HM7218

High Voltage Low Power Consumption LDO HM7218 Series

CMOS Voltage Regulator 1A

HM7218 series is a high voltage (up to 15V) ultra-low quiescent current low dropout voltage regulator (LDO) manufactured in CMOS processes. It can deliver up to 1A of current while consuming only 1.6uA of quiescent current. It consists of a reference voltage generator, an error amplifier, a current foldback circuit, and a phase compensation circuit plus a driver transistor. The HM7218 series is designed specifically for applications where very-low I_Q is a critical parameter. This device maintains low quiescent current consumption even in dropout mode to further increase the battery life.

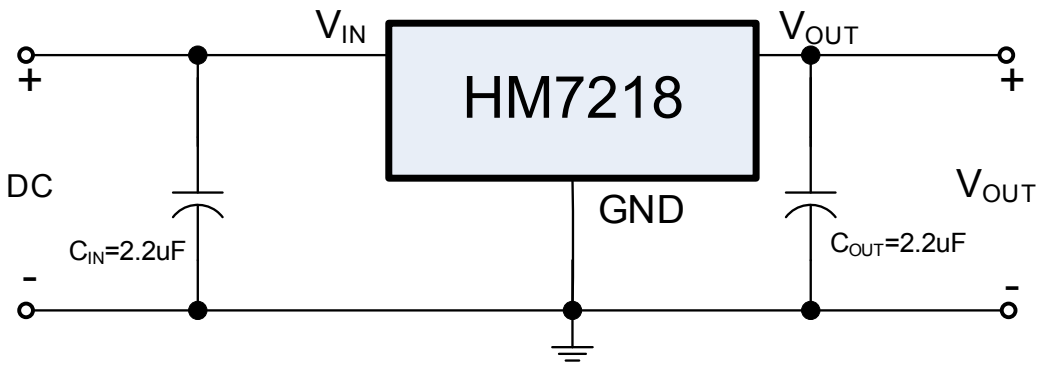
■ Features:

- Ultra-low Quiescent Current: 1.6uA
- Maximum Input Voltage: 15V
- Output Voltage Highly Accurate: ±2%
- Maximum Output Current: 1A
- Dropout Voltage: 650mV@I_{OUT}=1A
- Temperature Stability: ±50ppm/℃
- Protections Circuits: Current Limiter, Short Circuit, Foldback, Thermal shutdown
- Output Capacitor: Low ESR Ceramic Capacitor Compatible

■ Applications:

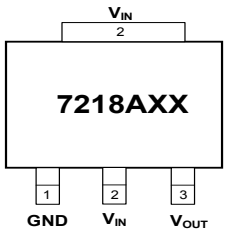
- Smart wearer
- Long-life battery-powered devices
- Portable mobile devices, such as mobile phones, cameras, and so on
- Wireless communication equipment

■ Typical Application:

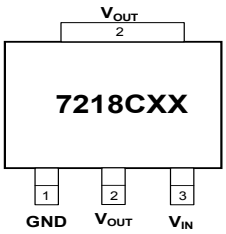


■ Pin Configuration (Top View):

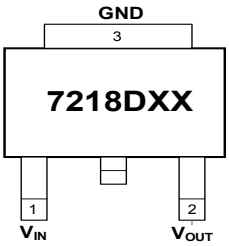
SOT89-3L
Top View



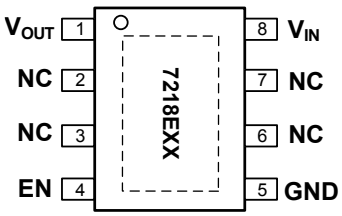
SOT223-3L
Top View



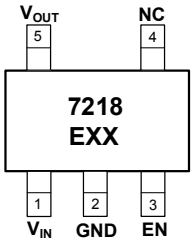
TO252-2L
Top View



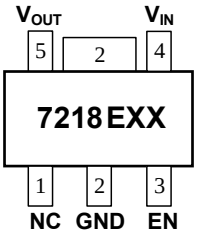
ESOP8
Top View



SOT23-5L
Top View



SOT89-5L
Top View



■ Product Selections

Product Name	V_{OUT} (V)	Package	Ordering Name	Marking	Package Information
HM7218A30PR	3.0	SOT89-3L	HM7218A30PR	7218A30	Tape and Reel, 1000pcs
HM7218A33PR	3.3	SOT89-3L	HM7218A33PR	7218A33	
HM7218A36PR	3.6	SOT89-3L	HM7218A36PR	7218A36	
HM7218A38PR	3.8	SOT89-3L	HM7218A38PR	7218A38	
HM7218A40PR	4.0	SOT89-3L	HM7218A40PR	7218A40	
HM7218A50PR	5.0	SOT89-3L	HM7218A50PR	7218A50	
HM7218AC0PR	12.0	SOT89-3L	HM7218AC0PR	7218AC0	
HM7218E33P5	3.3	SOT89-5L	HM7218E33P5	7218E33	
HM7218E36P5	3.6	SOT89-5L	HM7218E36P5	7218E36	
HM7218E50P5	5.0	SOT89-5L	HM7218E50P5	7218E50	
HM7218C30	3.0	SOT223-3L	HM7218C30	7218C30	Tape and Reel, 2500pcs
HM7218C33	3.3	SOT223-3L	HM7218C33	7218C33	
HM7218C36	3.6	SOT223-3L	HM7218C36	7218C36	
HM7218C40	4.0	SOT223-3L	HM7218C40	7218C40	
HM7218C50	5.0	SOT223-3L	HM7218C50	7218C50	
HM7218CC0	12.0	SOT223-3L	HM7218CC0	7218CC0	
HM7218D30T	3.0	TO252-2L	HM7218D30T	7218D30	Tape and Reel, 2500pcs
HM7218D33T	3.3	TO252-2L	HM7218D33T	7218D33	
HM7218D36T	3.6	TO252-2L	HM7218D36T	7218D36	
HM7218D40T	4.0	TO252-2L	HM7218D40T	7218D40	
HM7218D50T	5.0	TO252-2L	HM7218D50T	7218D50	
HM7218D80T	8.0	TO252-2L	HM7218D80T	7218D80	
HM7218DC0T	12.0	TO252-2L	HM7218DC0T	7218DC0	

