Low Power,Low Dropout,RF-Linear Regulators

GENERAL DESCRIPTION

The HT76LxxB series low-power, low-noise, low-dropout, CMOS linear voltage regulators operate from a 2.5V to 5.5V input voltage. They are the perfect choice for low voltage, low power applications. A low ground current makes this part attractive for battery operated power systems. The HT76LxxB series also offer ultra low dropout voltage to prolong battery life in portable electronics. Systems requiring a quiet voltage source, such as RF applications, will benefit from the HT76LxxB series' ultra low output noise (30μV_{RMS}) and high PSRR. An external noise bypass capacitor connected to the device's BP pin can further reduce the noise level.The output voltage is preset to voltages in the range of 1.2V to 5.0V. Other features include a 10nA logic-controlled shutdown mode, foldback current limit and thermal shutdown protection. The HT76LxxB is available in Green SOT-23-5 and SC70-5 packages. It operates over an ambient temperature range of -40℃ to +85℃.

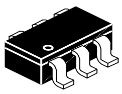
FEATURES

- Low Output Noise
- Low Dropout Voltage
- Thermal-Overload Protection
- Output Current Limit
- High PSRR (74dB at 1kHz)
- 10nA Logic-Controlled Shutdown
- Available in Multiple Output Voltage Versions
- Fixed Outputs of 1.2V, 1.5V, 1.8V, 2.5V, 2.6V, 2.8V, 2.85V, 3.0V and 3.3V
- Adjustable Output from 1.2V to 5.0V
- -40℃ to +85℃ Operating Temperature Range
- Available in Green SC70-5 and SOT-23-5 Packages

APPLICATIONS

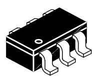
Cellular Telephones
Cordless Telephones
PCMCIA Cards
Modems
MP3 Player
Hand-Held Instruments
Palmtop Computers
Electronic Planners
Portable/Battery-Powered Equipment

PIN CONNECTIONS



SOT23-5
T SUFFIX
HT76LXXBRTZ

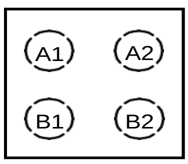
Pin 1.VIN
2.GND
3. EN
4. BP/FB
5.VOUT



SC-70-5
C SUFFIX
HT76LxxBRCZ

Pin 1.VIN
2.GND
3. EN
4. BP/FB
5.VOUT

XDFN4
X SUFFIX
HT76LXXBRXZ

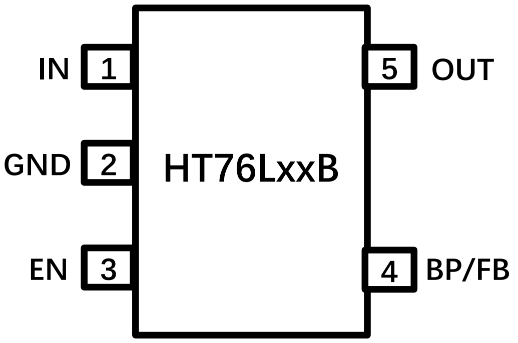


(Top View)

Pin
A1.Vout
B1.EN
B2. BP/FB
A2.VOUT

T_A = -40° to 125°C for all packages

PIN CONFIGURATIONS(TOP VIEW)



NOTES:

1.The location of pin 1 on the RExx is determined by orienting the package marking as shown.

2. “xx” is the output voltage code. (For Example: when the output voltage is 1.8V, it is expressed as 18.)

NOTE:

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ABSOLUTE MAXIMUM RATINGS

IN to GND...-0.3V to 6V
Output Short-Circuit Duration...................Infinite
EN to GND.. -0.3V to VIN
OUT, BP/FB to GND.............-0.3V to (VIN + 0.3V)
Power Dissipation, PD @ TA = 25℃
SOT-23-5..0.4W
SC70-5 ....0.3W
Package Thermal Resistance
SOT-23-5,θ_{JA}...260℃/W
SC70-5,θ_{JA}...330℃/W
Operating Temperature Range..-40℃ to +85℃
Junction Temperature.................................. 150℃
Storage Temperature Range....-65℃ to +150℃
Lead Temperature (Soldering, 10s).............260℃
ESD Susceptibility
HBM..2000V
MM.. 200V

PIN DESCRIPTION

PIN SC70-5/SOT-23-5	NAME	FUNCTION
1	IN	Regulator Input. Supply voltage can range from 2.5V to 5.5V. Bypass with a 1μF capacitor to GND.
2	GND	Ground.
3	EN	Shutdown Input. A logic low reduces the supply current to 10nA. Connect to IN for normal operation.
4	BP	Reference-Noise Bypass (fixed voltage version only). Bypass with a low-leakage 0.01μF ceramic capacitor for reduced noise at the output.
	FB	Adjustable Voltage Version Only. This is used to set the output voltage of the device.
5	OUT	Regulator Output.

