40-CHANNEL LED DRIVER
EXTERNAL BRIGHTNESS CONTROL

A8404

Description

The A8404 is a 40-Channel LED Driver, each of the 40 output stages can sink a current of up to 25 mA. The status of the current steered outputs is controlled by a micro controller via a serial interface and can be stored by a 40-bit latch.

The output current and thus the brightness of the LEDs can be adjusted by an external resistor or an D/A converter.

The integrated power-on-reset provides a reset signal to the chip, if the supply voltage drops below a certain value. A 'blank' input can be used to switch off all output stages simultaneously

The high output voltage range of up to 15V allows the serial connection of multiple LEDs per channel in order to achieve a higher light intensity.

A8404 is available in SSOP-56 package

Typical Application

Ordering Information

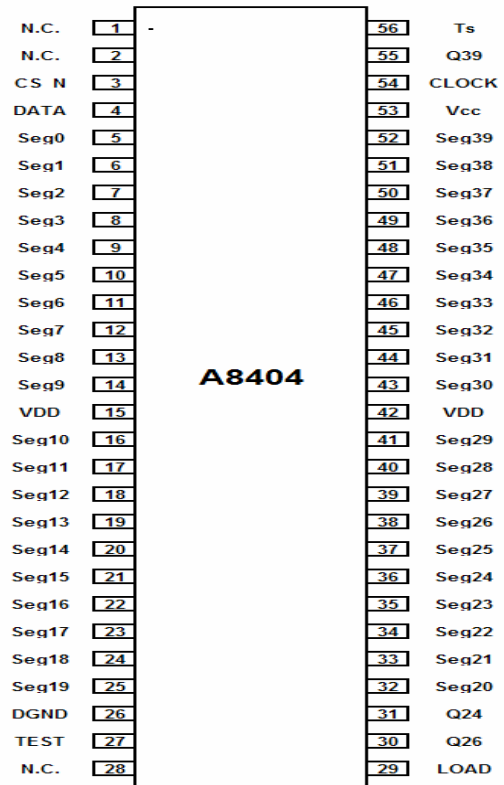| Package	Part Number
SSOP56	A8404MX56

Features

- 40 Output Channels
- LED Current Output with Maximum Sink Current 25mA Per Channel
- Serial Interface, Shift Register with Latch
- External Brightness Control
- Casecodable for 80, 120… Channles
- Supply Voltage: 6V
- SSOP-56 Package

Application

- LED Display
- Household LED Display
- Automotive LED Display

Pin Assignment

Pin	Name		Pin	Name
1	N.C.		56	Ts
2	N.C.		55	Q39
3	CS N		54	CLOCK
4	DATA		53	Vcc
5	Seg0		52	Seg39
6	Seg1		51	Seg38
7	Seg2		50	Seg37
8	Seg3		49	Seg36
9	Seg4		48	Seg35
10	Seg5		47	Seg34
11	Seg6		46	Seg33
12	Seg7		45	Seg32
13	Seg8		44	Seg31
14	Seg9		43	Seg30
15	VDD		42	VDD
16	Seg10		41	Seg29
17	Seg11		40	Seg28
18	Seg12		39	Seg27
19	Seg13		38	Seg26
20	Seg14		37	Seg25
21	Seg15		36	Seg24
22	Seg16		35	Seg23
23	Seg17		34	Seg22
24	Seg18		33	Seg21
25	Seg19		32	Seg20
26	DGND		31	Q24
27	TEST		30	Q26
28	N.C.		29	LOAD