HM7218E30ES	3.0	ESOP8	HM7218E30ES	7218E30	Tape and Reel, 4000pcs
HM7218E33ES	3.3	ESOP8	HM7218E33ES	7218E33	
HM7218E36ES	3.6	ESOP8	HM7218E36ES	7218E36	
HM7218E40ES	4.0	ESOP8	HM7218E40ES	7218E40	
HM7218E50ES	5.0	ESOP8	HM7218E50ES	7218E50	
HM7218EC0ES	12.0	ESOP8	HM7218EC0ES	7218EC0	
HM7218E30MR	3.0	SOT23-5L	HM7218E30MR	7218E30	Tape and Reel, 3000pcs
HM7218E33MR	3.3	SOT23-5L	HM7218E33MR	7218E33	
HM7218E36MR	3.6	SOT23-5L	HM7218E36MR	7218E36	
HM7218E40MR	4.0	SOT23-5L	HM7218E40MR	7218E40	
HM7218E50MR	5.0	SOT23-5L	HM7218E50MR	7218E50	

Notes:

1* Customer can request to customize the output voltage ranged from 1.8V to 12V, if desired voltage is not found in the selections.

2* Customer can request customization of package choice.

3* Please pay attention to the MARKING of the product package type.

■ Absolute Maximum Ratings (Unless otherwise indicated: T_a=25℃)

PARAMETER	SYMBOL	RATINGS		UNITS
Input Voltage	V_{IN}	-0.3 ~ 15		V
Output Voltage	V_{OUT}	Vss-0.3 ~ VIN+0.3V		
Power Dissipation	P_D	SOT89-3L	1000	mW
		SOT89-5L	1000	
		SOT223-3L	1500	
		TO252-2L	1800	
		ESOP8	800	
		SOT23-5L	250	
Thermal Resistance	$R_{\theta JB}$(1)	SOT89-3L	100	℃/W
		SOT89-5L	100	
		SOT223-3L	66	
		TO252-2L	55	
		ESOP8	80	
		SOT23-5L	180	
Operating Ambient Temperature	T_{opr}	-40 ~ +85		℃
Storage Temperature	T_{stg}	-40 ~ +125		
ESD Protection	ESD HBM	4000		V

Note: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device.

(1) Mounted on JEDEC standard 4layer (2s2p) PCB test board

■ Electrical Characteristics:

HM7218 Series (Unless otherwise indicated：T_a=25℃)

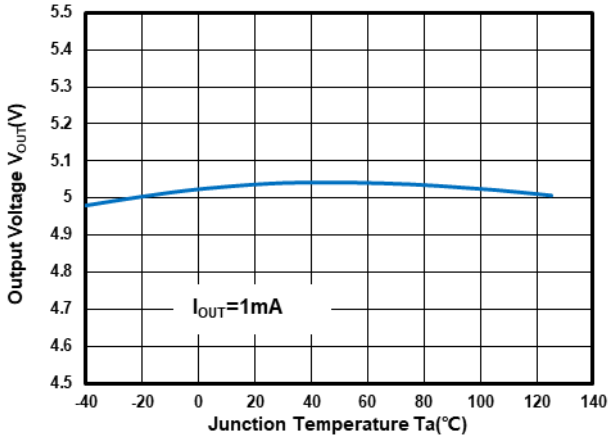
PARAMETER	SYMBOL	CONDITIONS		MIN.	TYP.	MAX.	UNIT
Output Voltage*1	$V_{OUT(S)}$	V_{IN}= $V_{OUT(S)}$+2V，I_{OUT}=1mA		$V_{OUT(S)}$× 0.98	$V_{OUT(S)}$	$V_{OUT(S)}$× 1.02	V
Dropout Voltage*2	V_{DROP}	I_{OUT}=1mA			4	8	mV
		I_{OUT}=1A			650	900	
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \bullet V_{OUT(s)}}$	$V_{OUT(S)}$+2V≤V_{IN}≤15V I_{OUT} =1mA			0.01	0.02	%/V
Load Regulation	ΔV_{OUT2}	V_{IN}=$V_{OUT(S)}$+2V 1mA≤I_{OUT}≤1A	$V_{OUT(S)}$≤5.0V		80		mV
			$V_{OUT(S)}$>5.0V		90		
Temperature Stability	$\frac{\Delta V_{OUT}}{\Delta T_a \bullet V_{OUT(s)}}$	V_{IN} = $V_{OUT(S)}$+2V，I_{OUT}=1mA -40℃≤T_a≤125℃			±50		ppm/℃
GND Current	I_{GND}	no load	$V_{OUT(S)}$≤5.0V	1	1.6	2	μA
			$V_{OUT(S)}$>5.0V	1.5	2.3	3	
		I_{OUT}=100mA			420		
Input Voltage	V_{IN}	---		2.2		18	V
Maximum Output Current	I_{OUTMAX}			1			A
Current Limit*3	I_{LIM}	V_{IN}= $V_{OUT(S)}$+2V, V_{OUT} = 0.95 ×$V_{OUT(S)}$			1.5		
Power Supply Rejection Ratio*4	PSRR	f=10Hz, I_{OUT}=10mA			71		dB
		f=100Hz, I_{OUT}=10mA			70		
		f=1kHz, I_{OUT}=10mA			51		
Short Circuit Current	I_{SHORT}	V_{IN}=$V_{OUT(S)}$+2.0V V_{OUT}=0V			30		mA
Over Temperature Protection	OTP	I_{OUT}=1mA			150		℃

Notes:

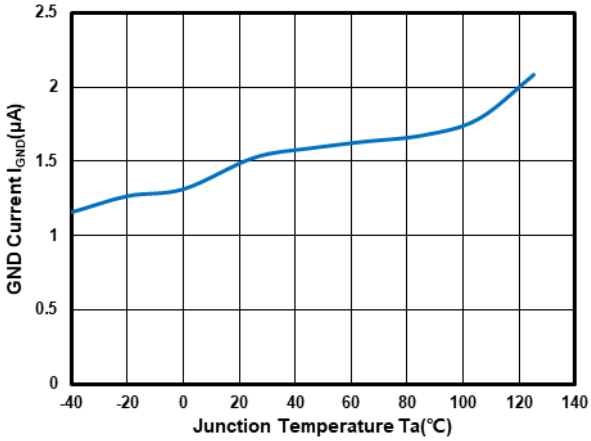
1. $V_{OUT(S)}$: Output voltage when V_{IN}=V_{OUT}+2V, I_{OUT}=1 mA.
2. V_{DROP}=V_{IN1} -（$V_{OUT(S)}$× 0.98）where V_{IN1} is the input voltage when V_{OUT} = $V_{OUT(S)}$× 0.98.
3. I_{LIM}: Output current when V_{IN}=$V_{OUT(S)}$+2V and V_{OUT} = 0.95*$V_{OUT(S)}$.
4. PSRR was measured for $V_{OUT(S)}$ = 5V and V_{IN}= 7V.

■ Typical Performance Characteristics:

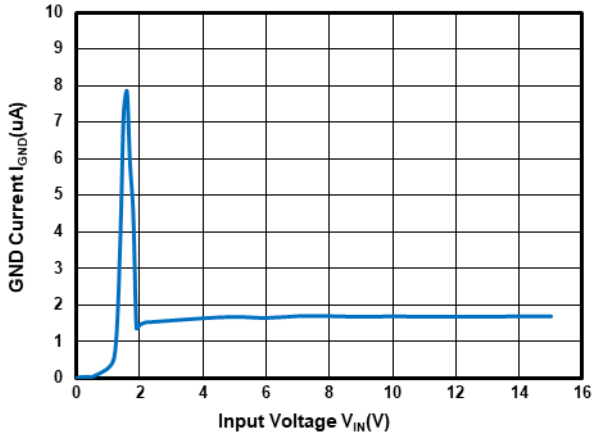
Test Conditions: V_{IN}=V_{OUT}+2.0V, C_{IN}=2.2μF, C_{OUT}=2.2μF, unless otherwise indicated.



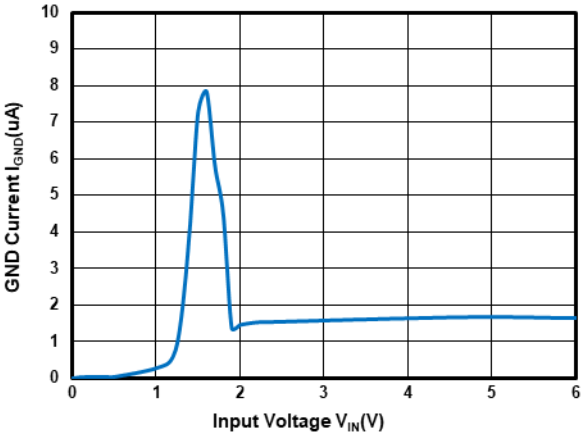
Output Voltage vs Temperature at V_{OUT}=5.0V



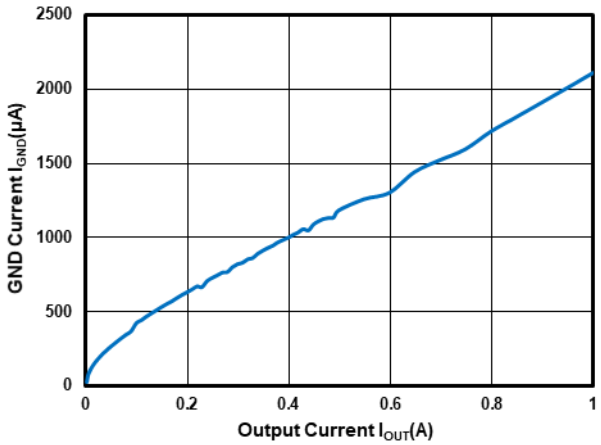
GND Current vs Temperature at V_{OUT}=5.0V



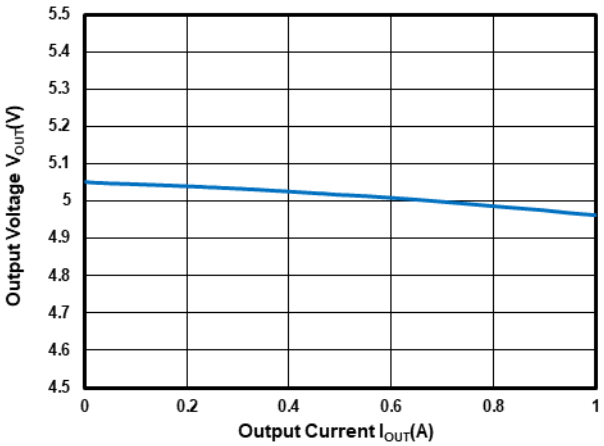
GND Current vs Input Voltage at V_{OUT}=5.0V



GND Current vs Input Voltage at V_{OUT}=5.0V



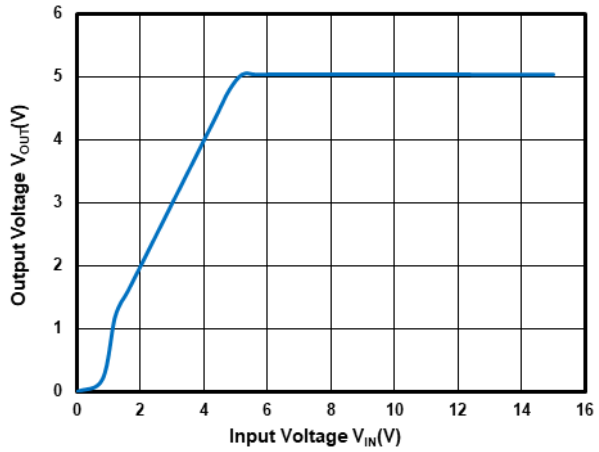
GND Current vs Output Current at V_{OUT}=5.0V



