# SP2525

## Low ESR Cap. & Low Power High-speed CMOS LDO

### DESCRIPTION

The SP2525 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 SP2525 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-23-3L / SOT-353 packages are available for portable electronic equipment.

### APPLICATIONS

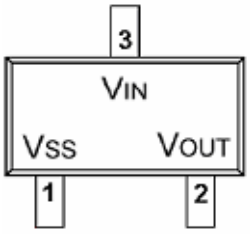
- Battery Power Equipment
- Cellular Phone
- Digital Cameras
- Computer Disk Drivers
- Portable games
- Communication tools

### FEATURES

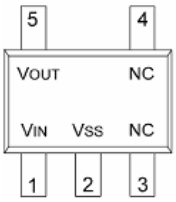
- Highly Accurate ± 2%
- Maximum operation voltage 7V.
- Dropout Voltage 200mV @ 150mA (3.3V type)
- High Ripple Rejection 45dB (10 KHz)
- Low Power Consumption 25 μ A (TYP.)
- Minimum Output Current 300mA
- Standby Current less than 0.1μA
- Internal protector current limiter and short
- Small packages SOT-23-3L / SOT-353 , and other required

### PIN CONFIGURATION

**SOT-23-3L**

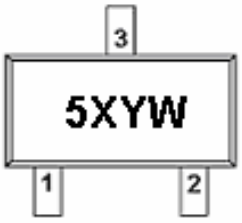



**SOT-353**



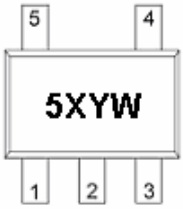

### PART MARKING

**SOT-23-3L**



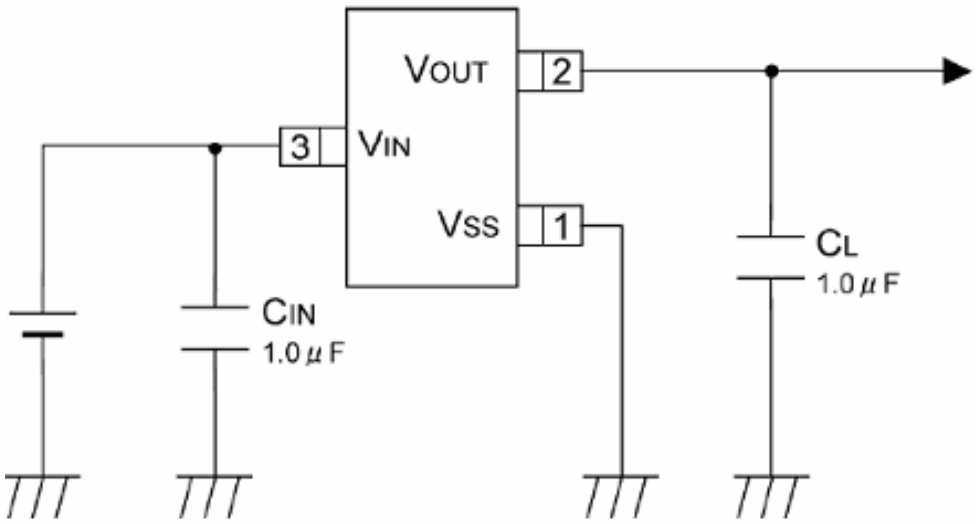

X : Voltage Code
Y : Year Code
W : Week Code

**SOT-353**




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

## APPLCATION CIRCUIT




## PIN DESCRIPTION

| SOT-23-3L | SOT-353 | Symbol | Description |
|---|---|---|---|
| 1 | 2 | VSS | Ground |
| 2 | 5 | VOUT | Voltage Output |
| 3 | 1 | VIN | Voltage Input |

