上海翱龙电子科技有限公司

■ Features

- Fixed 1/8duty mode, Up to 280 dots.
- Low power consumption design, 5uA current at typical condition.
- Internal LCD Contrast control Circuit
- No external component required
- Interface: 2 wire serial interface
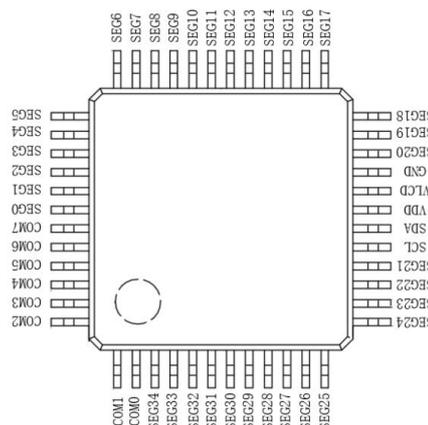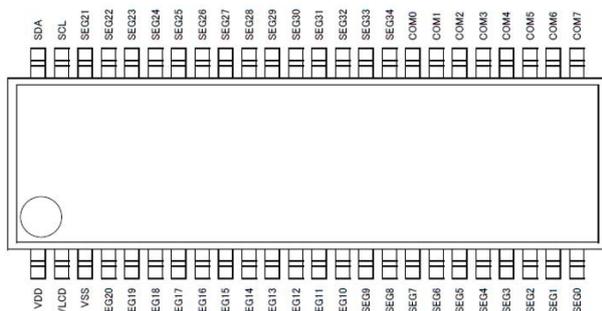- Compatible with TTL/CMOS

■ Applications

- Home electrical appliance
- Meter equipment etc.
- PDA

■ Order Information

Part No.	Package Type	Tape/Reel
AL8835	TSSOP-48	2500/Reel
	LQFP48	250/Tray

■ Pin Description

■ Typical Application Circuit

名称	I/O	TSSOP48	LQFP48	功能
SDA	I/O	48	18	2-line serial data input and output
SCL	I	47	17	2-line serial clock input
VSS	I	3	21	GND
VDD	I	1	19	Power supply for logic
VLCD	I	2	20	LCD biasing voltage, default tie low.
SEG 0~35	O	24~4，33~46	42~22，16~2	SEGMENT driver output for LCD
COM 0~7	O	32~25	2、1、48~43	COMMON driver output for LCD

