

Low Power, Low Dropout, 500mA RF Linear Regulators

FEATURES

- Low Dropout Voltage
- Thermal-Overload Protection
- Output Current Limit
- 10nA Logic-Controlled Shutdown
- 20 μ A Low Supply Current
- 1.7V to 7.5V Input Voltage Range
- 500mA Output Current
- -40°C to +85°C Operating Temperature Range
- Available in Green UTDFN-1x1-4, SOT23-5, SOT353(SC70-5) Package

APPLICATIONS

- Cellular Telephones
- Camera Modules
- Modems
- HiFi Audio Radio Transceivers
- PLL/Synthesizer, Clocking
- Medium-Current, Noise-Sensitive Applications

DESCRIPTION

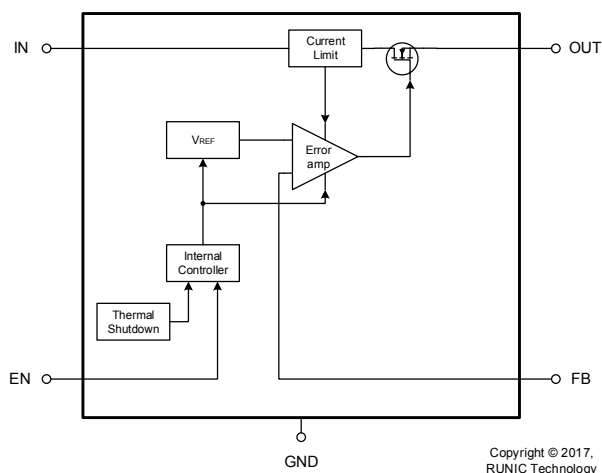
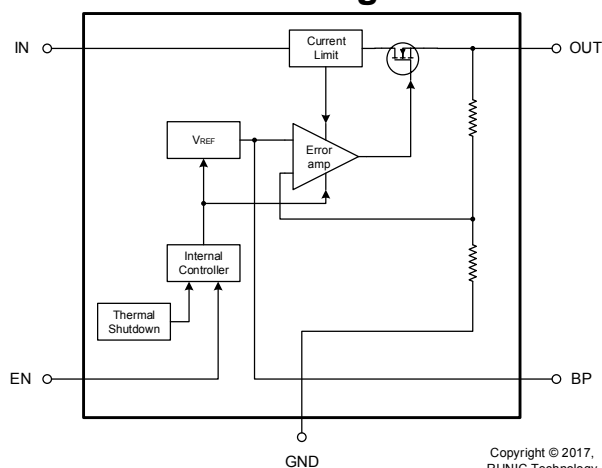
The HM1137 series low-power, low-dropout, CMOS LDO operate from 1.7V to 7.5V input voltage that can supply up to 500 mA of output current. Designed to meet the requirements of RF and analog circuits, the HM1137 series device provides low noise, high PSRR, low quiescent current, and low line and load transient response.

The device is designed to work with a 1- μ F input and a 1- μ F output ceramic capacitor (no separate noise bypass capacitor required). An external noise bypass capacitor connected to the device's BP pin can further reduce the noise level.

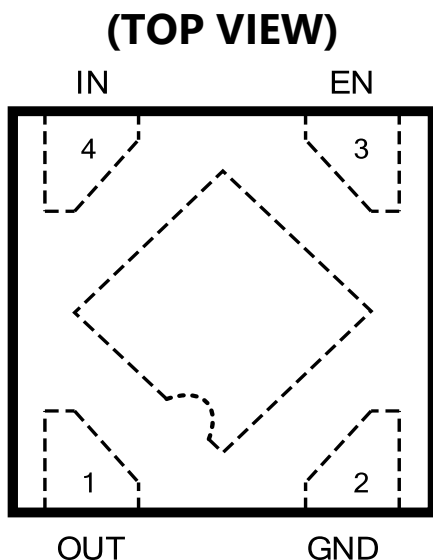
Other features include a 10nA logic-controlled shutdown mode, foldback current limit and thermal shutdown protection.

The HM1137 series is available in Green UTDFN-1x1-4, SOT23-5, SOT353(SC70-5) package. It operates over an ambient temperature range of -40°C to +85°C .