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

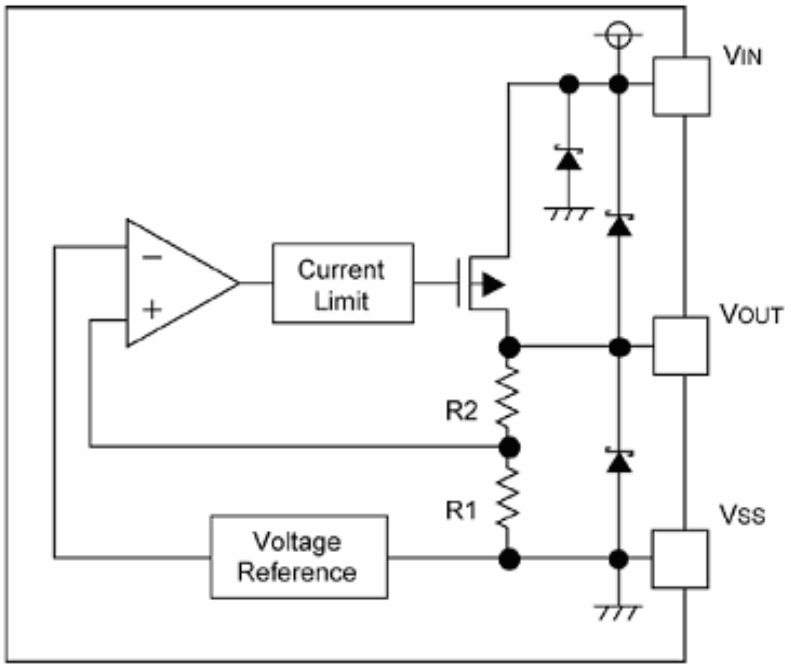
| Part Number | Package | Part Marking |
|---|---|---|
| SP2525XS23RG | SOT-23-3L | 5XYW |
| SP2525XS35RG | SOT-353 | 5XYW |

※ Week Code : A ~ Z ( 1 ~ 26 ) ; a ~ z ( 27 ~ 52 )
※ SP2525XS23RG : Tape Reel ; Pb – Free
※ SP2525XS35RG : Tape Reel ; Pb – Free

## VOLTAGE CODE INFORMATION

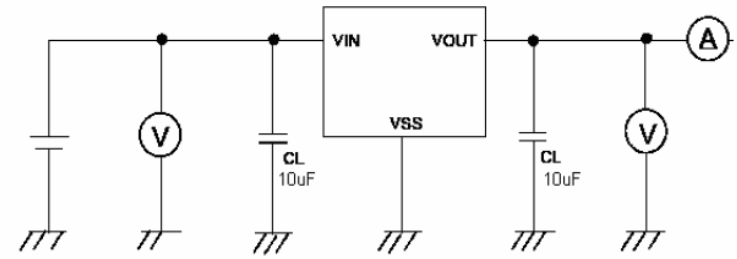
| Voltage Code (X) | Output Voltage (V) |
|---|---|
| D | 1.8 |
| K | 2.5 |
| N | 2.8 |
| S | 3.3 |

## BLOCK DIAGRAM

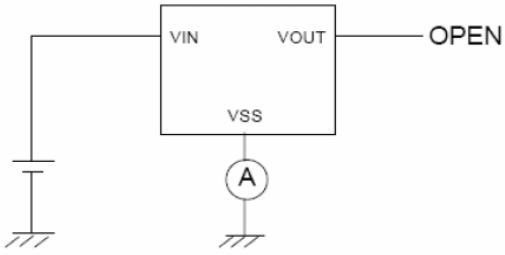



## TEST CIRCUIT

**Circuit 1 :**




**Circuit 2 :**




## ABSOULTE MAXIMUM RATINGS

($T_A$=25℃ Unless otherwise specified)

| Parameter | Symbol | | Value | Unit |
|---|---|---|---|---|
| Input Voltage | $V_{IN}$ | | 7 | $V_{IN}$ |
| Output Current | $I_{OUT}$ | | 500 | $I_{OUT}$ |
| Output Voltage | $V_{OUT}$ | | VSS-0.3 ~ VIN+0.3 | $V_{OUT}$ |
| Thermal Resistance | $\Theta_{JA}$ | SOT-23-3L | 120 | ℃/W |
| | | SOT-353 | 105 | |
| Power Dissipation | $P_D$ | SOT-23-3L | 1250 | mW |
| | | SOT-353 | 950 | |
| Operation Junction Temperature Range | $T_J$ | | -40 ~ +85 | $T_J$ |
| Storage Temperature Range | $T_{STG}$ | | -55 ~ +125 | $T_{STG}$ |

