

**LA5601**

Low Saturation 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.) saturation 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 saturation 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).

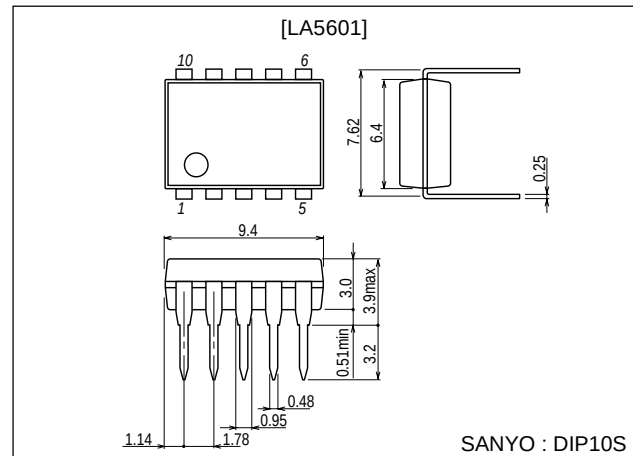
Features

- 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.

Package Dimensions

unit:mm

3098B-DIP10S



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SANYO Electric Co.,Ltd. Semiconductor Company

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

40500TN (KT)/92595HA/D059TA, TS (US) No.3222-1/8

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	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	Pd max		1	W
Operating temperature	Topr		–30 to +80	°C
Storage temperature	Tstg		–55 to +150	°C

Operating Conditions at Ta = 25°C

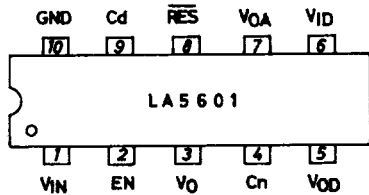
Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	V _{IN}		5.9 to 14	V
Output current	I _{OUT}		0 to 250	mA
H-level reset output current	I _{ORH}		0 to 200	μA
L-level reset output current	I _{ORL}		0 to 2	mA
Auxiliary regulator output current	I _{OA}		0 to 10	mA
Driver output voltage	V _{OD} max		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.

