

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

Specifications

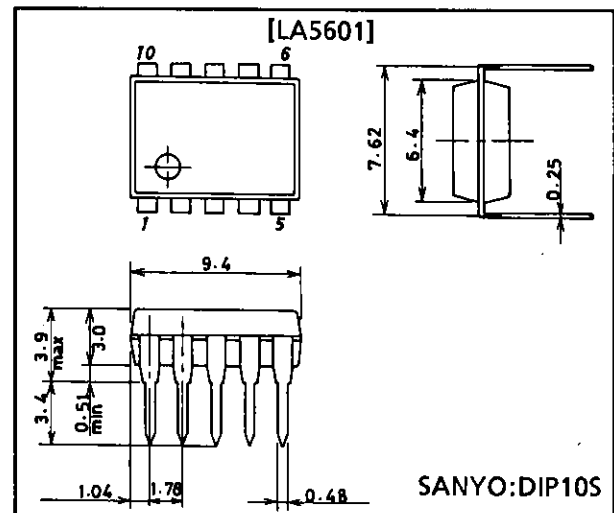
Maximum Ratings at $T_a = 25^\circ\text{C}$

			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



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Operating Conditions at Ta = 25°C

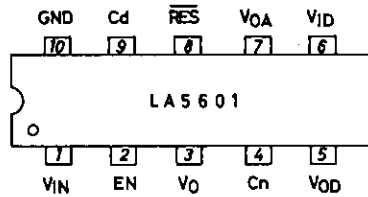
			unit
Input Voltage	V _{IN}	5.9 to 14	V
Output Current	I _{OUT}	0 to 250	mA
'H'-Level Reset Output Current	I _{ORH}	0 to 200	μA
'L'-Level Reset Output Current	I _{ORL}	0 to 2	mA
Auxiliary Regulator Output Current	I _{OA}	0 to 10	mA
Driver Output Voltage	V _{OD max}	14	V
'L'-Level Driver Output Current	I _{ODL max}	120	mA
'H'-Level Driver Input Voltage	V _{IDH}	I _{ODL} = 120mA	3 to 14 V
'L'-Level Driver Input Voltage	V _{IDL}	I _{ODL} ≤ 100μA	-0.3 to +0.3 V

Operating Characteristics at Tj = 25°C, V_{IN} = 6V, I_{OUT} = 200mA, See specified Test Circuit.

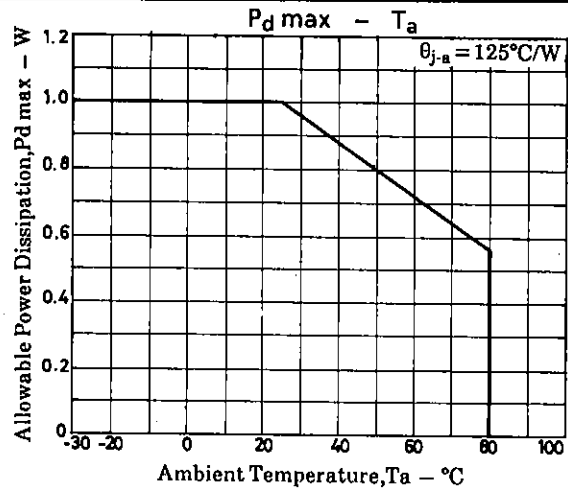
			min	typ	max	unit
[Main regulator : Output ON-state, V _{EN} = 'H' or open]						
Output Voltage	V _O		5.0	5.2	5.4	V
Dropout Voltage	V _{DROP}	I _{OUT} = 250mA		0.25	0.5	V
Line Regulation	ΔV _{OLN1}	5.5V ≤ V _{IN} ≤ 14V		30	80	mV
	ΔV _{OLN2}	6V ≤ V _{IN} ≤ 14V		20	40	mV
Load Regulation	ΔV _{OLD1}	5mA ≤ I _{OUT} ≤ 250mA		40	100	mV
	ΔV _{OLD2}	5mA ≤ I _{OUT} ≤ 100mA		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}	10Hz ≤ f ≤ 100kHz		70		μVrms
Temperature Coefficient of Output Voltage	ΔV _O /ΔT _j	T _j = 25 to 80°C		-0.7		mV/°C
Ripple Rejection	R _{rej}	f = 120Hz, 7V ≤ V _{IN} ≤ 13V		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} = 'L']						
'L'-Level Output Voltage	V _{O OFF}	V _{EN} = 0		50	200	mV
Quiescent Current	I _{Q 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 _{ORH}	I _{ORH} = 200μA	4.97	5.17	5.37	V
'L'-Level Reset Output Voltage	V _{ORL}	I _{ORL} = 2mA, V _{IN} = 3.7V		90	200	mV
Reset Threshold Voltage	V _{RT}	I _{OUT} = 5mA	3.7	3.9	4.1	V
Reset Hysteresis Voltage	V _{hys}	I _{OUT} = 5mA	50	150	300	mV
Reset Output Delay Time	t _d	C _d = 0.1μF	7.5	10	12.5	mS
[Auxiliary regulator]						
Output Voltage	V _{OA}	I _{OA} = 5mA	3.2	3.4	3.6	V
Line Regulation	ΔV _{OA LN}	6V ≤ V _{IN} ≤ 14V, I _{OA} = 5mA		15	40	mV
Load Regulation	ΔV _{OA LD}	2mA ≤ I _{OA} ≤ 10mA		130	200	mV
Output Short Current	I _{OA SC}		10	30		mA
Output Pin Leakage Current	I _{OA LEAK}	V _{IN} = 0, V _{OA} = 6V			2	μA
[Darlington driver]						
'L'-Level Driver Output Voltage	V _{ODL1}	I _{ODL} = 80mA, V _{ID} = 3V		1.1	1.6	V
	V _{ODL2}	I _{ODL} = 120mA, V _{ID} = 3V		1.2	1.8	V
'H'-Level Driver Input Current	I _{IDH}	I _{ODL} = 120mA, V _{ID} = 3V		0.4	1	mA
Output Pin Leakage Current	I _{ODH}	V _{IH} = 14V, V _{OD} = 14V, V _{ID} = 0.3V			50	μA