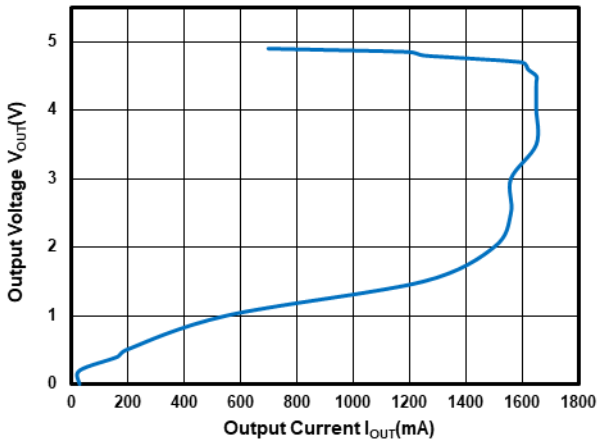
Output Voltage vs Output Current at V_{OUT}=5.0V

■ Typical Performance Characteristics (Continued):

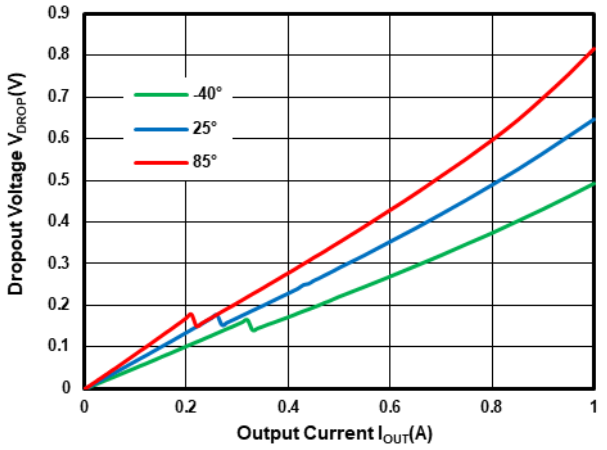
Test Conditions: V_{IN}=V_{OUT}+2.0V, C_{IN}=2.2μF, C_{OUT}=2.2μF, unless otherwise indicated.



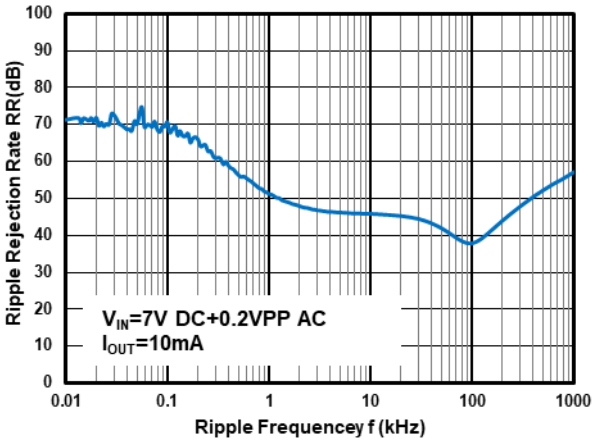
Output Voltage vs Input Voltage at V_{OUT}=5.0V



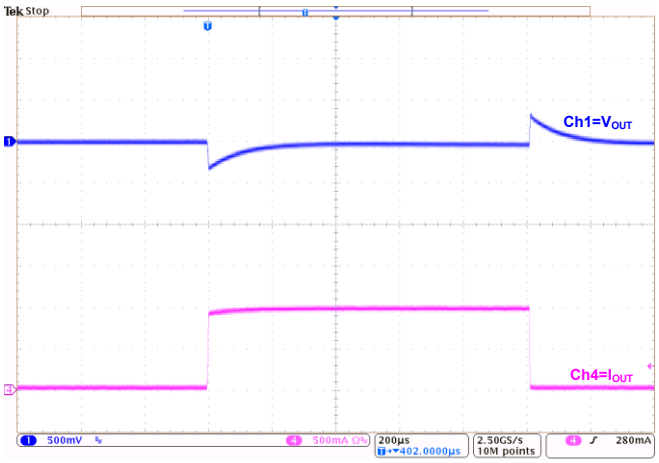
Output Current Fold-back at V_{OUT}=5.0V



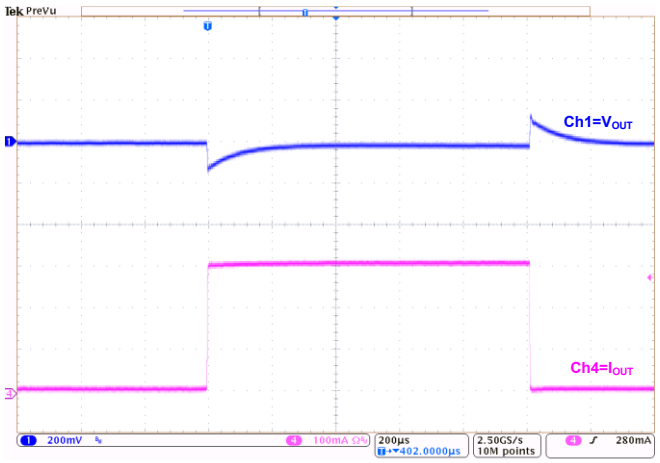
Dropout Voltage vs Temperature at V_{OUT}=5.0V