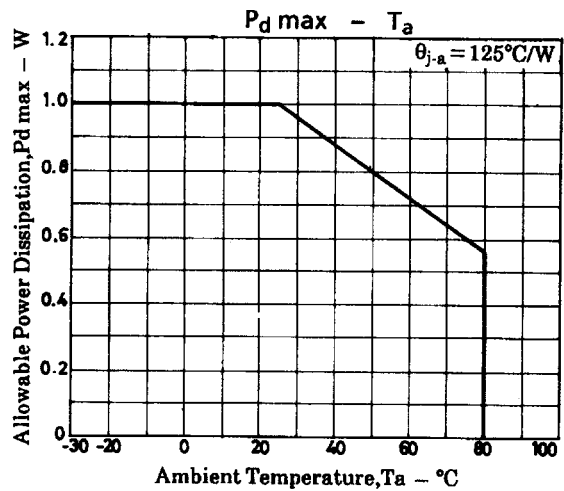
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Main regulator : Output ON-state, V _{EN} ='H' or open]						
Output voltage	V _O		5.0	5.2	5.4	V
Dropout voltage	V _{DROP}	I _{OUT} =250mA		0.25	0.5	V
Line regulation	ΔV _{OLN} 1	5.5V≤V _{IN} ≤14V		30	80	mV
	ΔV _{OLN} 2	6V≤V _{IN} ≤14V		20	40	mV
Load regulation	ΔV _{OLD} 1	5mA≤I _{OUT} ≤250mA		40	100	mV
	ΔV _{OLD} 2	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 _Q 1	I _{OUT} =0		2.2	6	mA
	I _Q 2			10	30	mA
Output noise voltage	V _{NO}	10Hz≤f≤100kHz		70		μVrms
Temperature coefficient of output voltage	ΔV _O /ΔTj	Tj=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	Cd=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 _{OASC}		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 _{ODL} 1	I _{ODL} =80mA, V _{ID} =3V		1.1	1.6	V
	V _{ODL} 2	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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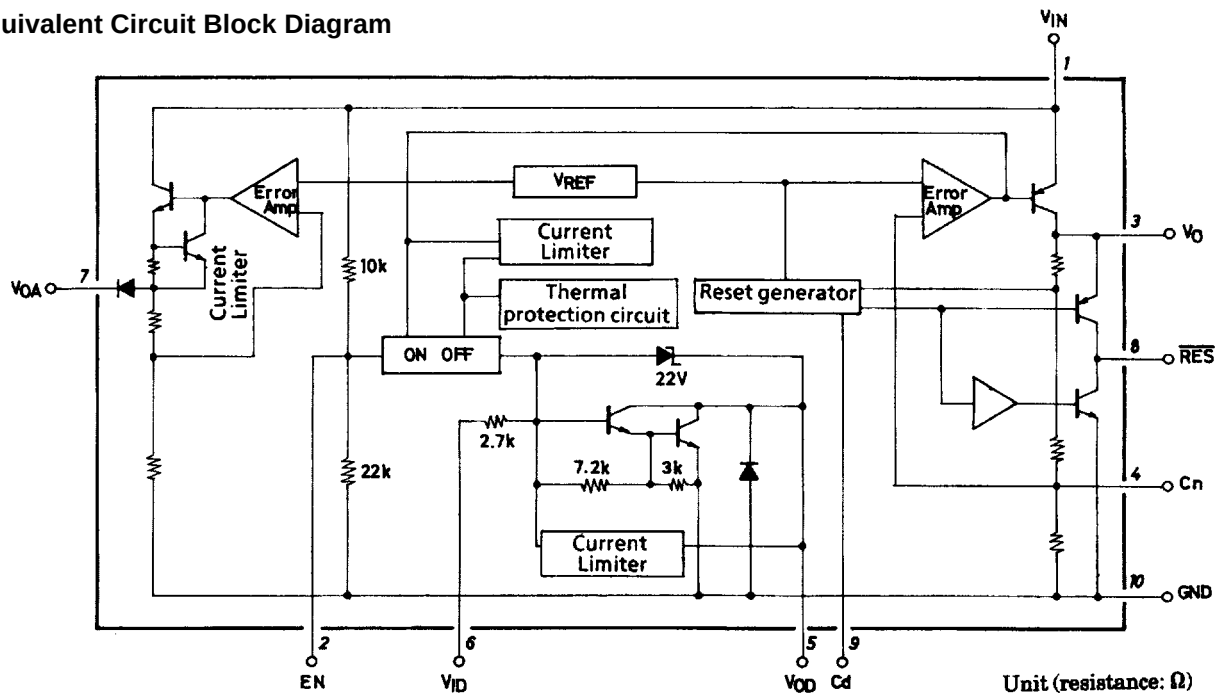
Pin Assignment