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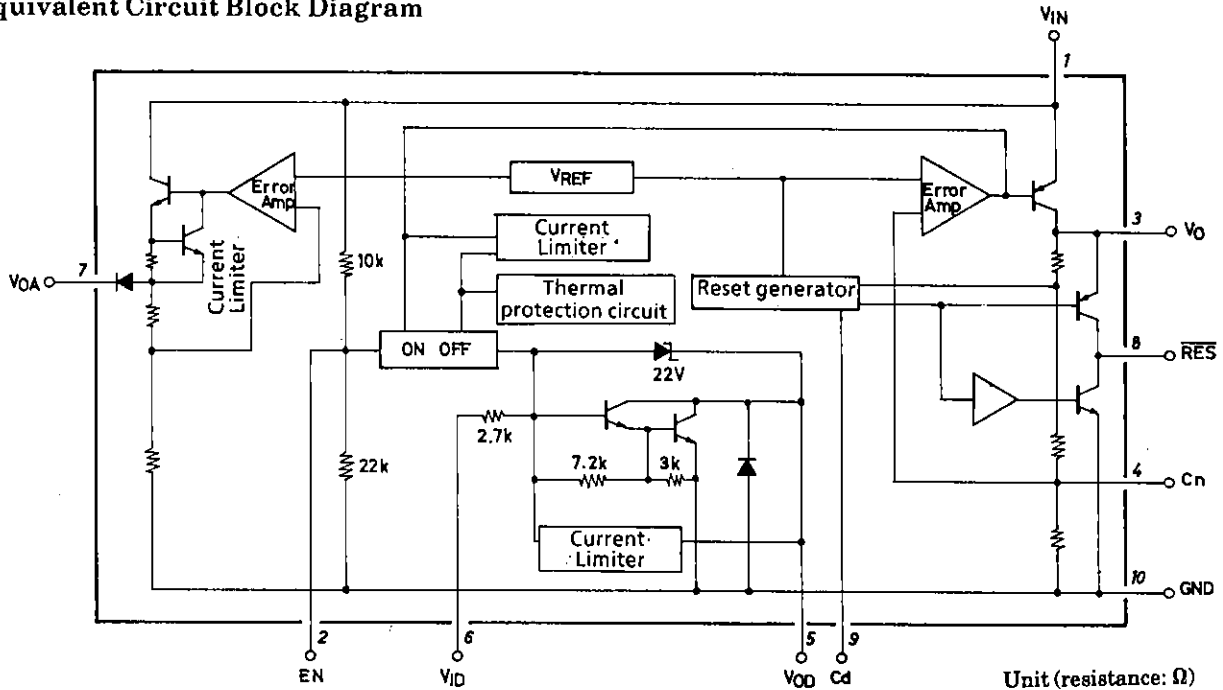
Pin Assignment