## ELECTRICAL CHARACTERISTICS

($T_A$=25℃ , 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 | VOUT(T) | x 1.02 | V |
| Maximum Output Current | $I_{OUT}$ | $V_{IN}$≥$V_{OUT}$+1.0 V | 300 | | | mA |
| Load Regulation | △$V_{OUT}$ 2 | $V_{IN}$=$V_{OUT}$+1.0 V<br>1.0 mA ≤$I_{OUT}$ ≤ 300 mA | | | VOUT(T)<br>X1.0% | V |
| Dropout Voltage | Vdif 1 | $I_{OUT}$=30mA | | **E1** | | mV |
| | Vdif 2 | $I_{OUT}$=150mA | | **E2** | | mV |
| Supply Current | $I_{DD}$ | $V_{IN}$=5V | 15 | 25 | 40 | uA |
| Line Regulations | $V_{OUT}$ / ( △$V_{IN}$ – $V_{OUT}$ ) | $V_{OUT}$+0.5 V ≤$V_{IN}$≤7V<br>$I_{OUT}$=30 mA | | 0.025 | 0.1 | %/V |
| Input Voltage | $V_{IN}$ | | 1.8 | | 7 | V |
| Output Voltage Temperature Characteristics | △$V_{OUT}$ / (△$T_{opr}$ – $V_{OUT}$) | $V_{IN}$=$V_{OUT}$+1.0V,$I_{OUT}$=10mA<br>-40℃ ≦ $T_{opr}$ ≦ 85℃ | | ±100 | | ppm/℃ |
| Ripple-Rejection | \|PSRR\| | $V_{IN}$=$V_{OUT}$+1.0V， f=1 kHz<br>$V_{rip}$=0.5$V_{rms}$, $I_{OUT}$=60 mA | | 55 | | dB |
| Ripple-Rejection | \|PSRR\| | $V_{IN}$=$V_{OUT}$+1.0V， f=10 kHz<br>$V_{rip}$=0.5$V_{rms}$, $I_{OUT}$=60 mA | | 45 | | dB |
| Short Current | Ishort | $V_{IN}$=$V_{OUT}$+1.0V, $V_{OUT}$=$V_{SS}$ | | 50 | | mA |

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

(NOTE 2) $V_{OUT(E)}$ = Effective Output Voltage (le. 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) Vdif = {$V_{IN}$ 1 (NOTE5) + $V_{OUT}$ 1 (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.

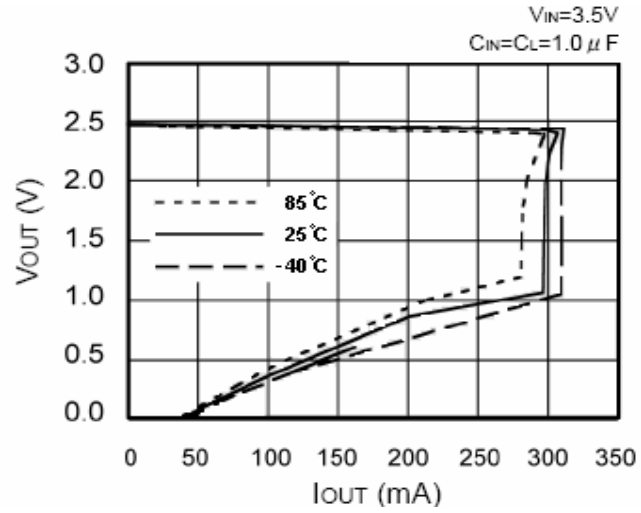
(NOTE 5) $V_{IN}$ 1 = The Input Voltage when $V_{OUT}$ 1 appears as Input Voltage is gradually decreased.

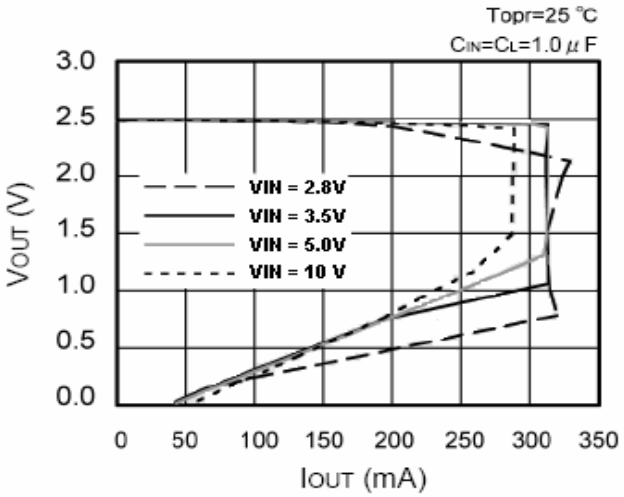
(NOTE 6) Unless otherwise stated, $V_{IN}$ = $V_{OUT(T)}$+1.0V

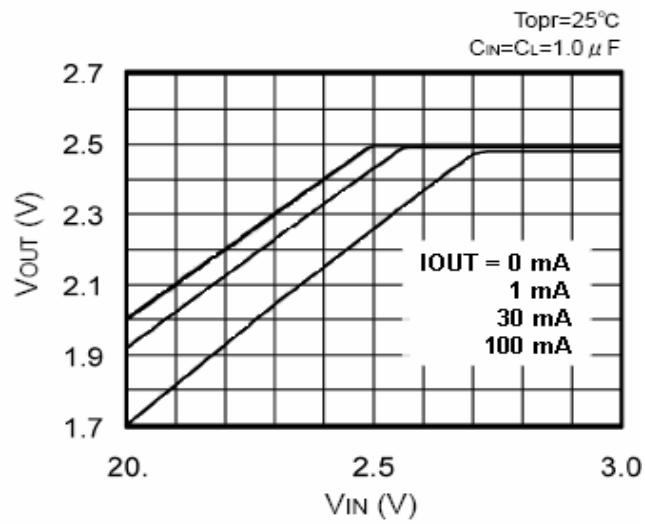
## DROPOUT VOLTAGE LIST ( E1 / E2 )

