

High Input Voltage Linear Charger

GENERAL DESCRIPTION

The HM5056HA is a complete constant-current/constant-voltage linear charger for single cell lithium battery. Its compact package with minimum external components requirement makes the HM5056HA ideal for portable application. No external sense resistor or blocking diode is necessary for it. Build-in thermal feedback mechanism regulates the charge current to control the die temperature during high power operation or at elevated ambient temperature. The HM5056HA has a pre-charge function for trickle charging deeply discharged batteries. The fast charge current can be programmed by an external resistor. CV regulation mode is automatically enable once the batter's charge curve reaches the constant voltage portion. The output current then decays and is finally terminated once the charge current drops to 1/10th of the programmed value. The HM5056HA keeps monitoring the battery voltage and enable a new charge cycle once the voltage drops by 250mV Below the CV value.

FEATURE

- Input voltage range 4.5V~6.5V, Maximum Voltage

for the Power Input 25V

- Charging battery voltage 4.2V/4.35V/4.4V (4.35V, 4.4V Charging voltage can be customized)
- Accuracy of charging voltage $\pm 1\%$
- Trickle/constant current/constant voltage charging
- Maximum constant current charging current 1.2A; External resistance adjustable
- Constant current charging accuracy $\pm 10\%$
- V_{IN} OVP 6.5V;
- When the chip is overheated, the temperature loop automatically reduces the charging current
- Battery anti-irrigation protection : Static power consumption 0uA
- Support single color light/dual color light display mode
- Package : ESOP8/DFN2X2-8L/DFN3X3-8L
- ESD 4KV

APPLICATION

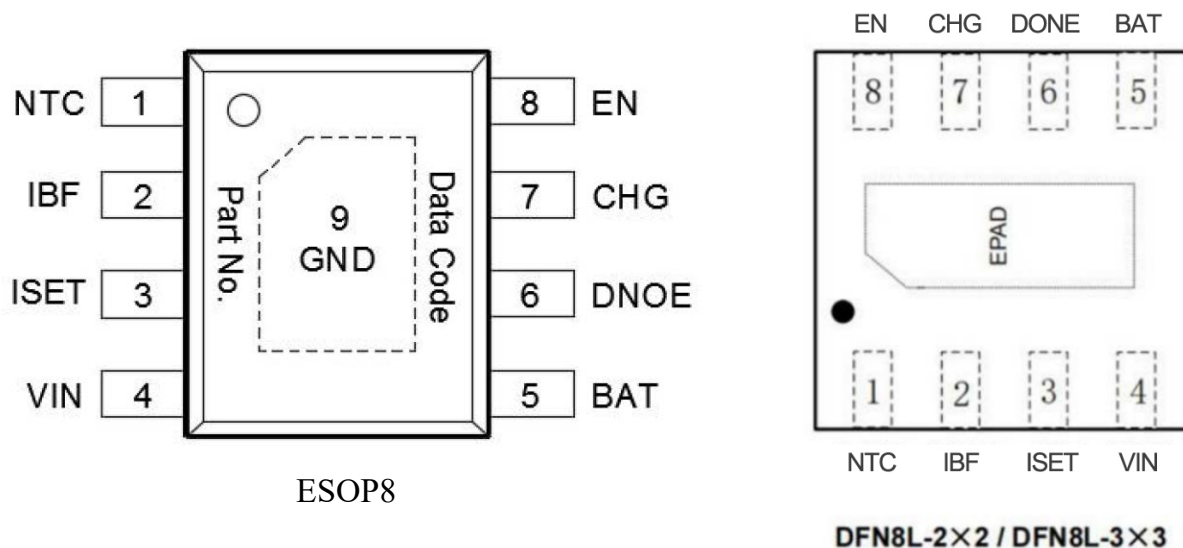
- IOT Gadgets; Wearable Devices; Credential Keys
- Wireless Remote; Electric toothbrush; Electric shaver; Electronic cigarette
- Other applications