Power Supply Rejection Ratio at V_{OUT}=5.0V



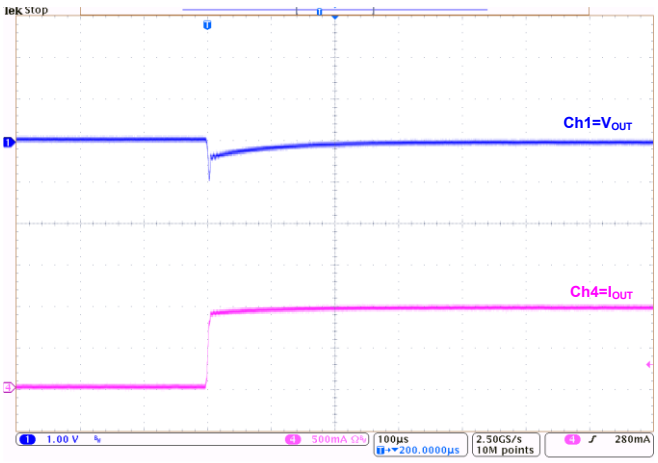
Load Transient at V_{OUT}=5.0V
(I_{OUT}=1mA~1A~1mA)



Load Transient at V_{OUT}=5.0V
(I_{OUT}=1mA~300mA~1mA)

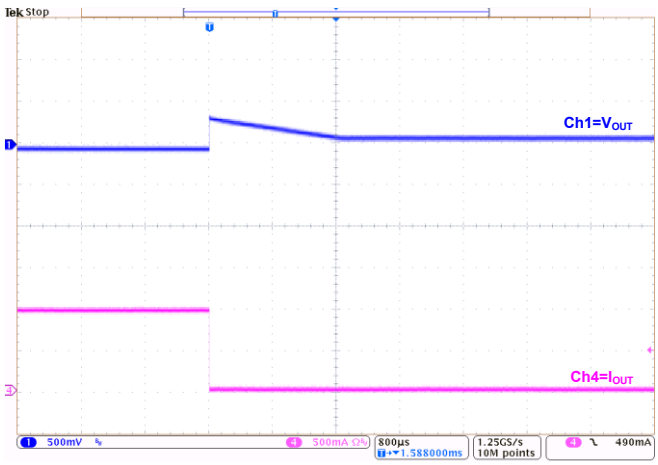
■ Typical Performance Characteristics (Continued):

Test Conditions: V_{IN}=V_{OUT}+2.0V, C_{IN}=2.2μF, C_{OUT}=2.2μF, unless otherwise indicated.



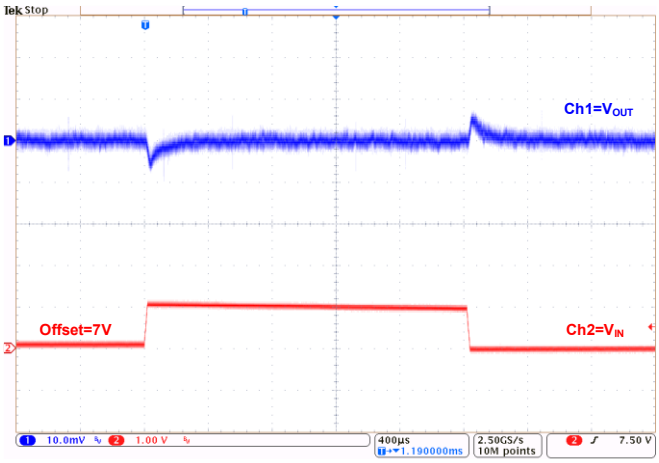
Load Transient at V_{OUT}=5.0V

(I_{OUT}=0mA~1A)



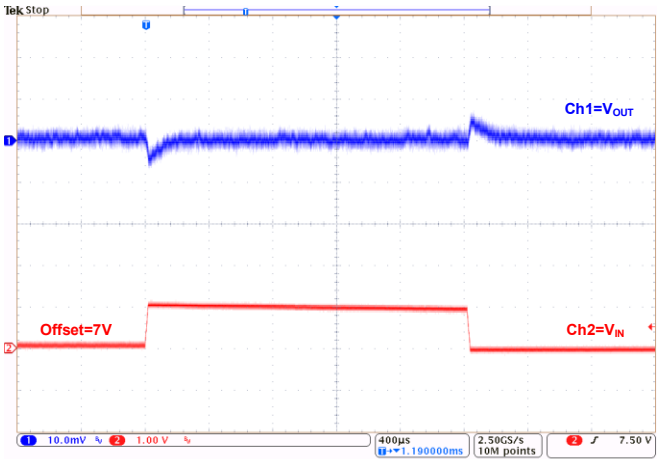
Load Transient at V_{OUT}=5.0V

(I_{OUT}=1A~0mA)



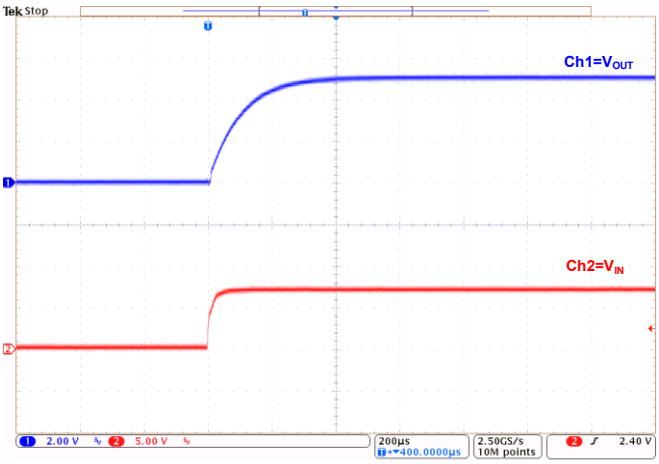
Line Transient at V_{OUT}=5.0V

(I_{OUT}=1mA)



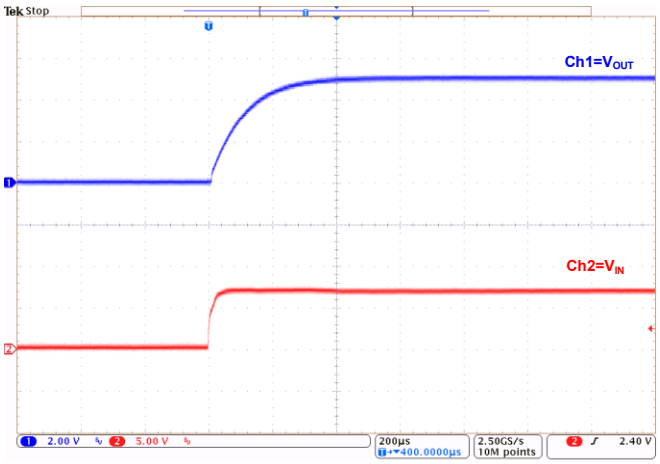
Line Transient at V_{OUT}=5.0V

(I_{OUT}=10mA)