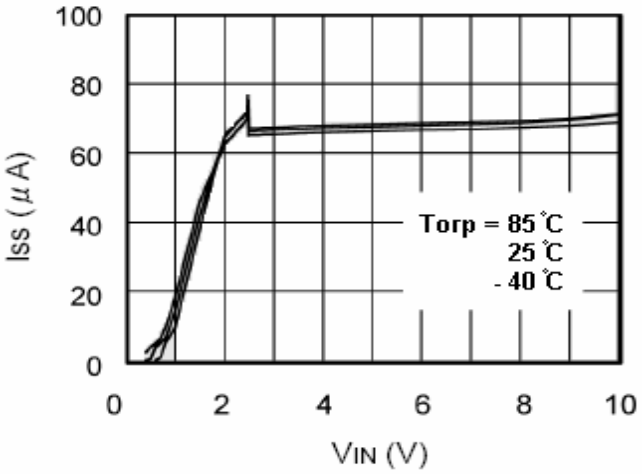
| **$V_{OUT}$** ($T_A$=25℃) | **E1** ($I_{OUT}$=30mA) | | **E2**( $I_{OUT}$=150mA) | |
|---|---|---|---|---|
| | TYP | MAX | TYP | MAX |
| 1.8 | 180 | 210 | 350 | 400 |
| 2.5 | 60 | 100 | 240 | 290 |
| 2.8 | 60 | 100 | 220 | 270 |
| 3.3 | 50 | 90 | 200 | 250 |

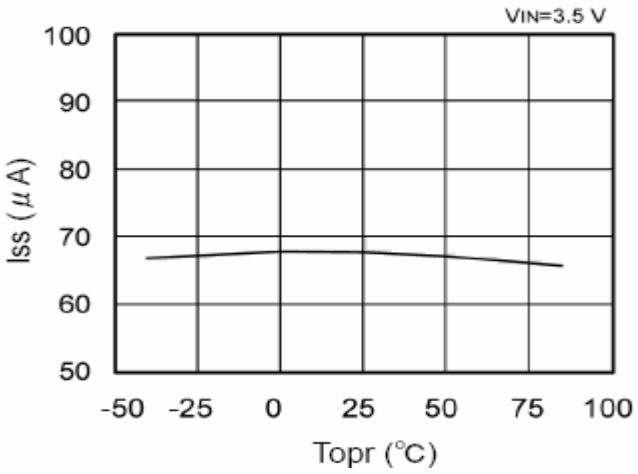
## PERFORMANCE CHARACTERISTICS ( Voltage Code = Z ; 2.5V )

