Monolithic IC

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.

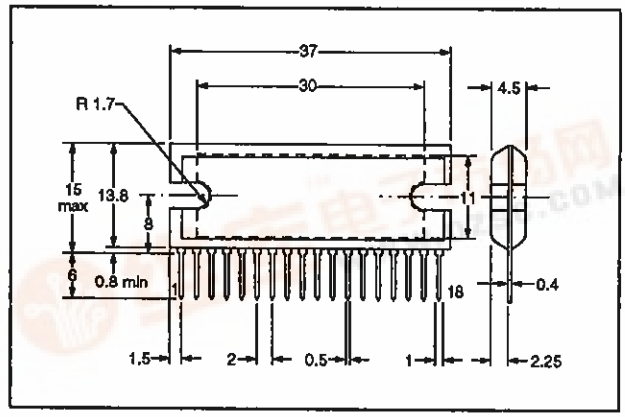
FEATURES

- 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



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 °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
$\overline{RES}$ LOW-level output sink current	$I_{O\overline{R}L}$	0 to 2	mA
$\overline{RES}$ HIGH-level output source current	$I_{O\overline{R}H}$	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} = ± 8.5 V, T_a = 25 °C, T_j = 25 °C, V_{OA1} = 5.6 V, V_{OA2} = 4.8 V, I_{OA1} = 100 mA unless otherwise noted

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Output voltage	V_{OA1}	I_{OA2} = 0 (I_{OA1} = 100 mA)	5.2	5.6	5.9	V
	V_{OA2}	I_{OA2} = 100 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 to 12 V, I_{OA1} = 50 mA	–	10	80	mV
Load regulation	$\Delta V_{OA1\ LD}$	I_{OA1} = 1 to 100 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 V, V_{OA2} = 6 V	–	–	2	μA

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Current consumption with negative power supply	I_{QM1}	I_{O1}, I_{O2}, I_{O3}, I_{OA1} and I_{MUTE} = 0 A	–	–3.2	–9.6	mA
	I_{QM2}	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_{QP1}	I_{O1}, I_{O2}, I_{O3}, I_{OA1} and I_{MUTE} = 0 A	–	6.5	19.5	mA
	I_{QP2}	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} = ±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 µA	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 µF	240	300	360	ms

5.6 V power supply

V_{CC}/V_{EE} = ±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_{O1}		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	–	µV
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} = ±8.5 V, T_j = 25 °C, T_a = 25 °C, I_O = 500 mA, C_O = 100 µF 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 mA	–	0.4	0.8	
Line regulation	ΔV_{OLN}	V_{CC} = 8.5 to 16 V	–	20	100	mV
Load regulation	ΔV_{OLD}	I_O = 5 mA to 1 A	–	80	200	mV
Peak output current	I_{OP}	V_{CC}/V_{EE} = ±12 V	1.0	1.5	–	A
Output short-circuit current	I_{OSC}		–	0.1	–	A
Output noise voltage	V_{NO}	f = 10 Hz to 100 kHz	–	70	–	µV
Output voltage temperature coefficient	$\Delta V_O/\Delta T_a$	T_j = 25 to 85 °C	–	±0.5	–	mV/°C
Ripple rejection ratio	R_{rej}	f = 120 Hz, V_{CC} = 8.5 to 16 V	–	60	–	dB

–7.5 V power supply

V_{CC}/V_{EE} = ±8.5 V, T_j = 25 °C, T_a = 25 °C, I_O = –500 mA, C_O = 100 µF 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 mA	–	0.4	0.8	
Line regulation	ΔV_{OLN}	V_{EE} = –16 to –8.5 V	–	200	300	mV
Load regulation	ΔV_{OLD}	I_O = –1 A to –5 mA	–	80	200	mV
Peak output current	I_{OP}	V_{CC}/V_{EE} = ±12 V	–	–1.5	–1.0	A
Output short-circuit current	I_{OSC}		–	–0.3	–	A
Output noise voltage	V_{NO}	f = 10 Hz to 100 kHz	–	70	–	µV
Output voltage temperature coefficient	$\Delta V_O/\Delta T_a$	T_j = 25 to 85 °C	–	±0.5	–	mV/°C
Ripple rejection ratio	R_{rej}	f = 120 Hz, V_{EE} = –16 to –8.5 V	–	60	–	dB

5.0 V power supply with mute

V_{CC}/V_{EE} = ±8.5 V, T_j = 25 °C, T_a = 25 °C, I_O = 5 mA

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

DESIGN NOTES

When the 5.6 (V_{O1}), 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_{O1}, V_{OA1}, and V_{OA2} should be 47 µF or greater. The output capacitors for V_{O2} and V_{O3} should be 100 µF 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.