ORDING INFORMATION

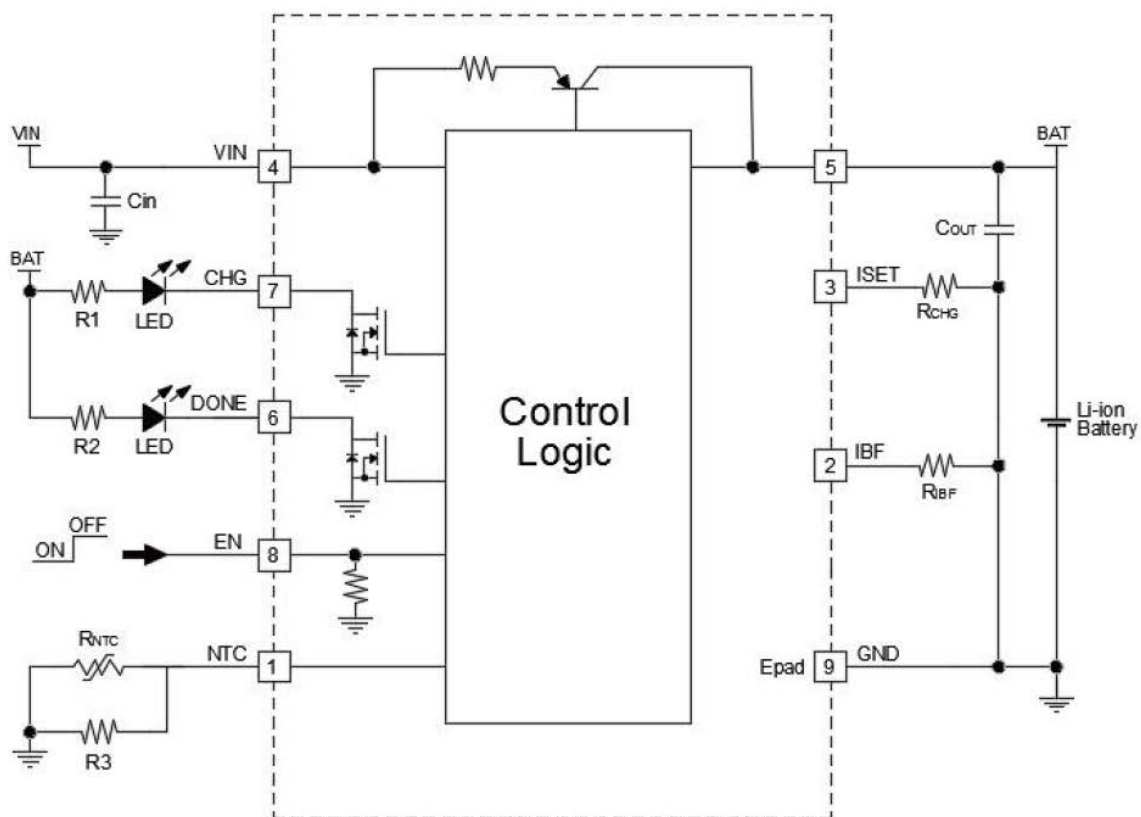
Part Number	Package Type	Package Quality	Op Temp(°C)
HM5056HA	ESOP8	3000	-40~85
HM5056HA	DFN2X2-8L	3000	-40~85
HM5056HA	DFN3X3-8	3000	-40~85

