

LM324

DATASHEET

Specification Revision History:

Version	Date	Description
V1.0	2020/05	New
V1.1	2021/02	Modify Ordering Information
V1.2	2024/02	Modify Ordering Information
V1.3	2025/03	Add application precautions and overall typesetting.

QUAD OPERATIONAL AMPLIFIERS

DESCRIPTION

The LM324 consists of four independent, high gain internally frequency compensated operational amplifiers which were designed specifically to operate from a single power supply over a wide voltage range.

Operation from split power supplies is also possible so long as the difference between the two supplies 3 Volts to 30 volts.

Application areas include transducer amplifier, DC gain blocks and all the conventional OP amp circuits which now can be easily implemented in single power supply system.

FEATURES

- * Internally frequency compensated for unity gain
- * Large DC voltage gain: 100dB
- * Wide operating supply range ($V_{CC}=3V\sim 30V$)
- * Input common-mode voltage includes ground
- * Large output voltage swing: From 0V to $V_{CC}-2.0V$
- * Power drain suitable for battery operation

The appearance of the product



DIP-14



SOP-14

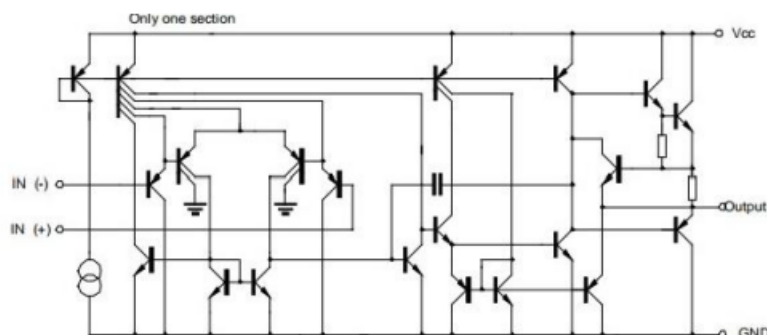


TSSOP-14

Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
LM324DR(GMIC)	SOP-14	LM324 244	REEL	2500PCS/REEL
LM324N(GMIC)	DIP-14	LM324 244	TUBE	1000PCS/BOX
LM324PWR(GMIC)	TSSOP-14	LM324 244	REEL	2500PCS/REEL
LM324(GMIC)	SOP-14	LM324 244	REEL	2500PCS/REEL
LM324(GMIC)	DIP-14	LM324 B44	TUBE	1000PCS/BOX
LM324(GMIC)	TSSOP-14	LM324 B44	REEL	2500PCS/REEL

LOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS(Ta=25°C)

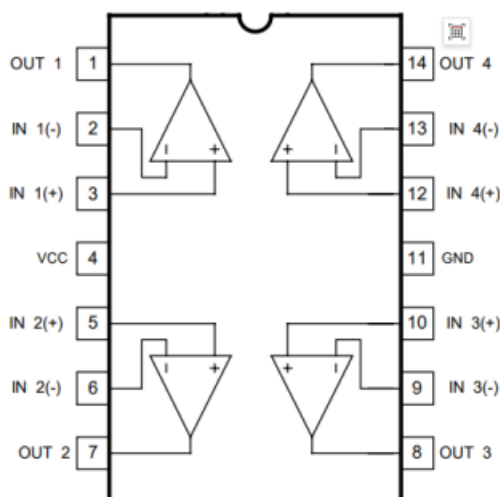
Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	± 15	V
Differential input voltage	V_{ID}	30	V
Input Voltage	V_{IN}	-0.3~30V	V
Power Dissipation	P_D	570	mW
Operating Temperature	T_{opr}	0 to +70	°C
Storage Temperature	T_{stg}	-65 to 150	°C

ELECTRICAL CHARACTERISTICS(Ta=25°C)

