# ACE575U

**350mA, Micropower, Very Low Dropout Linear Regulator**

## Description

The ACE575U series are very low dropout linear regulators designed for low power portable applications. Typical output noise is only 195μVRMS and maximum dropout is just 110mV(Typ) at the load current of 150mA.The internal P-channel MOSFET pass transistor requires no base current, allowing the device to draw only 190μA during normal operation at the maximum load current of 350mA.With a shutdown control pin, the ACE575U consumes less than 1μA current in shutdown mode.

Other features include high output voltage accuracy, excellent transient response, under voltage lockout, stability with ultralow ESR ceramic capacitors as small as 1μF, short-circuit and thermal overload protection and output current limiting.

The ACE575U series are available in low profile SOT23-5 and DFN2*2-6L packages.

## Features

- Very Low Dropout: 150mV (Max) at 150mA
- Maximum Input Voltage: 6.0V
- ±2% Voltage Accuracy at $V_{OUT}$>1.5V
- ±30mV Voltage Accuracy at $V_{OUT}$≤1.5V
- Fast Transient Response
- Under Voltage Lockout
- Adjustable Output Voltage of ACE575U from 1.0V to 5.0V
- Output Current Limit
- Stable with 1μF Output Capacitor
- Short-Circuit and Thermal Overload Protection
- Low Profile SOT23-5 and DFN2*2-6LPackages

## Application

- Bluetooth/802.11 Cards
- PDAs and Notebook Computers
- Portable Instruments and Battery-Powered Systems
- Cellular Phones

## Absolute Maximum Ratings (Note 1)

| Symbol | Parameter | | Value | Units |
|---|---|---|---|---|
| $V_{IN}$ | Supply Voltage on IN Pin | | -0.3 to 7.5 | V |
| $V_{\overline{SHDN}}$ | Voltage on $\overline{SHDN}$ Pin | | -0.3 to 7.5 | V |
| $V_{FB}$ | Voltage on FB Pin | | -0.3 to 7.5 | V |
| $V_{OUT}$ | Voltage on OUT Pin | | -0.3 to 7.5 | V |
| | Output Short-Circuit Duration | | Indefinite | |
| $\theta_{JA}$ | Junction Thermal Resistance (Note 2) | SOT23-5 | 215 | °C/W |
| | | DFN2*2-6L | 110 | |
| $T_J$ | Operating Junction Temperature (Note 3, 4) | | -40 to 125 | °C |
| $T_{STG}$ | Storage Temperature Range | | -65 to 150 | °C |
| $T_L$ | Lead Temperature for Soldering 10 Seconds | | +00 | °C |

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

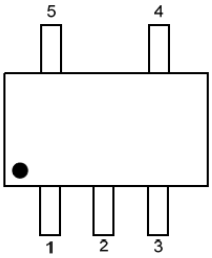
Note 2: The maximum allowable power dissipation of any $T_A$ (ambient temperature) is $P_{D(max)}=(T_{J(max)}–T_A)/\theta_{JA}$. Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into thermal shutdown.

Note 3: The ACE575U is tested and specified under pulse load conditions such that $T_J \approx T_A$. Specifications over the -40°C to 125°C operating junction temperature range are assured by design, characterization and correlation with statistical process controls.

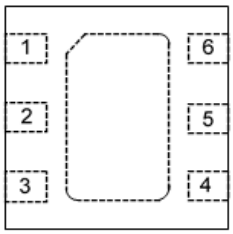
Note 4: This IC includes overtemperature protection that is intended to protect the device during momentary overload conditions. Junction temperature will exceed 125°C when overtemperature protection is active. Continuous operation above the specified maximum operating junction temperature may impair device reliability.

