



SP2524

Low ESR Cap. & Low Power High-speed CMOS LDO With CE Pin

DESCRIPTION

The SP2524 series are highly precise, low noise, positive voltage LDO regulators manufactured using CMOS processes. The series achieves high ripple rejection and low dropout and consists of a standard voltage source, an error correction, current limiter and a phase compensation circuit plus a driver transistor. The series is also compatible with low ESR ceramic capacitors which give added output stability.

This stability can be maintained even during load fluctuations due to the excellent transient response of the series. The current limiter's feedback circuit also operates as a short protect for the output current limiter and the output pin. The CE function enables the output to be turned off, resulting in greatly reduced power consumption.

The SP2524 family is compatible with low ESR capacitors. The current limiter's feedback circuit also operates as a short protect for the output current limiter. The SOT-23-5L / SOT-353 packages are available for portable electronic equipment.

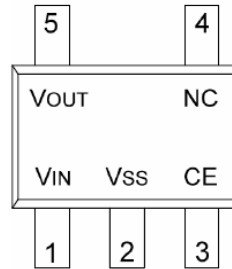
FEATURES

- ◆ Highly Accurate $\pm 2\%$
- ◆ Maximum operation voltage 7V.
- ◆ Dropout Voltage 200mV @ 150mA (3.3V type)
- ◆ High Ripple Rejection 45dB (10 KHz)
- ◆ Low Power Consumption 25 μ A (TYP.)
- ◆ Minimum Output Current 300mA
- ◆ Standby Current less than 0.1 μ A
- ◆ Internal protector current limiter and short protector
- ◆ Small packages SOT-23-5L / SOT-353 , and other required

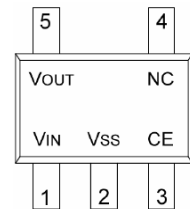
APPLICATIONS

- Battery Power Equipment
- Cellular Phone
- Digital Cameras
- Computer Disk Drivers
- Portable games
- Communication tools

PIN CONFIGURATION SOT-23-5L



SOT-353



PART MARKING SOT-23-5L



X : Voltag Code
 Y : Year Code
 W : Week Code

SOT-353



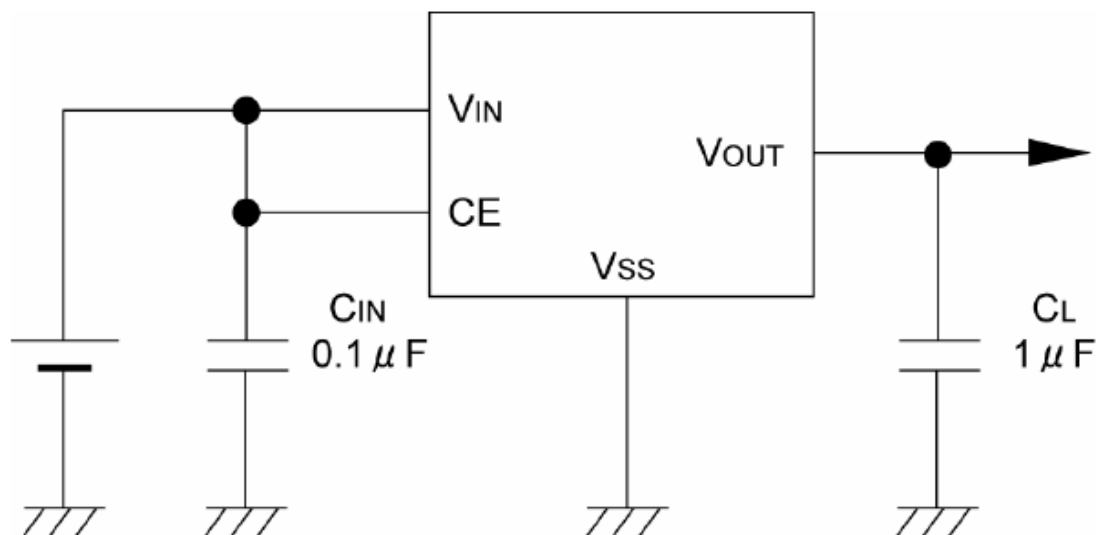
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APPLICATION CIRCUIT



PIN DESCRIPTION

SOT-23-5L	SOT-353	Symbol	Description
1	1	VIN	Voltage Input
2	2	VSS	Ground
3	3	CE	Enable
4	4	NC	No Connect
5	5	VOUT	Voltage Output

ORDERING INFORMATION (X : Voltage Code ; Y : Year Code ; W : Week Code)

Part Number	Package	Part Marking
SP2524XS25RG	SOT-23-5L	4XYW
SP2524XS35RG	SOT-353	4XYW