(V_{CC}=5.0V, All voltage referenced to GND unless otherwise specified)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Input offset voltage	V _{IO}	V _{CM} =0 to V _{CC} -1.5 V _{O(p)} =1.4V, R _S =0		2.07.0	mV	
Input offset current	I _{IO}			3.0	50	nA
Input Bias current	I _b			40	250	nA
Input Common-mode voltage range	V _{I(R)}	V _{CC} =30V	0	V _{CC} -2.0		V
Supply Current	I _{CC}	R _L =V _{CC} =30V V _{CC} =5V 0.72mA		1.04n	A	
Large signal Voltage Gain	GV	V _{CC} =15V, R _L >2kΩ V _{O(p)} =1V to 11V	25	100		V/mV
Output voltage Swing	V _(OH)	V _{CC} =30V, R _L =2kΩ	26			V
		V _{CC} =30V, R _L =10kΩ	26	28		V
	V _(OL)	V _{CC} =5, R _L >10kΩ		5	20	mV
Common-mode rejection Ratio	CMRR		65	75		dB
Power supply rejection Ratio	PSRR		65	100		dB
Channel Separation	CS	f=1 kHz to 20 kHz		5	20	mV
Short circuit to GND	I _{SC}			40	60	mA
Output current	I _{source}	V _{I(+)} =1V, V _{I(-)} =0 V _{CC} =15V, V _{O(p)} =2V	20	40		mA
	I _{sink}	V _{I(+)} =0V, V _{I(-)} =1V V _{CC} =15V, V _{O(p)} =2V	10	13		mA
		V _{I(+)} =1V, V _{I(-)} =0 V _{CC} =15V, V _{O(p)} =200mV	12	45		μA
Differential input voltage	V _{I(diff)}				V _{CC}	V

PIN CONFIGURATION



TYPICAL CHARACTERISTICS PERFORMANCE

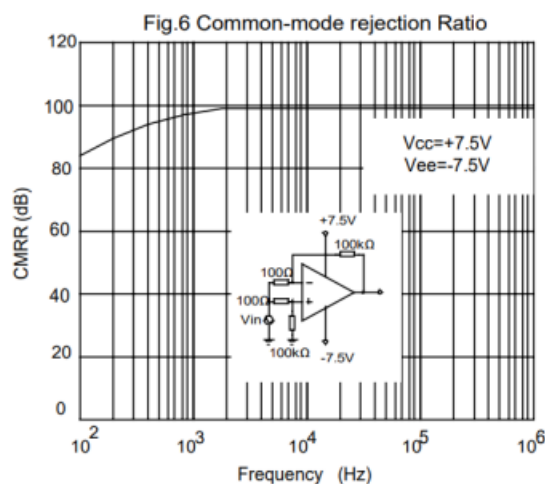
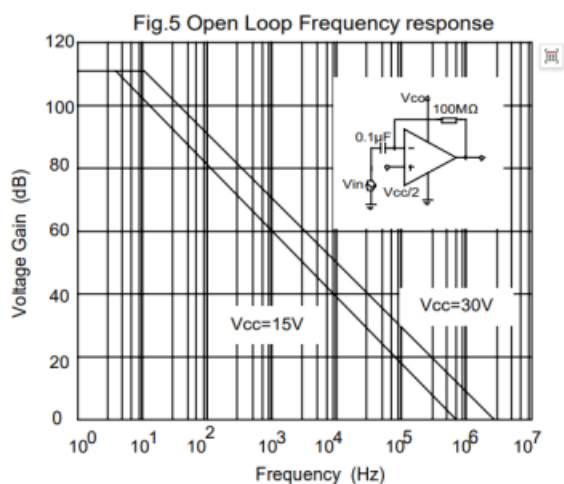
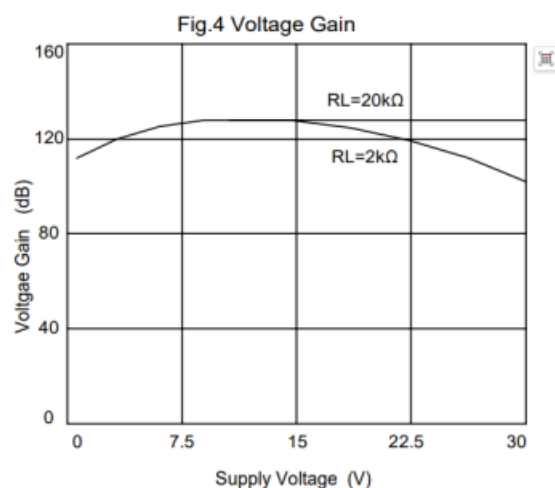
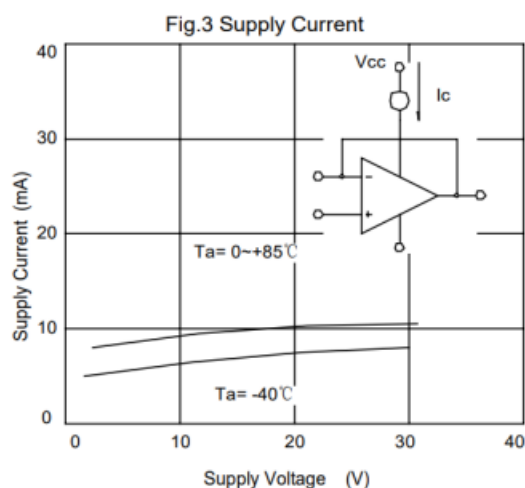
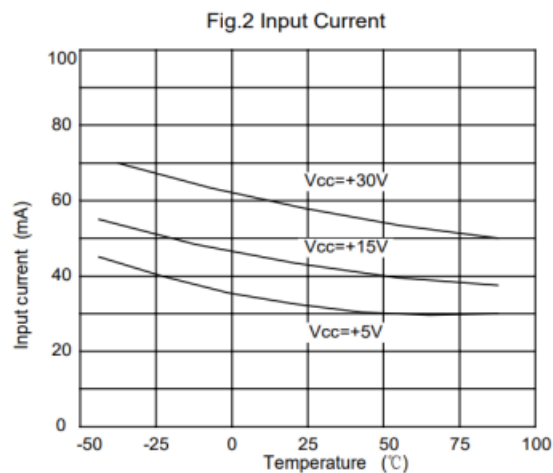
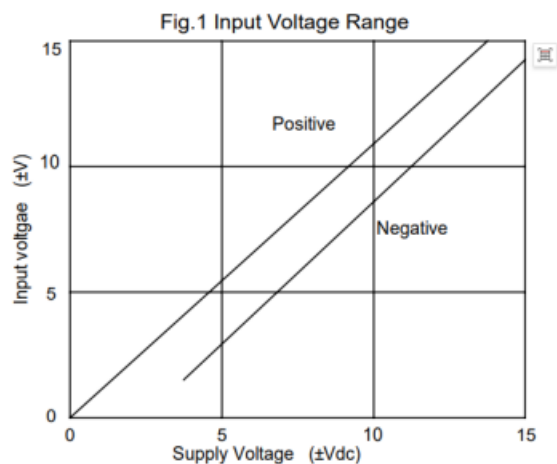


