

No. 4063

LA5603

Multi-function, Multiple Voltage Power Supply

OVERVIEW

The LA5603 is a multi-function, low dropout voltage, multiple voltage power supply for use in microcomputer controlled audio equipment such as CD players and minicomponent stereo systems.

The LA5603 features a 5.6 V, 0.5 A supply, a 7.5 V, 1.0 A supply and a -7.5 V, -1.0 A supply each with an on/off switch, a 4.8 V ($I_{OA2} = 0.1$ A, $I_{OA1} = 0$) supply with a reverse current prevention diode and a 5.6 V ($I_{OA1} = 0.1$ A, $I_{OA2} = 0$) supply enabling it to power both analog and digital components.

The LA5603 incorporates reset, mute and power-on functions for generating signals for the component(s) being powered and an adjustable startup delay function for controlling the sequence in which system components are powered up.

The LA5603 operates from a ± 8.5 to ± 16 V dual supply and is available in 18-pin SIPs.

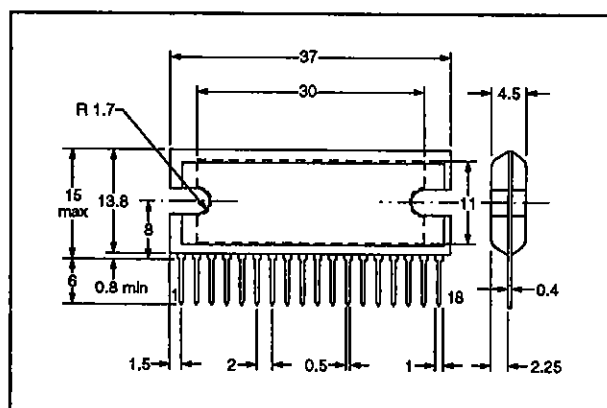
FEATURES

- Low dropout voltage power supply
- 5.6 V, 0.5 A supply with on/off switch
- 7.5 V, 1.0 A and -7.5 V, -1.0 A supplies with on/off switches
- 4.8 V ($I_{OA2} = 0.1$ A, $I_{OA1} = 0$) supply with diode to prevent reverse currents
- 5.6 V ($I_{OA1} = 0.1$ A, $I_{OA2} = 0$) supply
- Reset function
- Mute function
- Auto power-on function
- Powers both analog and digital components
- ± 8.5 to ± 16 V dual supply
- 18-pin SIP

PACKAGE DIMENSIONS

Unit: mm

3109-SIP18H



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SPECIFICATIONS

Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	16	V
	V_{EE}	-16	
QUICK IN input voltage	$V_{QUICK\ IN}$	16	V
Power dissipation (with infinite heatsink)	P_D	4.3 (15)	W
Operating temperature range	T_{opr}	-20 to 85	°C
Storage temperature range	T_{stg}	-55 to 150	°C

Recommended Operating Conditions

$T_a = 25\text{ °C}$

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	8.5	V
	V_{EE}	-8.5	
Supply voltage range	V_{CC}	8.5 to 16	V
	V_{EE}	-16 to -8.5	
Output current 1	I_{O1}	0 to 500	mA
Output current 2	I_{O2}	0 to 1.0	A
Output current 3	I_{O3}	-1.0 to 0	A
MUTE output current	I_{MUTE}	0 to 10	mA
RES LOW-level output sink current	I_{OHL}	0 to 2	mA
RES HIGH-level output source current	I_{ORH}	0 to 200	μA
Auxiliary power total supply output current ($I_{OA1} + I_{OA2}$)	I_{OA1}, I_{OA2}	0 to 100	mA

Electrical Characteristics

Main power supply

$V_{CC}/V_{EE} = \pm 8.5\text{ V}$, $T_a = 25\text{ °C}$, $T_j = 25\text{ °C}$, $V_{OA1} = 5.6\text{ V}$, $V_{OA2} = 4.8\text{ V}$, $I_{OA1} = 100\text{ mA}$ unless otherwise noted