## Packaging Type

SOT-23-5




DFN2*2-6L




## Pin Configuration

| SOT-23-5 | | DFN2*2-6L | | Symbol | Function |
|---|---|---|---|---|---|
| Fixed $V_{OUT}$ | Adjustable $V_{OUT}$ | Fixed $V_{OUT}$ | Adjustable $V_{OUT}$ | | |
| 1 | 1 | 3 | 3 | IN | Power Supply |
| 2 | 2 | 2 | 2 | GND | Ground |
| 3 | 3 | 1 | 1 | $\overline{SHDN}$ | Shutdown Input: Low=Shutdown LDO |
| 4 | | 5、6 | 5 | NC | Not Connected |
| 5 | 5 | 4 | 4 | OUT | Voltage Regulated Output |
| | 4 | | 6 | FB | Output Voltage Feedback |

## Ordering information

ACE575UXX XX + H

- Halogen - free
- Pb - free
- BN: SOT-23-5
  MN: DFN2*2-6L
- Output Voltage：1.0V/1.1V/…/4.0V / Default： Adjustable Version

## Typical Application

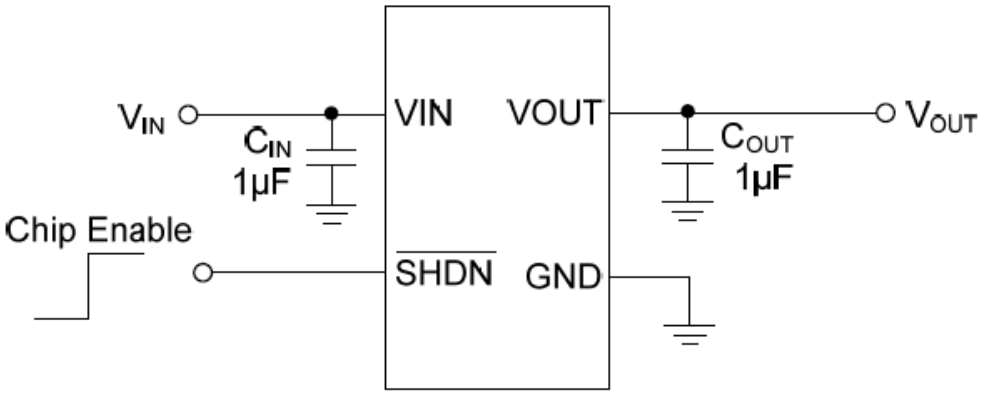



Figure 1. ACE575UXX Fixed $V_{OUT}$ Typical Application Circuit

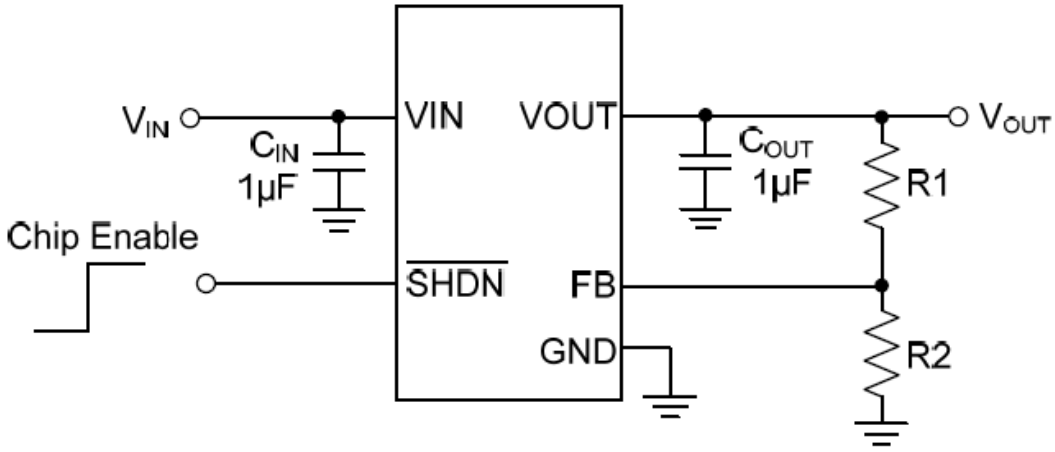



Figure 2. ACE575U Adjustable $V_{OUT}$ Typical Application Circuit

### ACE575U Output Voltage Setting

The output voltage of the ACE575U adjustable regulator is programmed using an external resistor divider as shown in Figure 2. The output voltage is calculated using:

$$V_{OUT} = V_{FB}\left(1+\frac{R1}{R2}\right)$$

Where: $V_{FB}$=1.00V (Typ) (the internal reference voltage)

Resistors R1 and R2 should be chosen for approximately 3-5µA divider current. Lower value resistors can be used but offer no inherent advantage and waste more power. Higher values should be avoided, as leakage currents at FB increase the output voltage error. The recommended design procedure is to choose R2=200kΩ to set the divider current at 5µA and then calculate R1 using:

$$R1 = \left(\frac{V_{OUT}}{V_{FB}} - 1\right) \times R2$$

Where: $V_{FB}$=1.00V (Typ).