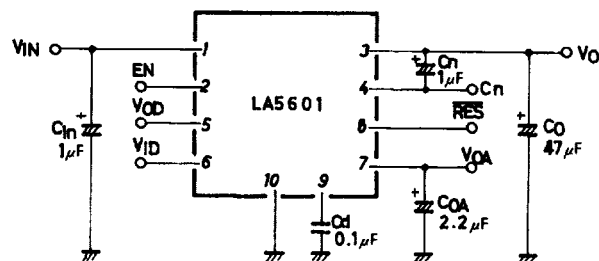
Top view



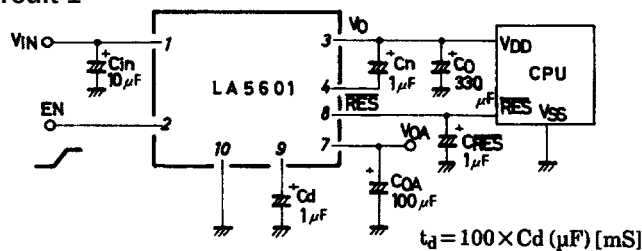
Equivalent Circuit Block Diagram



Specified Test Circuit



Sample Application Circuit 1

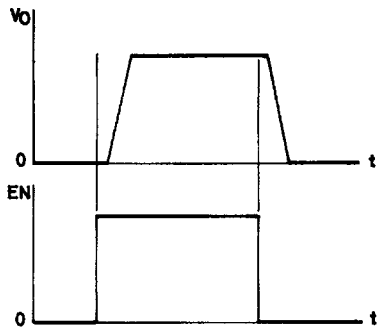


- Note) 1. Capacitors C_n and C_{RES} are only required if problems are experienced with noise from external sources.
 2. If capacitor C_n is present, ensure that C_o is at least more than one-third of the value of C_n in order to prevent output noise at power-down due to capacitor discharge timing.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

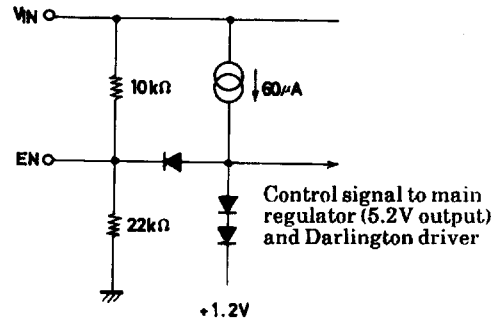
Function Table

V_{EN}	V_O	Driver
L	L	OFF
H	H	ON

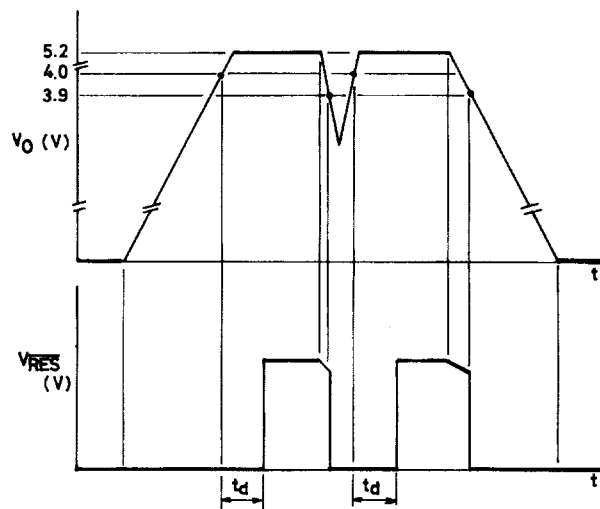
V_{EN} ='H' or open.



Enable Circuit

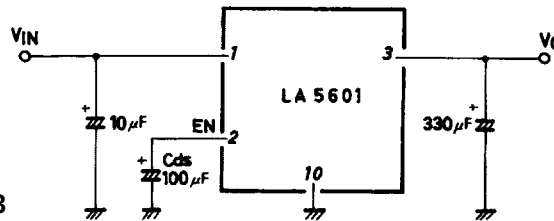


Reset Operation



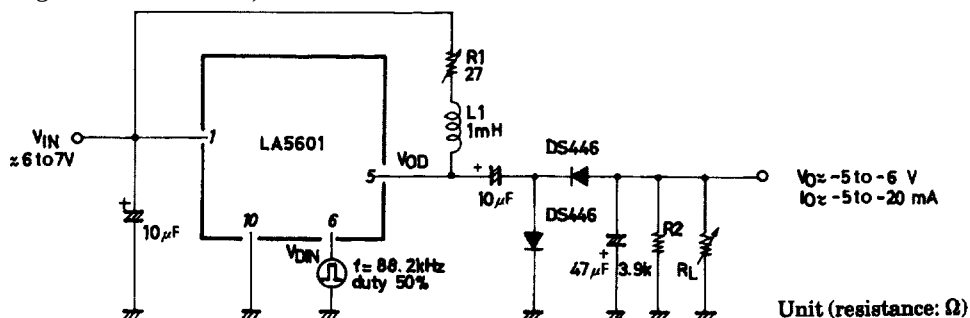
Sample Application Circuit 2

(Delay start regulator)