※ Week Code : A ~ Z (1 ~ 26) ; a ~ z (27 ~ 52)

※ SP2524XS25RG : Tape Reel ; Pb – Free

※ SP2524XS35RG : Tape Reel ; Pb – Free

VOLTAGE CODE INFORMATION

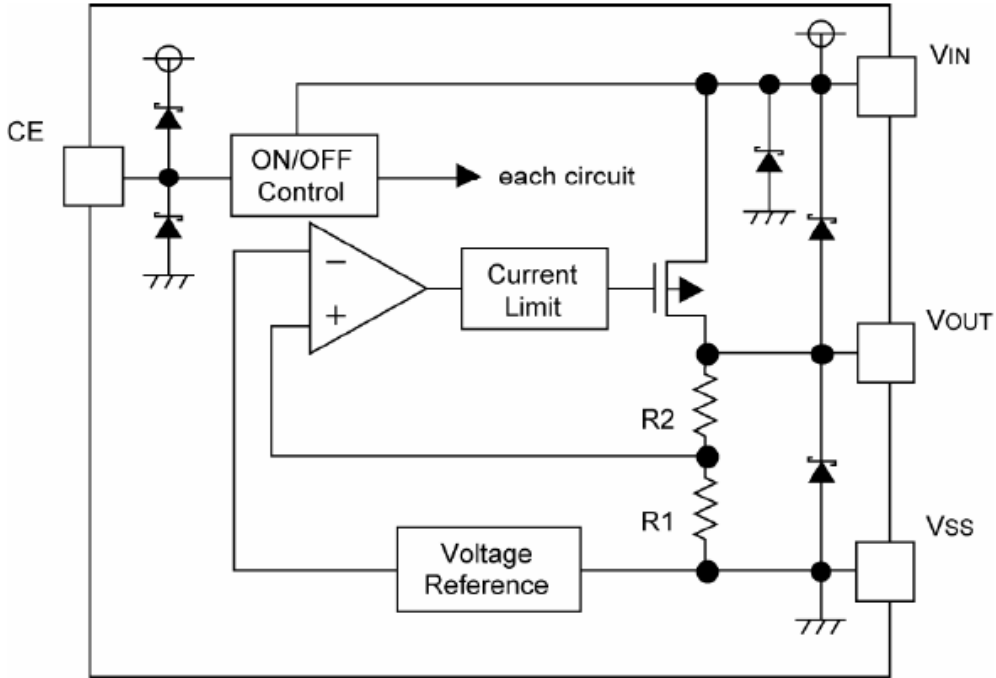
Voltage Code (X)	Output Voltage (V)
D	1.8
K	2.5
N	2.8
S	3.3



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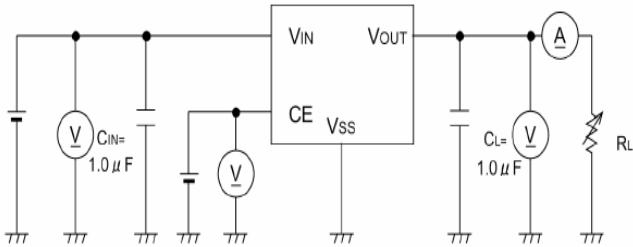
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BLOCK DIAGRAM

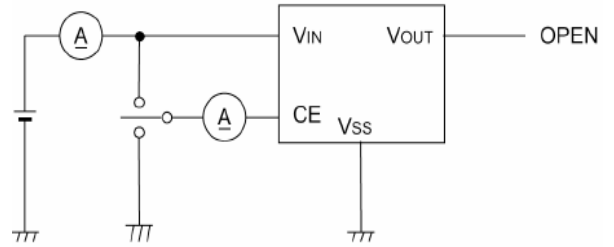


TEST CIRCUIT

Circuit 1 :



Circuit 2 :



ABSOLUTE MAXIMUM RATINGS

(TA=25°C Unless otherwise specified)

Parameter	Symbol	Value	Unit
Input Voltage	V _{IN}	7	V
Output Current	I _{OUT}	500	mA
Output Voltage	V _{OUT}	V _{SS} -0.3 ~ V _{IN} +0.3	V
Thermal Resistance	θ _{JA}	SOT-23-5L	260
		SOT-353	105
Power Dissipation	P _D	SOT-23-5L	1150
		SOT-353	950
Operation Junction Temperature Range	T _J	-40 ~ +85	T _J
Storage Temperature Range	T _{STG}	-55 ~ +125	T _{STG}