## Electrical Characteristics

$V_{\overline{SHDN}}$ =$V_{IN}$=$V_{OUT}$+1V, $C_{IN}$=$C_{OUT}$=1.0μF, $T_A$=25°C, unless noted.

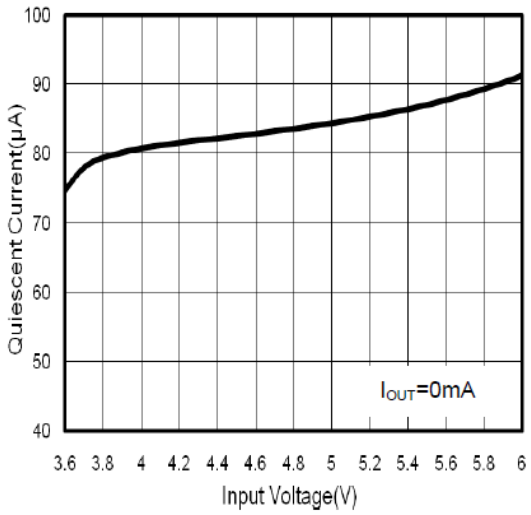
| Symbol | Parameter | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{IN}$ | Input Voltage Range | | | 2.5 | | 6.0 | V |
| $V_{UVLO}$ | Input Under Voltage Lockout | $V_{IN}$ Falling | | 1.8 | | 2.4 | V |
| $I_Q$ | Operating Quiescent Current | $V_{IN}$=4.3V, $I_{OUT}$=0mA | | | 90 | 130 | μA |
| | | $V_{IN}$=4.3V, $I_{OUT}$=350mA | | | 190 | 300 | |
| $I_{\overline{SHDN}}$ | Shutdown Leakage Current | | | | | 1 | μA |
| $I_{OUT}$ | Output Current | | | 350 | | | mA |
| $V_{FB}$ | Feedback Reference Voltage | $V_{IN}$=2.5V to 6.0V | | 0.98 | 1.00 | 1.02 | V |
| | Output Voltage Accuracy | 0mA≤$I_{OUT}$≤350 mA | $V_{OUT}$>1.5V | -2 | | 2 | % |
| | | | $V_{OUT}$≤1.5V | -30 | | 30 | mV |
| $\Delta V_{DO}$ (Note) | Dropout Voltage | $I_{OUT}$=150mA | | | 110 | 150 | mV |
| $I_{LIMIT}$ | Output Current Limit | $V_{IN}$≥2.5V | | 550 | | | mA |
| t | Startup Time Response | $R_L$=68Ω, $C_{OUT}$=1μF | | | 44 | | μs |
| $V_{IL}$ | $\overline{SHDN}$ Input Low Voltage | $V_{IN}$=6.0V | | | | 0.4 | V |
| $V_{IH}$ | $\overline{SHDN}$ Input High Voltage | $V_{IN}$=6.0V | | 2.0 | | | V |
| | $\overline{SHDN}$ Input Current | $\overline{SHDN}$ =$V_{IN}$ or GND | | -1 | | 1 | μA |
| $T_{SHDN}$ | Thermal-Shutdown Temperature | | | | 160 | | °C |
| $\Delta T_{SHDN}$ | Thermal-Shutdown Hysteresis | | | | 20 | | °C |
| | Line Regulation | $V_{OUT}$+1V≤$V_{IN}$≤$V_{OUT}$+2V, $V_{IN}$≥2.5V $I_{OUT}$=10mA | | | 0.09 | | %/V |
| | Load Regulation | $V_{IN}$=$V_{OUT}$+1V, $V_{IN}$≥2.5V 1mA≤$I_{OUT}$≤150mA | | | 0.2 | | % |
| | Output Voltage Noise | 10Hz to 100kHz $C_{IN}$=1μF, $V_{OUT}$=3.3V, $I_{OUT}$=150mA | | | 195 | | μVRMS |
| PSRR | Power Supply Ripple Rejection | $V_{IN}$=$V_{OUT}$+1V $I_{OUT}$=100mA | f=100Hz | | 63 | | dB |
| | | | f=1kHz | | 55 | | |
| | | | f=10kHz | | 40 | | |

Note : $\Delta V_{DO}$ just defined for device with $V_{OUT}$≥2.5V.