ELECTRICAL CHARACTERISTICS

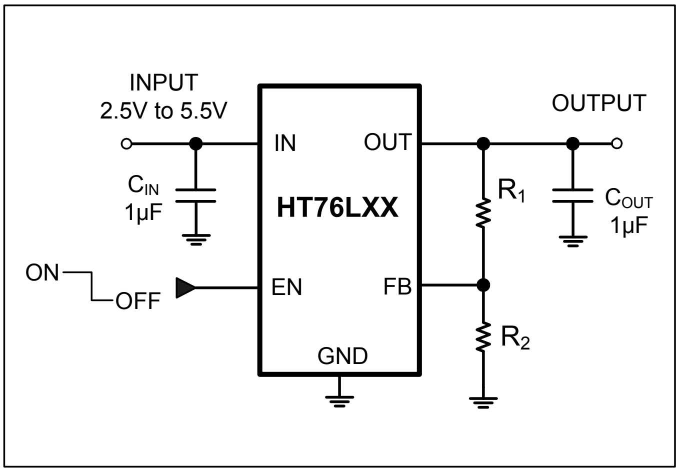
($V_{IN} = V_{OUT\ (NOMINAL)} + 0.5V$ [1], Full = -40℃ to +85℃, unless otherwise noted.)

<table>
<tr><th>PARAMETER</th><th>SYMBOL</th><th colspan="2">CONDITIONS</th><th>TEMP</th><th>MIN</th><th>TYP</th><th>MAX</th><th>UNITS</th></tr>
<tr><td>Input Voltage</td><td>V_{IN}</td><td colspan="2"></td><td>+25℃</td><td>2.5</td><td></td><td>5.5</td><td>V</td></tr>
<tr><td>Output Voltage Accuracy [1]</td><td></td><td colspan="2">I_{OUT} = 0.1mA</td><td>+25℃</td><td>-2.5</td><td></td><td>2.5</td><td>%</td></tr>
<tr><td rowspan="3">Maximum Output Current [1]</td><td rowspan="3"></td><td colspan="2">SOT-23-5</td><td rowspan="3">+25℃</td><td>300</td><td></td><td></td><td rowspan="3">mA</td></tr>
<tr><td colspan="2">V_{OUT} = 1.2V, 1.5V, 1.8V, SC70-5</td><td>150</td><td></td><td></td></tr>
<tr><td colspan="2">V_{OUT} > 2V, SC70-5</td><td>250</td><td></td><td></td></tr>
<tr><td>Current Limit [1]</td><td>I_{LIM}</td><td colspan="2"></td><td>+25℃</td><td>310</td><td>500</td><td></td><td>mA</td></tr>
<tr><td>Ground Pin Current</td><td>I_Q</td><td colspan="2">No load, EN = 2V</td><td>+25℃</td><td></td><td>100</td><td>200</td><td>μA</td></tr>
<tr><td rowspan="2">Dropout Voltage [2]</td><td rowspan="2"></td><td colspan="2">I_{OUT} = 1mA</td><td rowspan="2">+25℃</td><td></td><td>0.9</td><td></td><td rowspan="2">mV</td></tr>
<tr><td colspan="2">I_{OUT} = 300mA</td><td></td><td>270</td><td>400</td></tr>
<tr><td>Line Regulation [1]</td><td>ΔV_{LNR}</td><td colspan="2">V_{IN} = 2.5V or (V_{OUT} + 0.5V) to 5.5V, I_{OUT} = 1mA</td><td>+25℃</td><td></td><td>0.02</td><td>0.05</td><td>%/V</td></tr>
<tr><td rowspan="2">Load Regulation</td><td rowspan="2">ΔV_{LDR}</td><td colspan="2">I_{OUT} =0.1mA to 300mA, C_{OUT} = 1μF, V_{OUT} > 2V</td><td rowspan="2">+25℃</td><td></td><td>0.002</td><td>0.005</td><td rowspan="2">%/mA</td></tr>
<tr><td colspan="2">I_{OUT} =0.1mA to 300mA, C_{OUT} = 1μF, V_{OUT} ≤ 2V</td><td></td><td>0.004</td><td>0.008</td></tr>
<tr><td>Output Voltage Noise</td><td>e_n</td><td colspan="2">f = 10Hz to 100kHz, C_{BP} = 0.01μF, C_{OUT} = 10μF</td><td>+25℃</td><td></td><td>30</td><td></td><td>μV_{RMS}</td></tr>
<tr><td rowspan="2">Power Supply Rejection Ratio</td><td rowspan="2">PSRR</td><td rowspan="2">C_{BP} = 0.1μF, I_{LOAD} = 50mA, C_{OUT} = 1μF, V_{IN} = V_{OUT}+1V</td><td>f = 217Hz</td><td>+25℃</td><td></td><td>77</td><td></td><td>dB</td></tr>
<tr><td>f = 1kHz</td><td>+25℃</td><td></td><td>74</td><td></td><td>dB</td></tr>
<tr><td colspan="9">SHUTDOWN [3]</td></tr>
<tr><td rowspan="2">EN Input Threshold</td><td>V_{IH}</td><td colspan="2" rowspan="2">V_{IN} = 2.5V to 5.5V, V_{EN} = -0.3V to V_{IN}</td><td>Full</td><td>1.5</td><td></td><td></td><td rowspan="2">V</td></tr>
<tr><td>V_{IL}</td><td>Full</td><td></td><td></td><td>0.3</td></tr>
<tr><td rowspan="2">EN Input Bias Current</td><td rowspan="2">$I_{B(SHDN)}$</td><td colspan="2" rowspan="2">EN = 0V or EN = 5.5V</td><td>+25℃</td><td></td><td>0.01</td><td>1</td><td rowspan="2">μA</td></tr>
<tr><td>Full</td><td></td><td>0.01</td><td></td></tr>
<tr><td>Shutdown Supply Current</td><td>$I_{Q(SHDN)}$</td><td colspan="2">EN = 0.4V</td><td>Full</td><td></td><td>0.01</td><td></td><td>μA</td></tr>
<tr><td>Shutdown Exit Delay [4]</td><td></td><td colspan="2">C_{BP} = 0.01μF, C_{OUT} = 1μF, No Load</td><td>+25℃</td><td></td><td>30</td><td></td><td>μs</td></tr>
<tr><td colspan="9">THERMAL PROTECTION</td></tr>
<tr><td>Thermal Shutdown Temperature</td><td>T_{SHDN}</td><td colspan="2"></td><td></td><td></td><td>150</td><td></td><td>℃</td></tr>
<tr><td>Thermal Shutdown Hysteresis</td><td>ΔT_{SHDN}</td><td colspan="2"></td><td></td><td></td><td>15</td><td></td><td>℃</td></tr>
</table>