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ELECTRICAL CHARACTERISTICS

(TA=25°C , Unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V _{OUT(E)1}	V _{IN} =V _{OUT} +1.0V, I _{OUT} = 30mA	x 0.98	V _{OUT(T)}	x 1.02	V
Maximum Output Current	I _{OUT}	V _{IN} ≥V _{OUT} +1.0 V	300			mA
Load Regulation	ΔV _{OUT2}	V _{IN} =V _{OUT} +1.0 V 1.0 mA ≤I _{OUT} ≤ 300 mA			V _{OUT(T)} X1.0%	V
Dropout Voltage	V _{dif1}	I _{OUT} =30mA	E1			mV
	V _{dif2}	I _{OUT} =150mA	E2			mV
Supply Current	I _{DD}	V _{IN} =5V=V _{CE}	15	25	40	uA
Standby Current	I _{STBY}	V _{IN} =V _{OUT(T)} +1.0V, V _{CE} =V _{SS}		0.01	0.1	uA
Line Regulations	V _{OUT} / (ΔV _{IN} - V _{OUT})	V _{OUT} +0.5 V ≤V _{IN} ≤7V I _{OUT} =30 mA		0.025	0.1	%/V
Input Voltage	V _{IN}		1.8		7	V
Output Voltage Temperature Characteristics	ΔV _{OUT} / (ΔT _{opr} - V _{OUT})	V _{IN} =V _{OUT} +1.0V, I _{OUT} =10mA -40°C ≤ T _{opr} ≤ 85°C		± 100		ppm/°C
Ripple-Rejection	PSRR	V _{IN} =V _{OUT} +1.0V, f=1 kHz V _{rip} =0.5V _{rms} , I _{OUT} =60 mA		55		dB
Ripple-Rejection	PSRR	V _{IN} =V _{OUT} +1.0V, f=10 kHz V _{rip} =0.5V _{rms} , I _{OUT} =60 mA		45		dB
Short Current	I _{short}	V _{IN} =V _{OUT} +1.0V, V _{OUT} =V _{SS}		50		mA
CE High Voltage	V _{CEH}		1.6		V _{in}	V
CE Low Voltage	V _{CEL}				0.25	V
CE High Current	I _{CEH}	V _{IN} = V _{CE} = V _{OUT(T)} +1.0V	-0.1		0.1	uA
CE Low Current	I _{CEL}	V _{IN} =V _{OUT(T)} +1.0V, V _{CE} =V _{SS}	-0.1		0.1	uA

(NOTE 1) V_{OUT(T)} = Specified Output Voltage

(NOTE 2) V_{OUT(E)} = Effective Output Voltage (ie. The output voltage when "V_{OUT(T)}+1.0V" is provided at the V_{IN} pin while maintaining a certain I_{OUT} value.)

(NOTE 3) V_{dif} = {V_{IN1} (NOTE5) + V_{OUT1} (NOTE4)}

(NOTE 4) V_{OUT1} = A voltage equal to 98% of the Output Voltage whenever an amply stabilized I_{OUT} {V_{OUT(T)} + 1.0V} is input.

(NOTE 5) V_{IN1} = The Input Voltage when V_{OUT1} appears as Input Voltage is gradually decreased.

(NOTE 6) Unless otherwise stated, V_{IN} = V_{OUT(T)}+1.0V

DROPOUT VOLTAGE LIST (E1 / E2)