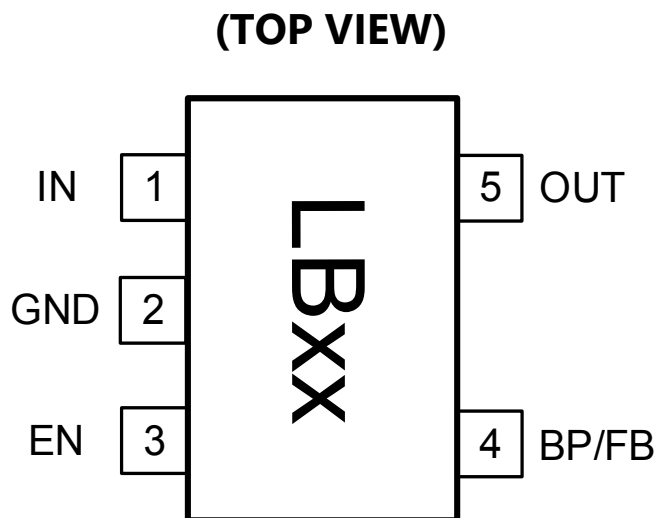
Functional Block Diagram



Pin Configuration and Functions (Top View)



UTDNFN-1×1-4



SOT23-5/SOT353(SC70-5)

UTDNFN-1×1-4		I/O	DESCRIPTION
NUMBER	NAME		
1	OUT	O	Regulator Output.
2	GND	G	Ground.
3	EN	I	Enable Input. A logic low reduces the supply current to 10nA. Connect to IN for normal operation.
4	IN	I	Regulator Input. Supply voltage can range from 1.7V to 7.5V. Bypass with a 1μF capacitor to GND.
Thermal Pad	–	–	Connect the thermal pad to a large-area ground plane. This pad is not an electrical connection to the device ground.

SOT23-5 /SOT353(SC70-5)		I/O	DESCRIPTION
NUMBER	NAME		
1	IN	I	Regulator Input. Supply voltage can range from 1.7V to 7.5V. Bypass with a 1μF capacitor to GND.
2	GND	G	Ground.
3	EN	I	Enable Input. A logic low reduces the supply current to 10nA. Connect to IN for normal operation.
4	BP	O	Reference-Noise Bypass (fixed voltage version only). Bypass with a low-leakage 0.01μF ceramic capacitor for reduced noise at the output. The capacitor is recommended to be placed very close to the pin for high PSRR.
	FB		Feedback Pin (adjustable voltage version only). This is used to set the output voltage of the device.
5	OUT	O	Regulator Output.