NOTES:

1. $V_{IN} = V_{OUT\ (NOMINAL)} + 0.5V$ or 2.5V, whichever is greater.
2. The dropout voltage is defined as $V_{IN} - V_{OUT}$, when V_{OUT} is 100mV below the value of V_{OUT} for $V_{IN} = V_{OUT} + 0.5V$.
   (Only applicable for V_{OUT} = +2.5V to +5.0V.)
3. V_{EN} = -0.3V to V_{IN}
4. Time needed for V_{OUT} to reach 90% of final value.

TYPICAL APPLICATION CIRCUIT

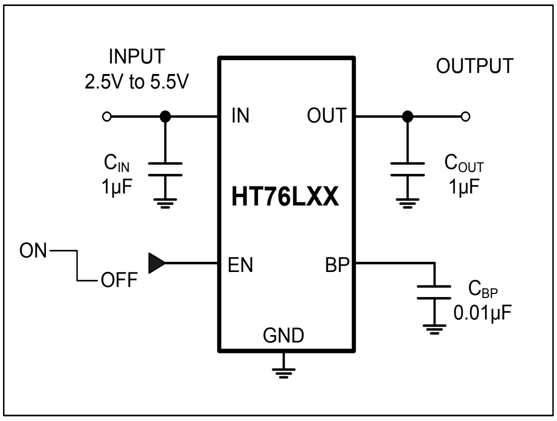


Standard 1% Resistor Values for Common Output Voltages of Adjustable Voltage Version

V_{OUT} (V)	R_1 (kΩ)	R_2 (kΩ)
1.2	0	63.4
1.5	10.5	42.2
1.8	34	63.4
2.8	84.5	63.4
3.0	63.4	42.2
3.3	73.2	42.2
3.6	84.5	42.2
4.2	105	42.2