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Output voltage	V_{OA1}	$I_{OA2} = 0$ ($I_{OA1} = 100\text{ mA}$)	5.2	5.6	5.9	V
	V_{OA2}	$I_{OA2} = 100\text{ mA}$ ($I_{OA1} = 0$)	4.2	4.8	5.2	
Dropout voltage	V_{DROP}		–	0.6	1.0	V
Line regulation	$\Delta V_{OA1\ LN}$	$V_{CC} = 7\text{ to }12\text{ V}$, $I_{OA1} = 50\text{ mA}$	–	10	80	mV
Load regulation	$\Delta V_{OA1\ LD}$	$I_{OA1} = 1\text{ to }100\text{ mA}$	–	20	100	mV
Peak output current	I_{OP}		100	200	–	mA
Output short-circuit current	I_{OSC}		–	10	–	mA
Output leakage current	$I_{OA\ LEAK}$	$V_{CC} = 0\text{ V}$, $V_{OA2} = 6\text{ V}$	–	–	2	μA

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Current consumption with negative power supply	I_{OM1}	$I_{O1}, I_{O2}, I_{O3}, I_{OA1}$ and $I_{MUTE} = 0$ A	–	–3.2	–9.6	mA
	I_{OM2}	I_{O1}, I_{O2}, I_{OA1} and $I_{MUTE} = 0$ A, $I_{O3} = -500$ mA	–	–6.3	–19	
Current consumption with positive power supply	I_{OP1}	$I_{O1}, I_{O2}, I_{O3}, I_{OA1}$ and $I_{MUTE} = 0$ A	–	6.5	19.5	mA
	I_{OP2}	$I_{O1} = 200$ mA, $I_{O2} = 500$ mA, $I_{O3} = 0$ mA, $I_{OA1} = 100$ mA, $I_{MUTE} = 5$ mA	–	26	78	

Reset

$V_{CC}/V_{EE} = \pm 8.5$ V, $T_j = 25$ °C, $T_a = 25$ °C

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
LOW-level output voltage	V_{ORL}	$I_{ORL} = 2$ mA, C_d grounded	–	100	200	mV
HIGH-level output voltage	V_{ORH}	$I_{ORH} = 200$ μ A	4.47	4.97	5.47	V
Output voltage threshold	V_{RT}	$I_{OA1} = 5$ mA, V_{OA1} detection voltage LOW	3.7	3.9	4.1	V
Hysteresis voltage	V_{hys}	$I_{OA1} = 5$ mA	–	100	200	mV
Output delay time	t_d	$C_d = 1$ μ F	240	300	360	ms

5.6 V power supply

$V_{CC}/V_{EE} = \pm 8.5$ V, $T_j = 25$ °C, $T_a = 25$ °C, $I_o = 200$ mA unless otherwise noted

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Output voltage	V_{OI}		5.1	5.6	5.9	V
Dropout voltage	V_{DROP}		–	0.6	1.0	V
Line regulation	ΔV_{OLN}	$V_{CC} = 8.5$ to 16 V	–	20	100	mV
		$V_{CC} = 9.5$ to 16 V	–	20	100	
Load regulation	ΔV_{OLD}	$I_o = 5$ to 500 mA	–	50	150	mV
		$I_o = 5$ to 100 mA	–	20	100	
Peak output current	I_{OP}		500	750	–	mA
Output short-circuit current	I_{osc}		–	80	–	mA
Output noise voltage	V_{NO}	$f = 10$ Hz to 100 kHz	–	70	–	μ V
Output voltage temperature coefficient	$\Delta V_o/\Delta T_a$	$T_j = 25$ to 85 °C	–	± 0.7	–	mV/°C
Ripple rejection ratio	R_{rej}	$f = 120$ Hz, $V_{CC} = 8.5$ to 16 V	–	74	–	dB
EN LOW-level input voltage	V_{ENL}	Main power source OFF	0	–	0.3	V

7.5 V power supply
 $V_{CC}/V_{EE} = \pm 8.5 \text{ V}$, $T_j = 25 \text{ }^\circ\text{C}$, $T_a = 25 \text{ }^\circ\text{C}$, $I_o = 500 \text{ mA}$, $C_o = 100 \text{ }\mu\text{F}$ unless otherwise noted