PACKAGE/ORDERING INFORMATION

MODEL	VOUT (V)	PIN-PACKAGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
HM1137-0.8	0.8V	UTDFN-1x1-4	HM1137B08DR	BA	Tape and Reel, 10000
HM1137-1.0	1.0V	UTDFN-1x1-4	HM1137B10DR	BB	Tape and Reel, 10000
HM1137-1.2	1.2V	UTDFN-1x1-4	HM1137B12DR	BC	Tape and Reel, 10000
HM1137-1.5	1.5V	UTDFN-1x1-4	HM1137B15DR	BD	Tape and Reel, 10000
HM1137-1.8	1.8V	UTDFN-1x1-4	HM1137B18DR	BE	Tape and Reel, 10000
HM1137-2.05	2.05V	UTDFN-1x1-4	HM1137B20DR	BF	Tape and Reel, 10000
HM1137-2.5	2.5V	UTDFN-1x1-4	HM1137B25DR	BG	Tape and Reel, 10000
HM1137-2.8	2.8V	UTDFN-1x1-4	HM1137B28DR	BH	Tape and Reel, 10000
HM1137-3.0	3.0V	UTDFN-1x1-4	HM1137B30DR	BI	Tape and Reel, 10000
HM1137-3.3	3.3V	UTDFN-1x1-4	HM1137B33DR	BJ	Tape and Reel, 10000
HM1137-3.6	3.6V	UTDFN-1x1-4	HM1137B36DR	BK	Tape and Reel, 10000
HM1137-4.0	4.0V	UTDFN-1x1-4	HM1137B40DR	BL	Tape and Reel, 10000
HM1137-5.0	5.0V	UTDFN-1x1-4	HM1137B50DR	BM	Tape and Reel, 10000
HM1137-0.8	0.8V	SOT23-5	HM1137B08MR	LB08	Tape and Reel, 3000
HM1137-1.0	1.0V	SOT23-5	HM1137B10MR	LB10	Tape and Reel, 3000
HM1137-1.2	1.2V	SOT23-5	HM1137B12MR	LB12	Tape and Reel, 3000
HM1137-1.5	1.5V	SOT23-5	HM1137B15MR	LB15	Tape and Reel, 3000
HM1137-1.8	1.8V	SOT23-5	HM1137B18MR	LB18	Tape and Reel, 3000
HM1137-2.05	2.05V	SOT23-5	HM1137B20MR	LB20	Tape and Reel, 3000
HM1137-2.5	2.5V	SOT23-5	HM1137B25MR	LB25	Tape and Reel, 3000
HM1137-2.8	2.8V	SOT23-5	HM1137B28MR	LB28	Tape and Reel, 3000
HM1137-3.0	3.0V	SOT23-5	HM1137B30MR	LB30	Tape and Reel, 3000
HM1137-3.3	3.3V	SOT23-5	HM1137B33MR	LB33	Tape and Reel, 3000
HM1137-3.6	3.6V	SOT23-5	HM1137B36MR	LB36	Tape and Reel, 3000
HM1137-4.0	4.0V	SOT23-5	HM1137B40MR	LB40	Tape and Reel, 3000
HM1137-5.0	5.0V	SOT23-5	HM1137B50MR	LB50	Tape and Reel, 3000
HM1137-0.8	0.8V	SOT353(SC70-5)	HM1137B08UR	LB08	Tape and Reel, 3000
HM1137-1.0	1.0V	SOT353(SC70-5)	HM1137B10UR	LB10	Tape and Reel, 3000
HM1137-1.2	1.2V	SOT353(SC70-5)	HM1137B12UR	LB12	Tape and Reel, 3000
HM1137-1.5	1.5V	SOT353(SC70-5)	HM1137B15UR	LB15	Tape and Reel, 3000
HM1137-1.8	1.8V	SOT353(SC70-5)	HM1137B18UR	LB18	Tape and Reel, 3000
HM1137-2.05	2.05V	SOT353(SC70-5)	HM1137B20UR	LB20	Tape and Reel, 3000
HM1137-2.5	2.5V	SOT353(SC70-5)	HM1137B25UR	LB25	Tape and Reel, 3000
HM1137-2.8	2.8V	SOT353(SC70-5)	HM1137B28UR	LB28	Tape and Reel, 3000
HM1137-3.0	3.0V	SOT353(SC70-5)	HM1137B30UR	LB30	Tape and Reel, 3000
HM1137-3.3	3.3V	SOT353(SC70-5)	HM1137B33UR	LB33	Tape and Reel, 3000
HM1137-3.6	3.6V	SOT353(SC70-5)	HM1137B36UR	LB36	Tape and Reel, 3000
HM1137-4.0	4.0V	SOT353(SC70-5)	HM1137B40UR	LB40	Tape and Reel, 3000
HM1137-5.0	5.0V	SOT353(SC70-5)	HM1137B50UR	LB50	Tape and Reel, 3000

MODEL	V _{FB} (V)	PIN- PACKAGE	ORDERING NUMBER	PACKAGE MARKING	PACKAGE OPTION
HM1137-ADJ8	0.8	SOT23-5	HM1137-ADJ8MR	LBAD8	Tape and Reel, 3000
		SOT353(SC70-5)	HM1137-ADJ8UR	LBAD8	Tape and Reel, 3000
HM1137-ADJC	1.2	SOT23-5	HM1137-ADJCMR	LBADC	Tape and Reel, 3000
		SOT353(SC70-5)	HM1137-ADJCUR	LBADC	Tape and Reel, 3000

Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) ⁽¹⁾⁽²⁾

		MIN	MAX	UNIT
V _{IN}	Input voltage	-0.3	8	V
V _{EN}	Enable input voltage	-0.3	V _{IN}	V
T _J	Junction temperature		150	°C
P _D	Continuous power dissipation ⁽³⁾	Internally Limited		W
T _{stg}	Storage temperature	-65	150	°C

- (1) 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 under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltages are with respect to the GND pin.
- (3) Internal thermal shutdown circuitry protects the device from permanent damage.

ESD Ratings

		VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human-body model (HBM)	±6000
		Machine model (MM)	±400

Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted) ⁽¹⁾

		MIN	MAX	UNIT
V _{IN}	Input supply voltage	1.7	7.5	V
V _{EN}	Enable input voltage	0	V _{IN}	V
I _{OUT}	Output current	0	500	mA
T _J	Junction temperature	-40	+85	°C

- (1) All voltages are with respect to the GND pin.