NOTE: $V_{OUT} = (R_1 + R_2)/ R_2 \times 1.207$

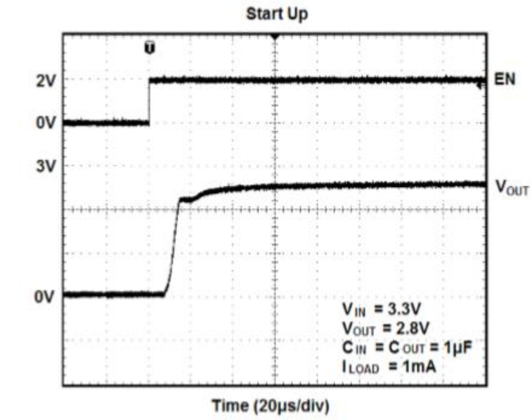
TYPICAL APPLICATION CIRCUIT

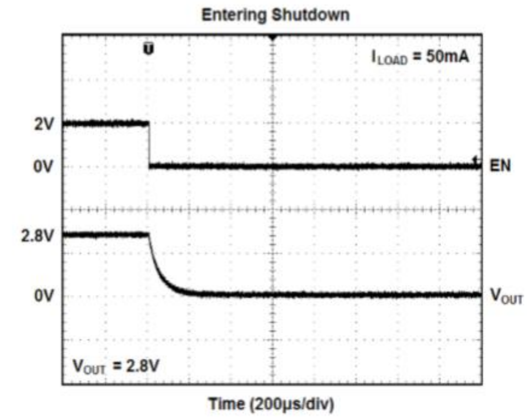


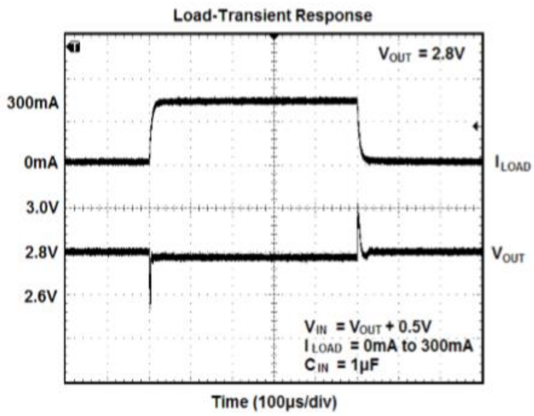
C_{BP} (nF)	Shutdown Exit Delay (μs) V_{OUT} = 2.8V, V_{IN} = 3.3V, EN = 0V to 2V			PSRR (dB) at 217Hz V_{OUT} = 2.8V, V_{IN} = V_{OUT} + 1V		
	I_{LOAD} = 50mA	I_{LOAD} = 150mA	I_{LOAD} = 300mA	I_{LOAD} = 50mA	I_{LOAD} = 150mA	I_{LOAD} = 300mA
None	21.5	21.5	21	71.1	64.4	55.0
0.001	21.5	21.5	22	71.1	64.6	55.1
0.01	22	22.5	22.5	71.6	64.7	55.2
0.1	22.5	23	23	71.7	64.8	55.4
1	25	27	28.5	72.1	65.2	55.9
10	30	35	39	74.3	68.8	59.6
100	265	280	300	77.0	73.7	63.1

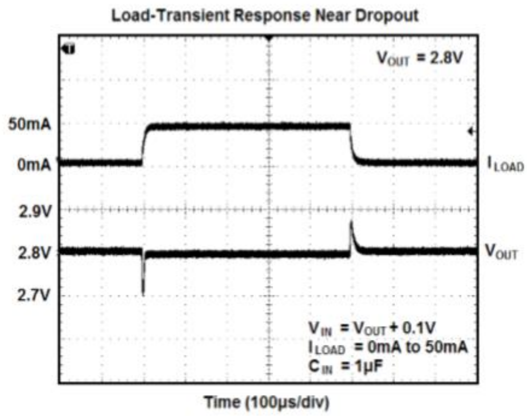
TYPICAL PERFORMANCE CHARACTERISTICS

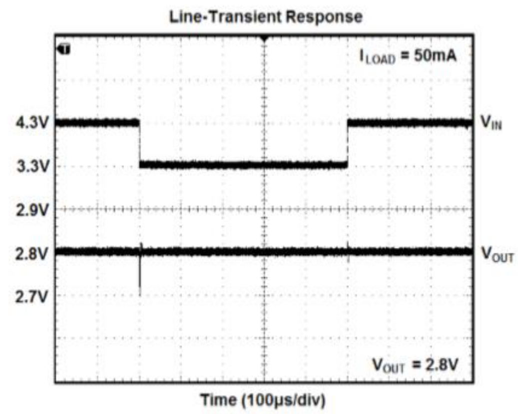
$V_{IN}=V_{OUT(NOMINAL)}+0.5V$ or 2.5V(whichever is greater),$C_{IN}=1\mu F$, $C_{OUT}=1\mu F$, $C_{BP}=0.01\mu F$,$T_A=+25℃$, unless otherwise noted.

