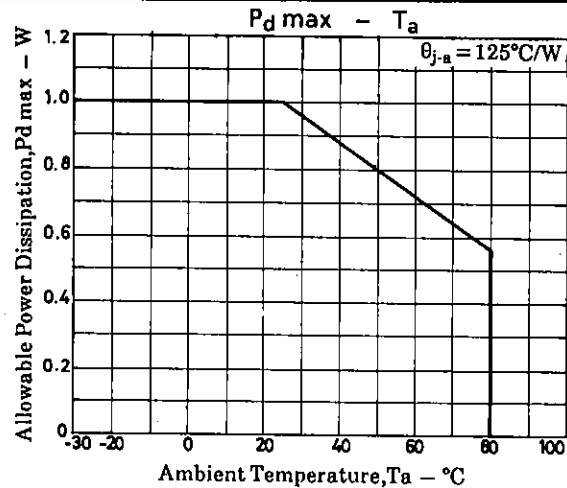
Operating Characteristics at $T_j = 25^\circ\text{C}$, $V_{IN} = 6\text{V}$, $I_{OUT} = 200\text{mA}$, See specified Test Circuit.

[Main regulator : Output ON-state, $V_{EN} = \text{'H'}$ or open]				min	typ	max	unit
Output Voltage	V_O			5.0	5.2	5.4	V
Dropout Voltage	V_{DROP}	$I_{OUT} = 250\text{mA}$		0.25	0.5		V
Line Regulation	ΔV_{OLN1}	$5.5\text{V} \leq V_{IN} \leq 14\text{V}$		30	80		mV
	ΔV_{OLN2}	$6\text{V} \leq V_{IN} \leq 14\text{V}$		20	40		mV
	ΔV_{OLD1}	$5\text{mA} \leq I_{OUT} \leq 250\text{mA}$		40	100		mV
	ΔV_{OLD2}	$5\text{mA} \leq I_{OUT} \leq 100\text{mA}$		14	50		mV
Peak Output Current	I_{OP}			250	500		mA
Output Short Current	I_{OSC}				80	300	mA
Current Drain	I_{Q1}	$I_{OUT} = 0$		2.2	6		mA
	I_{Q2}			10	30		mA
Output Noise Voltage	V_{NO}	$10\text{Hz} \leq f \leq 100\text{kHz}$		70			μV_{rms}
Temperature Coefficient of Output Voltage	$\Delta V_O / \Delta T_j$	$T_j = 25 \text{ to } 80^\circ\text{C}$		-0.7			mV/ $^\circ\text{C}$
Ripple Rejection	R_{rej}	$f = 120\text{Hz}$, $7\text{V} \leq V_{IN} \leq 13\text{V}$			74		dB
Output ON-State Control Voltage	V_{ENH}	Main regulator, driver ON		2.6		V_{IN}	V
[Main regulator : Output OFF-state, $V_{EN} = \text{'L'}$]							
'L'-Level Output Voltage	$V_{O\text{ OFF}}$	$V_{EN} = 0$			50	200	mV
Quiescent Current	$I_{Q\text{ OFF}}$	$V_{EN} = 0$		1.5	4		mA
Output OFF-State Control Voltage	V_{ENL}	Main regulator, driver OFF				1.0	V
[Reset circuit]							
'H'-Level Reset Output Voltage	$V_{\overline{ORH}}$	$I_{\overline{ORH}} = 200\mu\text{A}$		4.97	5.17	5.37	V
'L'-Level Reset Output Voltage	$V_{\overline{ORL}}$	$I_{\overline{ORL}} = 2\text{mA}$, $V_{IN} = 3.7\text{V}$			90	200	mV
Reset Threshold Voltage	V_{RT}	$I_{OUT} = 5\text{mA}$		3.7	3.9	4.1	V
Reset Hysteresis Voltage	V_{hys}	$I_{OUT} = 5\text{mA}$		50	150	300	mV
Reset Output Delay Time	t_d	$C_d = 0.1\mu\text{F}$		7.5	10	12.5	mS
[Auxiliary regulator]							
Output Voltage	V_{OA}	$I_{OA} = 5\text{mA}$		3.2	3.4	3.6	V
Line Regulation	ΔV_{OALN}	$6\text{V} \leq V_{IN} \leq 14\text{V}$, $I_{OA} = 5\text{mA}$			15	40	mV
Load Regulation	ΔV_{OALD}	$2\text{mA} \leq I_{OA} \leq 10\text{mA}$			130	200	mV
Output Short Current	I_{OASC}			10	30		mA
Output Pin Leakage Current	$I_{OA\text{ LEAK}}$	$V_{IN} = 0$, $V_{OA} = 6\text{V}$				2	μA
[Darlington driver]							
'L'-Level Driver Output Voltage	V_{ODL1}	$I_{ODL} = 80\text{mA}$, $V_{ID} = 3\text{V}$		1.1	1.6		V
	V_{ODL2}	$I_{ODL} = 120\text{mA}$, $V_{ID} = 3\text{V}$		1.2	1.8		V
'H'-Level Driver Input Current	I_{IDH}	$I_{ODL} = 120\text{mA}$, $V_{ID} = 3\text{V}$		0.4	1		mA
Output Pin Leakage Current	I_{ODH}	$V_{IH} = 14\text{V}$, $V_{OD} = 14\text{V}$, $V_{ID} = 0.3\text{V}$				50	μA