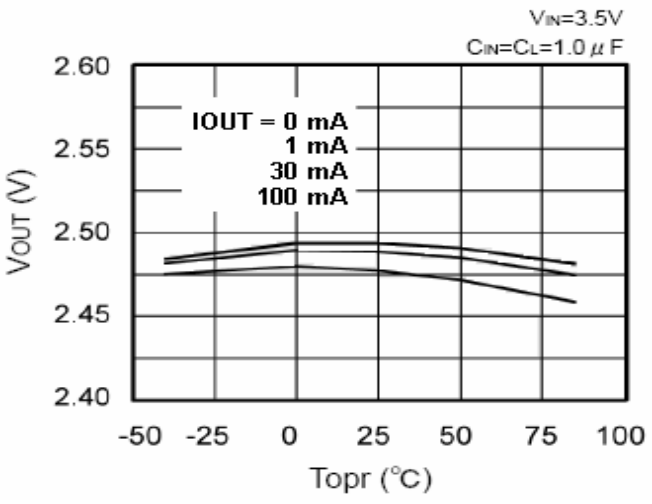


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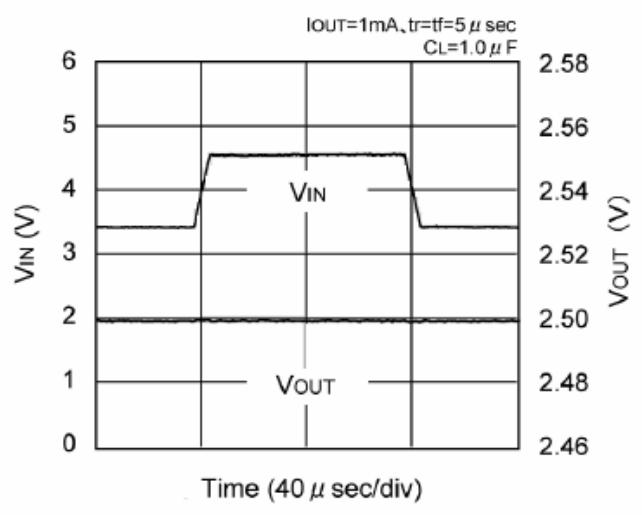