Power-Up at V_{OUT}=5.0V:

(I_{OUT}=1mA)

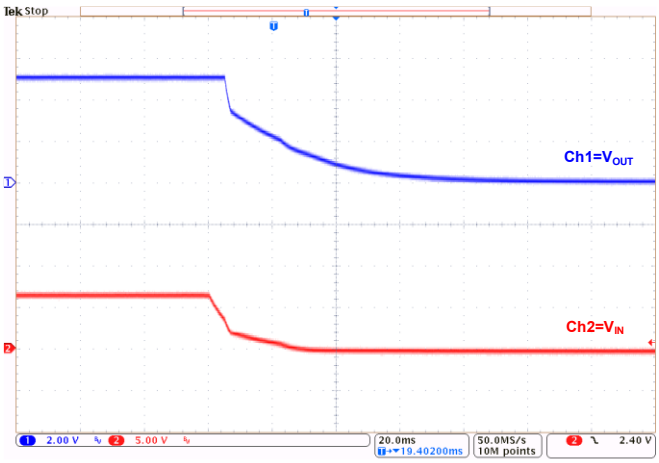


Power-Up at V_{OUT}=5.0V:

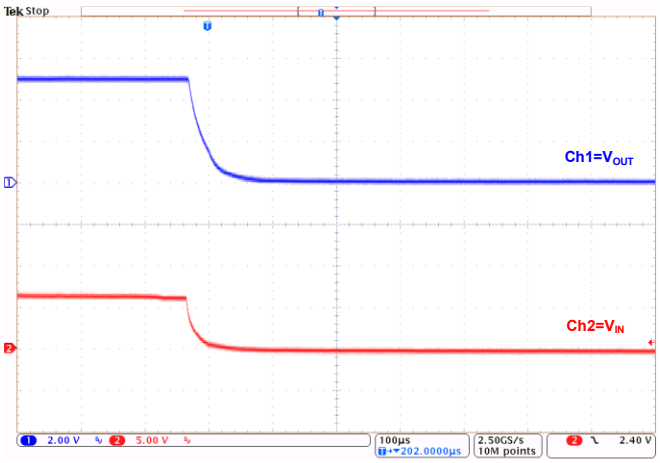
(I_{OUT}=1A)

■ Typical Performance Characteristics (Continued):

Test Conditions: V_{IN}=V_{OUT}+2.0V, C_{IN}=2.2μF, C_{OUT}=2.2μF, unless otherwise indicated.



Power-Down at V_{OUT}=5.0V:
(I_{OUT}=1mA))

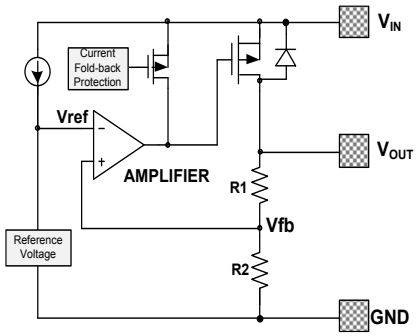


Power-Down at V_{OUT}=5.0V:
(I_{OUT}=1A)

■ Operational Explanation

Output voltage control

The voltage divided by resistors R1 and R2 is compared with the internal reference voltage by the error amplifier. The amplifier output then drives the P-channel MOSFET connected to the V_{OUT} pin. The output voltage at the V_{OUT} pin is regulated by this negative feedback system. The current limit circuit and short protect circuit operate in relation to output current level.



■ Pass transistor

The pass transistor with low turn-on resistance used in HM7218 is a P-channel MOSFET. If the potential on V_{OUT} pin is higher than VIN, it is possible that IC will be destroyed due to reverse current which is caused by parasitic diodes between V_{IN} and V_{OUT}. Therefore, the V_{OUT} pin potential exceeds V_{IN}+0.3V is not allowed.

■ Current limit, over temperature protection

The HM7218 series includes a combination of a fixed current limiter circuit which aid the operations of the current limiter and circuit protection. When the load current reaches the current limit level, the fixed current limiter circuit operates and output voltage drops. As a result of this drop in output voltage, the foldback circuit operates, output voltage drops further and output current decreases.

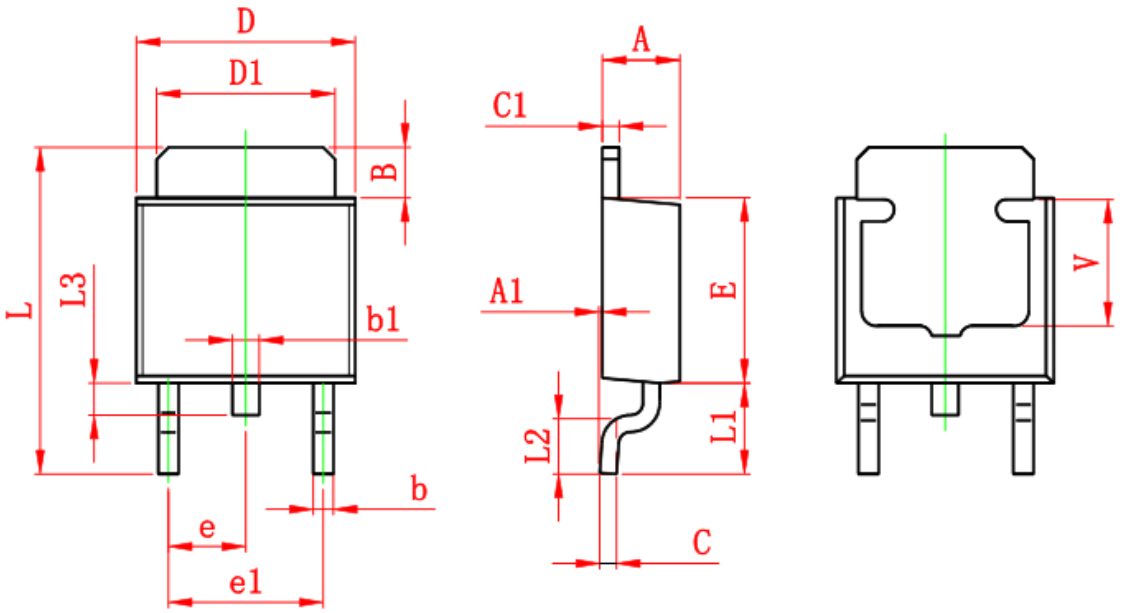
Special attention should be paid to that the product of the dropout voltage on the chip and the output current must be smaller than the heat dissipation. If power consumption on the chip is more than the heat dissipation, OTP will protect the chip from damaging due to over temperature.

