Features

- Low power consumption:0.3uA (Typ.)
- Low voltage drop:
  100mV@100mA@VOUT=3.3V(Typ.)
- High Output Current：≥500mA
- Low temperature coefficient
- Integrated Short-Circuit Protection
- Over-Temperature Protection
- High input voltage (up to 7V)
- Output voltage accuracy: tolerance ±1%
- Build-in Enable/Output Current Limit circuit
- SOT23-5、SOT23-3 、SOT89-3L、DFN1x1-4L package
- PSRR=70dB@1KHz
- Support Fixed Output Voltage：
  1.0v/1.2v/1.5v/1.8v/2.5v/2.8v/3.0v/3.3v/3.6v/5.0v

Applications

- Battery-powered equipment
- Communication equipment
- Portable games
- Cameras, Video cameras

General Description

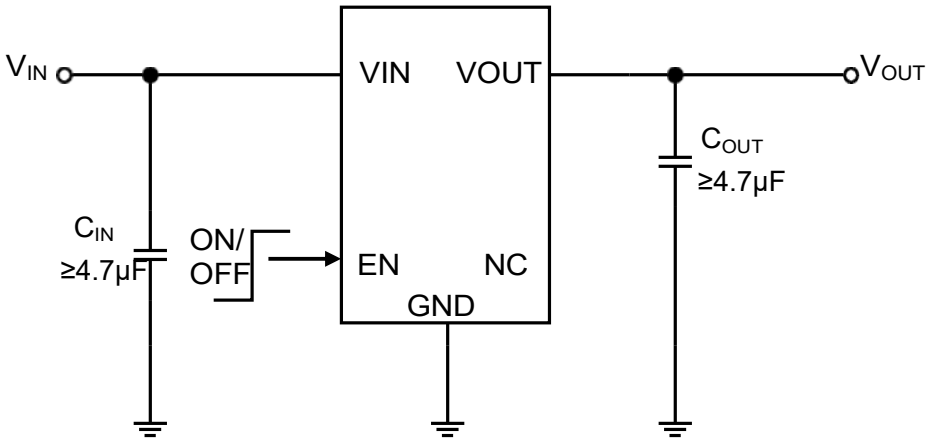
The HE9073 series are highly accurate, low noise, CMOS LDO Voltage Regulators. Offering low output noise, high ripple rejection ratio, low dropout and very fast turn-on times, the HE9073 series is ideal for today's cutting edge mobile phone. Internally the HE9073 includes a reference voltage source, error amplifiers, driver transistors, current limiters and phase compensators. The output voltage is set by current trimming. Voltages are selectable in 100mV steps within a range of 1.2V to 5.0V.

Order Information

HE9073①②③④⑤

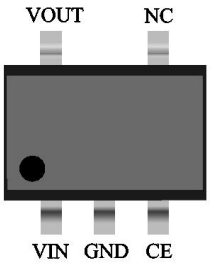
Designator	Symbol	Description
①	A	Standard
②③	Integer	Output Voltage(1.2~5.0V)
④	D4	Package:DFN1x1-4L
	P	Package:SOT89
	M	Package:SOT23-3
	M5	Package:SOT23-5
⑤	R	RoHS / Pb Free
	G	Halogen Free

Application Circuits

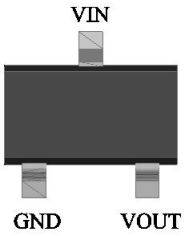


Pin Assignment

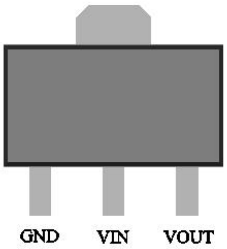
SOT23-5 (Top view)



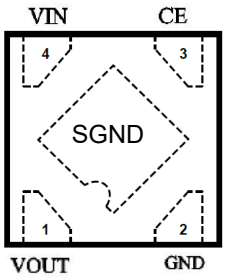
SOT23-3 (Top view)



SOT89 (Top view)



DFN1x1-4L (TOP view)