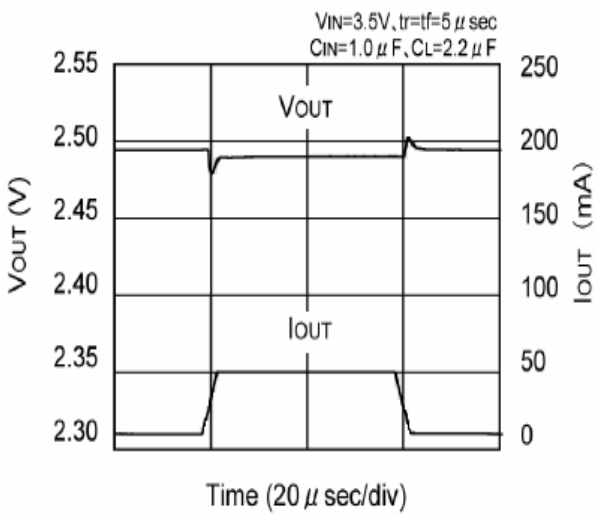


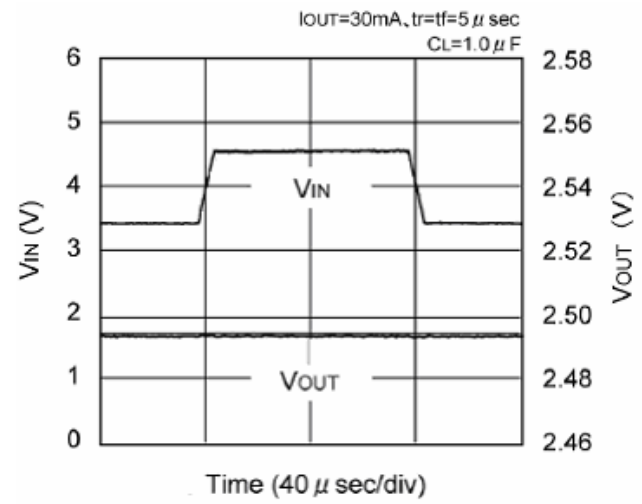


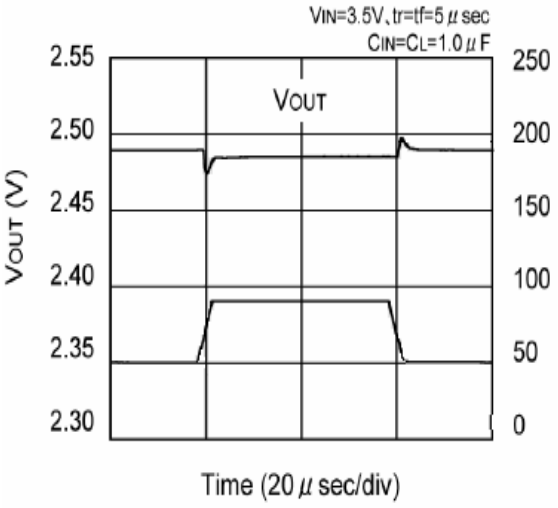


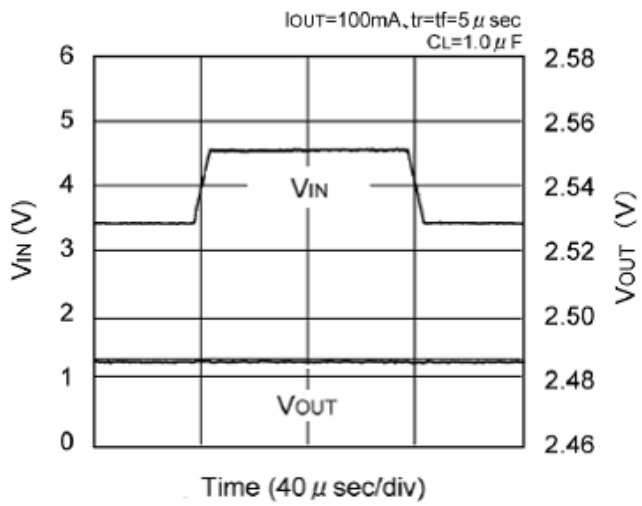


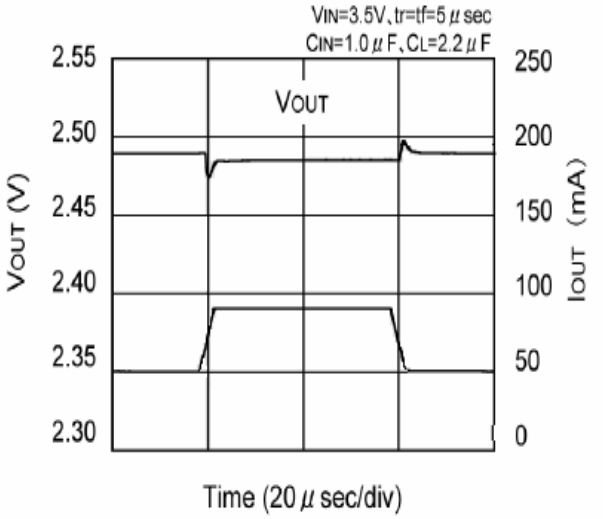

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