■ Notes:

1. The input and output capacitors should be placed as close as possible to the IC.
2. If the impedance of the power supply is high, which is caused by forgetting installing input capacitor or installing too small value capacitor, the oscillation may occur.
3. Pay attention to the operation conditions of input and output voltage and load current, such that the power consumption in the IC should not exceed the allowable power consumption of the package even though the chip has short circuit protection.
4. IC has a built-in anti-static protection (ESD) circuit, but please do not add excessive stress to the IC.

■ Packaging Information

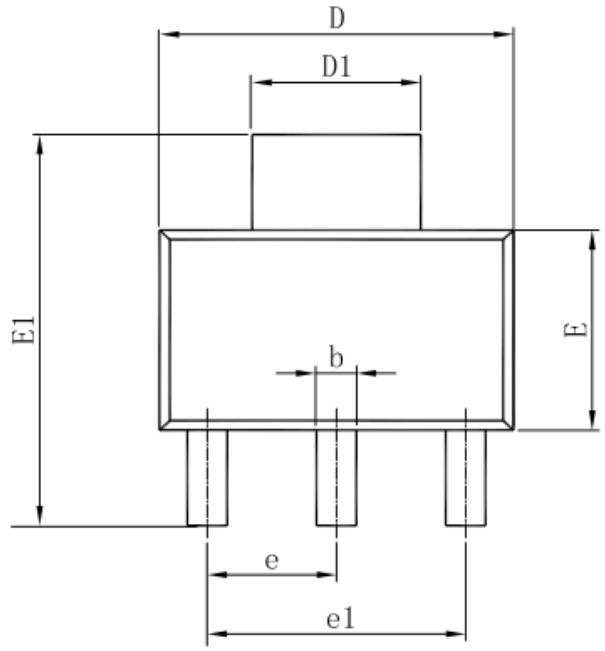
TO-252-2L PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP.		0.091 TYP.	
e1	4.500	4.700	0.177	0.185
L	9.500	9.900	0.374	0.390
L1	2.550	2.900	0.100	0.114
L2	1.400	1.780	0.055	0.070
L3	0.600	0.900	0.024	0.035
V	3.800 REF.		0.150 REF.	

■ Packaging Information (Continued)

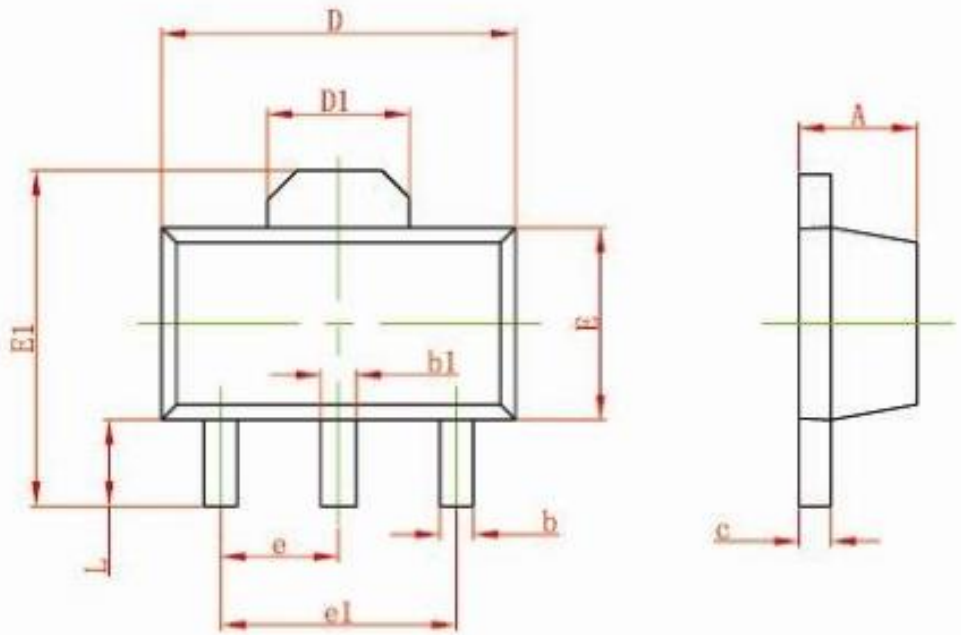
SOT-223 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.520	1.800	0.060	0.071
A1	0.000	0.100	0.000	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.820	0.026	0.032
c	0.250	0.350	0.010	0.014
D	6.200	6.400	0.244	0.252
D1	2.900	3.100	0.114	0.122
E	3.300	3.700	0.130	0.146
E1	6.830	7.070	0.269	0.278
e	2.300(BSC)		0.091(BSC)	
e1	4.500	4.700	0.177	0.185
L	0.900	1.150	0.035	0.045
θ	0°	10°	0°	10°

■ Packaging Information (Continued)