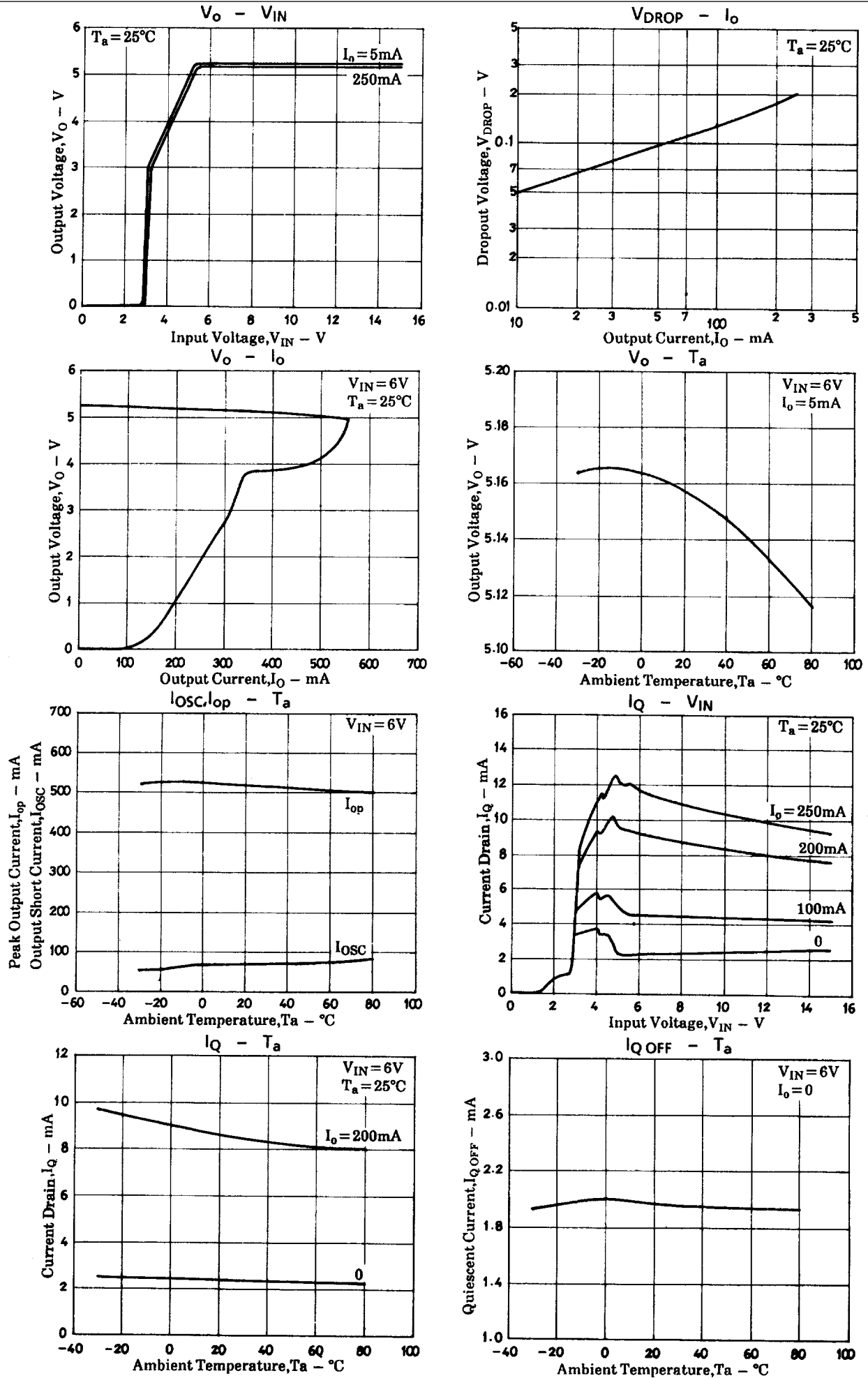


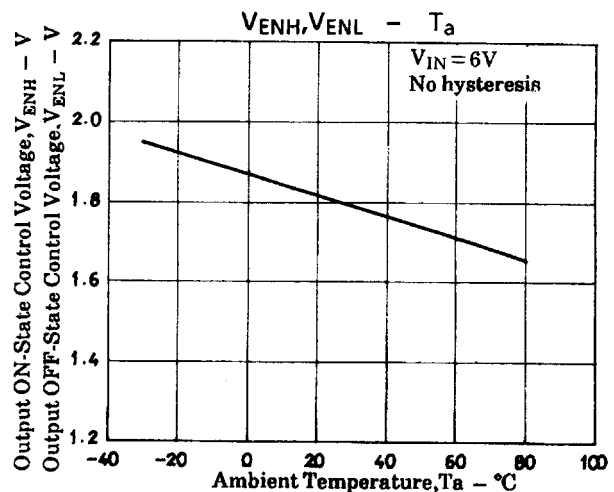
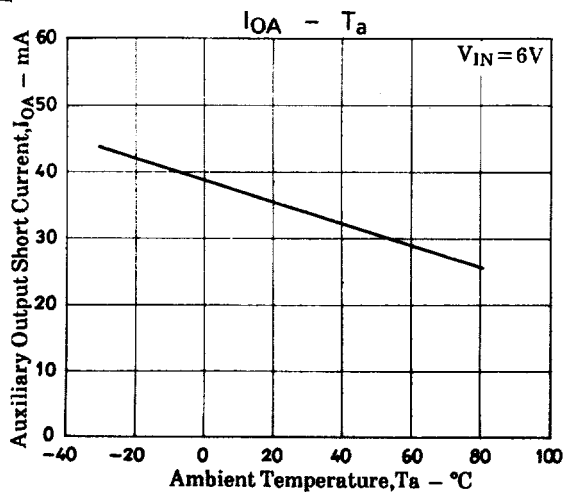