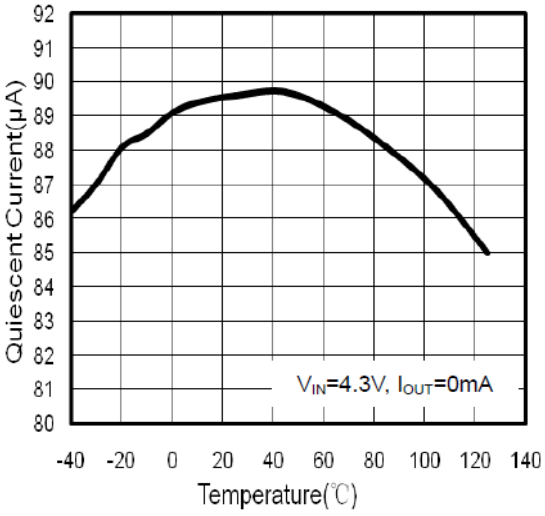
## Typical Performance Characteristics

(Shown for 3.3V Output Option)

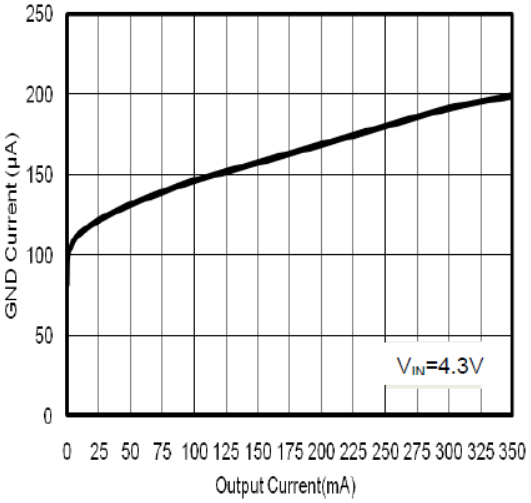
**Quiescent Current vs. Input Voltage**



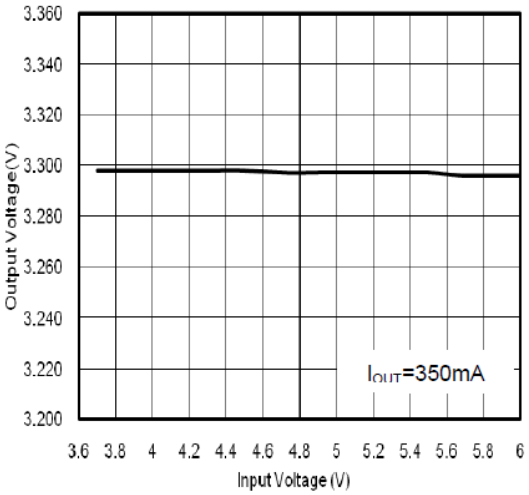

**Quiescent Current vs. Temperature**



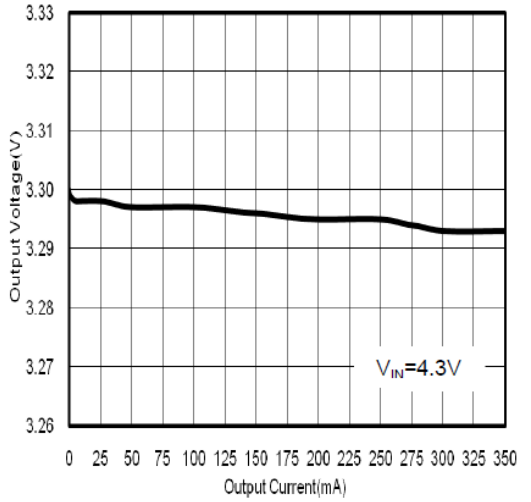

**GND Current vs. Output Current**



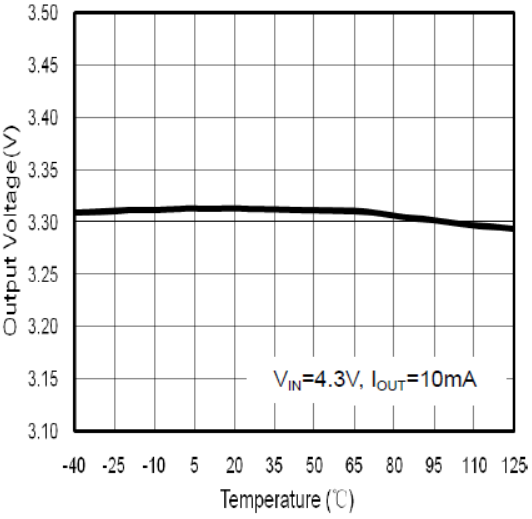

**Output Voltage vs. Input Voltage**



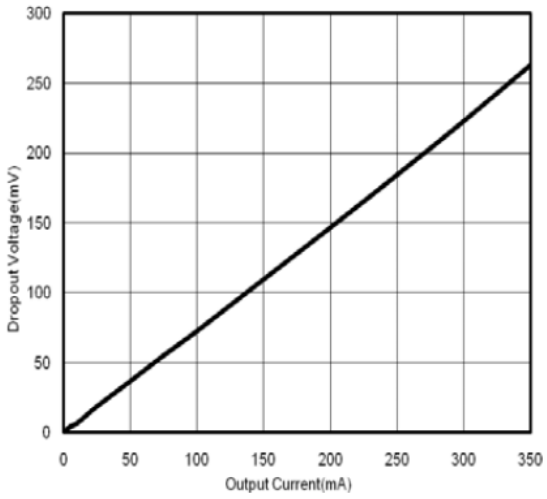

**Output Voltage vs. Output Current**



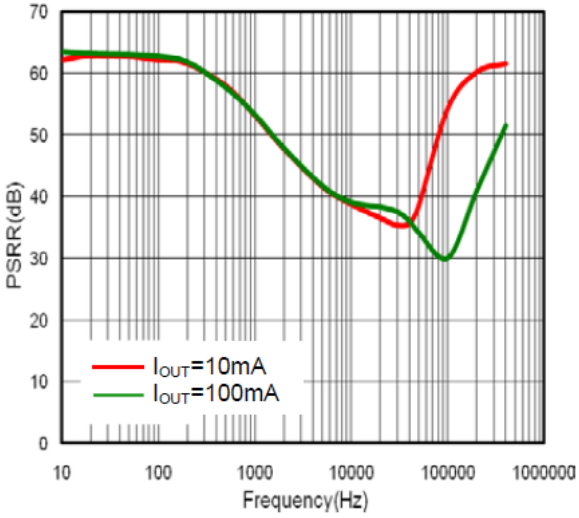