A8404

Pin Description

Pin #	Name	Description	Pin #	Name	Description
1	N.C.	Not Connected	29	Load	Load' Line Input
2	N.C.	Not Connected	30	Q26	Segment 26 Logic Output
3	CS_N	Chip Select Input	31	Q24	Segment 24 Logic Output
4	Data	Data' Line Input	32	Seg20	Segment 20 Output
5	Seg0	Segment 0 Output	33	Seg21	Segment 21 Output
6	Seg1	Segment 1 Output	34	Seg22	Segment 22 Output
7	Seg2	Segment 2 Output	35	Seg23	Segment 23 Output
8	Seg3	Segment 3 Output	36	Seg24	Segment 24 Output
9	Seg4	Segment 4 Output	37	Seg25	Segment 25 Output
10	Seg5	Segment 5 Output	38	Seg26	Segment 26 Output
11	Seg6	Segment 6 Output	39	Seg27	Segment 27 Output
12	Seg7	Segment 7 Output	40	Seg28	Segment 28 Output
13	Seg8	Segment 8 Output	41	Seg29	Segment 29 Output
14	Seg9	Segment 9 Output	42	V_{DD}	Ground
15	V_{DD}	Ground	43	Seg30	Segment 30 Output
16	Seg10	Segment 10 Output	44	Seg31	Segment 31 Output
17	Seg11	Segment 11 Output	45	Seg32	Segment 32 Output
18	Seg12	Segment 12 Output	46	Seg33	Segment 33 Output
19	Seg13	Segment 13 Output	47	Seg34	Segment 34 Output
20	Seg14	Segment 14 Output	48	Seg35	Segment 35 Output
21	Seg15	Segment 15 Output	49	Seg36	Segment 36 Output
22	Seg16	Segment 16 Output	50	Seg37	Segment 37 Output
23	Seg17	Segment 17 Output	51	Seg38	Segment 38 Output
24	Seg18	Segment 18 Output	52	Seg39	Segment 39 Output
25	Seg19	Segment 19 Output	53	Vcc	Positive Power Supply +5V
26	DGND	Logic Ground	54	Clock	Clock' Line Input
27	TEST	Test Line Input	55	Q39	Segment 39 Logic Output
28	N.C.	Not Connected	56	TS	Temperature Sensor Output

Absolute Maximum Ratings

Maximum Voltage	15V
Maximum Sink Current Though Pin #Seg0…Seg39	25mA
Maximum Sink Current Though Pin#Q24, Q26, Q39	0.5mA

Electrical Characteristics

T=20°C, unless otherwise noted.

Parameter	Conditions	Min	Typ	Max	Unit
Vcc			6		V
Current Through Pin# Seg0…Seg39	Vcc=5V		25		mA
Power-On Reset Voltage		2.2	2.55	2.9	V

Application Information

Typical Sequence of Signal to Control all 40 Segments
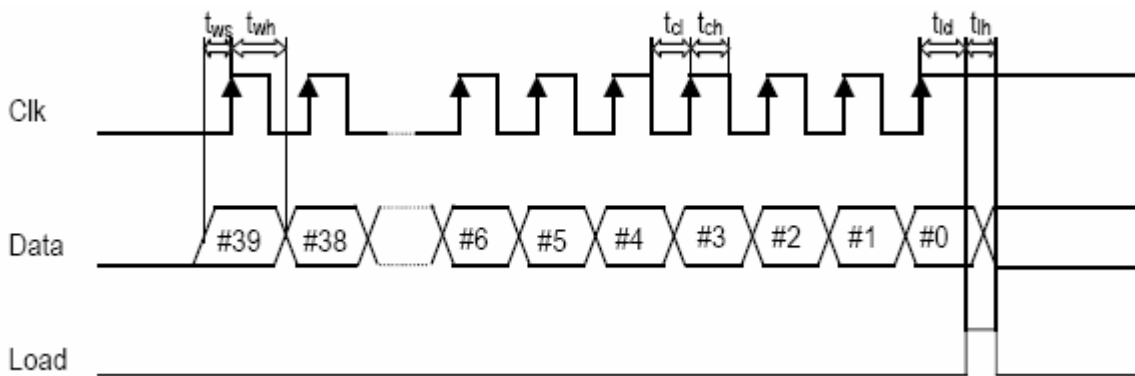
Description	Name	Time/us	
		Min	**Max**
'Clock' Signal Low Level Hold Time	t_{cl}	5	-
'Clock' Signal High Level Hold Time	t_{ch}	5	-
'Write bit' Setup Time	t_{ws}	2	t_{cl}-2
'Write bit' Hold Time	t_{wh}	t_{ch}+2	t_{ch}+t_{cl}-2
'Load' Signal Delay	t_{ld}	5	-
'Load' Signal Hold Time	t_{lh}	5	-

Shift Register

The A8404 contains a 40bit shift register (Pins DATA and CLK), make by positive edge-trigger D-type Flip-Flops.