Thermal Information

	THERMAL METRIC (1)	HM1137	HM1137	HM1137	UNIT
		UTDFN-1x1-4	SOT353 (SC70-5)	SOT23-5	
		4 PINS	5 PINS	5 PINS	
R _{θJA}	Junction-to-ambient thermal resistance	144.1	268	185.6	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	137.9	171.8	104.3	°C/W
R _{θJB}	Junction-to-board thermal resistance	83.5	64.5	54.5	°C/W
ψ _{JT}	Junction-to-top characterization parameter	5.3	40.5	31.0	°C/W
ψ _{JB}	Junction-to-board characterization parameter	83.8	62.9	54.5	°C/W
R _{JC(bot)}	Junction-to-case (bottom) thermal resistance	71.8	N/A	N/A	°C/W

ELECTRICAL CHARACTERISTICS

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

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
Input Voltage	V_{IN}			$+25^{\circ}C$	1.7 ⁽¹⁾		7.5	V
Output Voltage Accuracy ⁽¹⁾		$I_{OUT} = 0.1mA$		$+25^{\circ}C$	-2.5		2.5	%
Feedback Voltage	V_{FB}	$I_{OUT} = 0.1mA$, HM1137-ADJ8		$+25^{\circ}C$	0.78	0.8	0.82	V
		$I_{OUT} = 0.1mA$, HM1137-ADJC		$+25^{\circ}C$	1.17	1.2	1.23	V
Maximum Output Current ⁽¹⁾				$+25^{\circ}C$	500			mA
Current Limit ⁽¹⁾	I_{LIM}			$+25^{\circ}C$	500	800		mA
Ground Pin Current	I_Q	No load		$+25^{\circ}C$		15	20	μA
Dropout Voltage ⁽²⁾	V_{DROP}	$I_{OUT} = 500mA$	$V_{OUT}=3.3V$	$+25^{\circ}C$		450	600	mV
Line Regulation ⁽¹⁾	ΔV_{LNR}	$V_{IN} = (V_{OUT} + 0.5V)$ to $7.5V$, $I_{OUT} = 1mA$		$+25^{\circ}C$		0.1	0.2	%/V
Load Regulation	ΔV_{OUT}	$I_{OUT} = 0.1mA$ to $500mA$, $C_{OUT} = 1\mu F$,		$+25^{\circ}C$		25	50	mV
Output Voltage Noise	e_n	$f = 10Hz$ to $100kHz$, $C_{BP} = 0.01\mu F$, $C_{OUT} = 10\mu F$, $I_{OUT}=30mA$		$+25^{\circ}C$		80		μV_{RMS}
Output Voltage Temperature Coefficient	$\frac{\Delta V_{OUT}}{\Delta T_A \times V_{OUT}}$	$I_{LOAD} = 0.1mA$		FULL		35		ppm/ $^{\circ}C$
Power Supply Rejection Ratio	PSRR	$C_{BP} = 0\mu F$, $I_{LOAD} = 30mA$, $C_{OUT} = 1\mu F$, $V_{IN} = V_{OUT}+1V$ $\Delta V_{RIPPLE}=0.2V_{P-P}$	$f = 217Hz$	$+25^{\circ}C$		72		dB
			$f = 1kHz$			70		
		$C_{BP} = 0.01\mu F$, $I_{LOAD} = 30mA$, $C_{OUT} = 1\mu F$, $V_{IN} = V_{OUT}+1V$ $\Delta V_{RIPPLE}=0.2V_{P-P}$	$f = 217Hz$	$+25^{\circ}C$		74		dB
			$f = 1kHz$			70		

SHUTDOWN

EN Input Threshold	V_{IH}	$V_{IN} = 1.7V$	Full	1.4			V
	V_{IL}		Full			0.4	
EN Input Threshold	V_{IH}	$V_{IN} = 7.5V$	Full	2.3			V
	V_{IL}		Full			0.8	
EN Input Bias Current	I_{BH}	$EN = 7.5V$	$+25^{\circ}C$		0.01	1	μA
	I_{BL}	$EN = 0V$	Full		0.01		
Shutdown Supply Current	$I_{Q(SHDN)}$	$EN = 0V$	Full		0.01	1	μA
Start-Up Time ⁽⁴⁾	t_{STR}	$C_{OUT} = 1\mu F$, No Load	$+25^{\circ}C$		180		μs

THERMAL PROTECTION

Thermal Shutdown Temperature	T_{SHDN}				140		$^{\circ}C$
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NOTES:

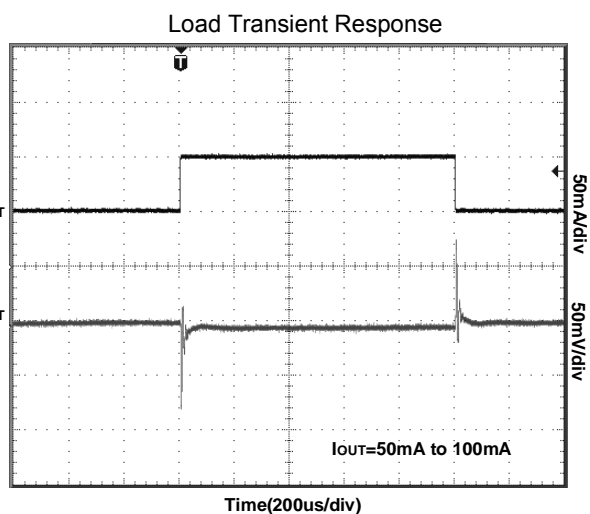
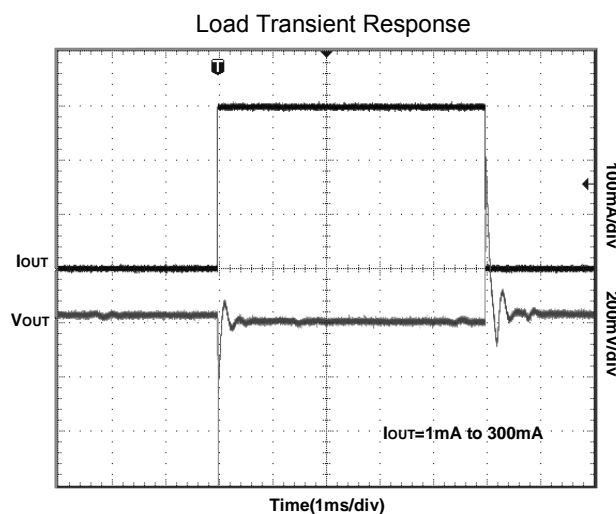
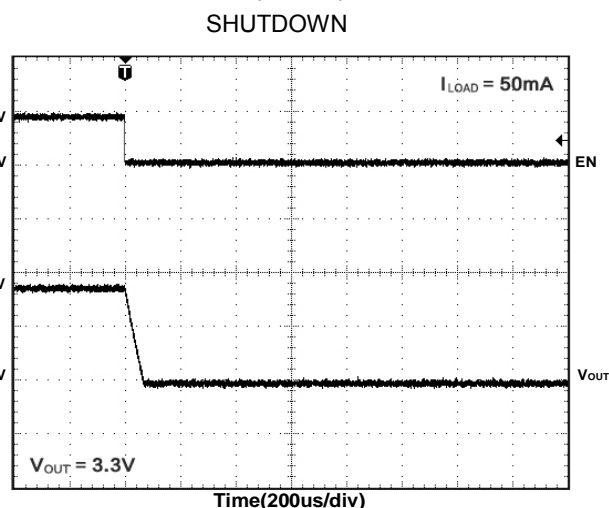
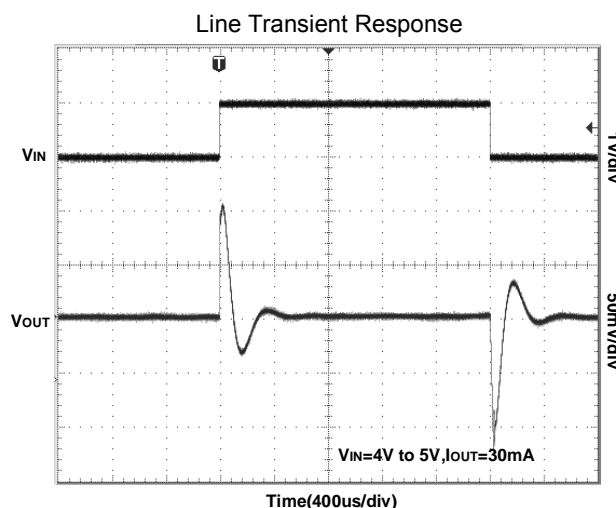
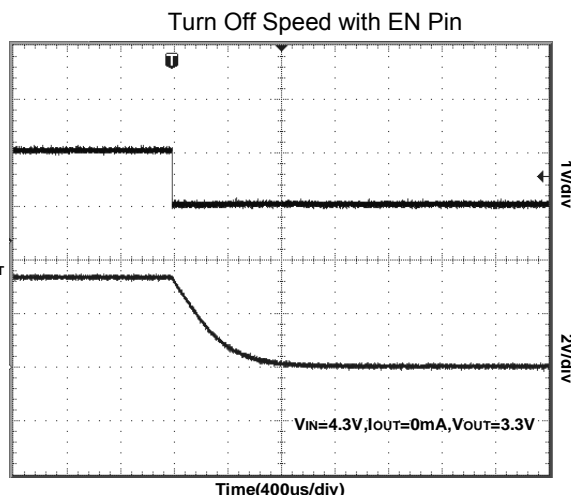
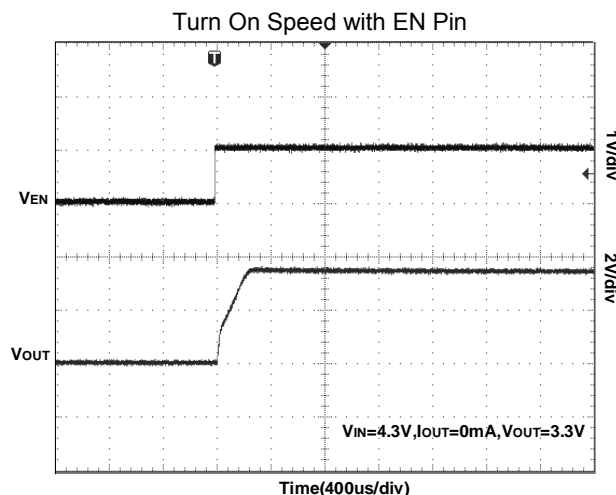
- $V_{IN} = V_{OUT(NOMINAL)} + 0.5V$ or $1.7V$, whichever is greater.
- The dropout voltage is defined as $V_{IN} - V_{OUT}$, when V_{OUT} is 100mV below the value of V_{OUT} for $V_{IN} = V_{OUT} + 0.5V$.
- Time needed for V_{OUT} to reach 90% of final value.