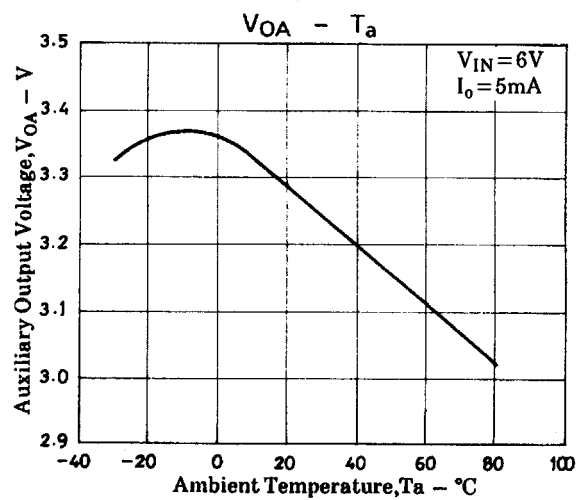
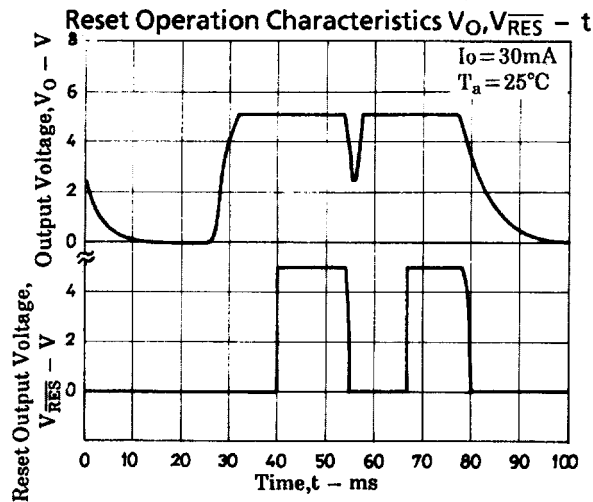
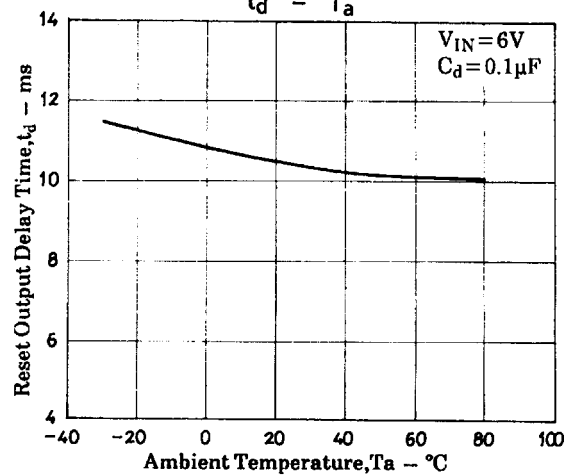