**Output Voltage vs. Temperature**



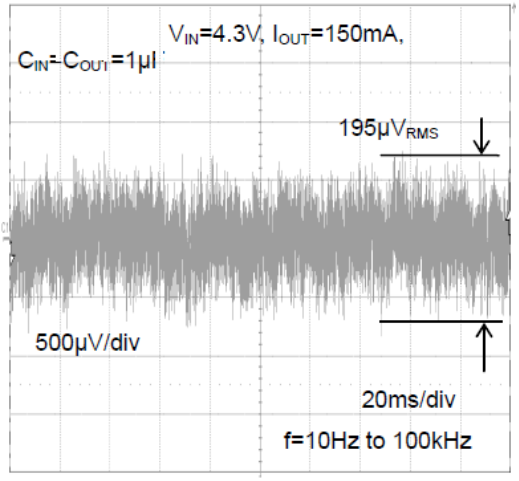
### Dropout Voltage vs. Output Current



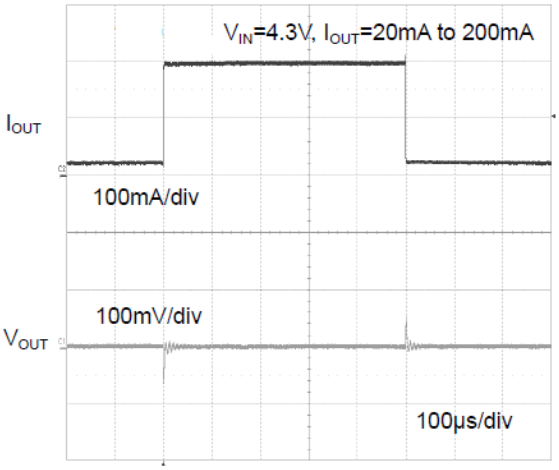

### PSRR vs. Frequency



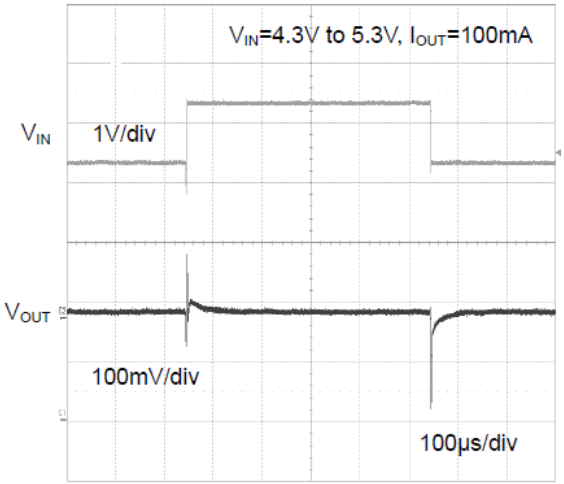

### Noise



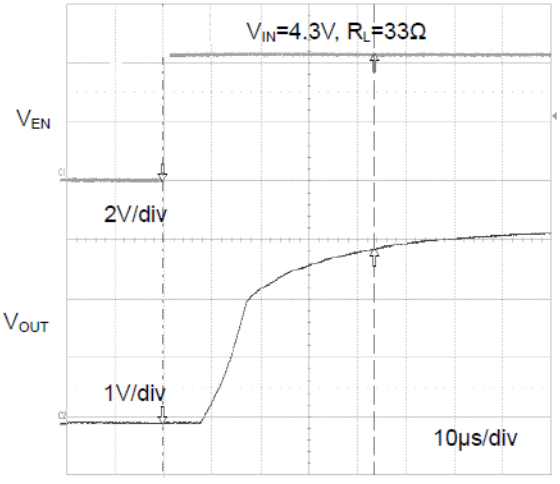

### Load Transient Response




### Line Transient Response

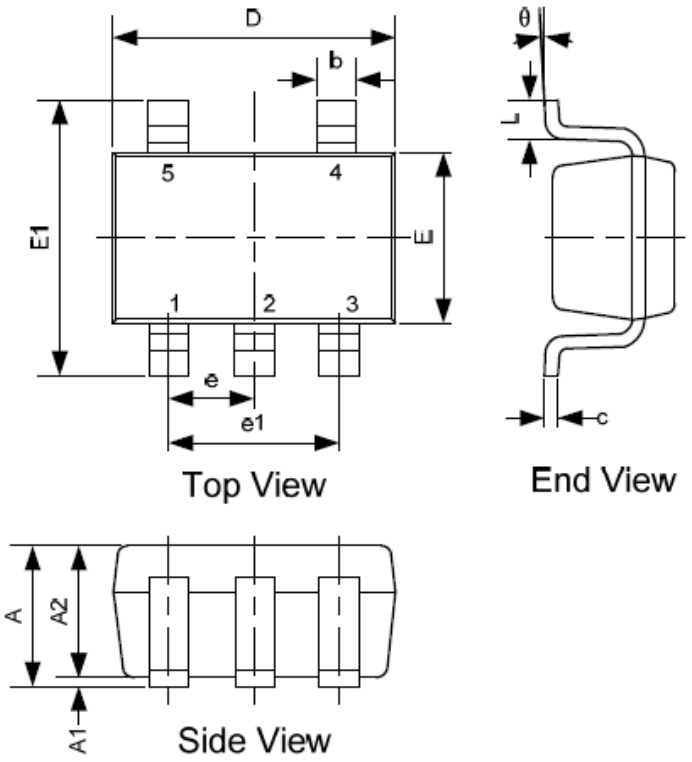



### Startup Waveform



## Packing Information

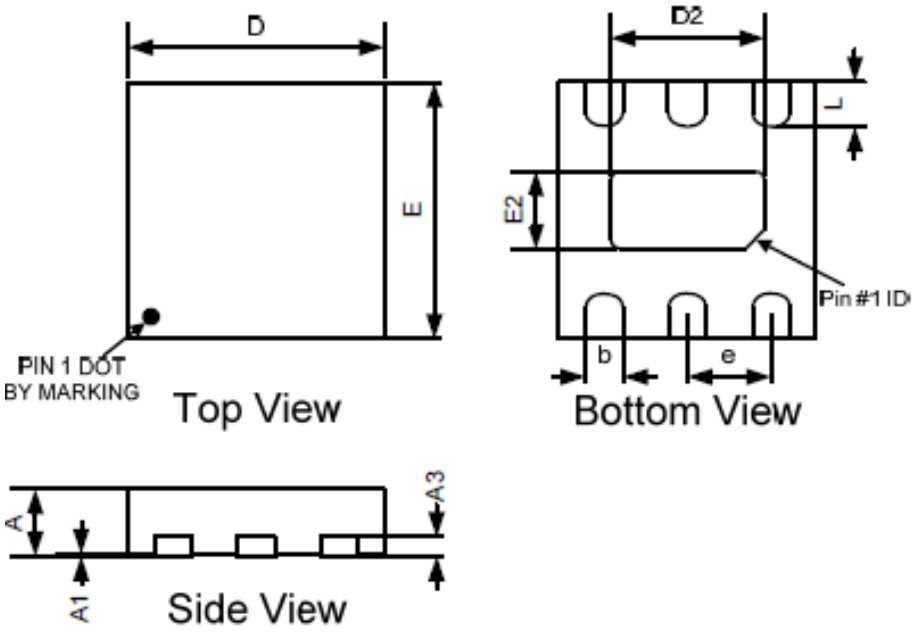
### SOT-23-5




| Symbol | Millimeters | | | Inches | | |
|---|---|---|---|---|---|---|