Latch Control

Three Logical outputs from stages 24, 26 and 39 are available.   The Output of the shift register are latched (Pin LOAD) by a 40 bit latch, made of positive D-type Flip-Flops with reset.   This latch controls the segment drivers as follows:

a.   If the "1" had been loaded into a certain bit, the respective segment driver will be switched on.

b.   A Power-On reset circuit provides an internal "Reset" signal being active if the supply voltage Vcc drops below specified value.

Test Signal

The TEST Signal can be used to switch ON all output stages without reloading the latch.   For example, for blink mode (TEST=0V: Test Mode Active, all output stages on, TEST=open/not connected=Operation Mode).

Select Pin

The CS_N signal is a chip selection pin (CS_N=0V: Chip is selected, CS_N=open/not connected: Chip is not selected)

The A8404 can be used as a LED driver for dot matrix displays as well as for LED segments. The custom application consists of 16 5x5 dot matrix modules, arranged in two lines. Two A8404 are used to control the modules, one A8404 the 40 columns of the matrix, the other A8404 the base current for the PNP transistors, that multiplex the 10 rows.

Both A8404 and the transistors can be mounted on the backside of the LED display in a space saving way.

Package Information

Dimension in SSOP56 Package   (Unit: mm)
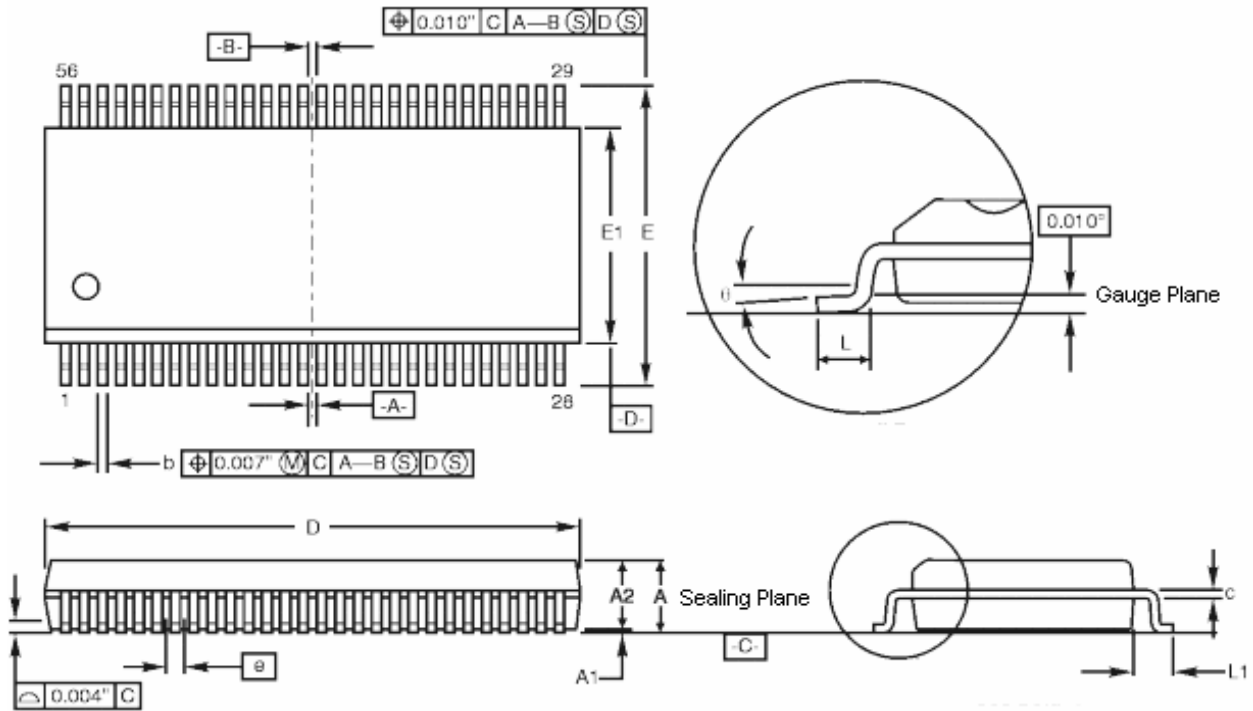
Dimension	Inch	
	Typ	Max
A	0.102	0.110
A1	0.012	0.016
A2	0.094	0.099
b	0.010	0.015
c	0.008	0.010
D	0.725	0.730
E1	0.295	0.299
E1	0.025BSC	
E1	0.406	0.420
L	0.030	0.040
L1	0.056	
θ		8.°

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