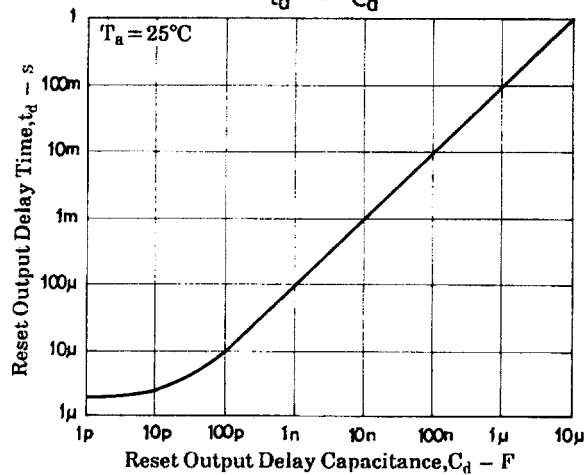
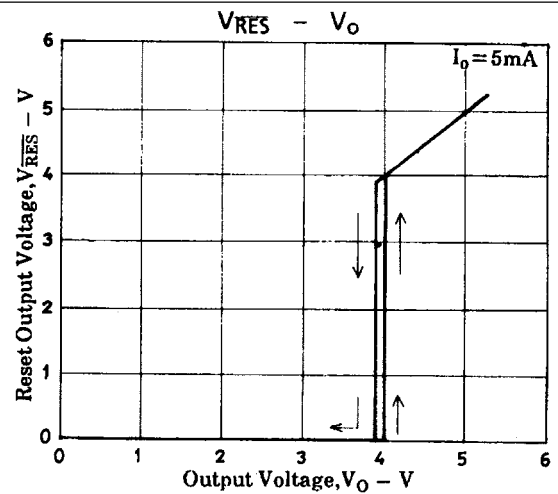
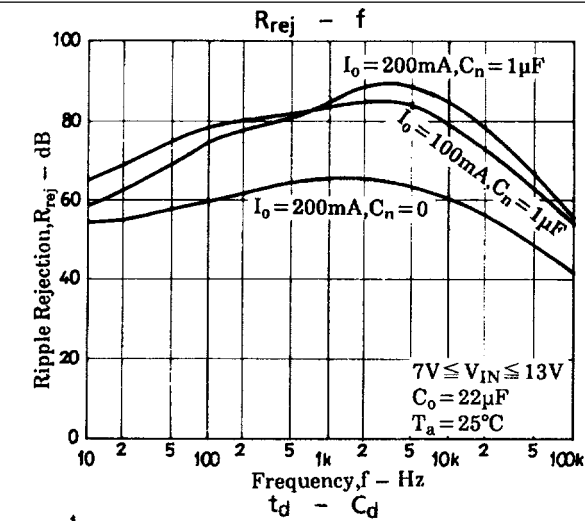
Sample Application Circuit 3