| | Min | Typ | Max | Min | Typ | Max |
| A | 1.013 | 1.15 | 1.40 | 0.040 | 0.045 | 0.055 |
| A1 | 0.00 | 0.05 | 0.10 | 0.000 | 0.002 | 0.004 |
| A2 | 1.00 | 1.10 | 1.30 | 0.039 | 0.043 | 0.051 |
| b | 0.30 | | 0.50 | 0.012 | | 0.020 |
| c | 0.10 | 0.15 | 0.20 | 0.004 | 0.006 | 0.008 |
| D | 2.82 | | 3.10 | 0.111 | | 0.122 |
| E | 1.50 | 1.60 | 1.70 | 0.059 | 0.063 | 0.067 |
| E1 | 0.95REF | | | 0.037REF | | |
| e | 1.90REF | | | 0.075REF | | |
| e1 | 0.30 | | 0.60 | 0.012 | | 0.024 |
| L | 0° | | 8° | 0° | | 8° |

## Packing Information

### DFN2*2-6L




| Symbol | Millimeters | | | Inches | | |
|---|---|---|---|---|---|---|
| | Min | Typ | Max | Min | Typ | Max |
| A | 0.55 | | 0.80 | 0.022 | | 0.031 |
| A1 | 0.00 | | 0.05 | 0.000 | | 0.002 |
| A3 | 0.20REF | | | 0.008REF | | |
| b | 0.25 | 0.30 | 0.35 | 0.010 | 0.012 | 0.014 |
| D | 1.924 | 2.00 | 2.076 | 0.076 | 0.079 | 0.082 |
| D2 | 1.35 | | 1.75 | 0.053 | | 0.069 |
| E | 1.924 | 2.00 | 2.076 | 0.076 | 0.079 | 0.082 |
| E2 | 0.65 | | 1.06 | 0.026 | | 0.042 |
| e | 0.65BSC | | | 0.026BSC | | |
| L | 0.224 | | 0.45 | 0.009 | | 0.018 |

Notes

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.