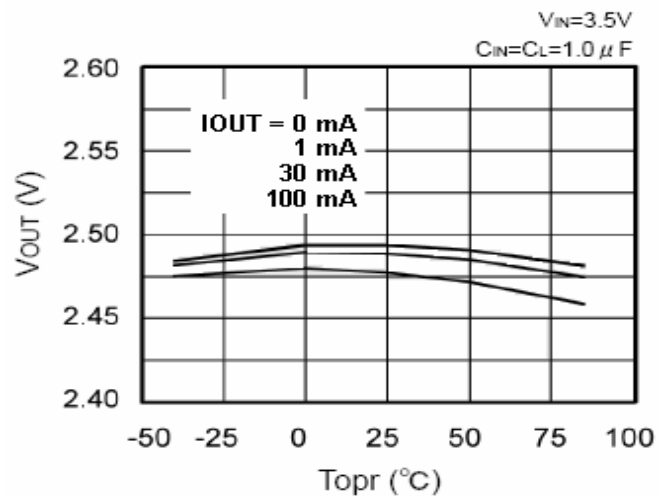
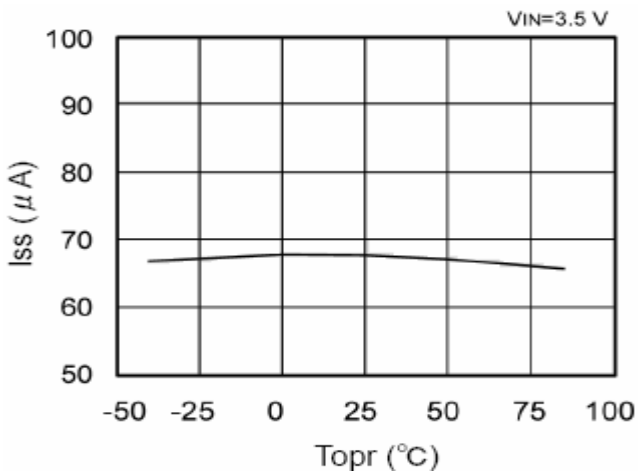
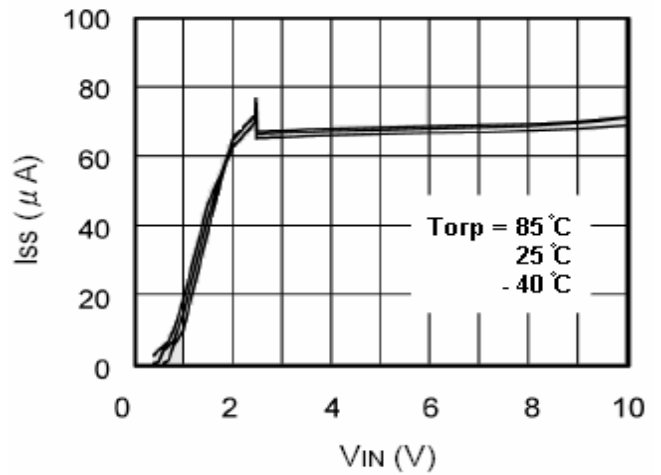
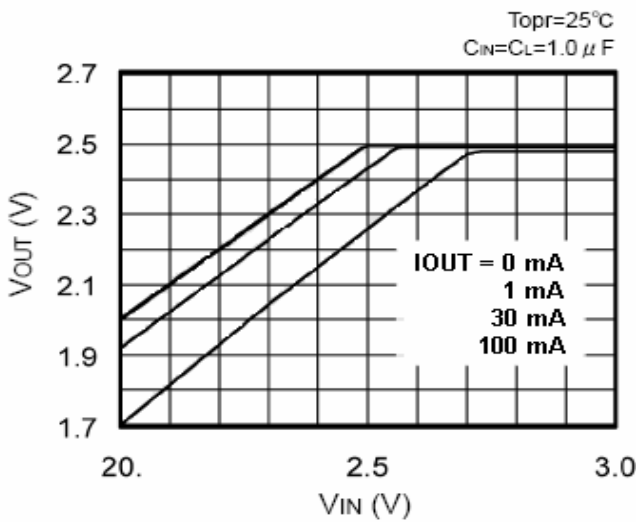
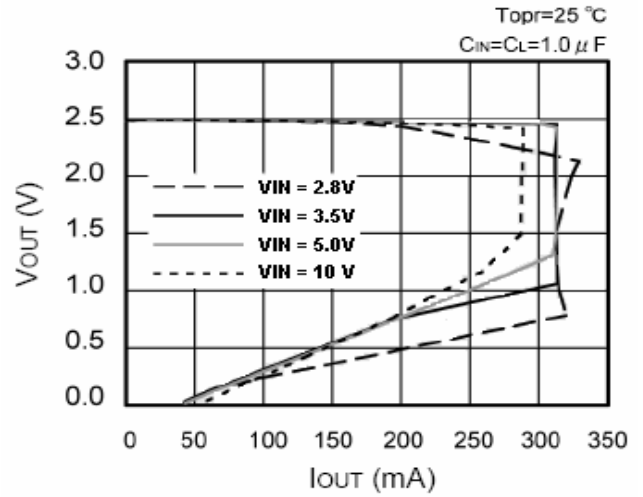