■ Block Diagram
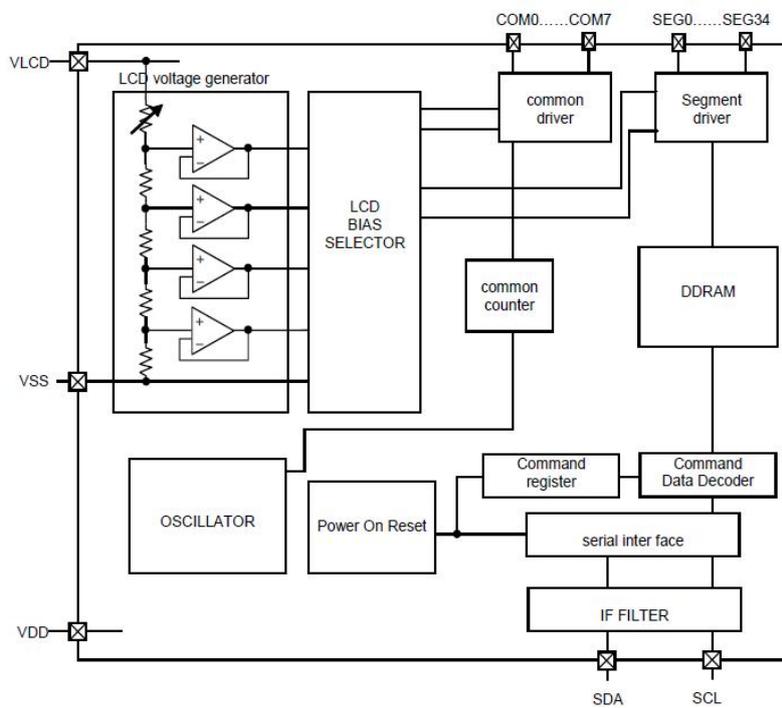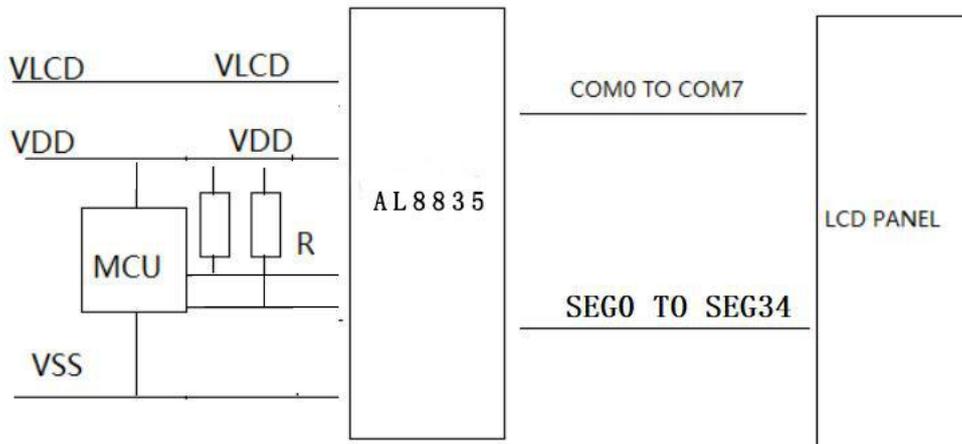
■ Electrical Characteristics

Test conditions: VDD=3.3V, VLCD=5V, VSS=0, EVR=8, Ta=25℃ unless otherwise noted.