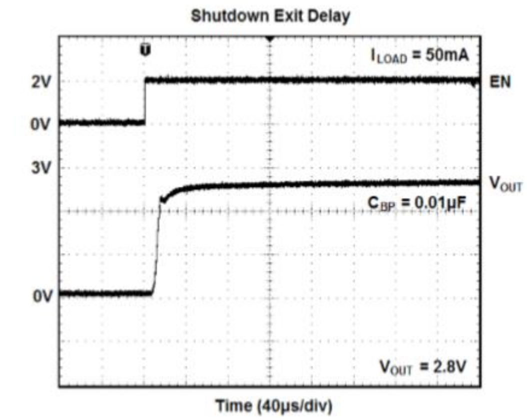






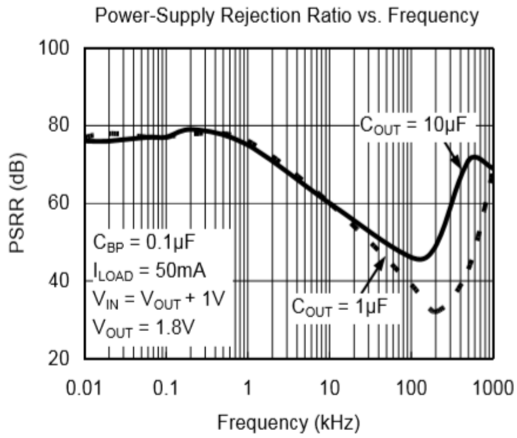


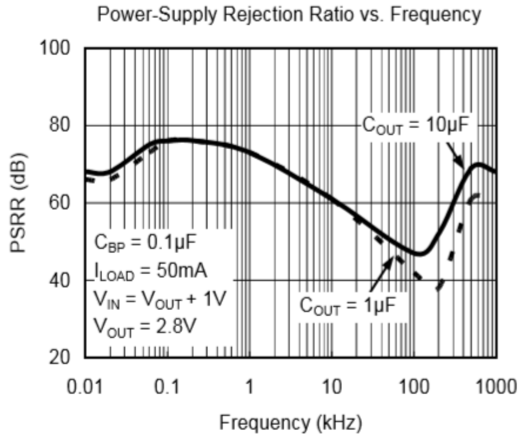


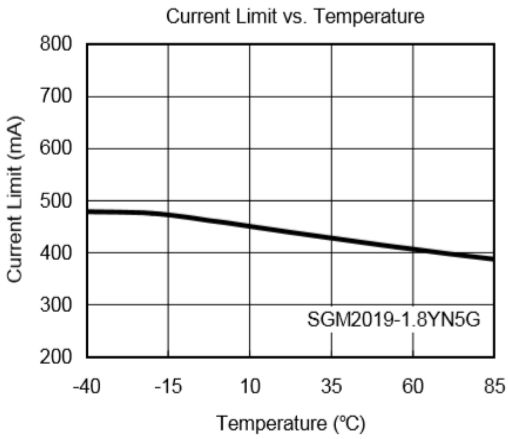


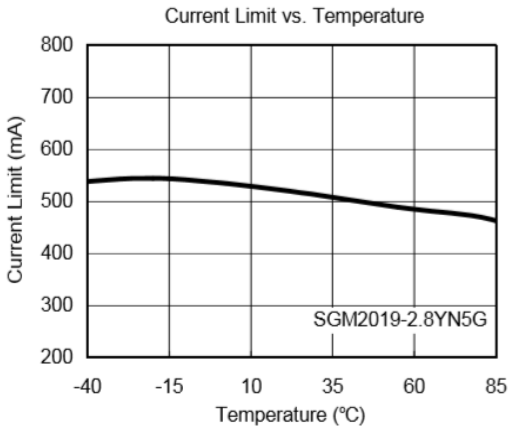
TYPICAL PERFORMANCE CHARACTERISTICS

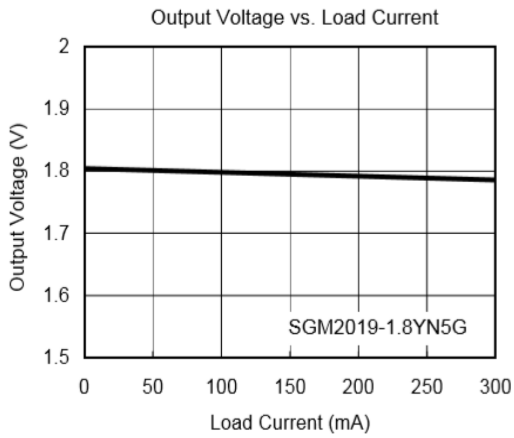
V_{IN}=$V_{OUT(NOMINAL)}$+0.5V or 2.5V(whichever is greater),C_{IN}=1μF, C_{OUT}=1μF, C_{BP}=0.01μF,T_A= +25℃, unless otherwise noted.