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MARK INFORMATION



CONFIGURATION

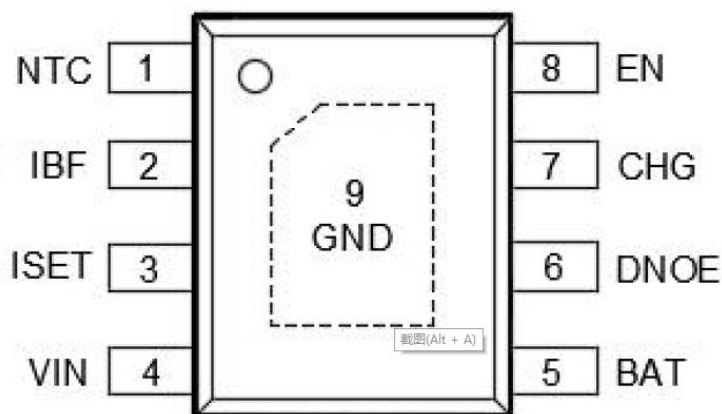


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PIN FUNCTIONS

Pin Name	PIN Number	Description
NTC	1	Negative Thermal Coefficient (NTC) Thermistor Pin.
IBF	2	Charge Status Threshold Program. Connect this pin to an external resistor to program the battery full current.
ISET	3	Charge current program/monitor and shutdown pin $IBAT=1V*180/RISET$
VIN	4	Power supply input, Vin can range from 4.5V to 6.5V
BAT	5	Charge current output.
DONE	6	Open drain charge status output for full
CHG	7	Open drain charge status output
EN	8	Charge Enable Input (active low).
GND	9 (EPAD)	Ground

PACKAGE



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THERMAL CHARACTERISTICS

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

THERMAL METRIC			UNIT	
ESOP8	θ_{JA}	Package thermal impedance ⁽¹⁾	45	°C/W

The package thermal impedance is calculated in accordance with JESD 51-7.

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Over recommended operating free-air temperature range (unless otherwise noted)

Parameter	Symbol	Min	Type	Max	Unit
Input voltage range	V_{IN}	-0.3		25	V
Battery voltage range	BAT	-0.3		12	V
Junction temperature range			125		°C
Storage temperature range		-40		150	°C
HBM(Human Body Model)	ESD		4K		V

RECOMMENDED OPERATING CONDITIONS

parameter	Symbol	Min	Type	Max	Unit
Input voltage range	V_{IN}	4.5	5	25	V

* Beyond these working conditions, the operating characteristics of the device can't be guaranteed °

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ELECTRICAL CHARACTERISTICS

Chip working condition is 25°C except special specification

parameter	Symbol	Test conditions	Min	Type	Max	Unit
Input voltage range	V_{IN}		4.5	5	6.5	V
Input under voltage	V_{IN_UVLO}			3.2		V
	slow-moving			0.3		V
Input overvoltage	V_{IN_OVP}	$V_{IN_OVP}=21.5V$ Customizable		7.0		V
	slow-moving			0.5		V
$V_{IN}-V_{BAT}$	VSD	$V_{IN}-V_{BAT}$ up and charge	160	200	240	mV
		$V_{IN}-V_{BAT}$ down, Turn off charge	60	90	120	mV
Input static current	I_Q	$V_{IN}=5V$, $V_{BAT}=1\mu F$		0.42		mA
BAT pin sink Current	$I_{standby}$	Charger disabled or the input is floating			50	nA
Trickle charge current	I_{trick}			$0.1 \cdot I_{CC}$		A
Trickle charging to constant current charging threshold				3.03		V
Constant current charging to trickle charging threshold				2.82		V
I_{BF}	Battery full programming range		10		50	% I_{BAT}
Constant current charging current	I_{CC}	RISET=1K		1		A
Accuracy of constant current charging current				± 5		%
Full voltage	BAT	4.35V/4.4V Customizable		4.2		V
Accuracy of full voltage				± 1		%
Battery overvoltage				$102\% \cdot V_{BAT}$		V
Charging cut-off current	I_{term}			$0.1 \cdot I_{CC}$		A
Charging cut-off time	T_{term}			2		s
Recharge threshold	V_{BAT_rechg}	Full voltage=4.2V		3.95		V
Temperature loop threshold				140		°C

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LED DISPLAY MODE

	Charge	Full voltage	VIN_OVP
Default	CHG Lights on/DONE Lights out	CHG , Lights out/ DONE, Lights on	CHG, DONE, Lights out
Customizable	CHG 1HZ, twinkle	CHG, Lights on	CHG , Lights out