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
VDD Power Range	VDD	2.5	-	5.5	V	
VLCD Power RANGE	VLCD	2.5	-	5.5	V	VLCD Drive Voltage
Sleep electricity	IST	0.6*VDD	-	0.5	µA	Turn Off the Display and OSC
Operationoal Current	IDD	---	2	5	µA	VDD=3.3V, VLCD=5V, Power saving mode1，T=25℃ FR=80HZ, 1/4bias, Frame in version
LCD Operationoal Current	ILCD	---	6	10	µA	VDD=3.3V, VLCD=5V, Power saving mode1，T=25℃ FR=80HZ, 1/4bias, Frame in version
Frame Frequency	FCLK	60	80	110	HZ	VDD=3.3V, FR=80HZ
direct component	VCM	-20	---	+20	mV	CCM=32nF, COM0~COM7
direct component	VS	-20	---	+20	mV	CS=4.7nF, SEG0~SEG34
I^{2}C high level input	VIH	0.6VDD	---	VDD	V	SDA, SCL
I^{2}C low level input	VIH	VSS	---	0.3VDD	V	SDA, SCL
I^{2}C high level electric	IIH	---	---	1	µA	SDA, SCL
I^{2}C low level electric	IIL	-1	---	---	µA	SDA, SCL
LCD Drive impedance	RONSEG	---	3.5	---	kΩ	SEG Iload = ±10µA
LCD Drive impedance	RONCOM	---	3.5	---	kΩ	COM Iload = ±10µA
input rise	tr	---	---	0.3	µs	
input fall	tf	---	---	0.3	µs	
SCL Cycle time	tSCYC	2.4	---	---	µs	
SCL High level Pulse width	tSHW	0.6	---	---	µs	
SCL Low level Pulse width	tSLW	1.2	---	---	µs	
SDA Adjustment time	tSDS	100	---	---	ns	
SDAHold Time	tSDH	100	---	---	ns	
BUS Free Time	tBUF	1.3	---	---	µs	
Start Condition Hold Time	tHD;STA	0.6	---	---	µs	
Start Condition set up Time	tSU;STA	0.6	---	---	µs	
Stop Condition set up Time	tSU;STO	0.6	---	---	µs	
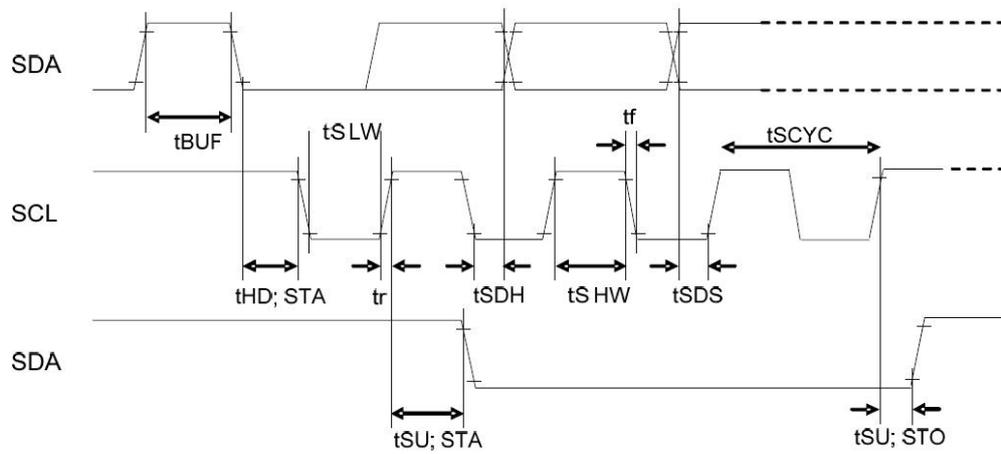
■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit	Remarks
VDD Voltage	V_{DD}	-0.5 to + 6	V	Power supply
VLCD Voltage	V_{LCD}	-0.5 to + 6	V	LCD drive voltage
Input voltage range	V_{IN}	-0.5 to VDD + 0.5	V	
Operational temperature range	Topr	-45 to + 85	°C	
Storage temperature range	Tstg	-50 to + 120	°C	

■ Function Description

● Command and Data Transfer Method

1. Generate "START condition".
2. Issue Slave address 7C.
3. Transfer command.
4. Transfer display data.
5. Generate "STOP condition"
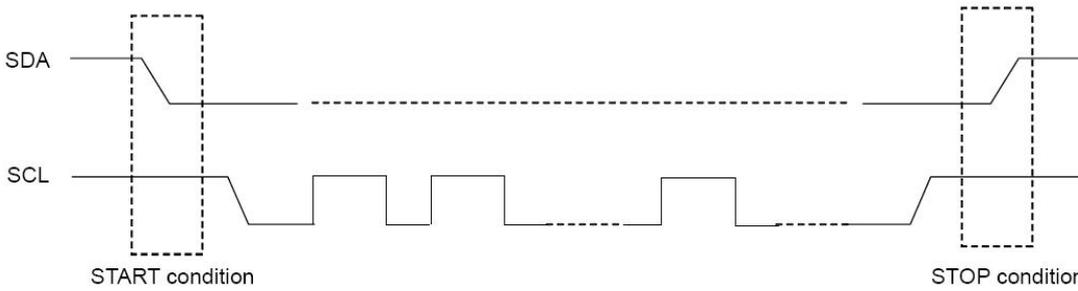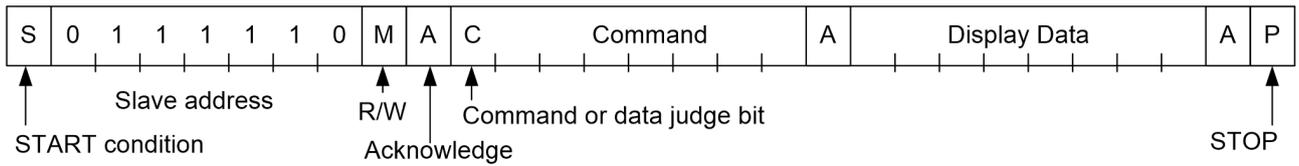
ACK