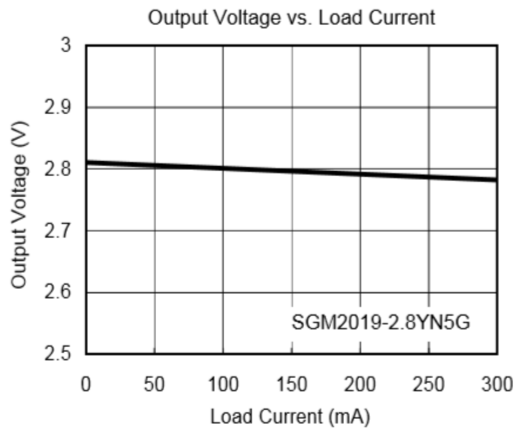












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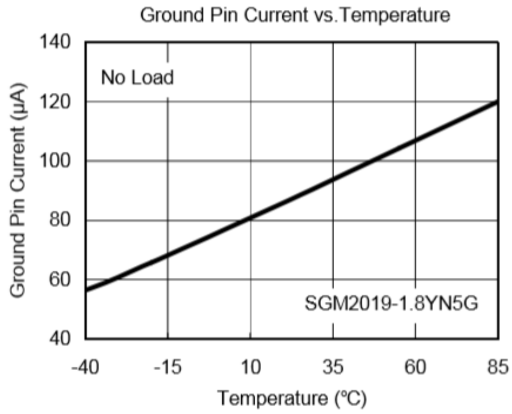
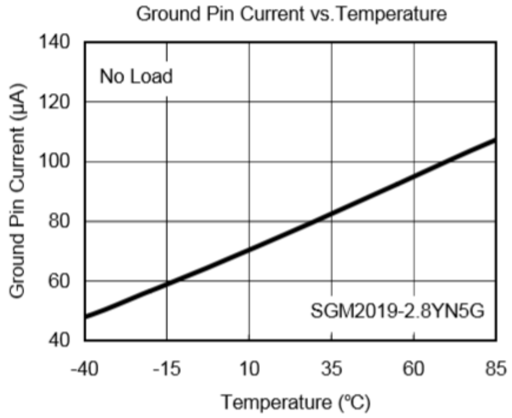
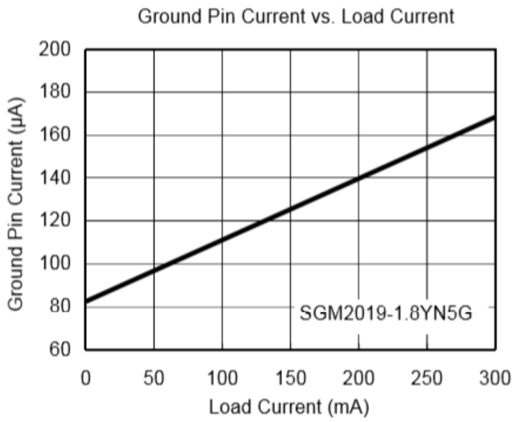
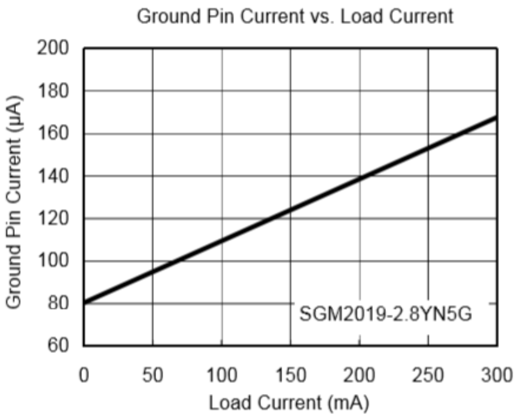
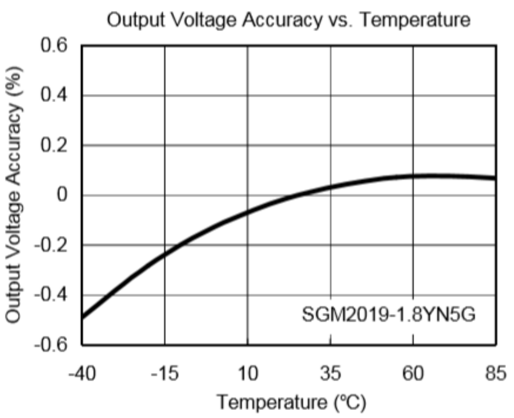
V_{IN}=$V_{OUT(NOMINAL)}$+0.5V or 2.5V(whichever is greater),C_{IN}=1μF, C_{OUT}=1μF, C_{BP}=0.01μF,T_A= +25℃, unless otherwise noted.

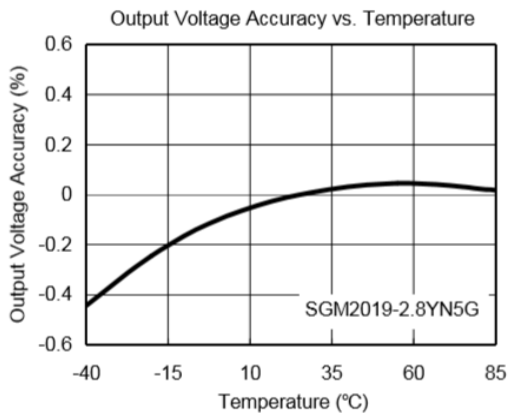












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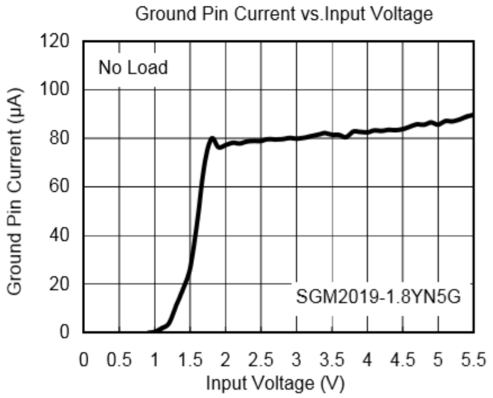