Fig.7

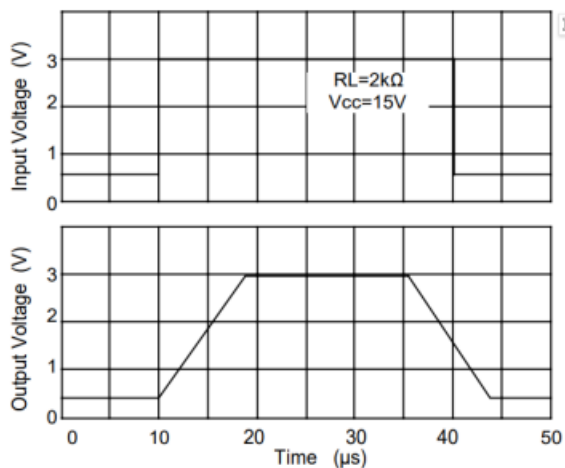


Fig.8 voltage Follower pulse response (small signal)

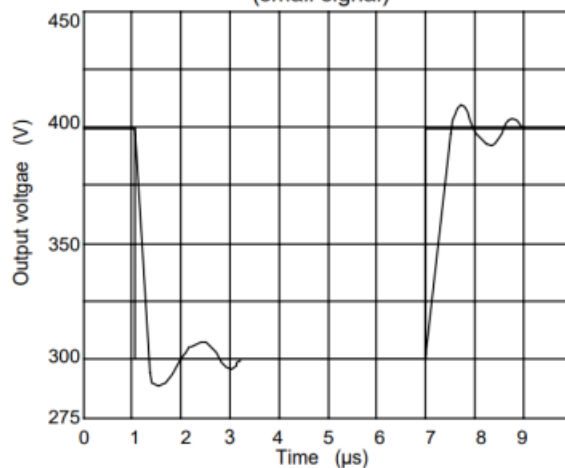


Fig.9 Large signal Frequency Response

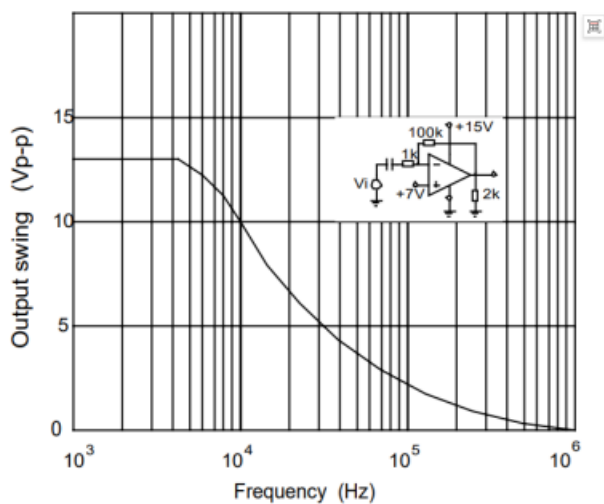


Fig.10 Output Characteristics current sourcing

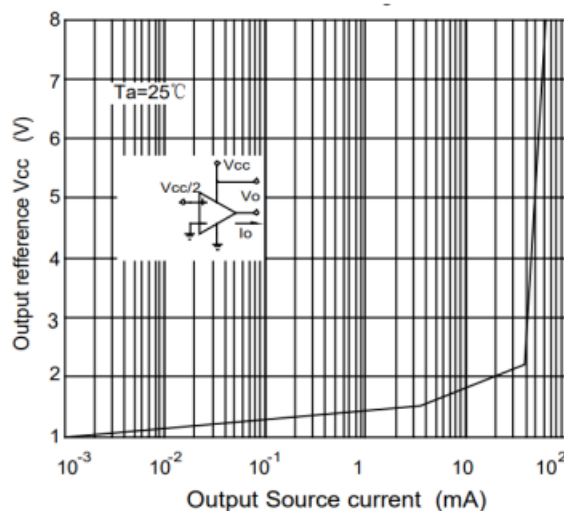


Fig.11 Output Characteristics Current sinking

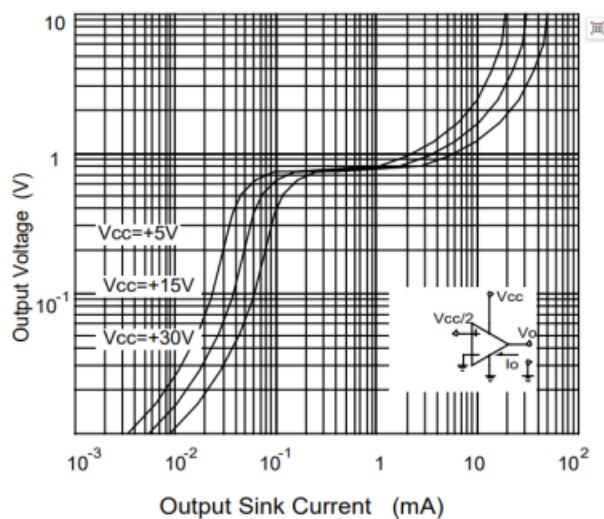
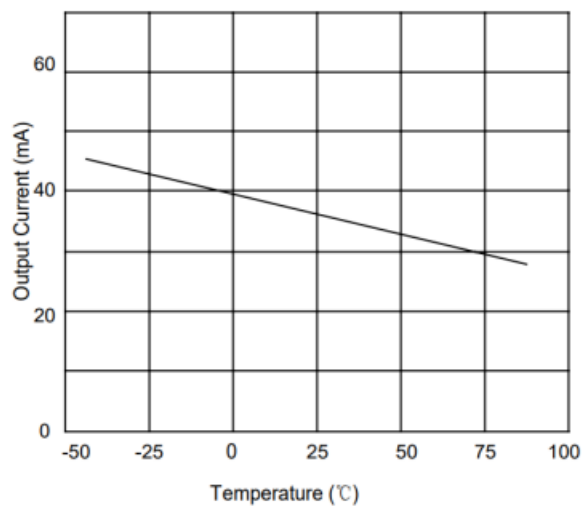