● Write Display Data and Transfer Method

● Set R/W bit to '0' to come into write mode.
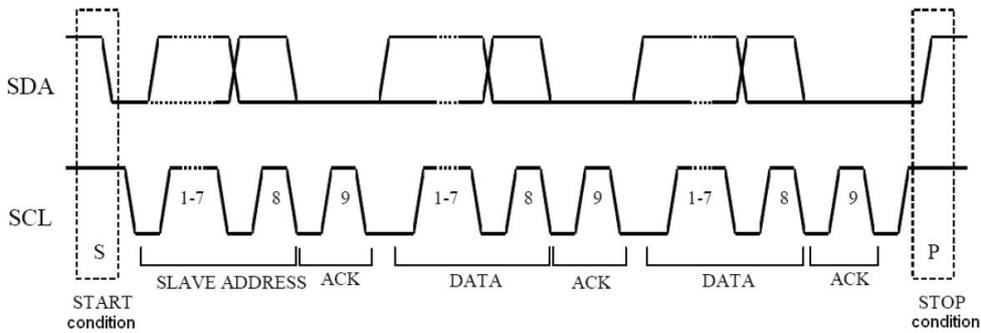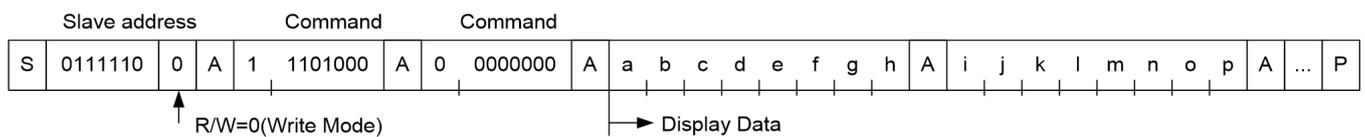
● This device has Display Data RAM (DDRAM) of 35×8=280 bit.

8-bit data will be stored in DDRAM. The address to be written is the address specified by Address set command, and the address is automatically incremented in every 8bit data. Data can be continuously written in DDRAM by transmitting Data continuously.

COMMD:

D7 It is the judgment of command or data bit;

C=0, Represents the next byte (D7~D0) is write data, C=1, Represents the next byte is commd.

- **Address Set**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
Default Value	C	0	0	0	0	0	0	0

D5~D0: addr[5:0]

Address Write data: 000000~100010

Address Read data : 000000~100010

- **Electrical volume register Set[EVR]**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
Default Value	C	1	0	0	0	0	1	0

D4~D0: Display the contrast setting, and the relationship between the maximum voltage V0 of the driving circuit and VLCD is as follows:

EVR	Calculation formula	VLCD= 5.500	VLCD= 5.000	VLCD= 4.000	VLCD= 3.500	VLCD= 3.000	VLCD= 2.500	[V]
0	VLCD	V0= 5.500	V0= 5.000	V0= 4.000	V0= 3.500	V0= 3.000	V0= 2.500	[V]
1	0.967*VLCD	V0= 5.323	V0= 4.839	V0= 3.871	V0= 3.387	V0= 2.903	V0= 2.419	[V]
2	0.937*VLCD	V0= 5.156	V0= 4.688	V0= 3.750	V0= 3.281	V0= 2.813	V0= 2.344	[V]
3	0.909*VLCD	V0= 5.000	V0= 4.545	V0= 3.636	V0= 3.182	V0= 2.727	V0= 2.273	[V]
4	0.882*VLCD	V0= 4.853	V0= 4.412	V0= 3.529	V0= 3.088	V0= 2.647	V0= 2.206	[V]
5	0.857*VLCD	V0= 4.714	V0= 4.286	V0= 3.429	V0= 3.000	V0= 2.571	V0= 2.143	[V]
6	0.833*VLCD	V0= 4.583	V0= 4.167	V0= 3.333	V0= 2.917	V0= 2.500	V0= 2.083	[V]
7	0.810*VLCD	V0= 4.459	V0= 4.054	V0= 3.243	V0= 2.838	V0= 2.432	V0= 2.027	[V]
8	0.789*VLCD	V0= 4.342	V0= 3.947	V0= 3.158	V0= 2.763	V0= 2.368	V0= 1.974	[V]
9	0.769*VLCD	V0= 4.231	V0= 3.846	V0= 3.077	V0= 2.692	V0= 2.308	V0= 1.923	[V]
10	0.750*VLCD	V0= 4.125	V0= 3.750	V0= 3.000	V0= 2.625	V0= 2.250	V0= 1.875	[V]
11	0.731*VLCD	V0= 4.024	V0= 3.659	V0= 2.927	V0= 2.561	V0= 2.195	V0= 1.829	[V]
12	0.714*VLCD	V0= 3.929	V0= 3.571	V0= 2.857	V0= 2.500	V0= 2.143	V0= 1.786	[V]
13	0.697*VLCD	V0= 3.837	V0= 3.488	V0= 2.791	V0= 2.442	V0= 2.093	V0= 1.744	[V]
14	0.681*VLCD	V0= 3.750	V0= 3.409	V0= 2.727	V0= 2.386	V0= 2.045	V0= 1.705	[V]
15	0.666*VLCD	V0= 3.667	V0= 3.333	V0= 2.667	V0= 2.333	V0= 2.000	V0= 1.667	[V]
16	0.652*VLCD	V0= 3.587	V0= 3.261	V0= 2.609	V0= 2.283	V0= 1.957	V0= 1.630	[V]
17	0.638*VLCD	V0= 3.511	V0= 3.191	V0= 2.553	V0= 2.234	V0= 1.915	V0= 1.596	[V]
18	0.625*VLCD	V0= 3.438	V0= 3.125	V0= 2.500	V0= 2.188	V0= 1.875	V0= 1.563	[V]
19	0.612*VLCD	V0= 3.367	V0= 3.061	V0= 2.449	V0= 2.143	V0= 1.837	V0= 1.531	[V]
20	0.600*VLCD	V0= 3.300	V0= 3.000	V0= 2.400	V0= 2.100	V0= 1.800	V0= 1.500	[V]
21	0.588*VLCD	V0= 3.235	V0= 2.941	V0= 2.353	V0= 2.059	V0= 1.765	V0= 1.471	[V]
22	0.576*VLCD	V0= 3.173	V0= 2.885	V0= 2.308	V0= 2.019	V0= 1.731	V0= 1.442	[V]
23	0.566*VLCD	V0= 3.113	V0= 2.830	V0= 2.264	V0= 1.981	V0= 1.698	V0= 1.415	[V]
24	0.555*VLCD	V0= 3.056	V0= 2.778	V0= 2.222	V0= 1.944	V0= 1.667	V0= 1.389	[V]
25	0.545*VLCD	V0= 3.000	V0= 2.727	V0= 2.182	V0= 1.909	V0= 1.636	V0= 1.364	[V]
26	0.535*VLCD	V0= 2.946	V0= 2.679	V0= 2.143	V0= 1.875	V0= 1.607	V0= 1.339	[V]
27	0.526*VLCD	V0= 2.895	V0= 2.632	V0= 2.105	V0= 1.842	V0= 1.579	V0= 1.316	[V]
28	0.517*VLCD	V0= 2.845	V0= 2.586	V0= 2.069	V0= 1.810	V0= 1.552	V0= 1.293	[V]
29	0.508*VLCD	V0= 2.797	V0= 2.542	V0= 2.034	V0= 1.780	V0= 1.525	V0= 1.271	[V]
30	0.500*VLCD	V0= 2.750	V0= 2.500	V0= 2.000	V0= 1.750	V0= 1.500	V0= 1.250	[V]
31	0.491*VLCD	V0= 2.705	V0= 2.459	V0= 1.967	V0= 1.721	V0= 1.475	V0= 1.230	[V]