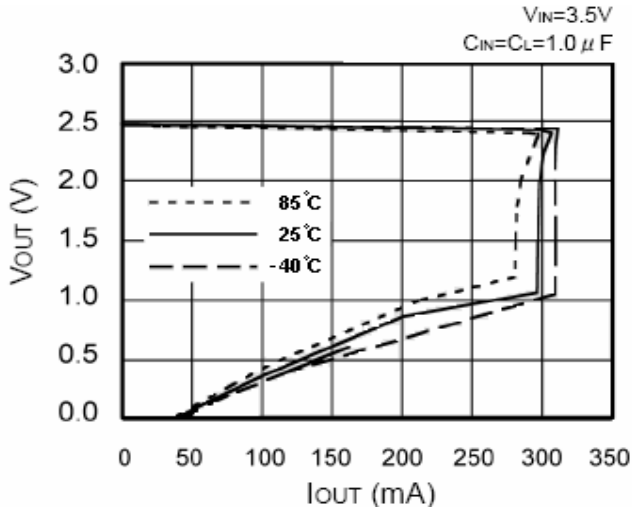
V _{OUT} (TA=25°C)	E1 (I _{OUT} =30mA)		E2 (I _{OUT} =150mA)	
	TYP	MAX	TYP	MAX
1.8	180	210	350	400
2.5	60	100	240	290
2.8	60	100	220	270
3.3	50	90	200	250