Selection Table

Part No.	Output Voltage	Package	Marking
HE9073A12M5R	1.2V	SOT23-5	Refer to Marking rule
HE9073A15M5R	1.5V	SOT23-5	
HE9073A18M5R	1.8V	SOT23-5	
HE9073A25M5R	2.5V	SOT23-5	
HE9073A28M5R	2.8V	SOT23-5	
HE9073A30M5R	3.0V	SOT23-5	
HE9073A33M5R	3.3V	SOT23-5	
HE9073A36M5R	3.6V	SOT23-5	
HE9073A50M5R	5.0V	SOT23-5	
HE9073A12MR	1.2V	SOT23-3	
HE9073A15MR	1.5V	SOT23-3	
HE9073A18MR	1.8V	SOT23-3	
HE9073A25MR	2.5V	SOT23-3	

Selection Table

Part No.	Output Voltage	Package	Marking
HE9073A28MR	2.8V	SOT23-3	Refer to Marking rule
HE9073A30MR	3.0V	SOT23-3	
HE9073A33MR	3.3V	SOT23-3	
HE9073A36MR	3.6V	SOT23-3	
HE9073A50MR	5.0V	SOT23-3	
HE9073A30PR	3.0V	SOT89	
HE9073A33PR	3.3V	SOT89	
HE9073A50PR	5.0V	SOT89	
HE9073A12D4R	1.2V	DFN1x1-4L	
HE9073A15D4R	1.5V	DFN1x1-4L	
HE9073A18D4R	1.8V	DFN1x1-4L	
HE9073A25D4R	2.5V	DFN1x1-4L	
HE9073A28D4R	2.8V	DFN1x1-4L	
HE9073A30D4R	3.0V	DFN1x1-4L	
HE9073A33D4R	3.3V	DFN1x1-4L	

Absolute Maximum Ratings (1) (2)

Parameter		Symbol	Maximum Rating	Unit
Input Voltage		V_{IN}	V_{SS} -0.3~V_{SS}+9.0	V
		$V_{ON/OFF}$	V_{SS} -0.3~V_{IN}+0.3	V
Output Current		I_{OUT}	550	mA
Output Voltage		V_{OUT}	V_{SS} -0.3~V_{IN}+0.3	V
Power Dissipation	SOT23-3	Pd	400	mW
	SOT23-5		450	
	SOT89		500	
	DFN1x1-4L		400	
Thermal Resistance	SOT23-3	$R_{\theta JA}$ (3) (Junction-to-ambient thermal resistance)	250	℃/W
	SOT23-5		220	℃/W
	SOT89		200	℃/W
	DFN1x1-4L		250	℃/W
Operating Temperature		Topr	-40~85	℃
Storage Temperature		Tstg	-40~125	℃
Soldering Temperature & Time		Tsolder	260℃, 10s	

Note (1): Exceeding these ratings may damage the device.

Note (2): The device is not guaranteed to function outside of its operating conditions

Note (3): The package thermal impedance is calculated in accordance to JESD 51-7.

ESD Ratings

Item	Description	Value	Unit
$V_{(ESD-HBM)}$	Human Body Model (HBM) ANSI/ESDA/JEDEC JS-001-2014 Classification, Class: 2	±4000	V
$V_{(ESD-CDM)}$	Charged Device Mode (CDM) ANSI/ESDA/JEDEC JS-002-2014 Classification, Class: C0b	±200	V
$I_{LATCH-UP}$	JEDEC STANDARD NO.78E APRIL 2016 Temperature Classification, Class: I	±150	mA

ESD testing is performed according to the respective JESD22 JEDEC standard.The human body model is a 100 pF capacitor discharged through a 1.5kΩ resistor into each pin. The machine model is a 200pF capacitor discharged directly into each pin.

Recommended Operating Conditions

Parameter	MIN.	MAX.	Units
Supply voltage at V_{IN}	2.0	7.0	V
Operating junction temperature range, Tj	-40	125	°C
Operating free air temperature range, TA	-25	85	°C

Electrical Characteristics

（At T_A=25°C, C_{IN}=1uF, V_{IN}=V_{OUT}+1.0V,V_{OUT}=3.3V, C_{OUT}=1μF, unless otherwise noted）