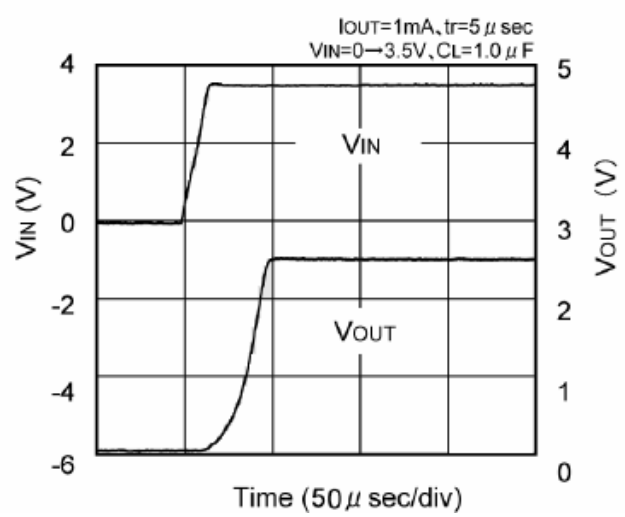
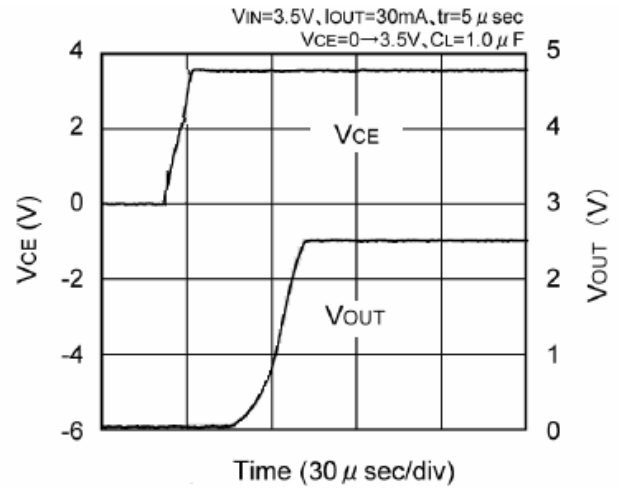
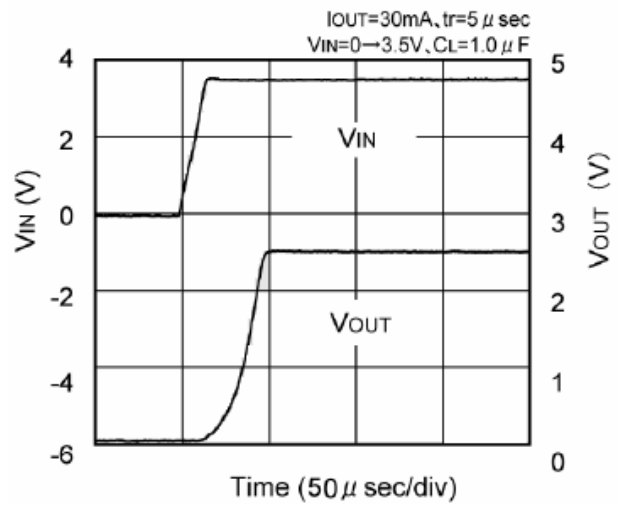
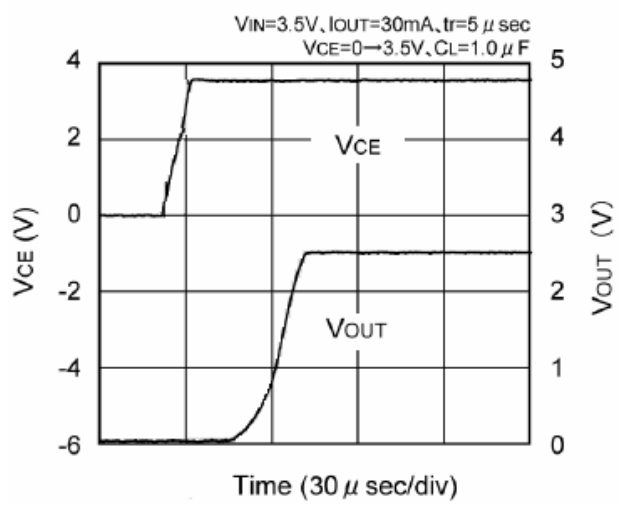
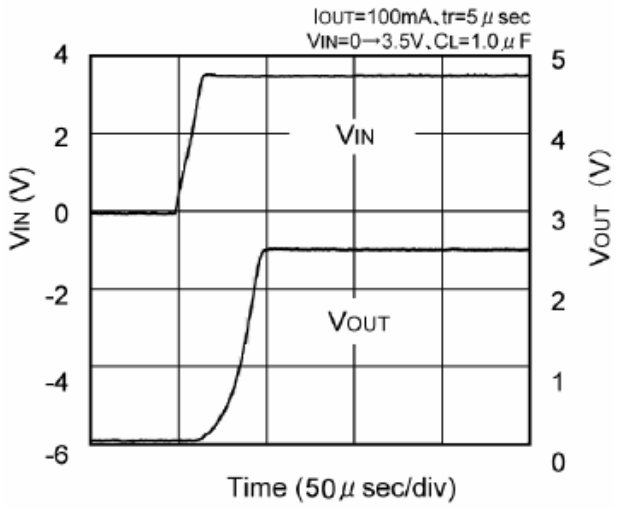
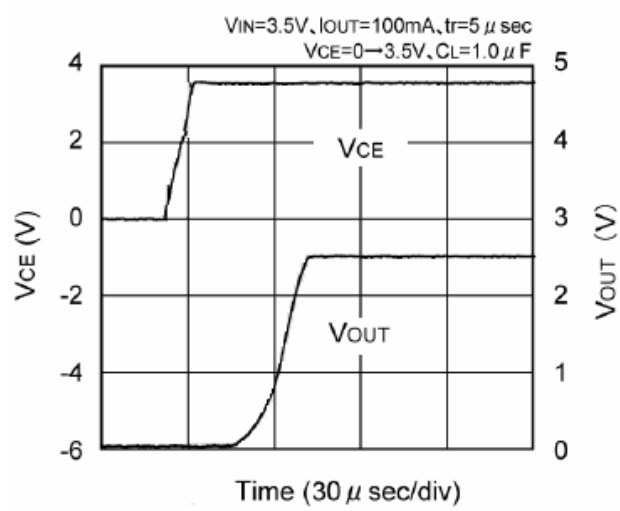