TYPICAL APPLICATION CIRCUIT

<p>Typical Circuit</p> <p>HM1137</p> <p>SOT23-5/SOT353(SC70-5)</p>	<p>Typical Circuit</p> <p>HM1137</p> <p>UTDFN-1x1-4</p>
<p>Typical Circuit</p> <p>HM1137-ADJ8</p> <p>SOT23-5/SOT353(SC70-5)</p>	<p>Typical Circuit</p> <p>HM1137-ADJC</p> <p>SOT23-5/SOT353(SC70-5)</p>
<p>NOTE: Choose $R_2 = 160k\Omega$ to maintain a $5\mu A$ minimum load. Calculate the value for R_1 using the following equation:</p> $R_1 = R_2 * \left(\frac{V_{OUT}}{0.8} - 1 \right)$	<p>NOTE: Choose $R_2 = 240k\Omega$ to maintain a $5\mu A$ minimum load. Calculate the value for R_1 using the following equation:</p> $R_1 = R_2 * \left(\frac{V_{OUT}}{1.2} - 1 \right)$

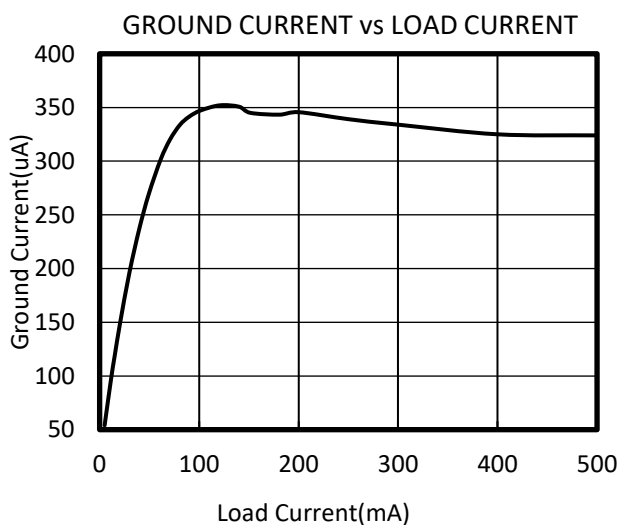
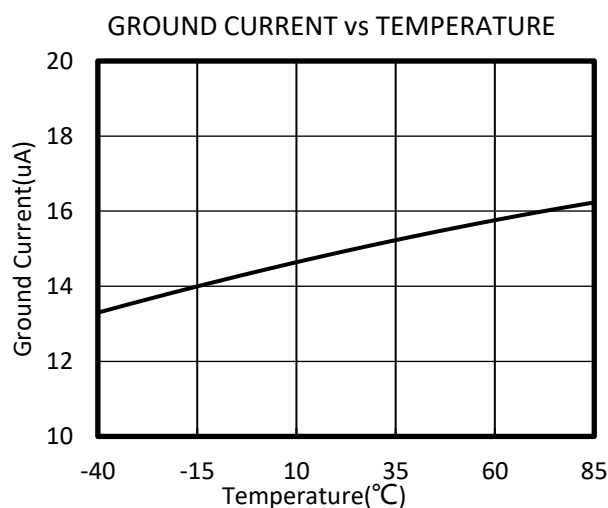
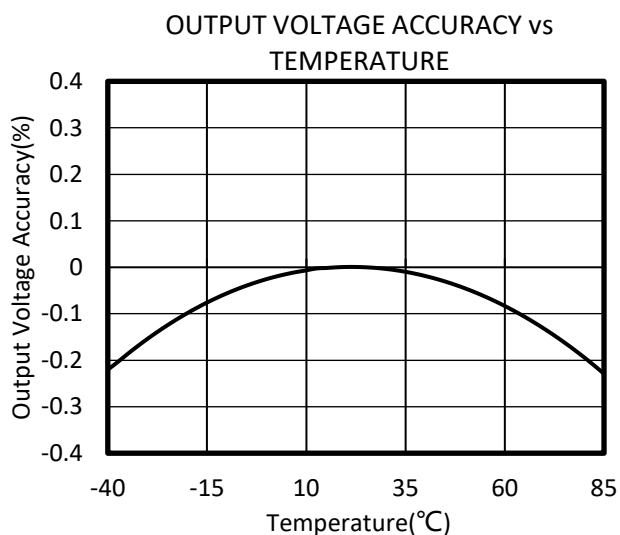
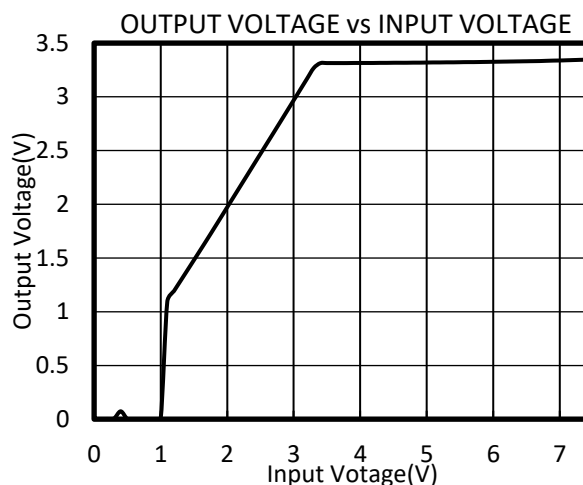
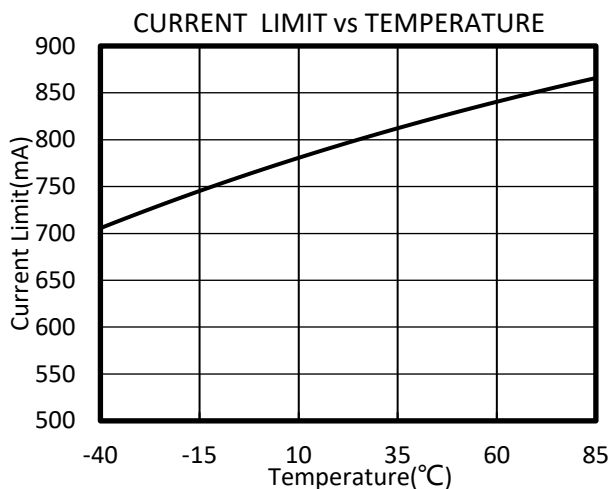
TYPICAL PERFORMANCE CHARACTERISTICS

$V_{IN} = V_{OUT (NOMINAL)} + 0.5V$, $C_{IN} = 1\mu F$, $C_{OUT} = 1\mu F$, $C_{BP} = 0\mu F$, $T_A = +25^\circ C$, unless otherwise noted.