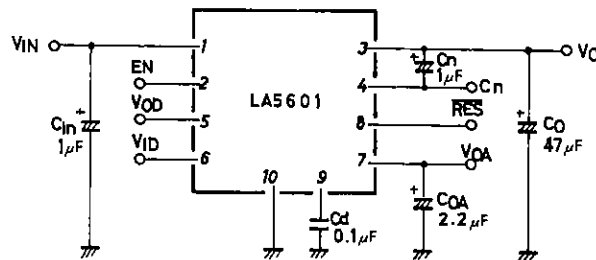
Top view



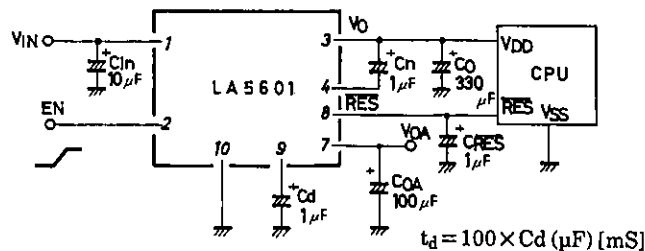
Equivalent Circuit Block Diagram



Specified Test Circuit



Sample Application Circuit 1

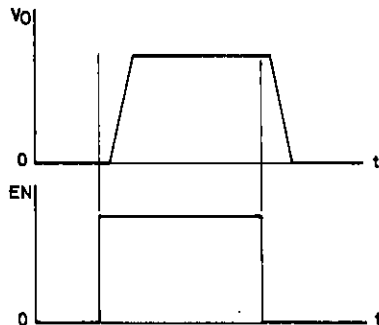


- Note) 1. Capacitors C_n and C_{RES} are only required if problems are experienced with noise from external sources.
2. If capacitor C_n is present, ensure that C_o is at least more than one-third of the value of C_{in} in order to prevent output noise at power-down due to capacitor discharge timing.
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 .

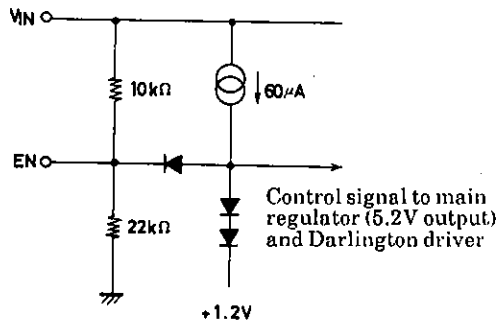
Function Table

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

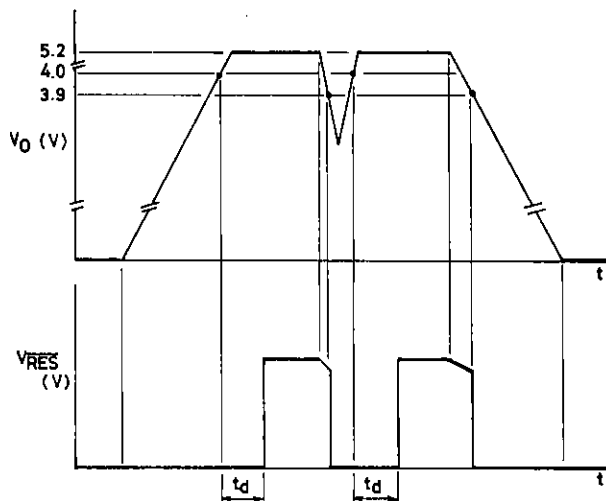
V_{EN}='H' or open.



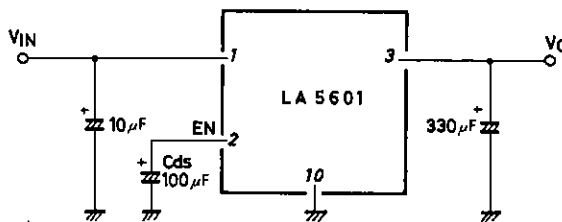
Enable Circuit



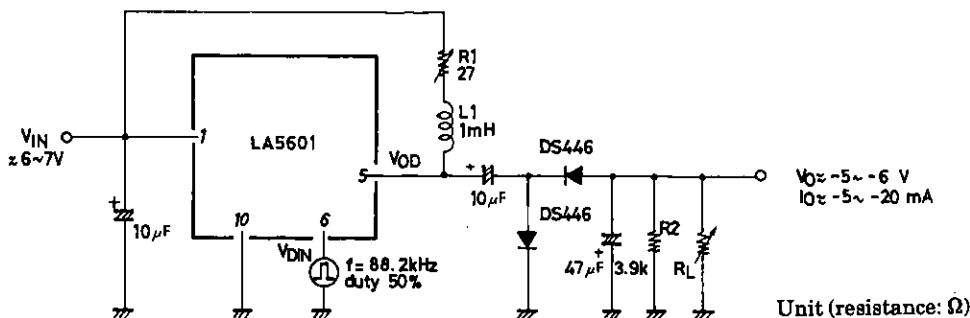
Reset Operation



Sample Application Circuit 2
(Delay start regulator)