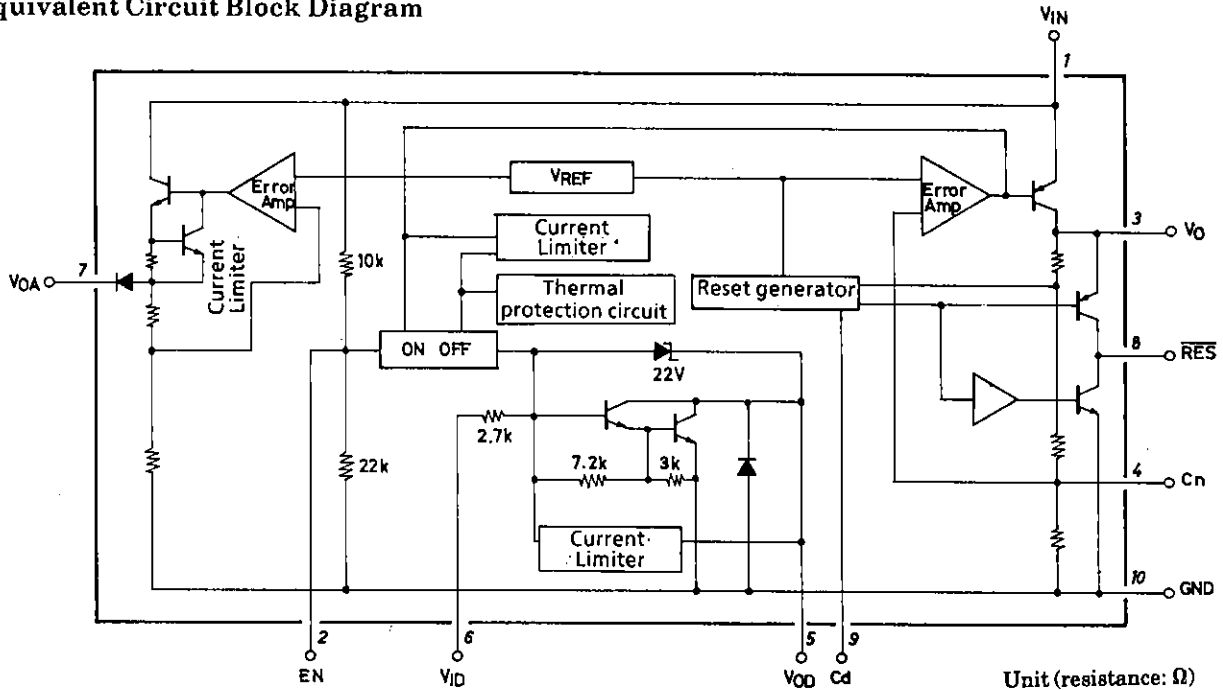
Pin Assignment



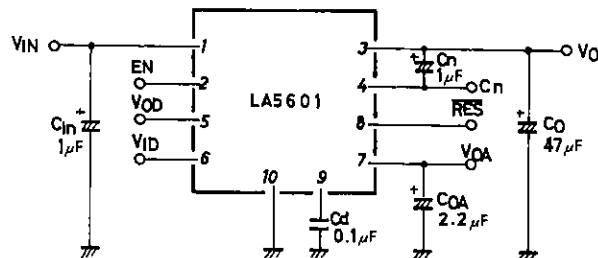
Top view



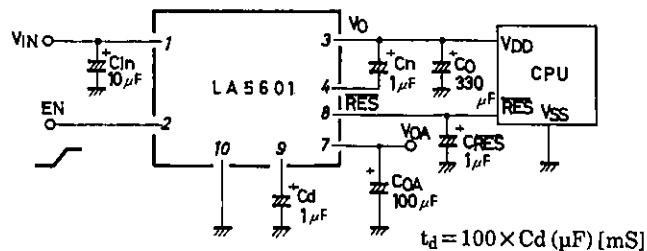
Equivalent Circuit Block Diagram



Specified Test Circuit



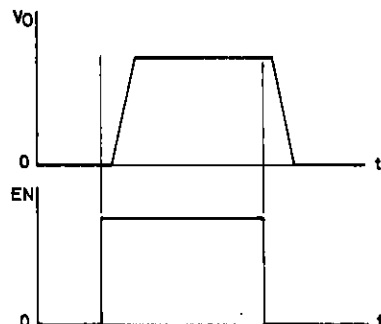
Sample Application Circuit 1



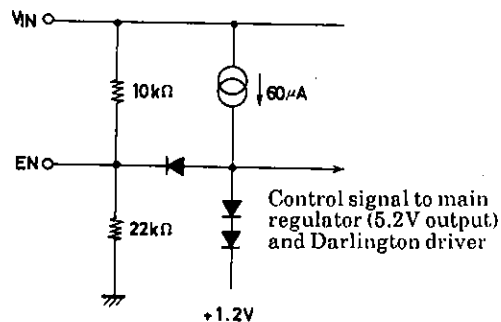
- Note) 1. Capacitors C_n and C_{RES} are only required if problems are experienced with noise from external sources.
2. If capacitor C_n is present, ensure that C_o is at least more than one-third of the value of C_{in} in order to prevent output noise at power-down due to capacitor discharge timing.
3. The minimum recommended value of output capacitor C_o is $47\mu F$.
4. Use a low temperature coefficient capacitor for the delay time capacitor C_d .