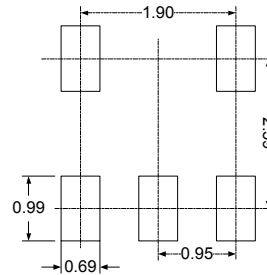
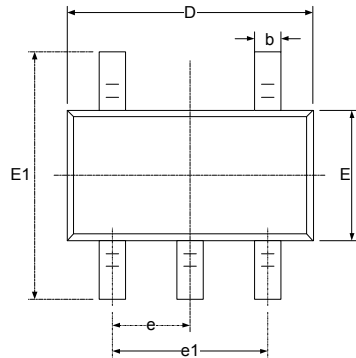
TYPICAL PERFORMANCE CHARACTERISTICS

$V_{IN} = V_{OUT (NOMINAL)} + 0.5V$, $C_{IN} = 1\mu F$, $C_{OUT} = 1\mu F$, $C_{BP} = 0.1\mu F$, $T_A = +25^\circ C$, unless otherwise noted.

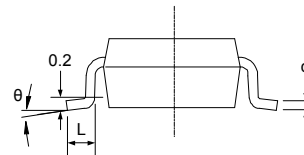
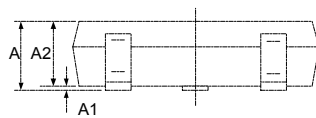


PACKAGE OUTLINE DIMENSIONS

SOT23-5

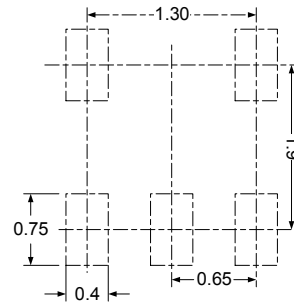
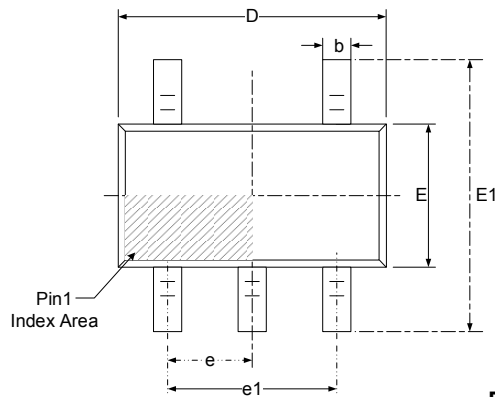


RECOMMENDED LAND PATTERN (Unit: mm)

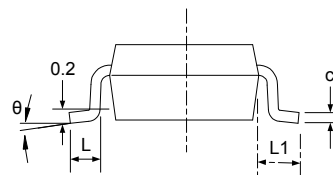
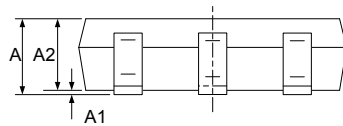


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

SOT353(SC70-5)

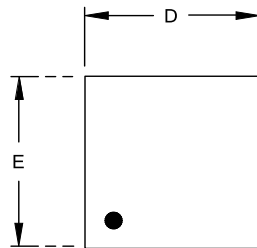


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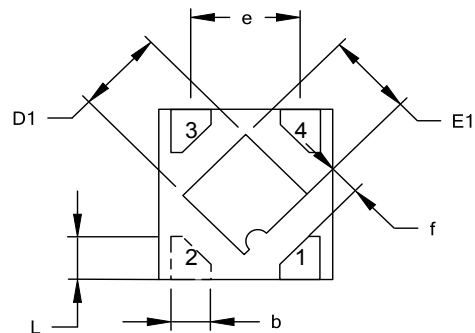


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650(BSC)		0.026(BSC)	
e1	1.300(BSC)		0.051(BSC)	
L	0.260	0.460	0.010	0.018
L1	0.525		0.021	
θ	0°	8°	0°	8°

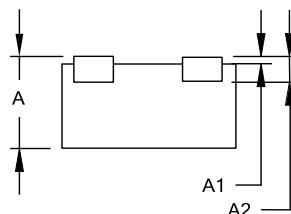
UTDFN-1x1-4



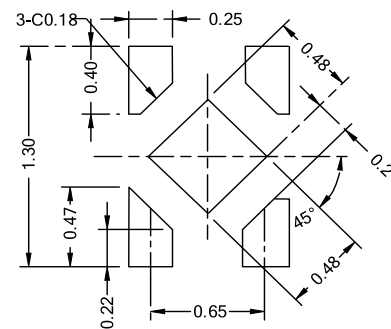
TOP VIEW



BOTTOM VIEW



SIDE VIEW



RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.340	0.370	0.400
A1	0.000	0.020	0.050
A2	0.100REF		
D	0.950	1.000	1.050
D1	0.430	0.480	0.530
E	0.950	1.000	1.050
E1	0.430	0.480	0.530
b	0.170	0.220	0.270
e	0.600	0.650	0.700
f	0.195REF		
L	0.200	0.250	0.300