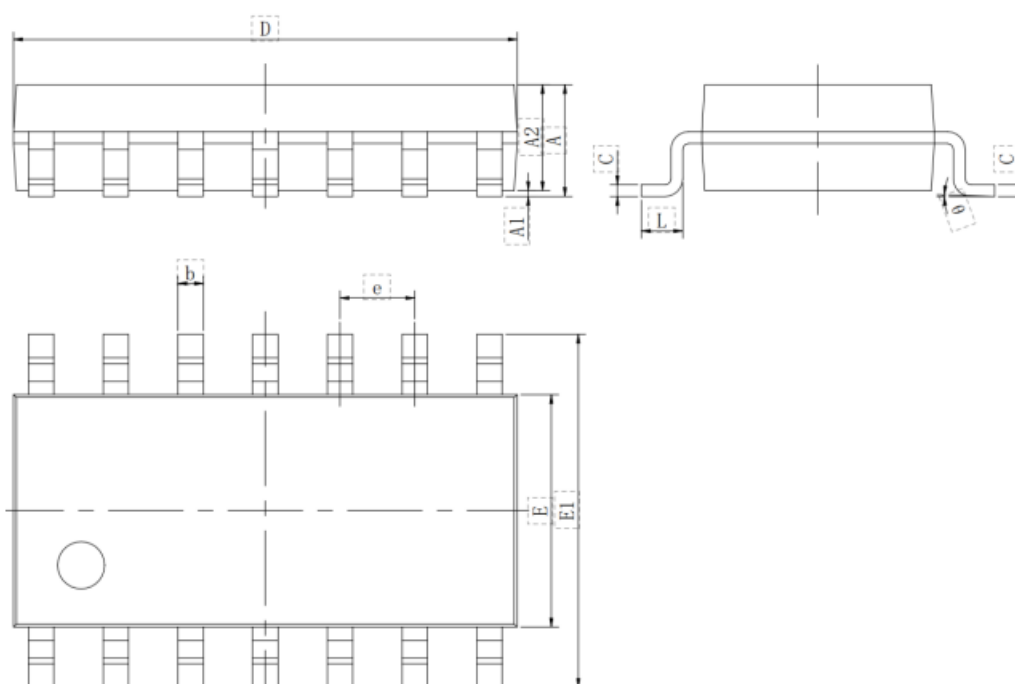
Fig.12 Current Limiting



Outline Dimensions

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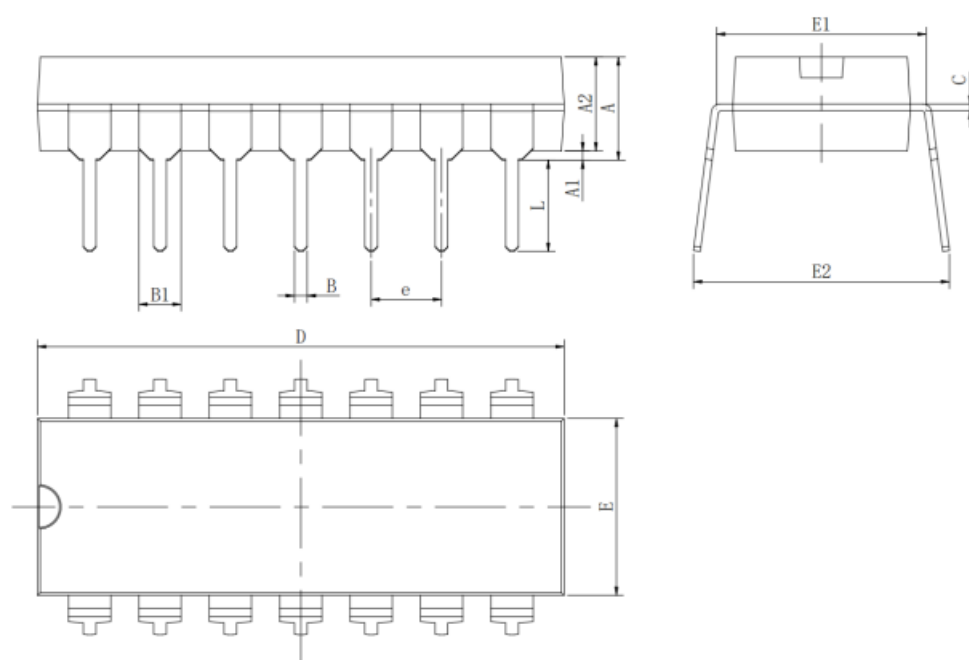
Unit : mm