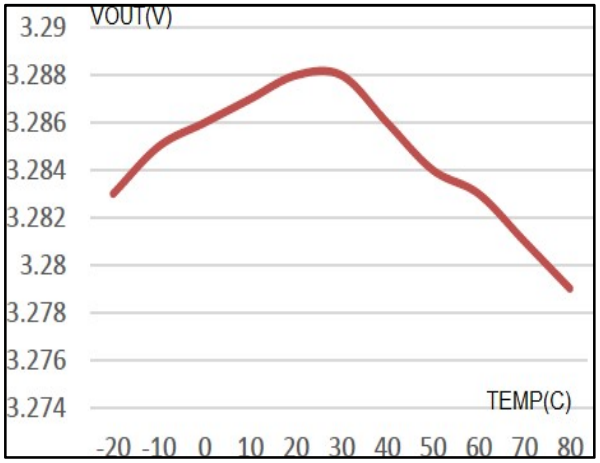
Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
V_{IN}	Input Voltage		2	—	7	V
I_Q	Quiescent Current	V_{IN} > V_{OUT} ,EN=V_{IN} No load	—	0.3	0.7	μA
V_{OUT}	Output Voltage	I_{OUT} =1mA	-1.0		+1.0	%
I_{SD}	Shutdown Ground Current	V_{EN}=0V	—	—	0.1	μA
I_{LEAK}	V_{OUT} Shutdown Leakage Current	V_{OUT} = 0V	—	—	0.1	μA
I_{OUT_MAX}	Output Current	V_{IN} - V_{OUT} =0.5V	—	500	—	mA
V_{DROP}	Dropout Voltage(1)	I_{OUT} =100mA V_{OUT} =3.3V	—	100	120	mV
		I_{OUT} =200mA V_{OUT} =3.3V	—	200	250	mV
ΔLOAD	Load Regulation	V_{IN}=V_{OUT}+1V 1mA≤I_{OUT}≤300mA	—	20	30	mV
ΔLINE	Line Regulation	I_{OUT}=1mA, V_{OUTNOM} +0.5V≤V_{IN}≤7V	—	0.1	0.15	%/V
I_{LIMIT}	Current Limit	V_{IN} =5V	—	550	—	mA
PSRR	Power Supply Rejection Ratio	I_{OUT}=100mA f=10KHz		65		dB
		I_{OUT}=100mA f=1KHz		70		dB
I_{SHORT}	Short /Start Load Current	RL=1Ω		90		mA
V_{IH}	EN Threshold Voltage,Logic-High	V_{IN}=5.0V, I_{OUT}=1mA	1.2	—	—	V
V_{IL}	EN Threshold Voltage,Logic-Low	V_{IN}=5.0V	—	—	0.4	V
e_{NO}	Output Noise Voltage	10Hz to 100kHz C_{OUT}=1μF	—	100	—	μV_{RMS}
T_{SD}	Thermal Shutdown Temperature		—	160	—	℃
ΔT_{SD}	Thermal Shutdown Hysteresis		—	20	—	℃

Note：(1) Dropout Voltage is the voltage difference between the input and the output at which the output voltage drops 2% below its nominal value.