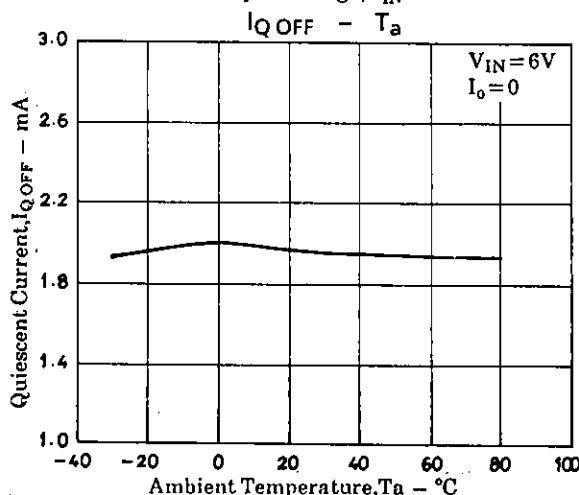
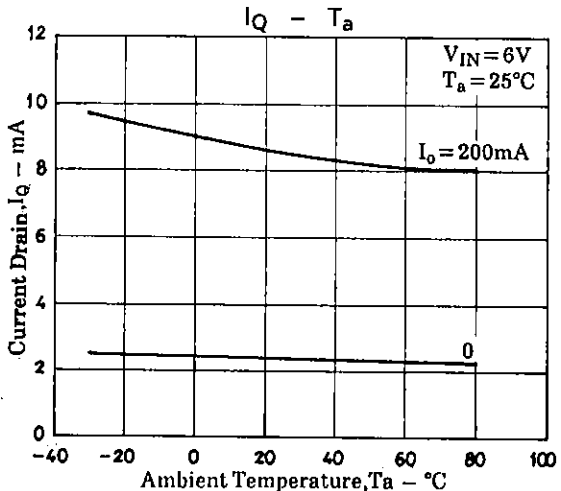
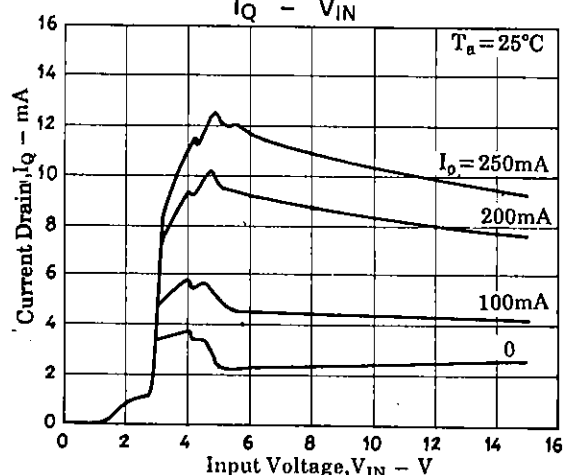
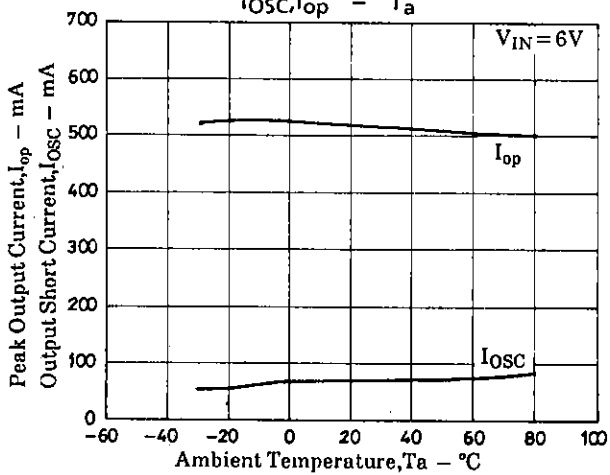
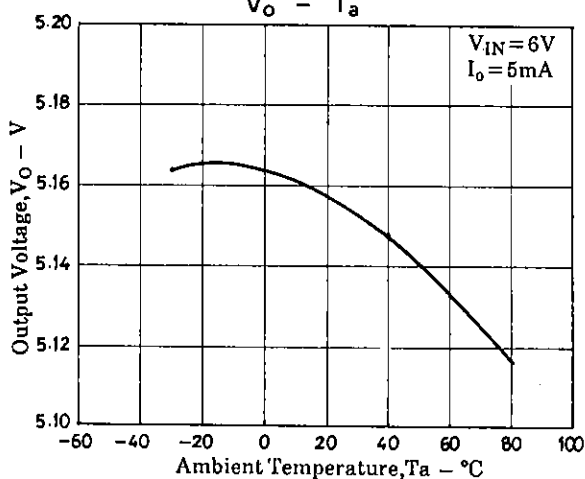
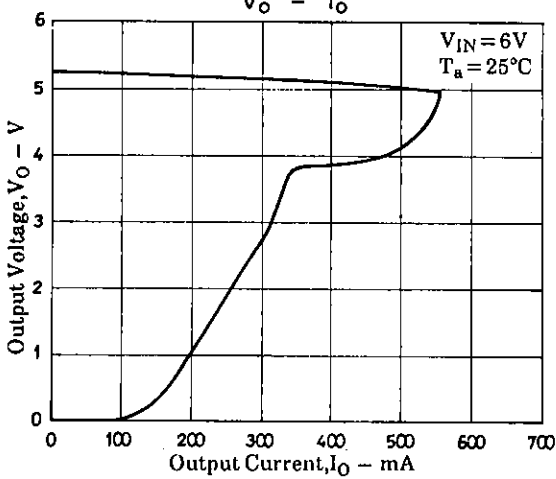
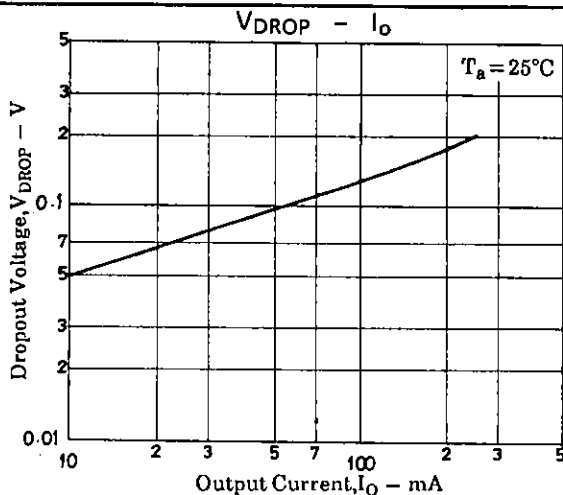
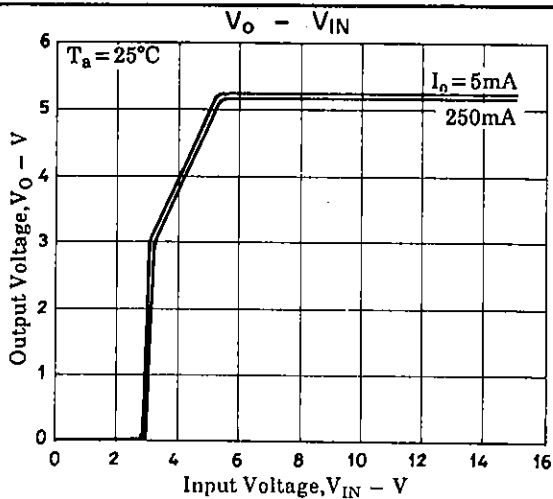