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PERFORMANCE CHARACTERISTICS (Voltage Code = Z ; 2.5V)

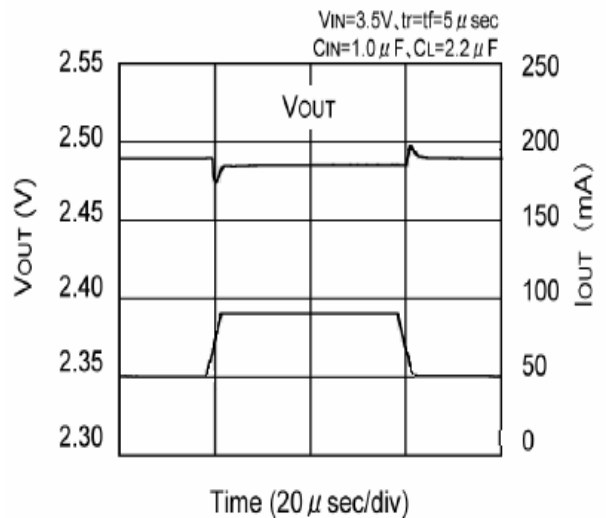
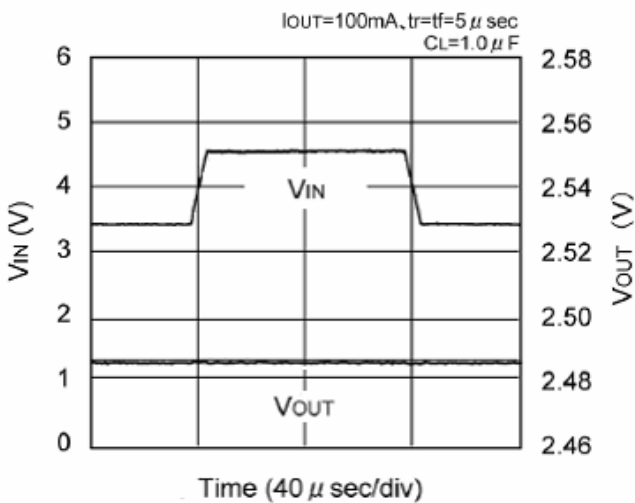
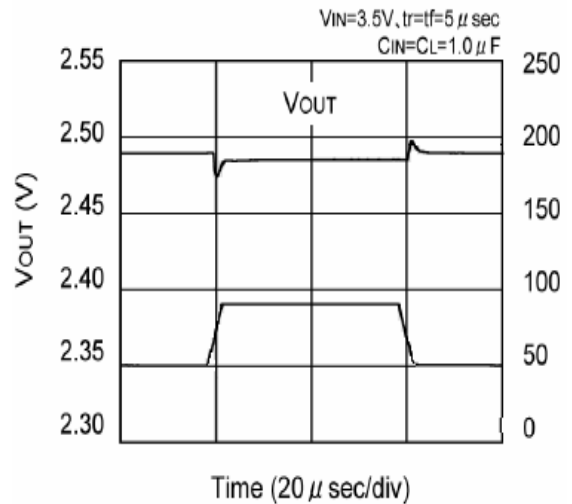
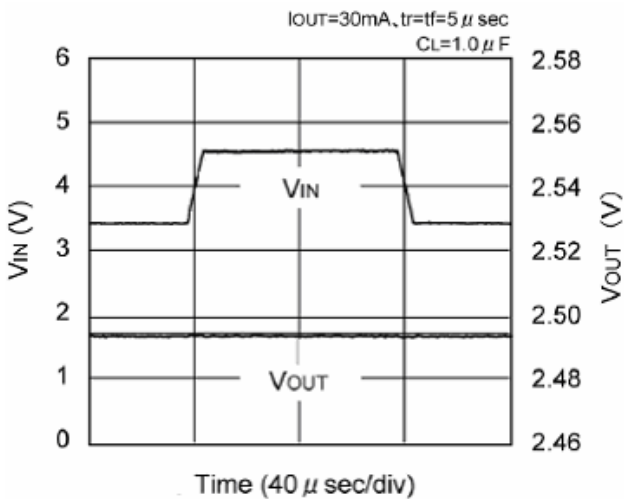
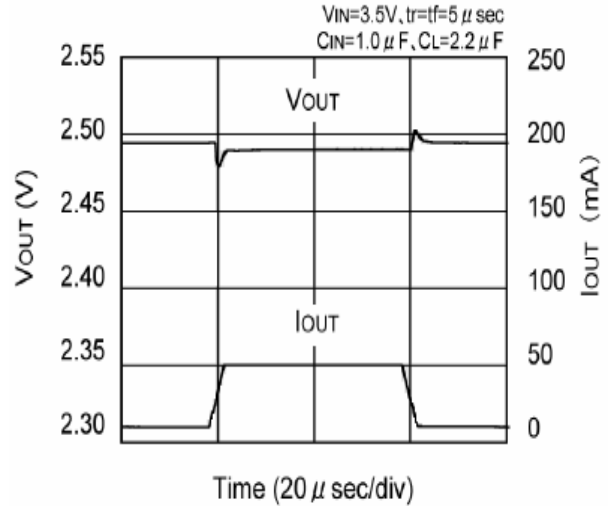
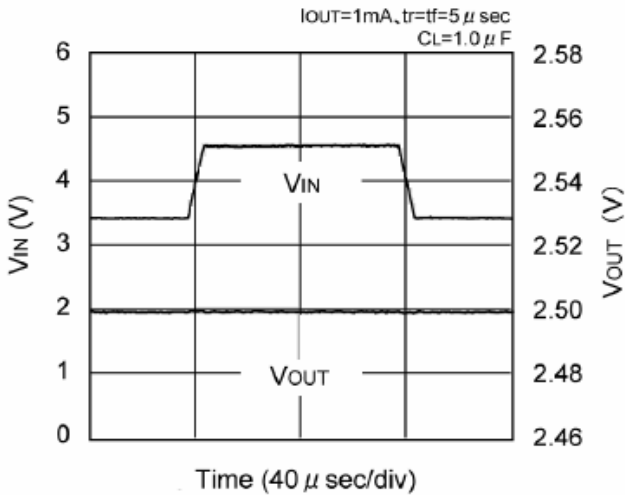