CHARGER CURRENT SET

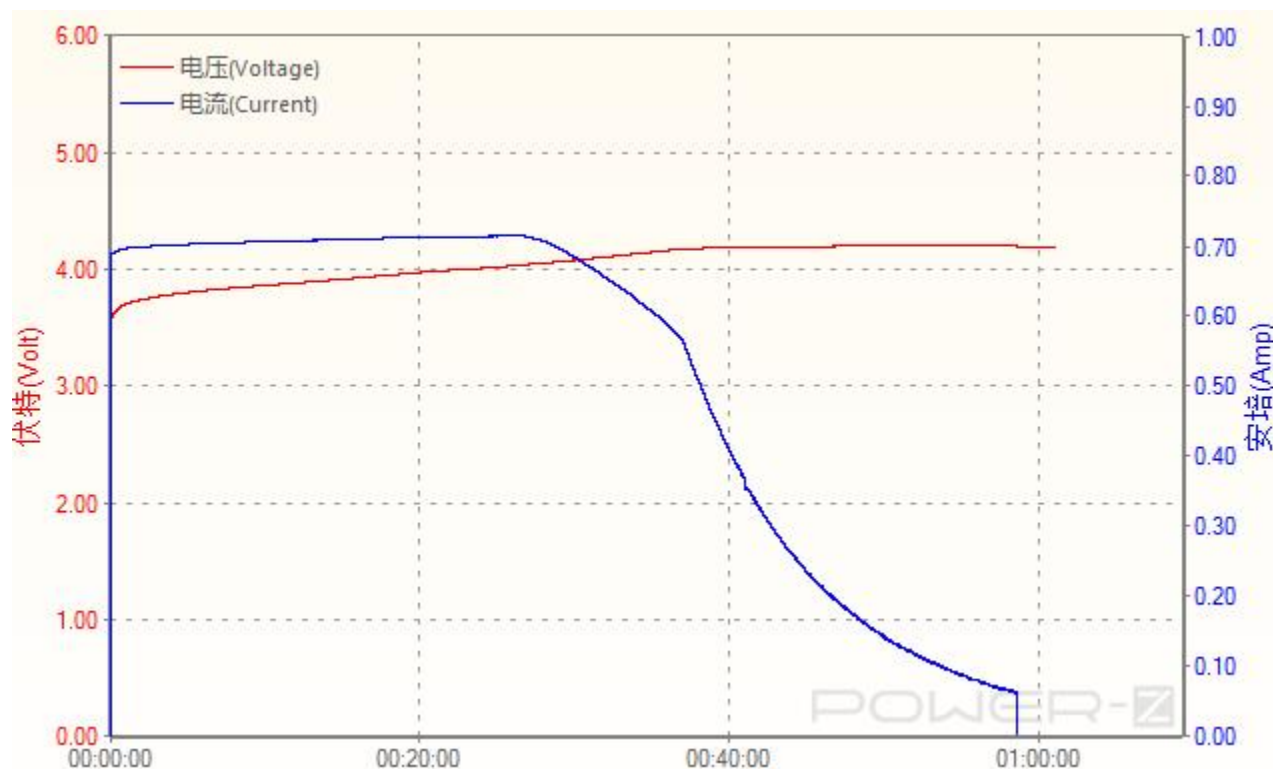
Formula for setting charging current : $I = 1000/R_{ISET}$