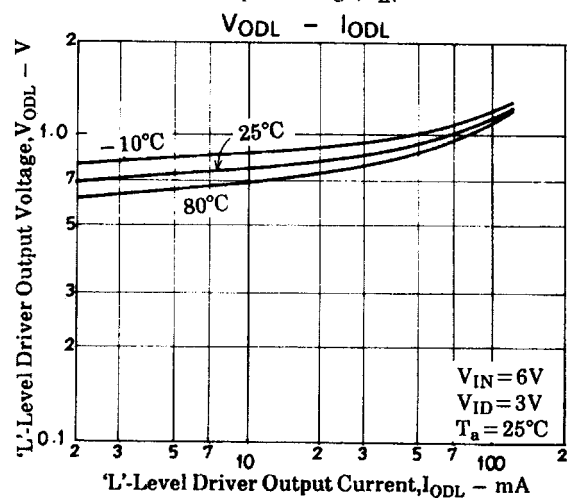
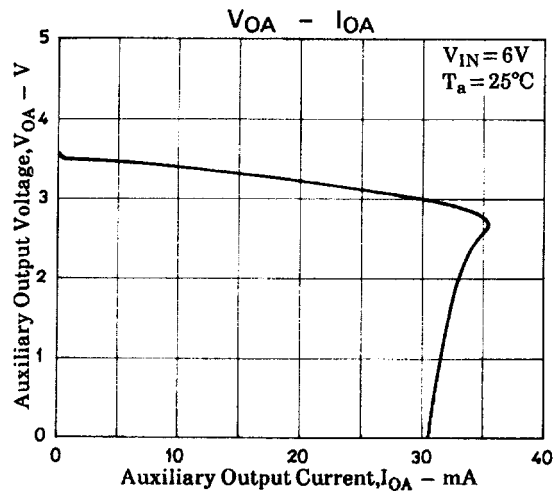
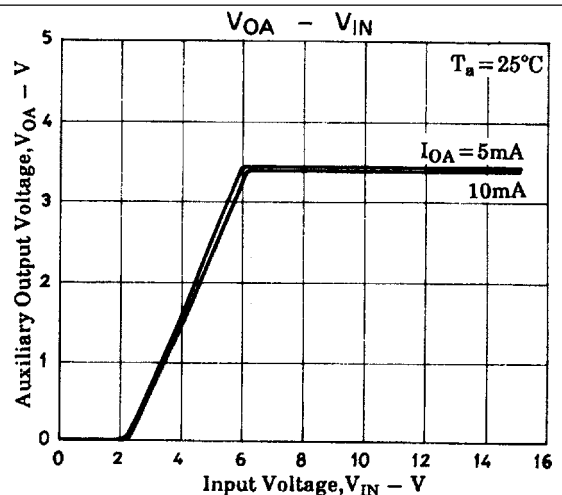
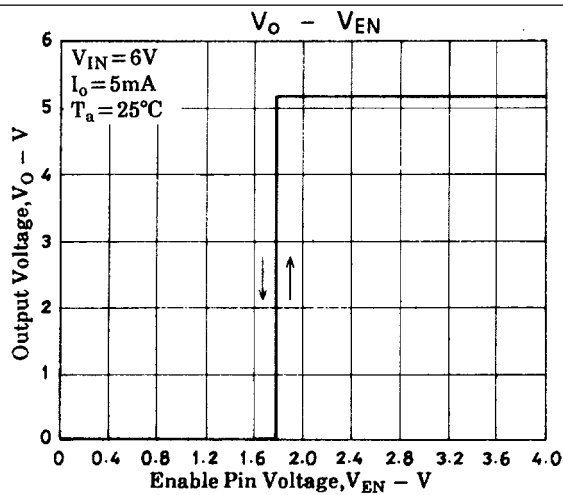
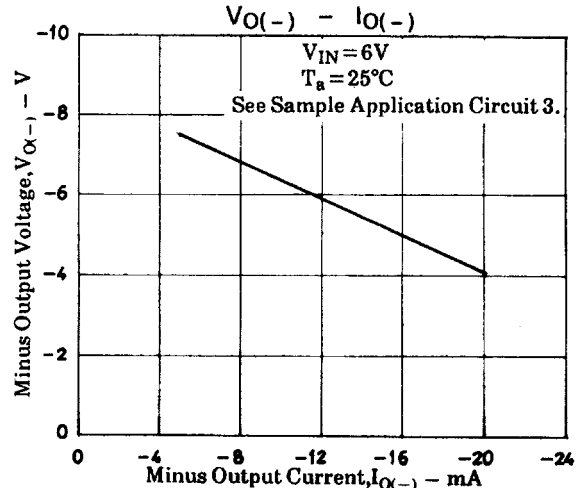
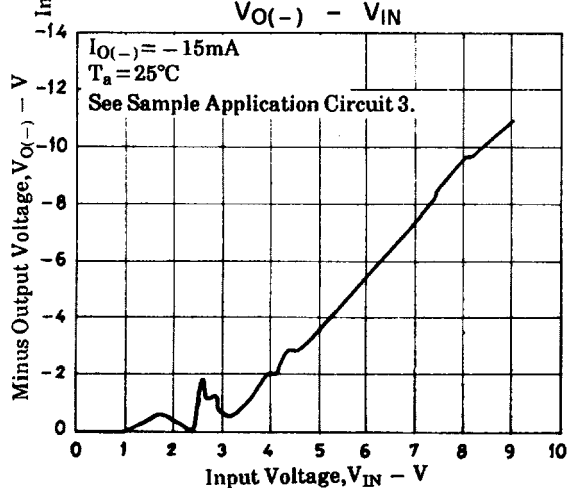
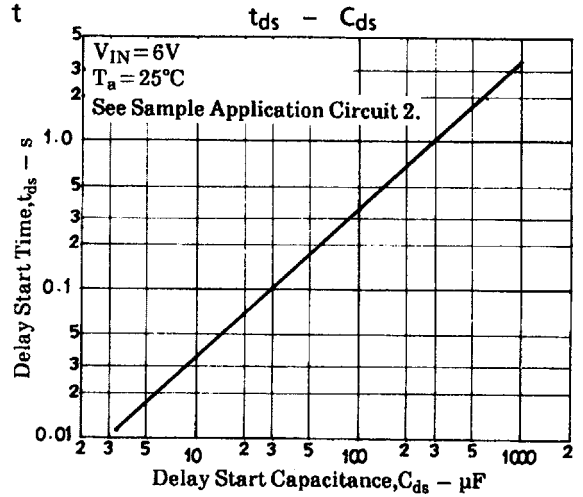
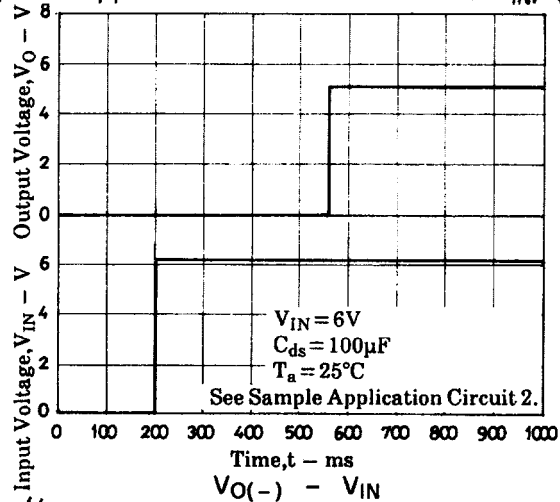
(Positive-to-negative DC converter)



- Note) 1. The output voltage can be fine-trimmed by adjusting R1. To protect the output transistor against overvoltage, 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 $V_{ODL} < 14V$, 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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