Function Table

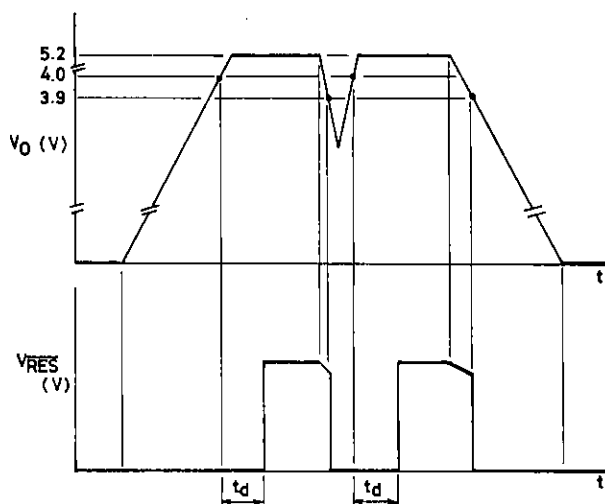
V _{EN}	V _O	Driver
L	L	OFF
H	H	ON

 $V_{EN} = 'H' \text{ or open.}$ 

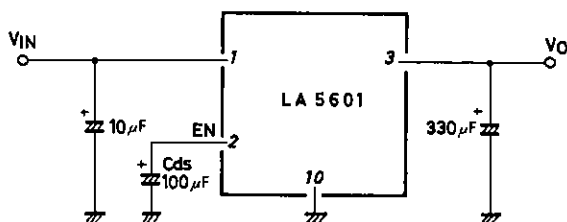
Enable Circuit



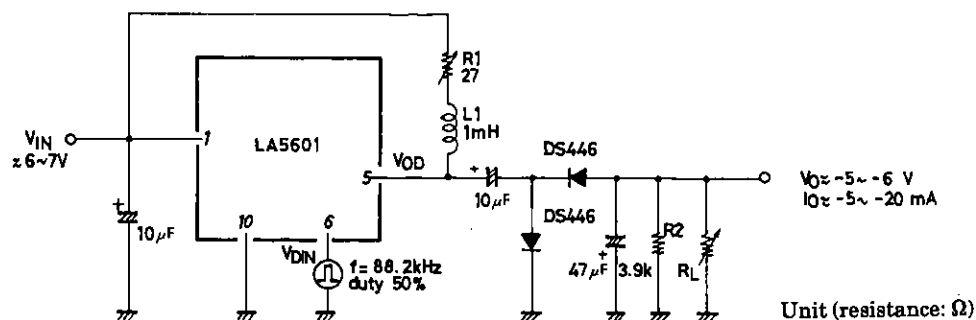
Reset Operation



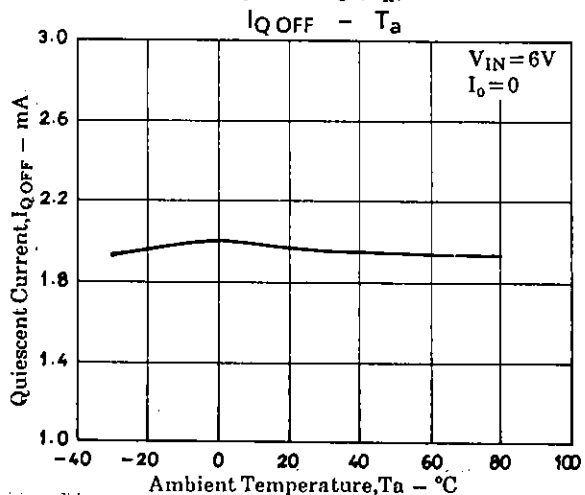
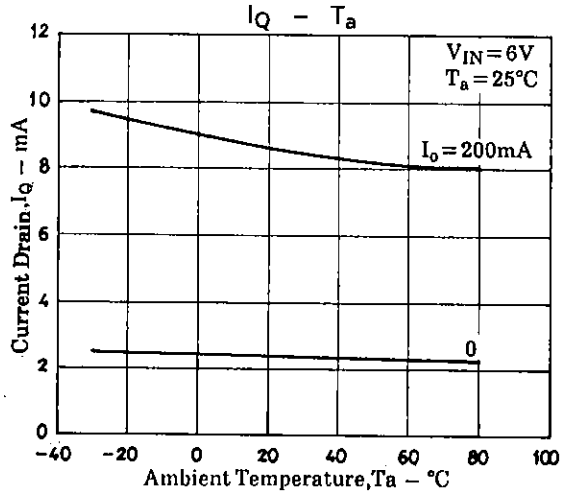