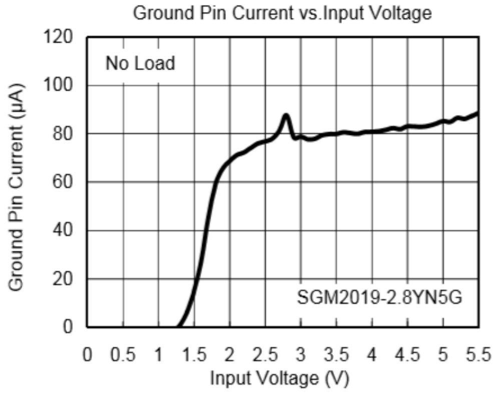

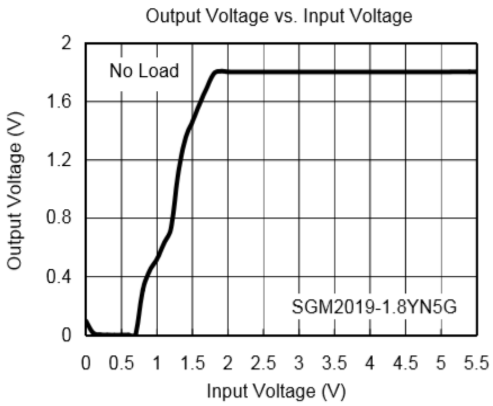

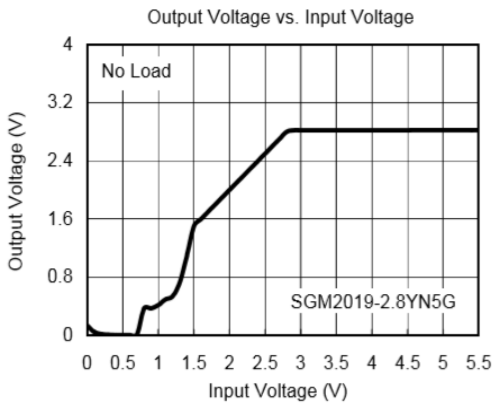

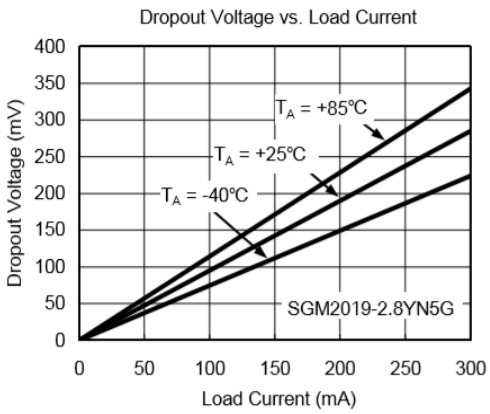

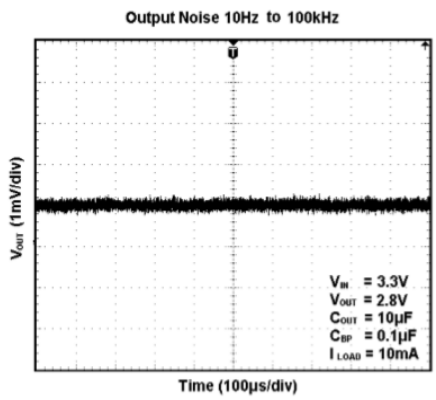

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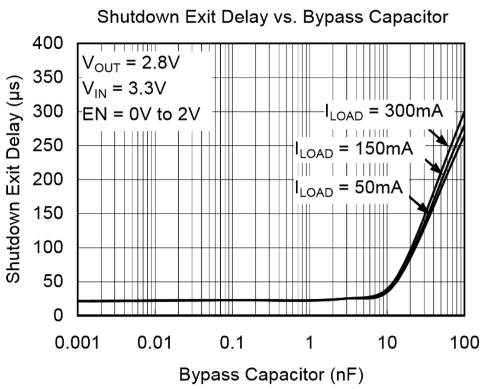
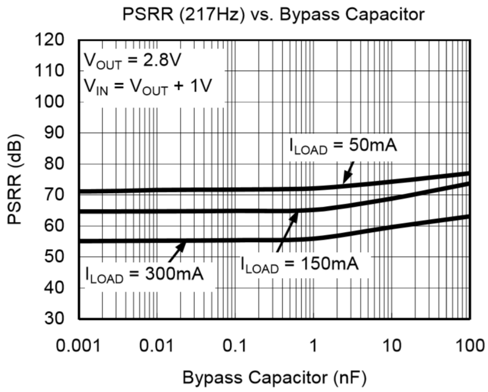
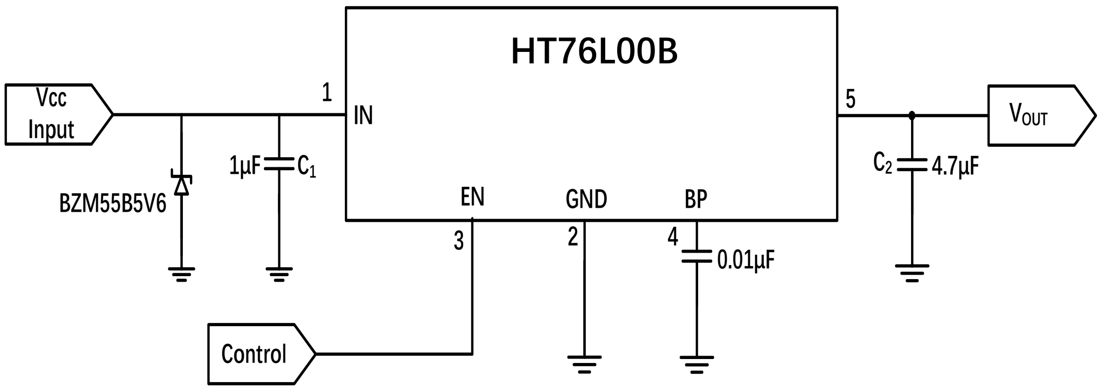