Note: 1、 ▆ No use;

2、 USE EVR , VLCD-V0>0.6V;

3、 V0>2.5V。

- **Display Control**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
Default Value	C	1	1	0	0	0	1	0

D3~D2: FR set
     00: 80HZ
     01: 70HZ
     10: 64HZ
     11: 50HZ
D1~D0: Power Save Set
     00: Power Save 1
     01: Power Save 2
     10: Normal mode
     11: High power

- **Set IC Operation**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
Default Value	C	1	1	1	0	1	0	0

D2: LCD drive mode
    0: LINE
    1: FRAME
D1: softwafer reset
    0: No reset
    1: reset
D0: display set
    0: ON
    1: OFF

- **All Pixel Contral**

Bit	D7	D6	D5	D4	D3	D2	D1	D0
Default Value	C	1	1	1	1	0	0	0

D1: All LCD display ON/OFF
    0: Normal display
    1: ALL display ON
D0: All LCD black dot ON/OFF
    0: Normal display
   1: All LCD black dot ON

Working Example:

No.	Input	D7	D6	D5	D4	D3	D2	D1	D0	Descriptions
1	Power on									VDD=0 to 5V (Tr=0.1ms)
	↓									
2	wait 100us									Initialize IC
	↓									
3	Stop									Stop condition
	↓									
4	Start									Start condition
5	Slave address	0	1	1	1	1	1	0	0	Issue slave address
	↓									
6	ICSET	1	1	1	1	0	*	1	*	Software Reset
	↓									
7	DISCTL	1	1	1	0	0	0	1	0	Unnecessary when initial value setup
	↓									(If you need to change the condition)
8	EVRSET	1	1	0	0	0	0	0	0	Unnecessary when initial value setup
	↓									(If you need to change the condition)
9	ADSET	0	0	0	0	0	0	0	0	RAM address set
	↓									
10	Display Data	*	*	*	*	*	*	*	*	Address 00h
	⋮									⋮
	Display Data	*	*	*	*	*	*	*	*	Address 22h
	↓									
11	Stop									Stop condition
	↓									
12	Start									Start condition
13	Slave address	0	1	1	1	1	1	0	0	Issue slave address
	↓									
14	ICSET	1	1	1	1	0	*	0	1	Display ON

■ TSSOP48 package
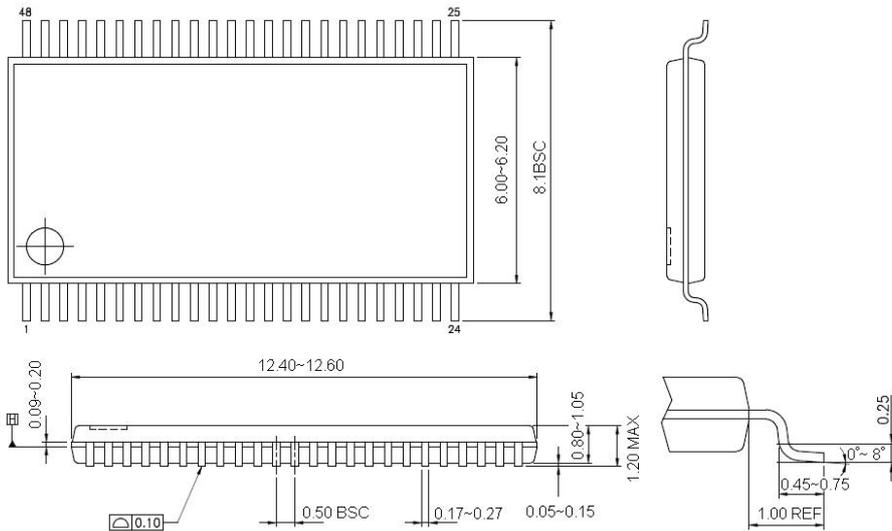
Symbol	TSSOP48	
	Min	Max
A		1.2
A1	0.05	0.15
A1	0.85	1.05
E	7.9	8.3
E1	6	6.2
D	12.4	12.6
L	1.00REF	
L1	0.45	0.75
e	0.50BSC	
b	0.19	0.28
A-A	0.15	0.21