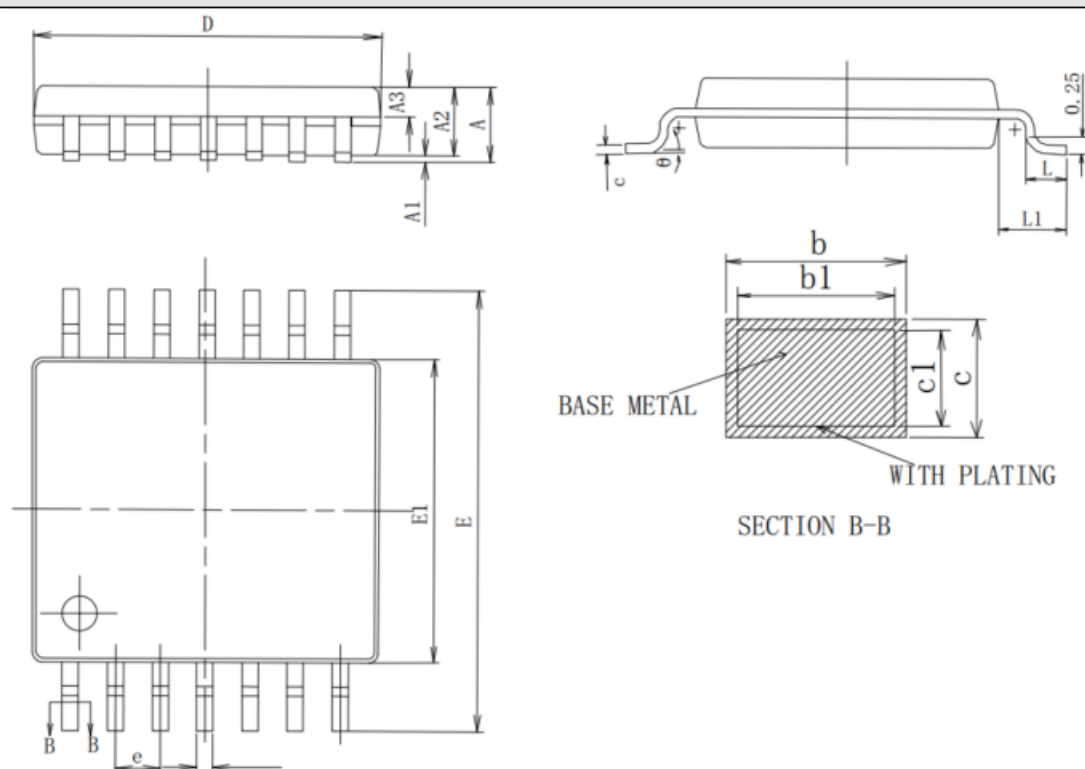
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	8.360	8.760	0.329	0.345
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0 °	8 °	0 °	8 °

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Unit:mm



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	0.142
B	0.380	0.570	0.015	0.022
B1	1.524(BSC)		0.060(BSC)	
C	0.204	0.360	0.008	0.014
D	18.800	19.200	0.740	0.756
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
e	2.540(BSC)		0.100(BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354

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Unit:mm


SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.90	1.00	1.05
A3	0.39	0.44	0.49
b	0.20	—	0.28
b1	0.19	0.22	0.25
c	0.13	—	0.17
cl	0.12	0.13	0.14
D	4.90	5.00	5.10
E1	4.30	4.40	4.50
E	6.20	6.40	6.60
e	0.65BSC		
L	0.45	0.60	0.75
L1	1.00BSC		
θ	0	—	8°

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