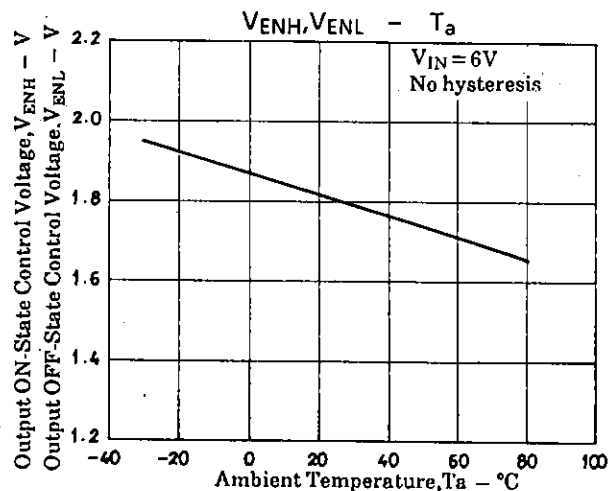
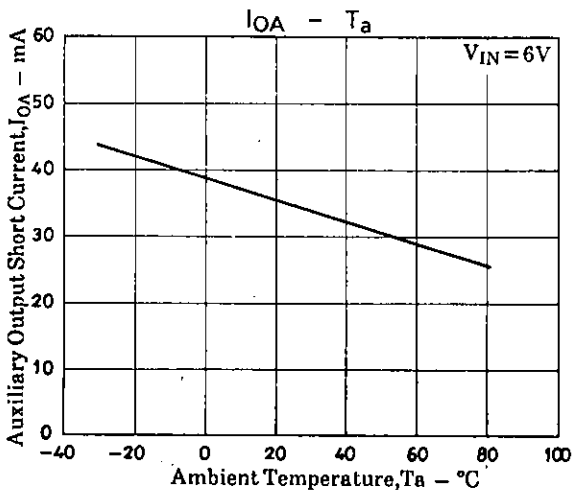
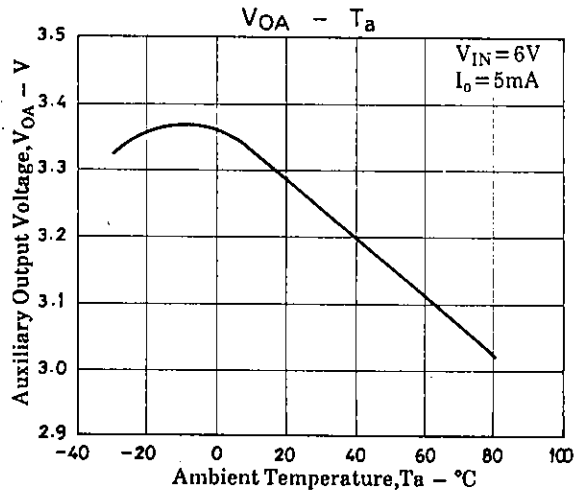
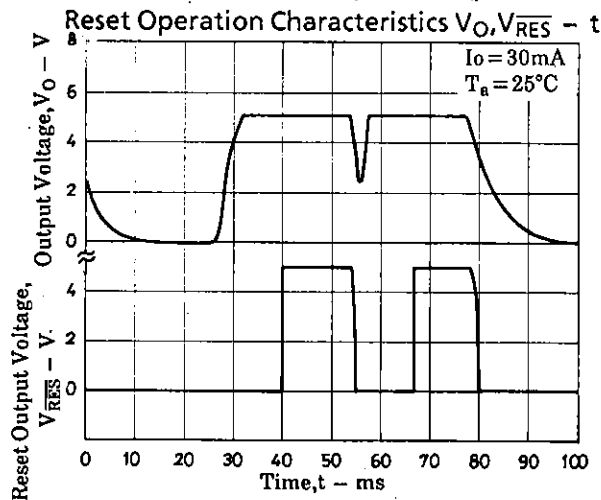
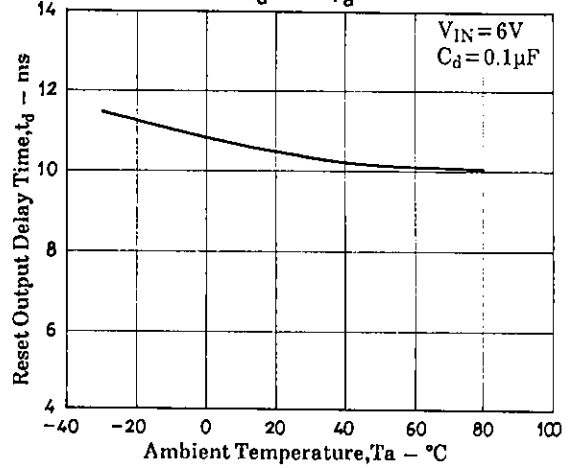