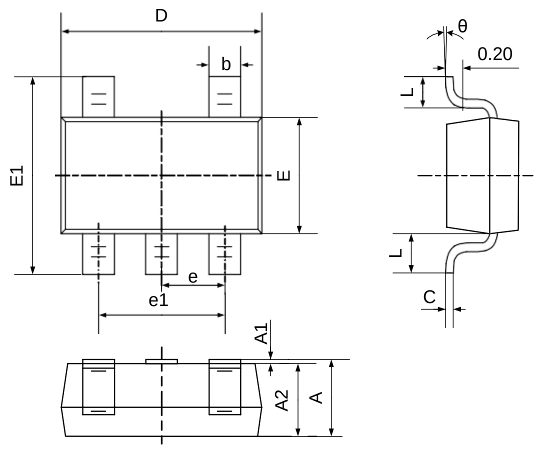
APPLICATION NOTE

When LDO is used in handheld products, attention must be paid to voltage spikes which could damage HT76LxxB. In such applications, voltage spikes will be generated at charger interface and VBUS pin of USB interface when charger adapters and USB equipments are hot-plugged. Besides this, handheld products will be tested on the production line without battery. Test engineer will apply power from the connector pin which connects with positive pole of the battery. When external power supply is turned on suddenly, the voltage spikes will be generated at the battery connector. The voltage spikes will be very high, and it always exceeds the absolute maximum input voltage (6.0V) of LDO. In order to get robust design, design engineer needs to clear up this voltage spike. Zener diode is a cheap and effective solution to eliminate such voltage spike. For example, BZM55B5V6 is a 5.6V small package Zener diode which can be used to remove voltage spikes in cell phone designs. The schematic is shown below.



PACKAGE OUTLINE DIMENSIONS

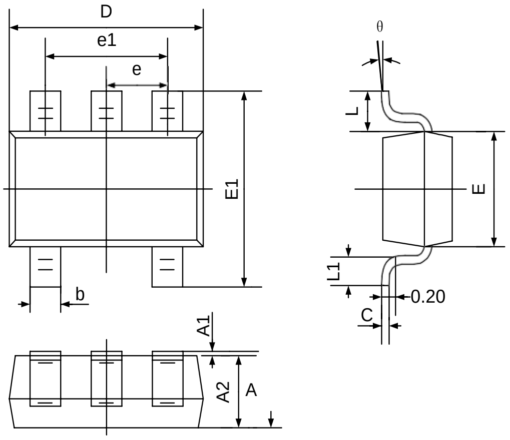
SOT23-5



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°

PACKAGE OUTLINE DIMENSIONS

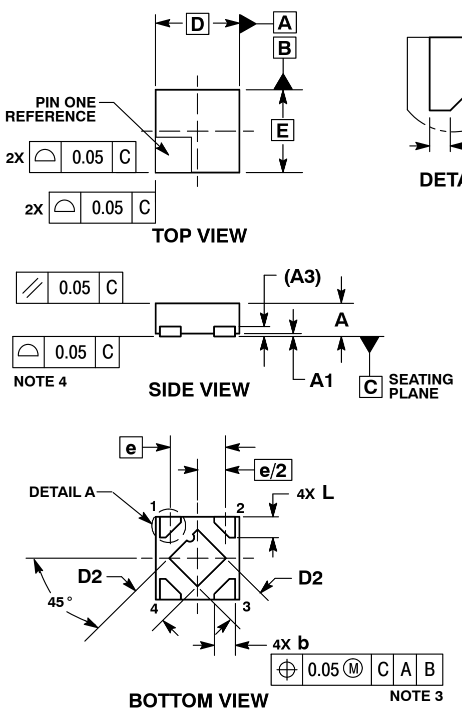
SC70-5



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	0.650TYP		0.026TYP	
e1	1.200	1.400	0.047	0.055
L	0.525REF		0.021REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

PACKAGE DIMENSIONS

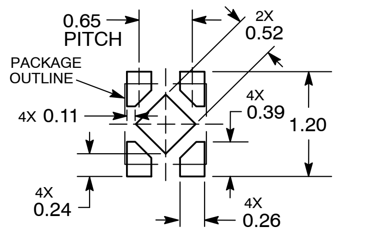
XDFN4 1.0x1.0, 0.65P
X SUFFIX



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.20 mm FROM THE TERMINAL TIPS.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.33	0.43
A1	0.00	0.05
A3	0.10 REF	
b	0.15	0.25
b2	0.02	0.12
D	1.00 BSC	
D2	0.43	0.53
E	1.00 BSC	
e	0.65 BSC	
L	0.20	0.30
L2	0.07	0.17

RECOMMENDED MOUNTING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.