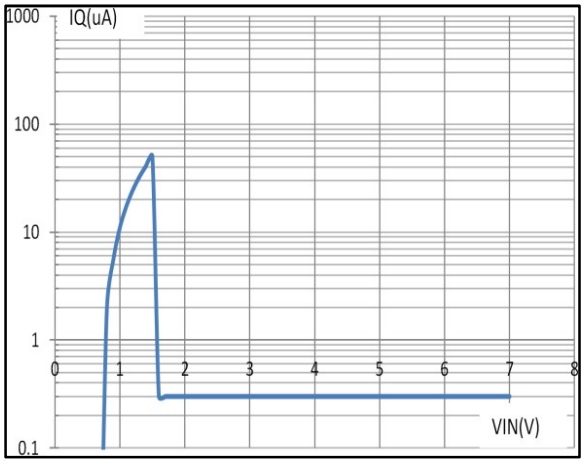
Typical Performance Characteristics

Test Condition: $T_{A=}$25°C, unless otherwise note

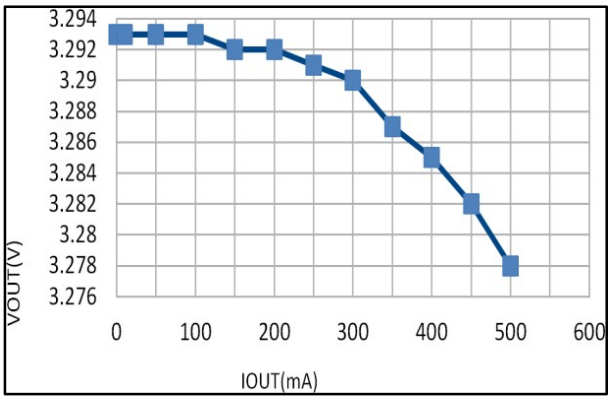
1、VOUT vs TEMP



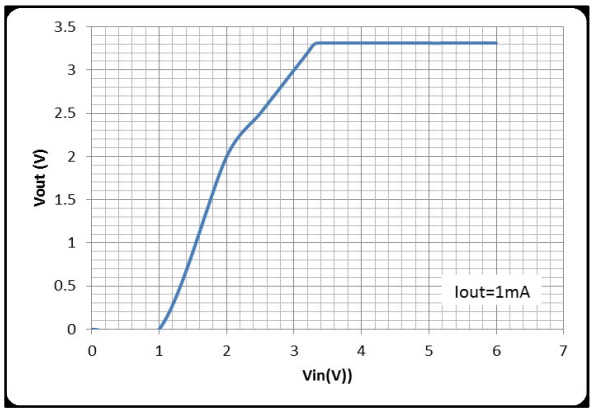
2、IQ vs VIN (1)