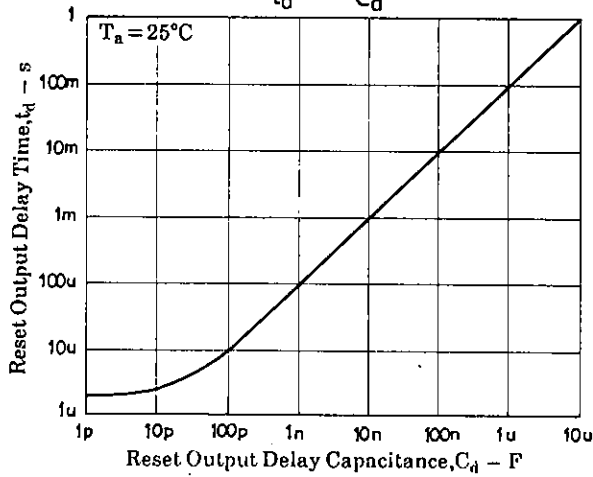
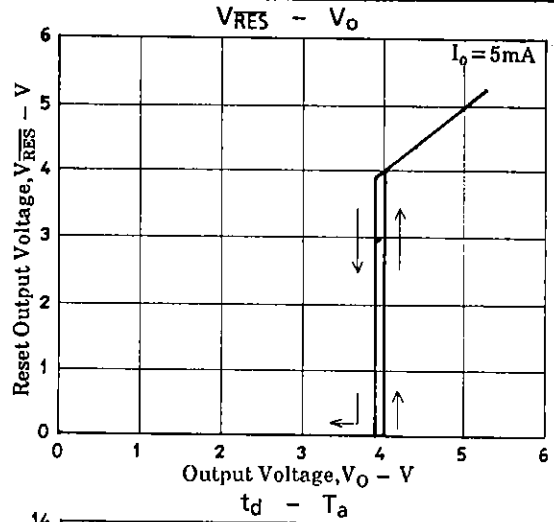
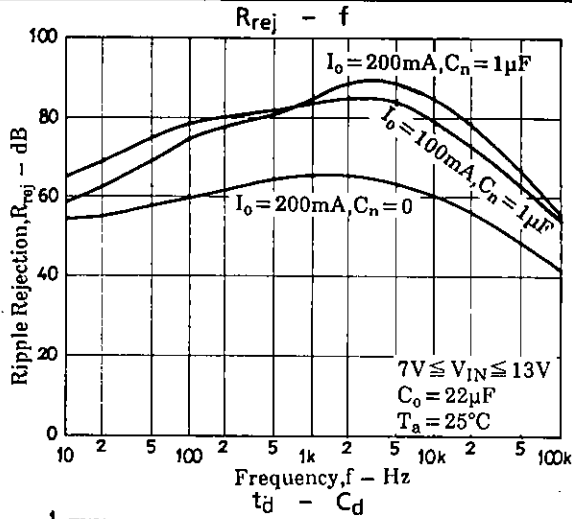
Sample Application Circuit 3
(Positive-to-negative DC converter)