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Output voltage	V_{O2}		7.1	7.5	7.8	V
Dropout voltage	V_{DROP}		–	0.6	1.0	V
		$I_o = 300 \text{ mA}$	–	0.4	0.8	
Line regulation	ΔV_{OLN}	$V_{CC} = 8.5 \text{ to } 16 \text{ V}$	–	20	100	mV
Load regulation	ΔV_{OLD}	$I_o = 5 \text{ mA to } 1 \text{ A}$	–	80	200	mV
Peak output current	I_{OP}	$V_{CC}/V_{EE} = \pm 12 \text{ V}$	1.0	1.5	–	A
Output short-circuit current	I_{OSC}		–	0.1	–	A
Output noise voltage	V_{NO}	$f = 10 \text{ Hz to } 100 \text{ kHz}$	–	70	–	μV
Output voltage temperature coefficient	$\Delta V_o/\Delta T_a$	$T_j = 25 \text{ to } 85 \text{ }^\circ\text{C}$	–	± 0.5	–	mV/ $^\circ\text{C}$
Ripple rejection ratio	R_{rej}	$f = 120 \text{ Hz}$ $V_{CC} = 8.5 \text{ to } 16 \text{ V}$	–	60	–	dB

–7.5 V power supply
 $V_{CC}/V_{EE} = \pm 8.5 \text{ V}$, $T_j = 25 \text{ }^\circ\text{C}$, $T_a = 25 \text{ }^\circ\text{C}$, $I_o = -500 \text{ mA}$, $C_o = 100 \text{ }\mu\text{F}$ unless otherwise noted

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Output voltage	V_{O3}		–7.8	–7.5	–7.1	V
Dropout voltage	V_{DROP}		–	0.6	1.0	V
		$I_o = -300 \text{ mA}$	–	0.4	0.8	
Line regulation	ΔV_{OLN}	$V_{EE} = -16 \text{ to } -8.5 \text{ V}$	–	200	300	mV
Load regulation	ΔV_{OLD}	$I_o = -1 \text{ A to } -5 \text{ mA}$	–	80	200	mV
Peak output current	I_{OP}	$V_{CC}/V_{EE} = \pm 12 \text{ V}$	–	–1.5	–1.0	A
Output short-circuit current	I_{OSC}		–	–0.3	–	A
Output noise voltage	V_{NO}	$f = 10 \text{ Hz to } 100 \text{ kHz}$	–	70	–	μV
Output voltage temperature coefficient	$\Delta V_o/\Delta T_a$	$T_j = 25 \text{ to } 85 \text{ }^\circ\text{C}$	–	± 0.5	–	mV/ $^\circ\text{C}$
Ripple rejection ratio	R_{rej}	$f = 120 \text{ Hz}$ $V_{EE} = -16 \text{ to } -8.5 \text{ V}$	–	60	–	dB

5.0 V power supply with mute
 $V_{CC}/V_{EE} = \pm 8.5 \text{ V}$, $T_j = 25 \text{ }^\circ\text{C}$, $T_a = 25 \text{ }^\circ\text{C}$, $I_o = 5 \text{ mA}$

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
MUTE OFF output voltage	$V_{MUTE \text{ OFF}}$	$V_{QUICK \text{ IN}} = 5.5 \text{ V}$	–	0.2	0.3	V
MUTE ON output voltage	$V_{MUTE \text{ ON}}$		4.6	5.0	5.4	V
QUICK IN LOW-level input voltage	$V_{QUICK \text{ IN L}}$		–	–	5.5	V
QUICK IN HIGH-level input voltage	$V_{QUICK \text{ IN H}}$		7.5	–	V_{CC}	V
QUICK IN HIGH-level current	$I_{QUICK \text{ IN H}}$	$V_{QUICK \text{ IN}} = 7.5 \text{ V}$	–	240	480	μA

DESIGN NOTES

When the 5.6 (V_{01}), 7.5 and -7.5 V outputs are ON, EN is high impedance.

When QUICK IN is HIGH, mute mode is ON. When QUICK IN is LOW, mute mode is OFF.

The output capacitors for V_{01} , V_{0A1} , and V_{0A2} should be $47\text{ }\mu\text{F}$ or greater. The output capacitors for V_{02} and V_{03}

should be $100\text{ }\mu\text{F}$ or greater. The output capacitors and C_d , the startup delay capacitor, should have good temperature stability to prevent oscillations at low temperatures.

Capacitors CN1, CN2, CN3 and CNA suppress noise and improve ripple rejection.

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