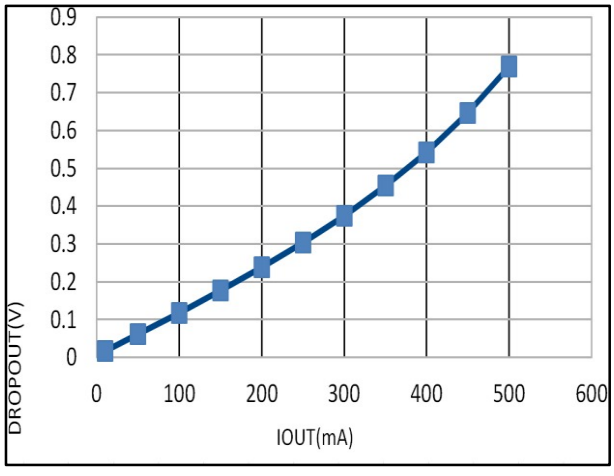
3、Load Regulation



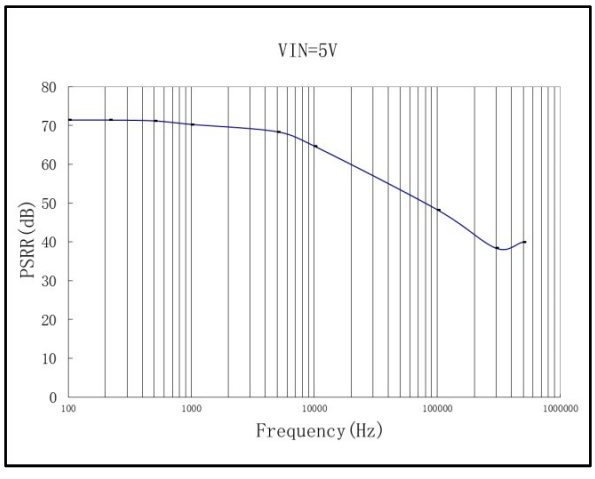
4、Line Regulation



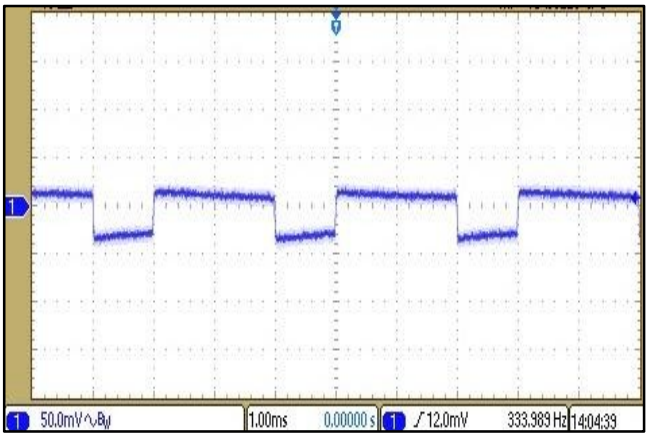
5、Dropout Voltage vs Load Current



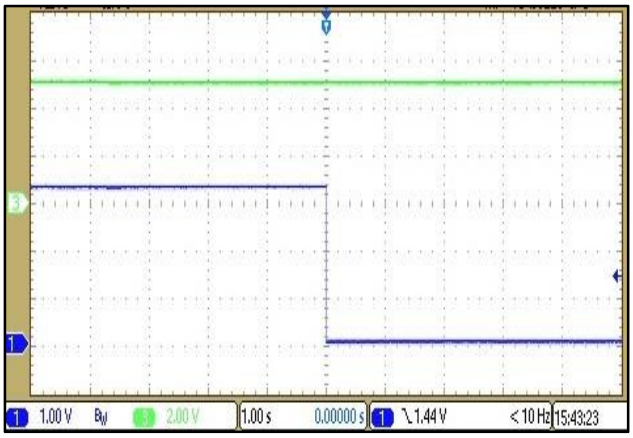
6、PSRR



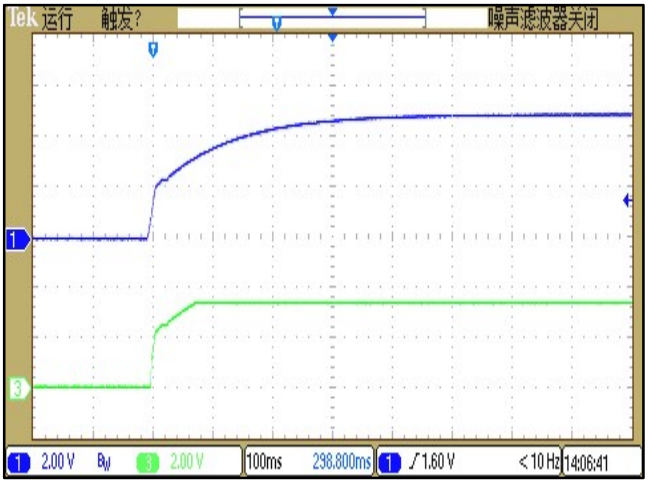
7、Load Transient Response



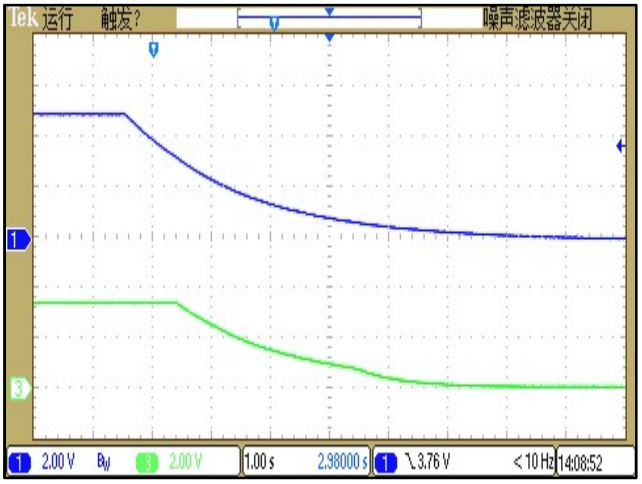
8、Short Output & Over-Current Response



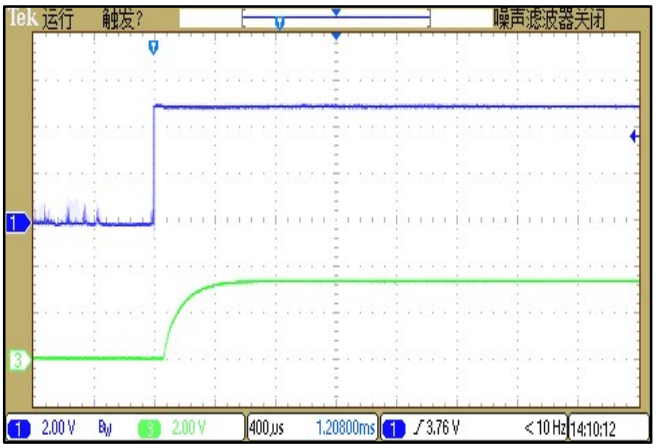
9、Power-On



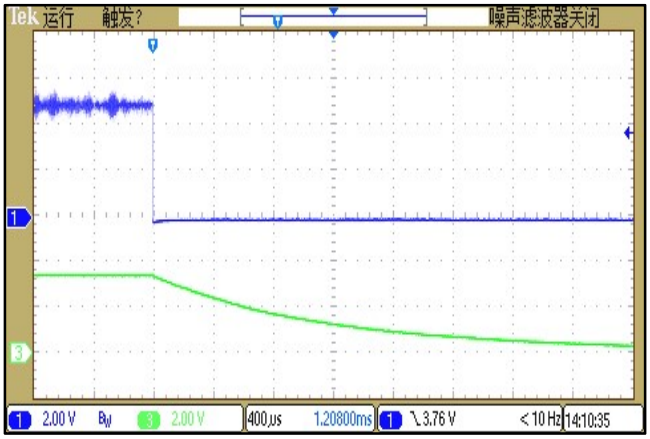
10、Power-Off



11、Enable



12、Disable



Note：(1)

Operational Explanation

<Output Voltage Control>

The P-channel MOSFET is connected to the VOUT pin, driven by the subsequent output signal. The output voltage at the VOUT pin is controlled and stabilized by a system of negative feedback. The IC's internal circuitry can shut-down by the CE pin's signal