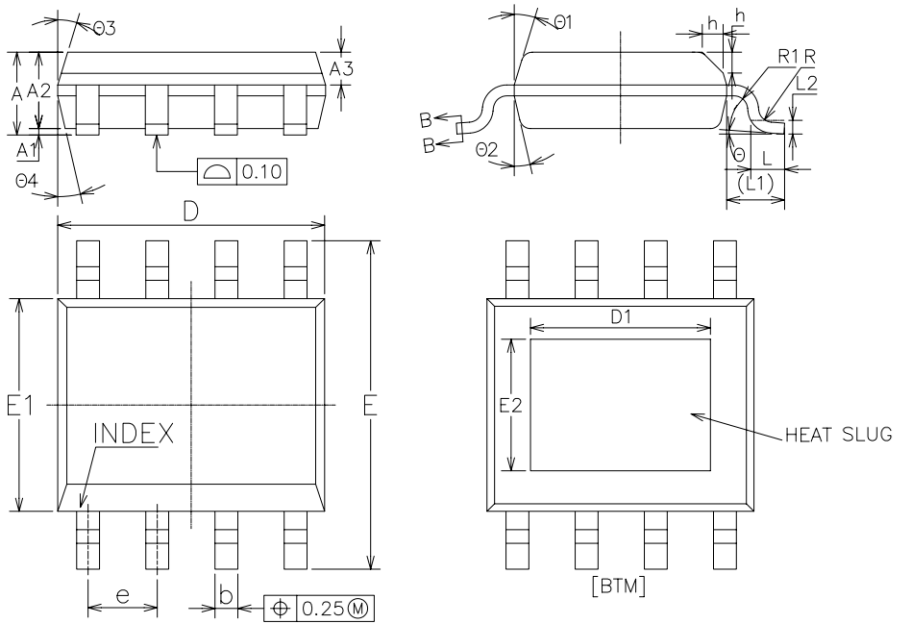
SOT-89-3L PACKAGE OUTLINE DIMENSIONS

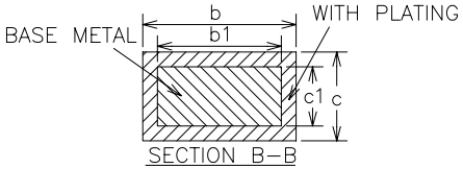


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060TYP	
e1	3.000 TYP		0.118TYP	
L	0.900	1.200	0.035	0.047

■ Packaging Information (Continued)

ESOP8 PACKAGE OUTLINE DIMENSIONS



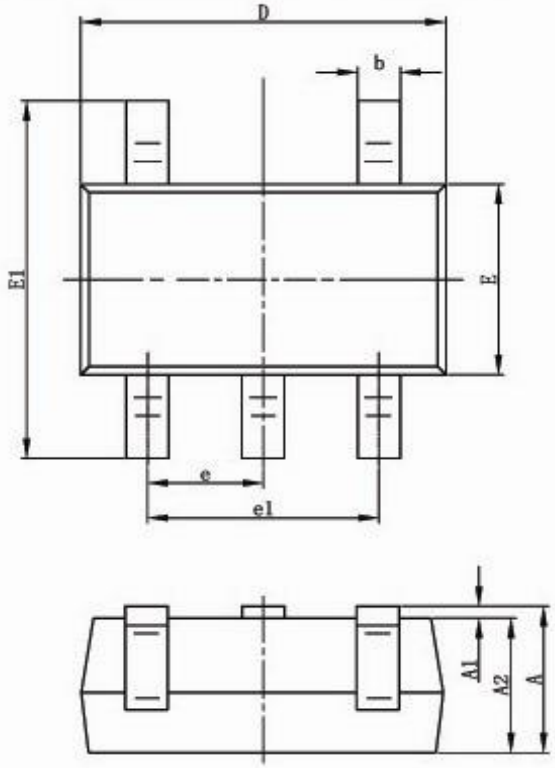


COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	1.35	1.55	1.70
A1	0	0.10	0.15
A2	1.25	1.40	1.65
A3	0.50	0.60	0.70
b	0.38	–	0.51
b1	0.37	0.42	0.47
c	0.17	–	0.25
c1	0.17	0.20	0.23
D	4.80	4.90	5.00
D1 Option 1	3.10	3.30	3.50
D1 Option 2	2.09	2.29	2.49
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
E2 Option 1	2.20	2.40	2.60
E2 Option 2	2.09	2.29	2.49
e	1.17	1.27	1.37
L	0.45	0.60	0.80
L1		1.04REF	
L2		0.25BSC	
R	0.07	–	–
R1	0.07	–	–
h	0.30	0.40	0.50
θ	0°	–	8°
θ1	15°	17°	19°
θ2	11°	13°	15°
θ3	15°	17°	19°
θ4	11°	13°	15°

■ Packaging Information (Continued)

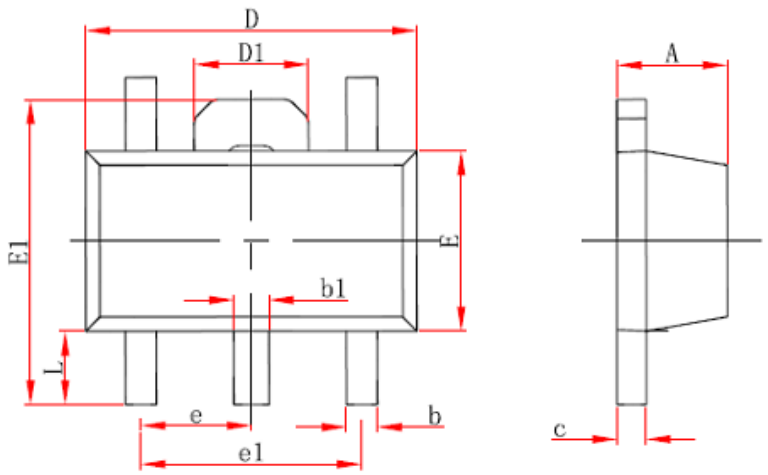
SOT-23-5L PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

■ Packaging Information (Continued)

SOT-89-5L PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.380	0.580	0.015	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047