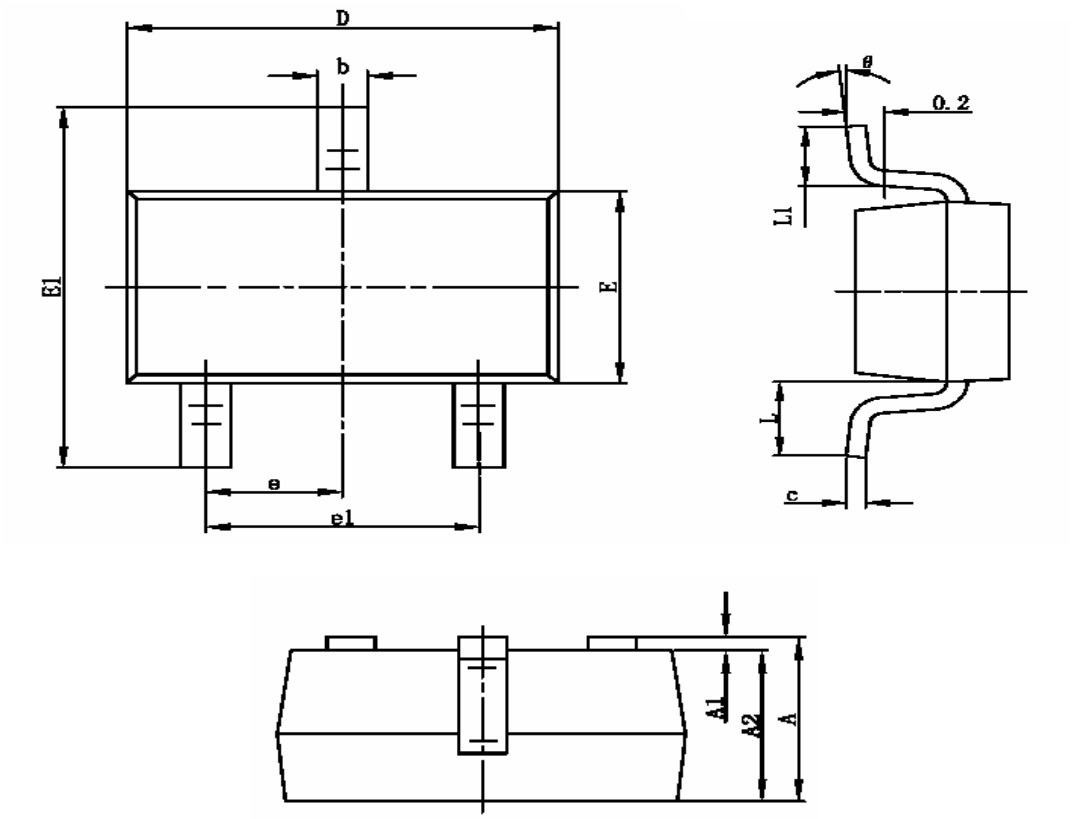



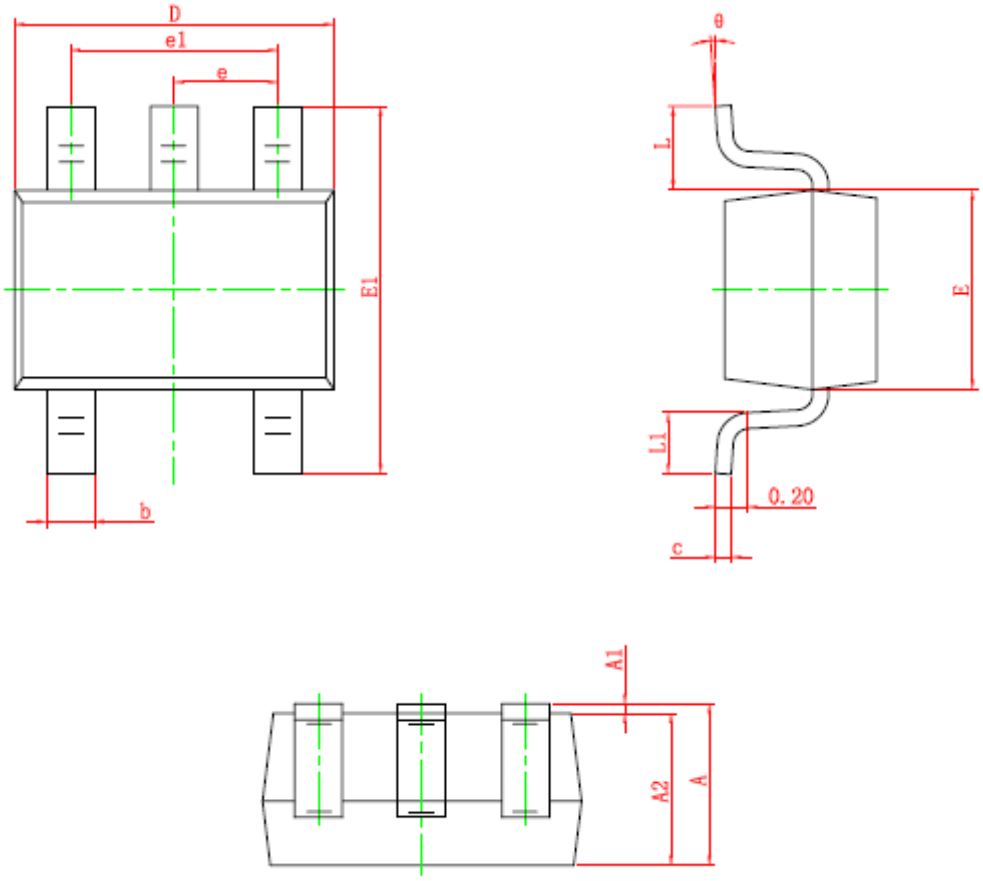



**SOT-23-3L PACKAGE OUTLINE**




| 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° |

**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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