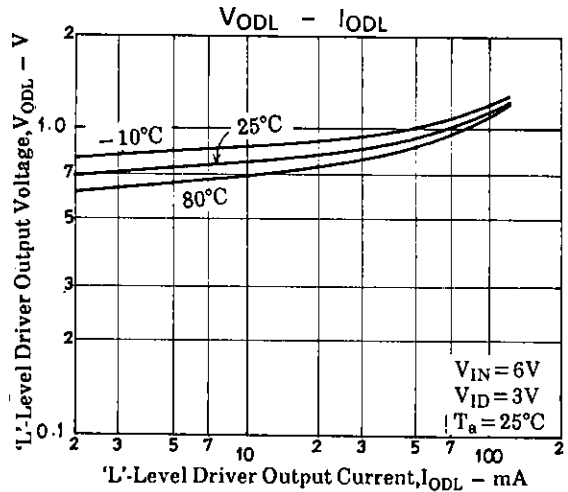
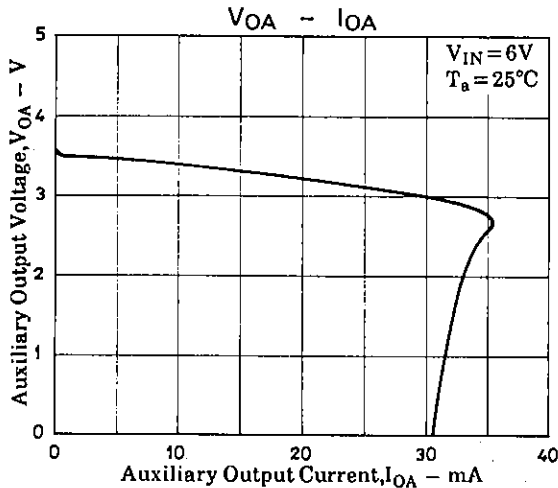
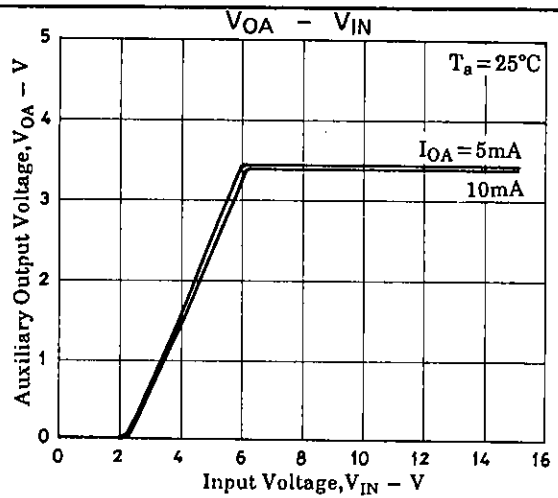
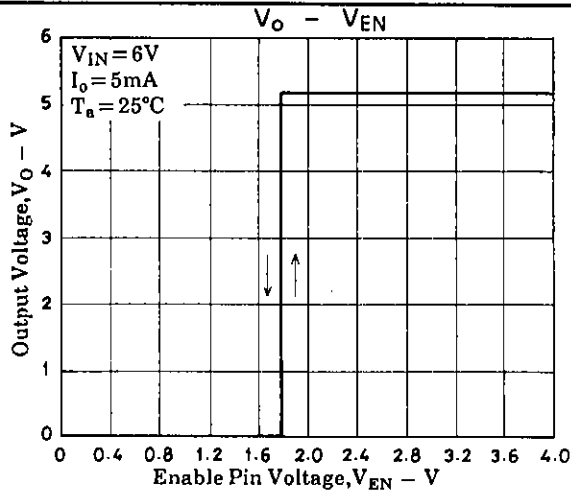