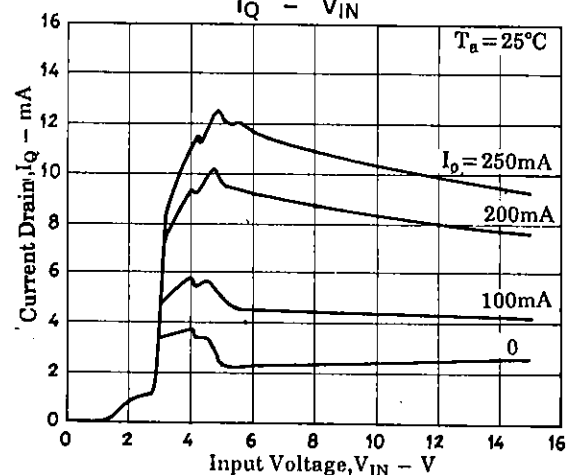
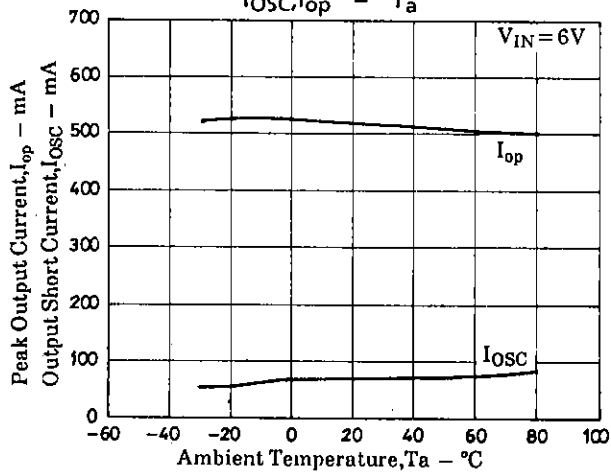
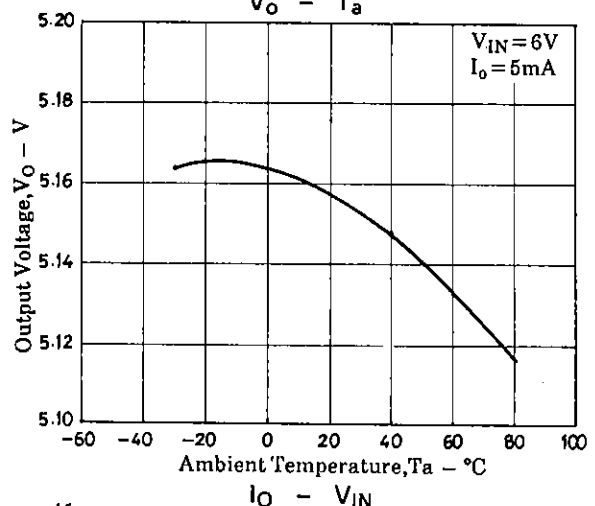
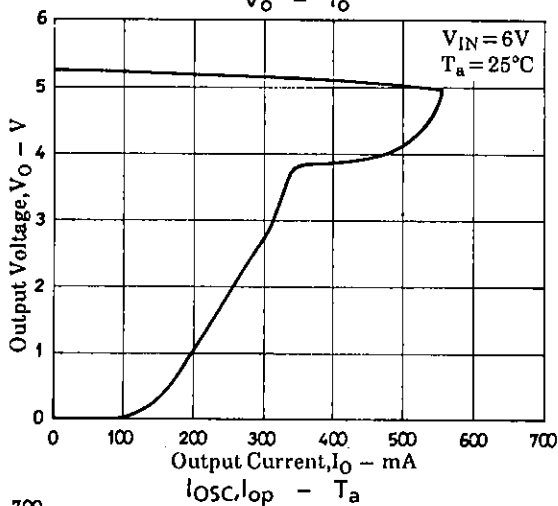
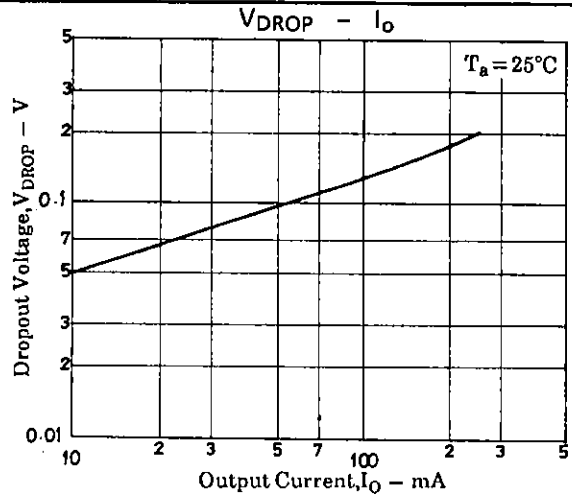
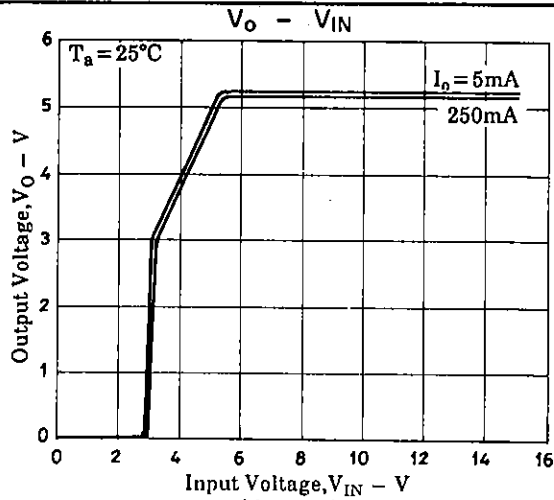
Sample Application Circuit 2 (Delay start regulator)