■ LQFP48package

DETAIL: F

SECTION B-B

BASE METAL

WITH PLATING
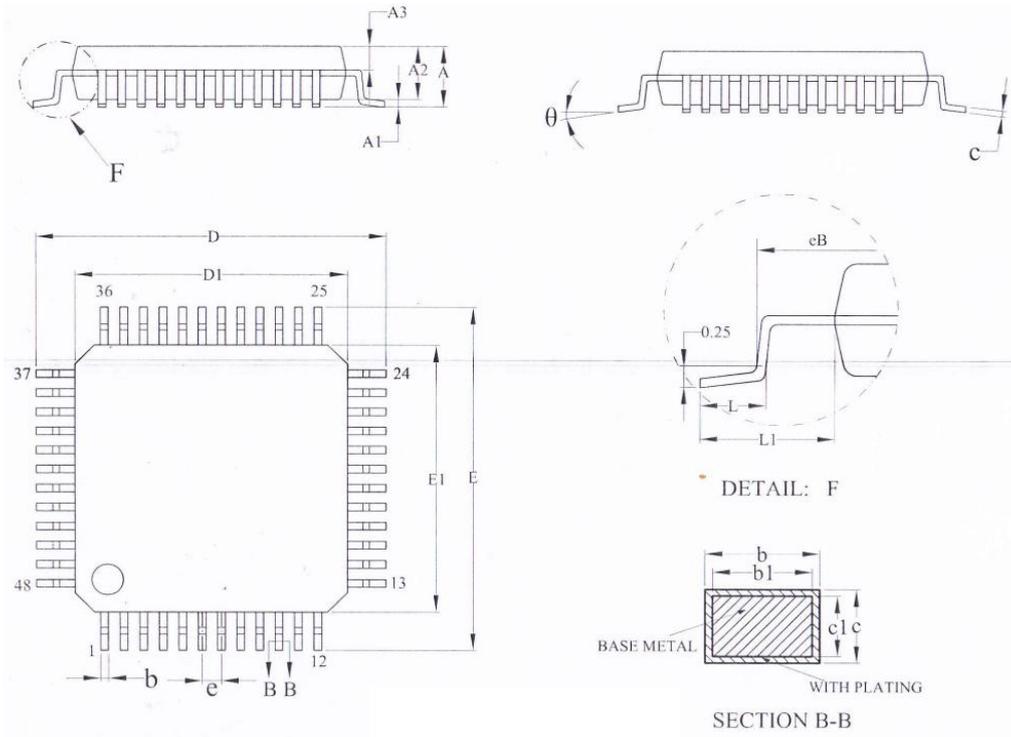
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.60
A1	0.05	—	0.15
A2	1.35	1.40	1.45
A3	0.59	0.64	0.69
b	0.18	—	0.26
b1	0.17	0.20	0.23
c	0.13	—	0.17
c1	0.12	0.13	0.14
D	8.80	9.00	9.20
D1	6.90	7.00	7.10
E	8.80	9.00	9.20
E1	6.90	7.00	7.10
eB	8.10	—	8.25
e	0.50BSC		
L	0.45	—	0.75
L1	1.00REF		
θ	0	—	7