<Low ESR Capacitors>

With the HE9073 series, a stable output voltage is achievable even if used with low ESR capacitors as a phase compensation circuit is built-in. In order to ensure the effectiveness of the phase compensation, we suggest that an output capacitor (CL) is connected as close as possible to the output pin (VOUT) and the GND pin. Please use an output capacitor with a capacitance value of at least 10uF. Also, please connect an input capacitor (CIN) of 10uF between the VIN pin and the GND pin in order to ensure a stable power input. Stable phase compensation may not be ensured if the capacitor runs out capacitance when depending on bias and temperature. In case the capacitor depends on the bias and temperature, please make sure the capacitor can ensure the actual capacitance.

<CE Pin>

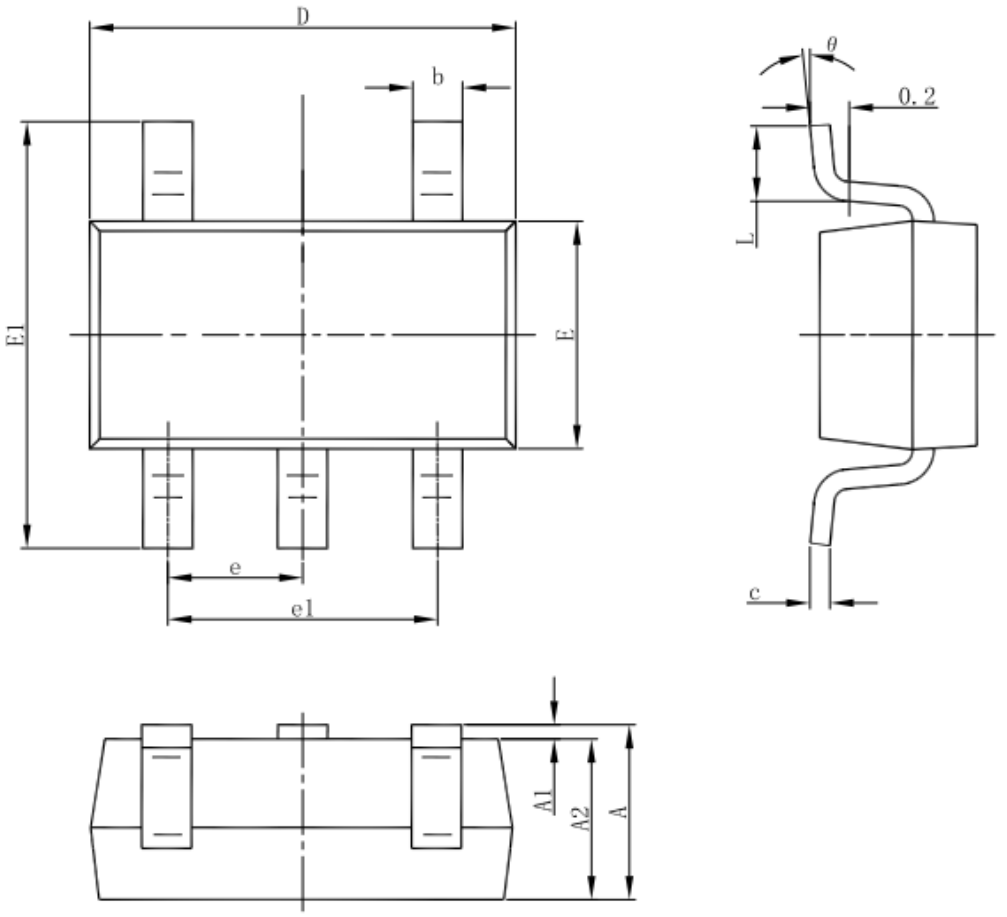
The IC's internal circuitry can be shutdown via the signal from the CE pin with the HE9073 series. The operational logic of the IC's CE pin is selectable (please refer to the selection guide). Although the CE pin is equal to an inverter input with CMOS hysteresis, with either the pull-up or pull-down options, the CE pin input current will increase when the IC is in operation. We suggest that you use this IC with either a VIN voltage or a VSS voltage input at the CE pin. If this IC is used with the correct specifications for the CE pin, the operational logic is fixed and the IC will operate normally. However, supply current may increase as a result of through current in the IC's internal circuitry.