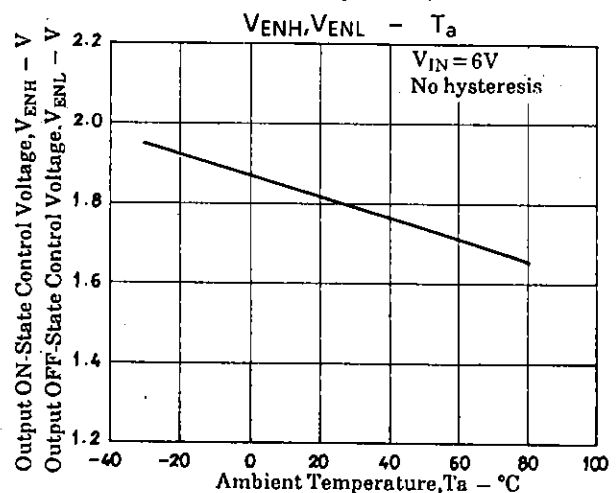
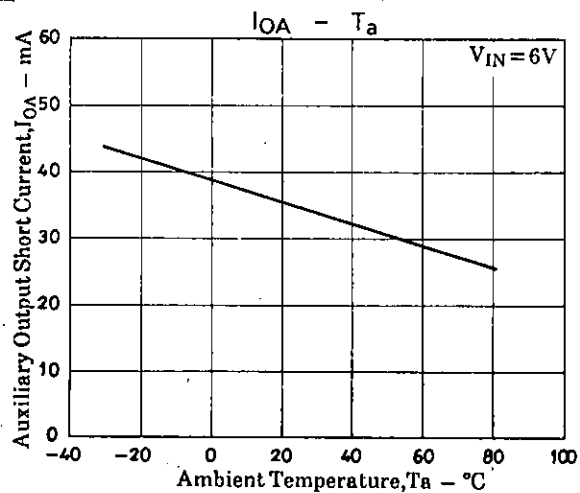
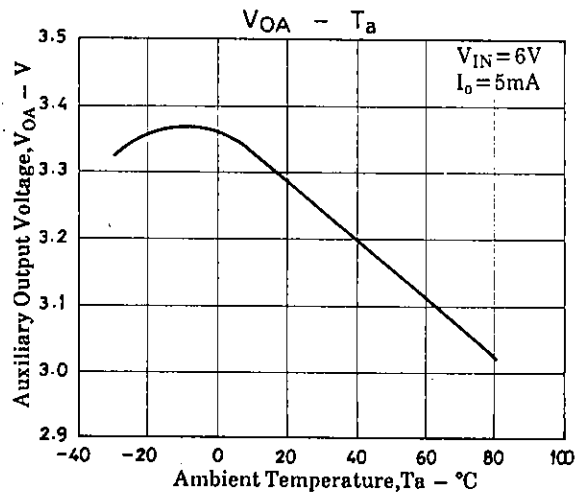
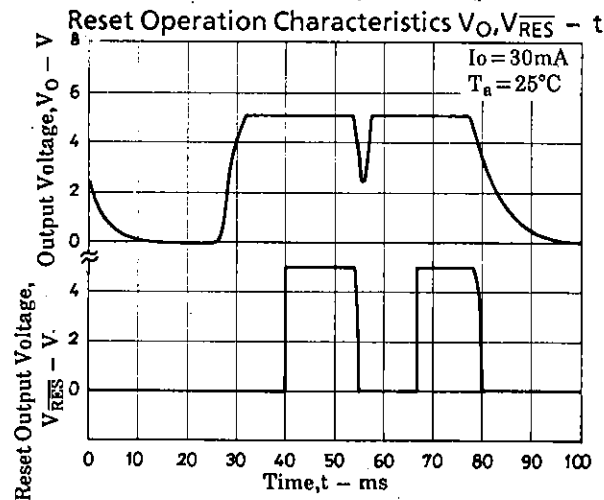