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PERFORMANCE CHARACTERISTICS (Voltage Code = Z ; 2.5V)

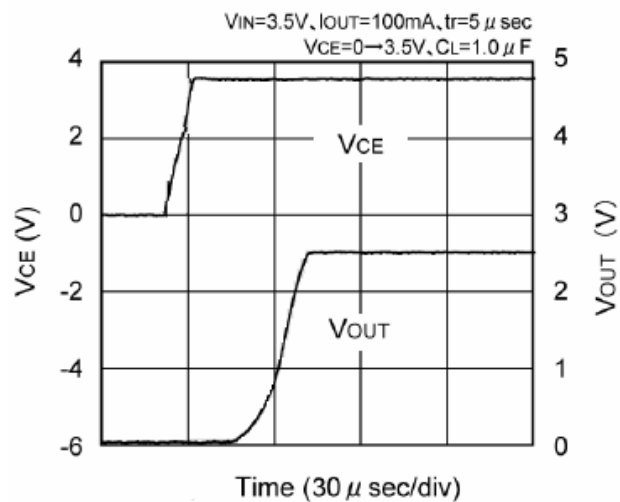
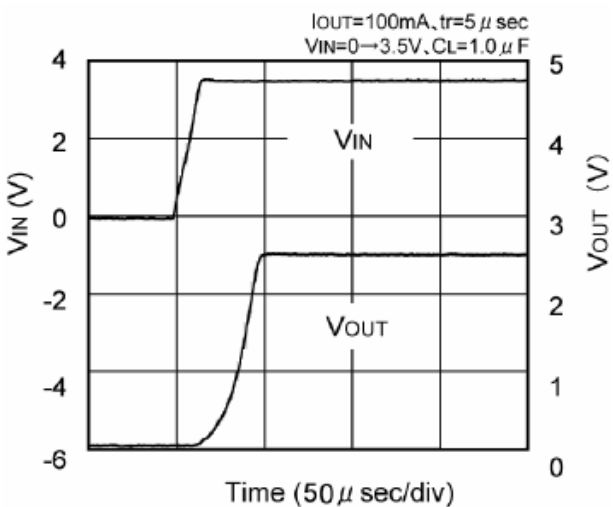
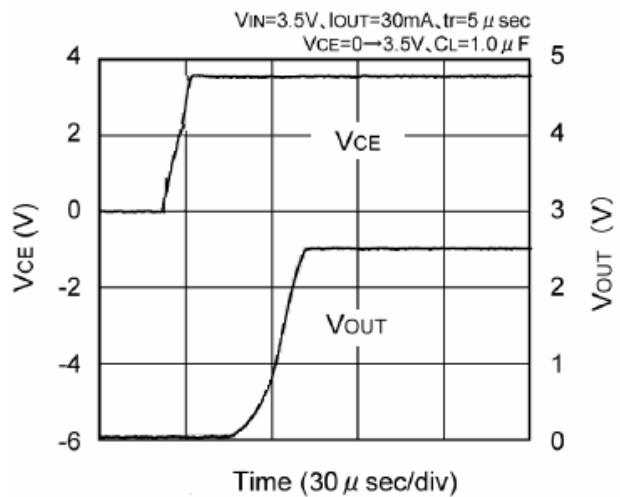
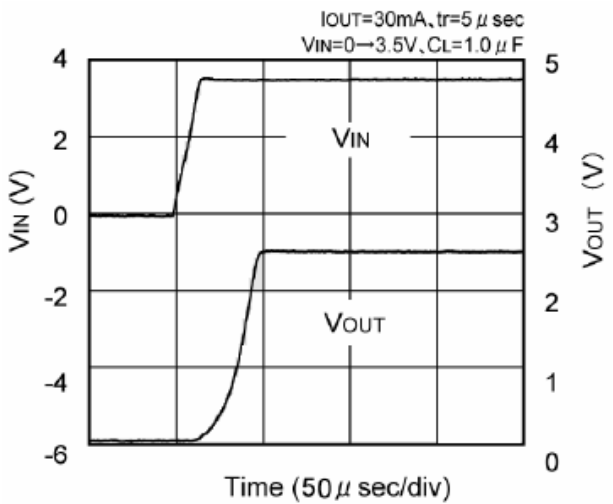
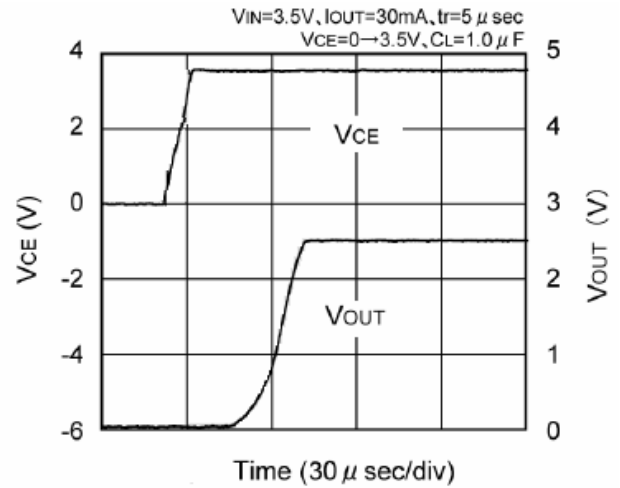
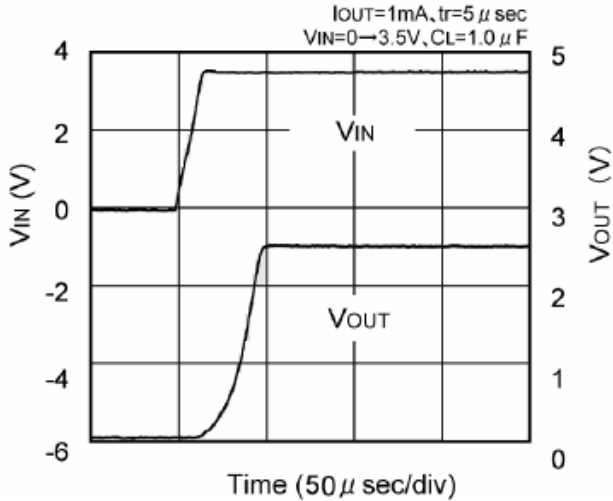