- Note 1. The output voltage can be fine-trimmed by adjusting R1. To protect the output transistor against over voltage, ensure that either R1 is non zero or use a low-Q coil for L1.
- Note 2. A load must always be present on power-up. To safeguard against excessive output voltages that occur when the circuit is powered up without a load, a dummy load resistor is recommended. This is shown on the circuit as R2.
- Note 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.

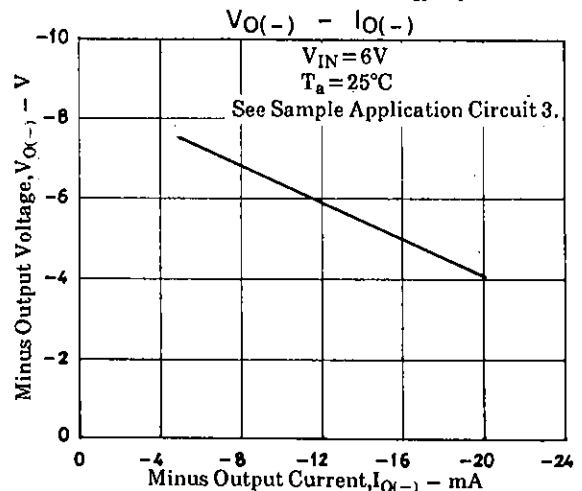
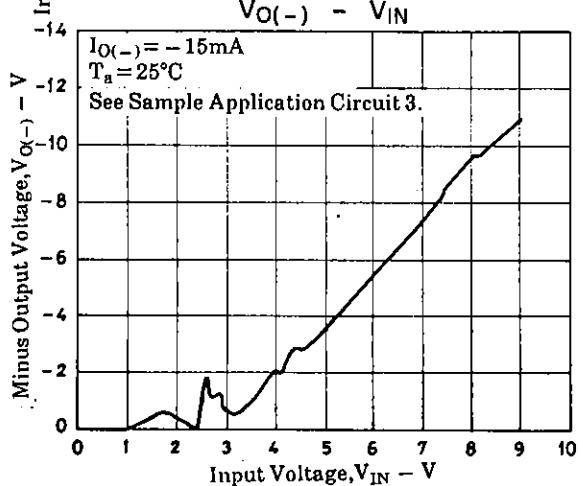
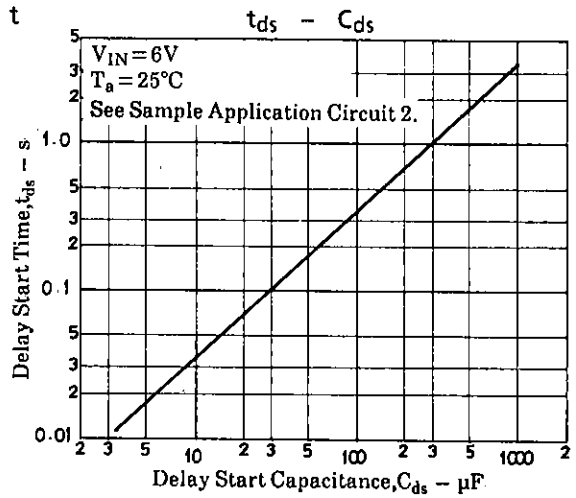
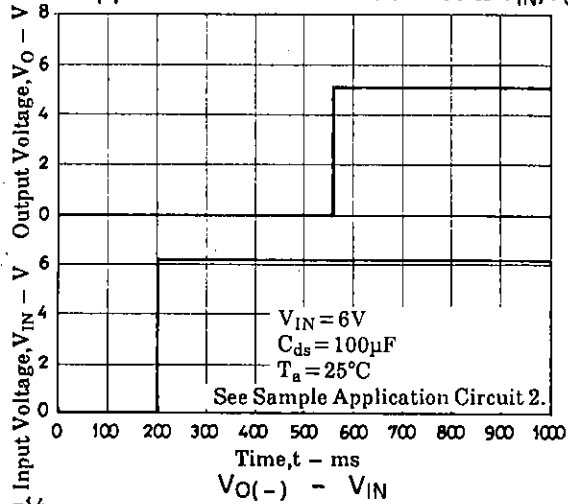
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Delay Start Application Circuit Characteristics $V_{IN}, V_O - t$



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