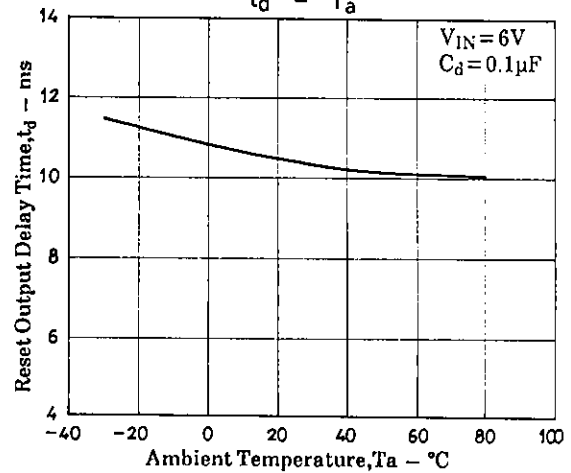
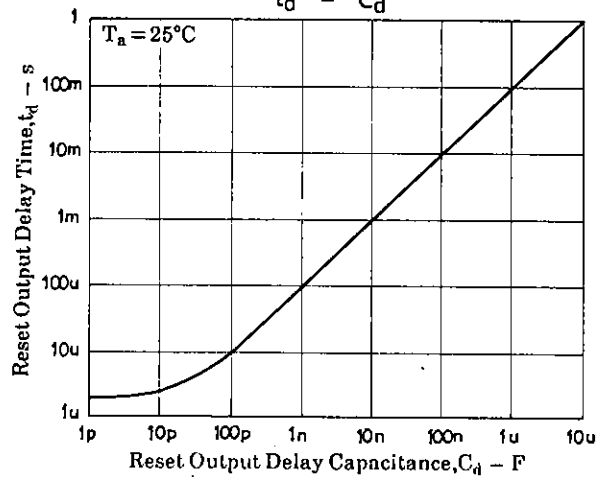
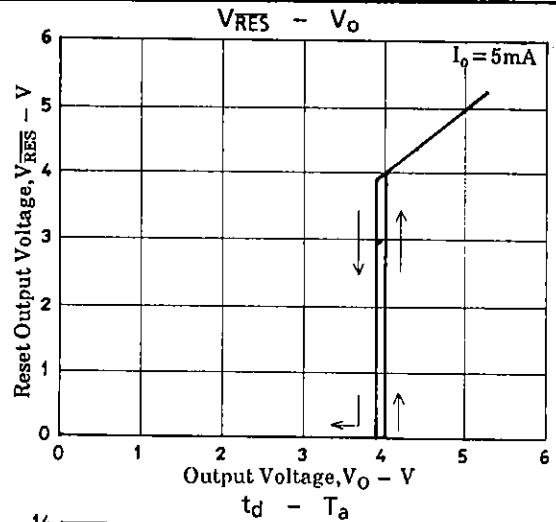
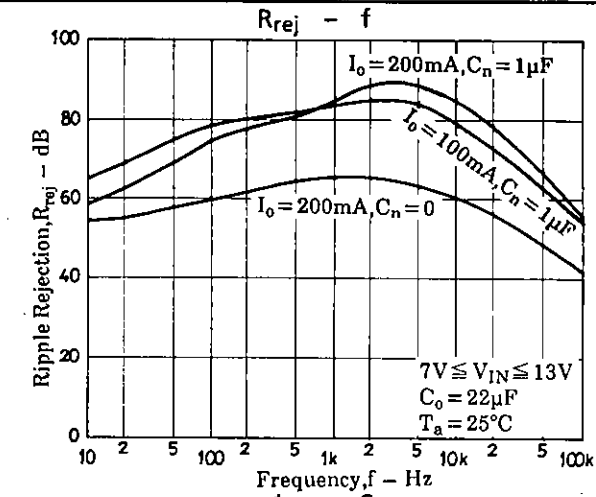