Notes on Use

1. Please use this IC within the stated absolute maximum ratings. The IC is liable to malfunction should the ratings be exceeded.
2. Where wiring impedance is high, operations may become unstable due to noise and/or phase lag depending on output current. Please keep the resistance low between VIN and VSS wiring in particular.
3. Please wire the input capacitor (CIN) and the output capacitor (CL) as close to the IC as possible.

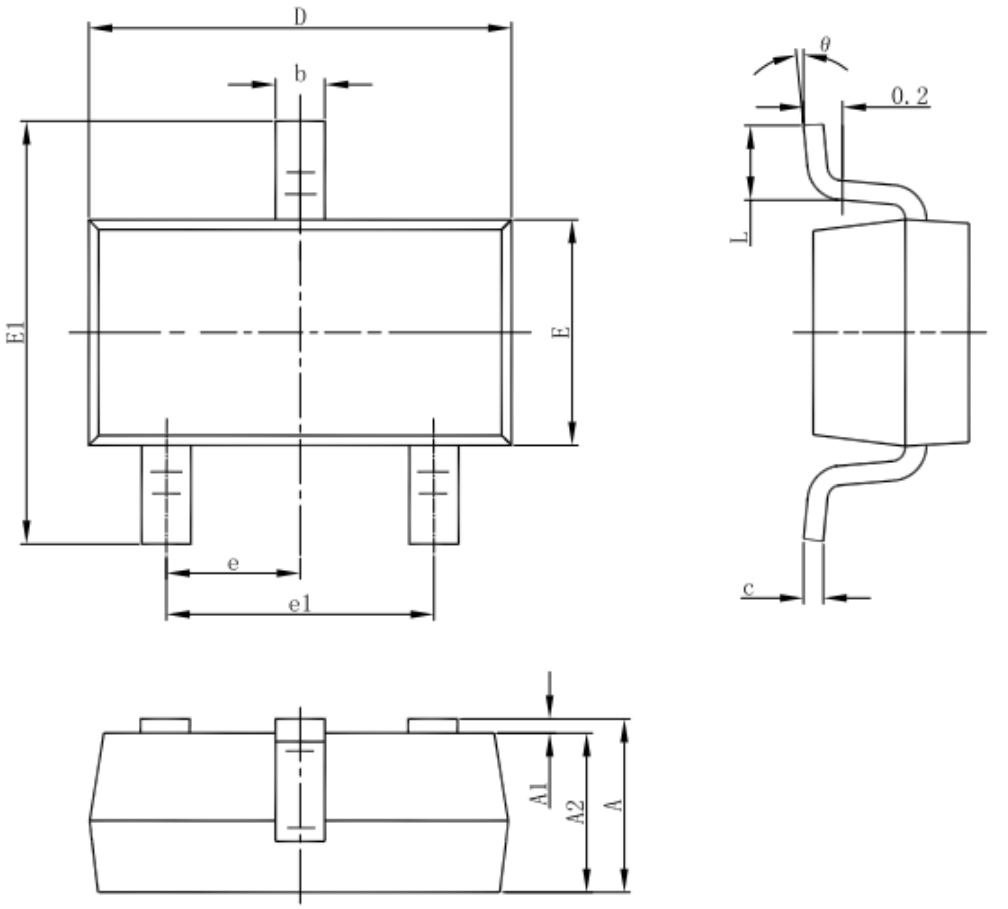
Packaging Information

SOT23-5 Outline Dimensions



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°

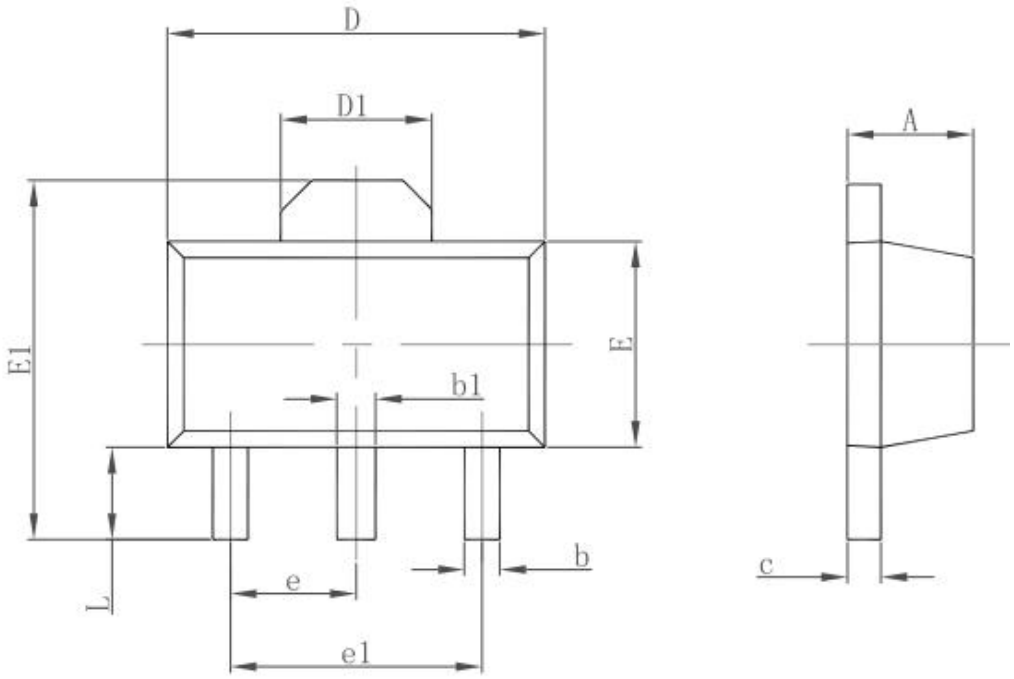
3-pin SOT23-3 Outline Dimensions



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°

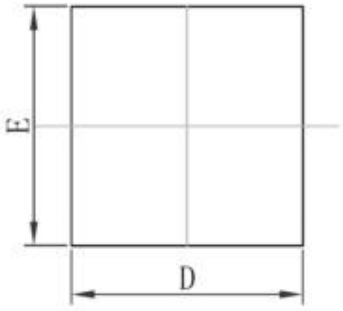
Package Information

3-pin SOT89 Outline Dimensions

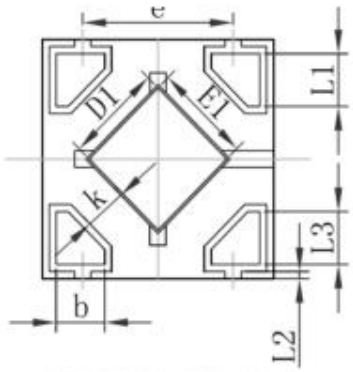


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047

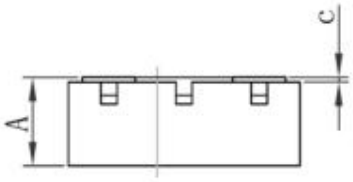
DFN1×1-4 Outline Dimensions



TOP VIEW
[顶视图]



BOTTOM VIEW
[背视图]



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.335	0.405	0.013	0.016
D	0.950	1.050	0.037	0.041
E	0.950	1.050	0.037	0.041
D1	0.370	0.470	0.015	0.019
E1	0.370	0.470	0.015	0.019
k	0.17MIN.		0.007MIN.	
b	0.160	0.260	0.006	0.010
c	0.010	0.090	0.000	0.004
e	0.600	0.700	0.024	0.028
L1	0.185	0.255	0.007	0.010
L2	0.030 REF.		0.001 REF.	
L3	0.185	0.255	0.007	0.010