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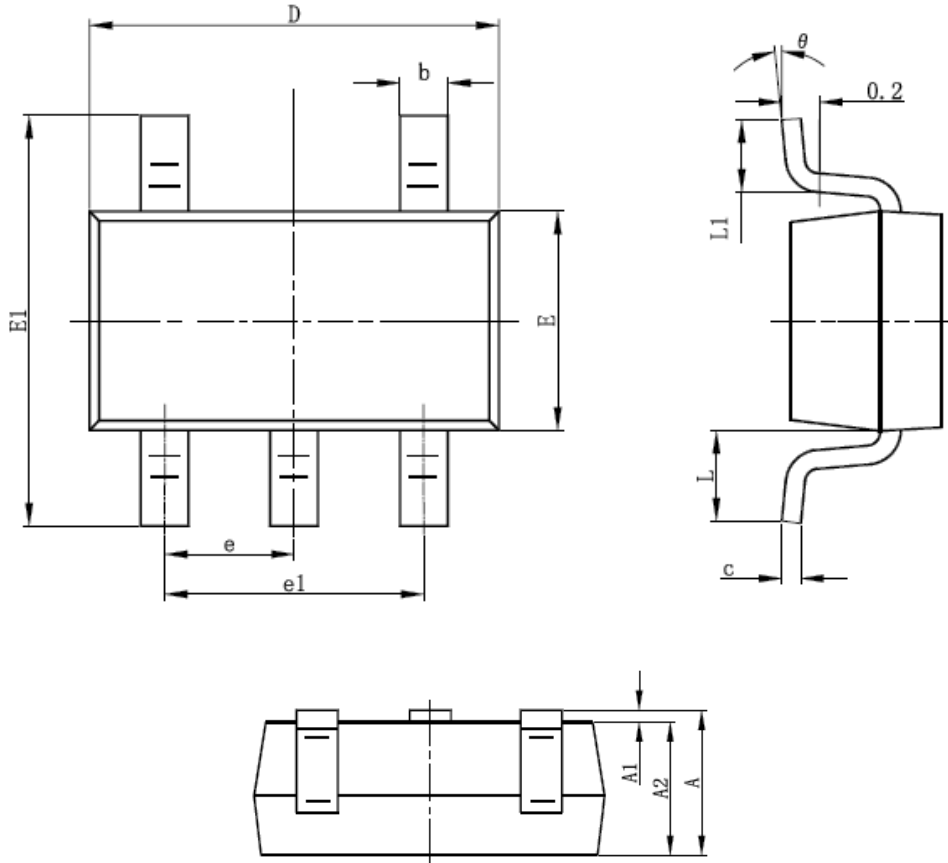




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SOT-23-5L PACKAGE OUTLINE



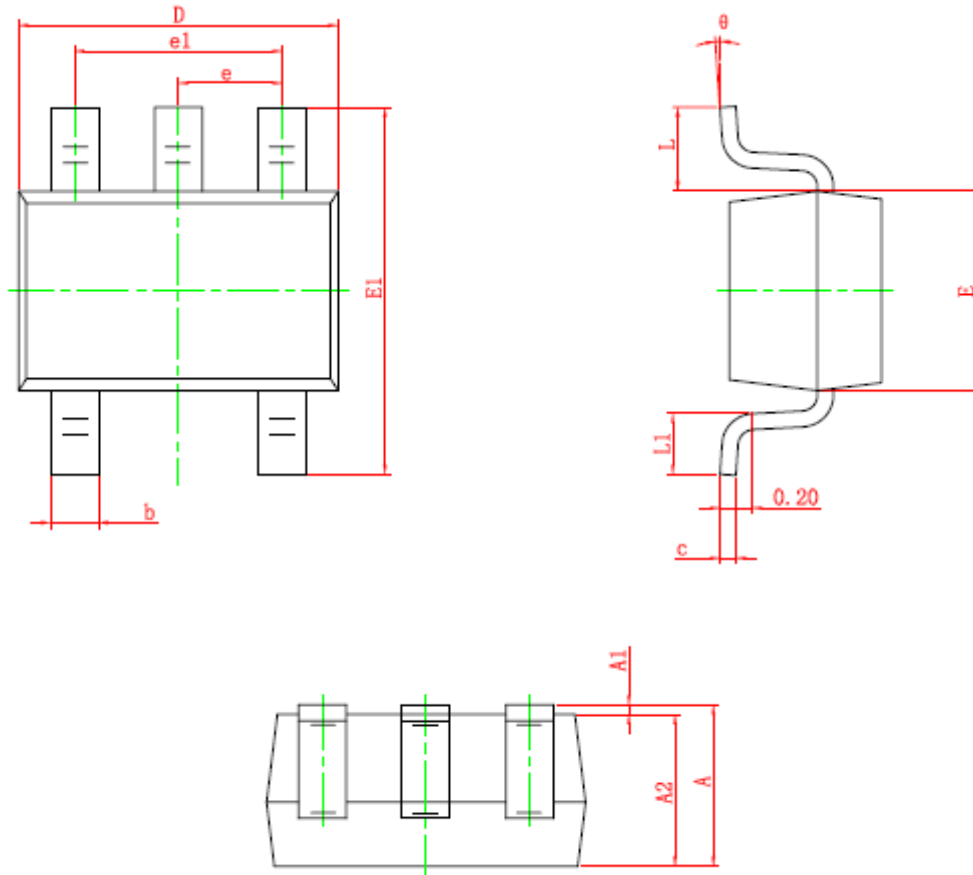
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°



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SOT-353 PACKAGE OUTLINE



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650 TYP		0.026 TYP	
e1	1.200	1.400	0.047	0.055
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°



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