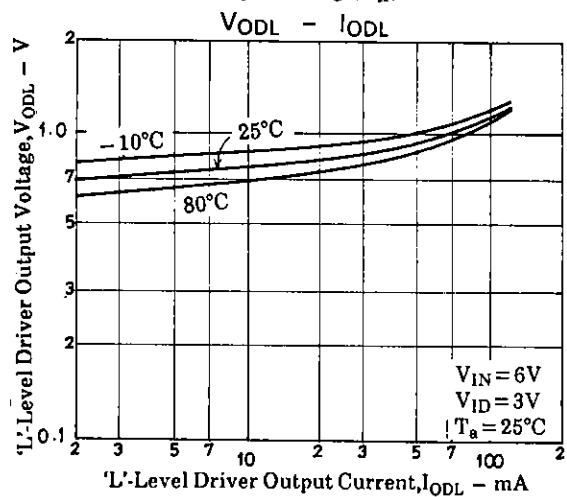
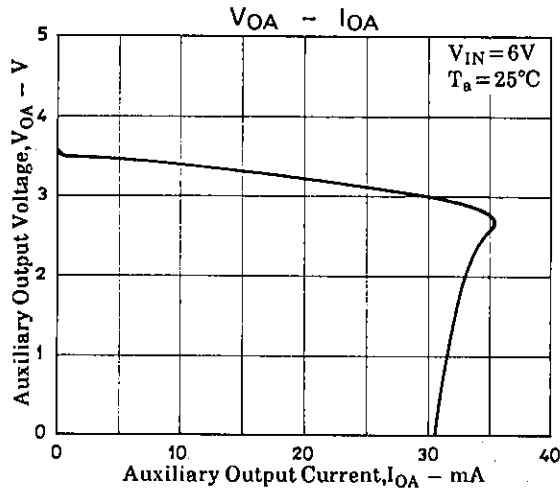
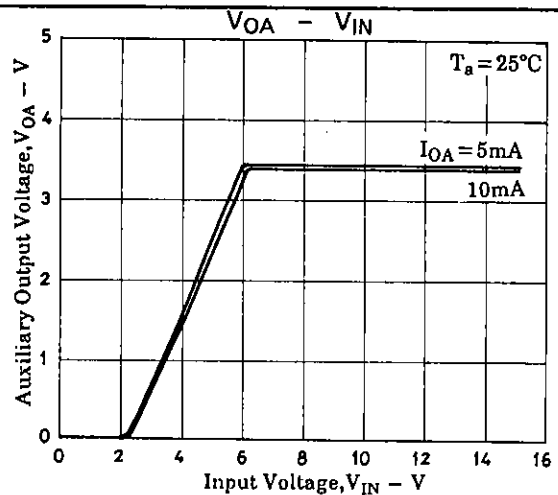
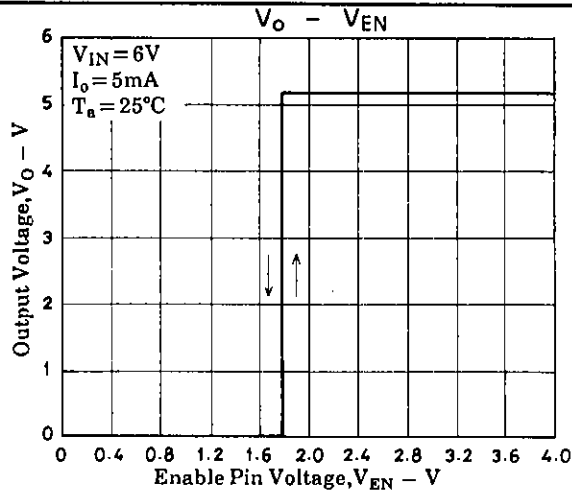
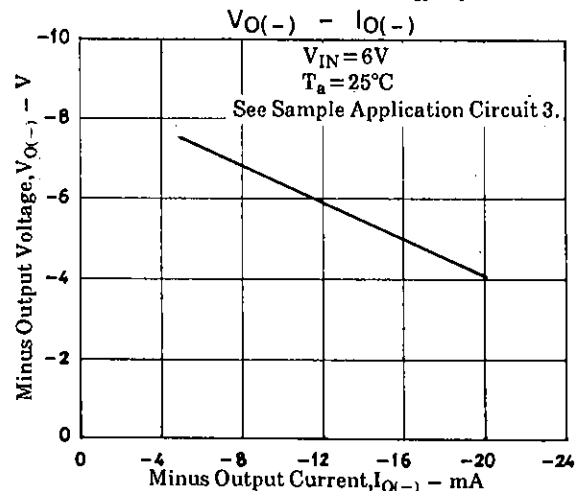
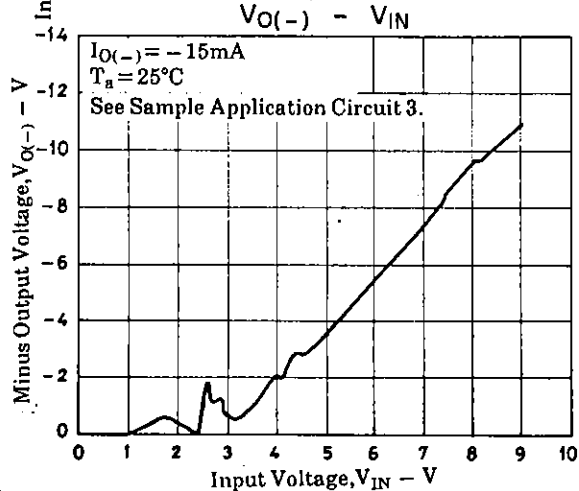
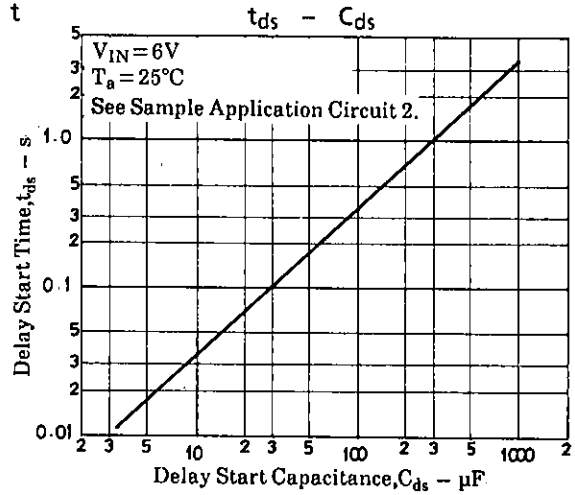
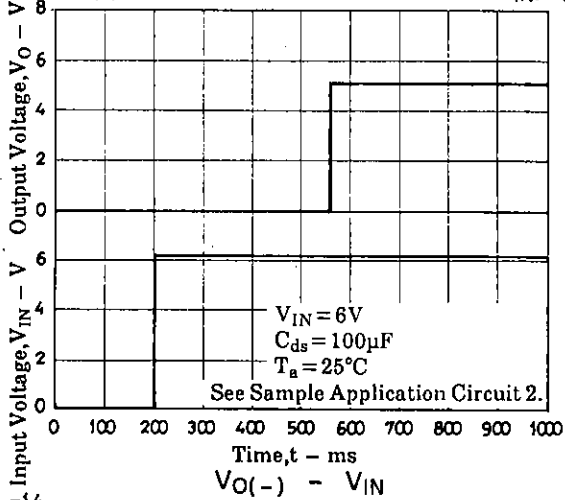
Sample Application Circuit 3 (Positive-to-negative DC converter)



- Note) 1. The output voltage can be fine-trimmed by adjusting R1. To protect the output transistor against over voltage, ensure that either R1 is non zero or use a low-Q coil for L1.
2. A load must always be present on power-up. To safeguard against excessive output voltages that occur when the circuit is powered up without a load, a dummy load resistor is recommended. This is shown on the circuit as R2.
3. Select V_{IN} , R1 and L1 so that $V_{OD} < 14V$, and $I_{ODL} < 120mA$. The component values shown require that V_{IN} never exceeds 9V.





Delay Start Application Circuit Characteristics $V_{IN}, V_O - t$ 

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