Such as: $R_{ISET} = 1000\Omega$; Charging current $I = 1000/1000 = 1A$

CHARGE TERMINATION CURRENT

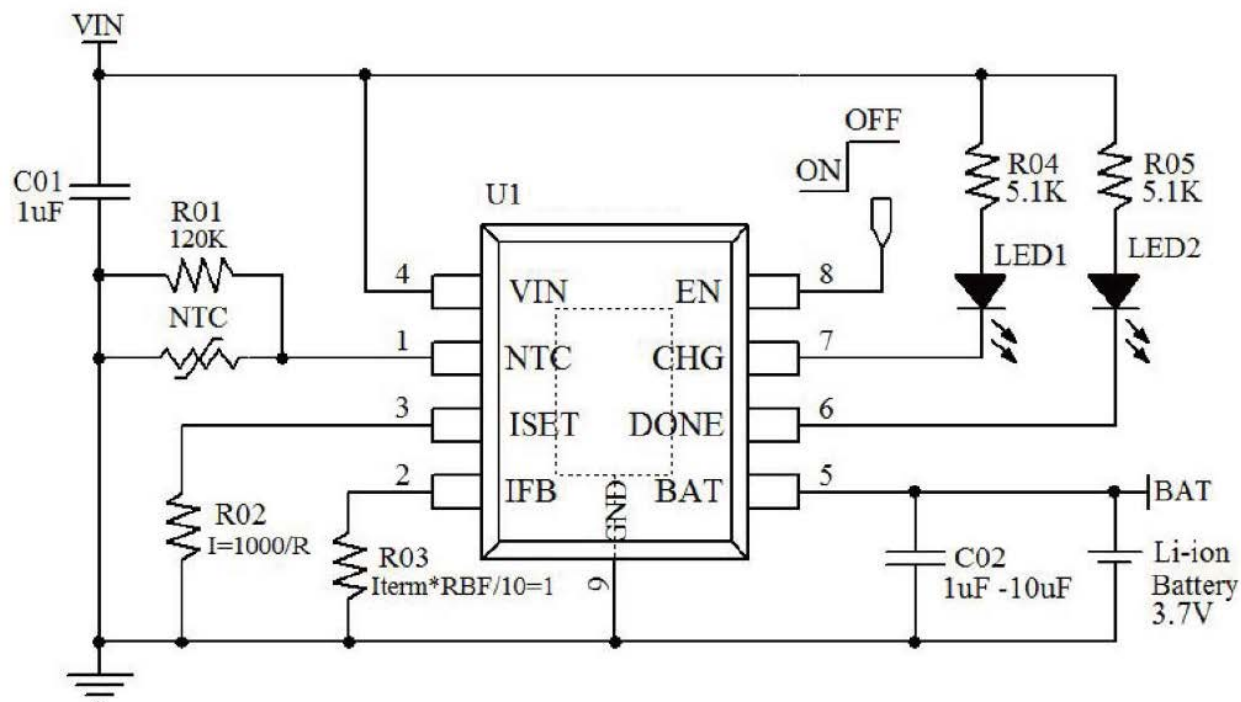
$I_{term} \cdot R_{BF} / 100 = 0.1$ $R_{BF} = 10K$, 则 $I_{term} = 1mA$

CHARGING CURVE



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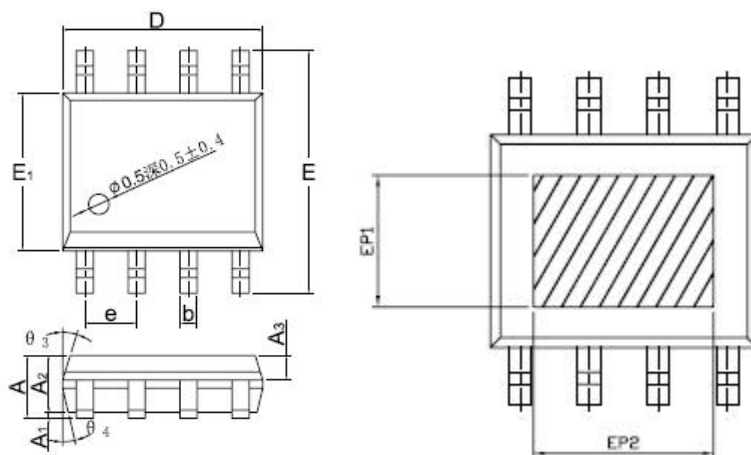
Typical Application Circuit



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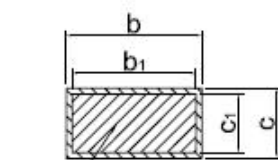
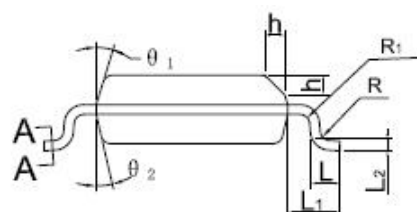
Package information

ESOP8



DIMENSIONS IN MILLIMETERS

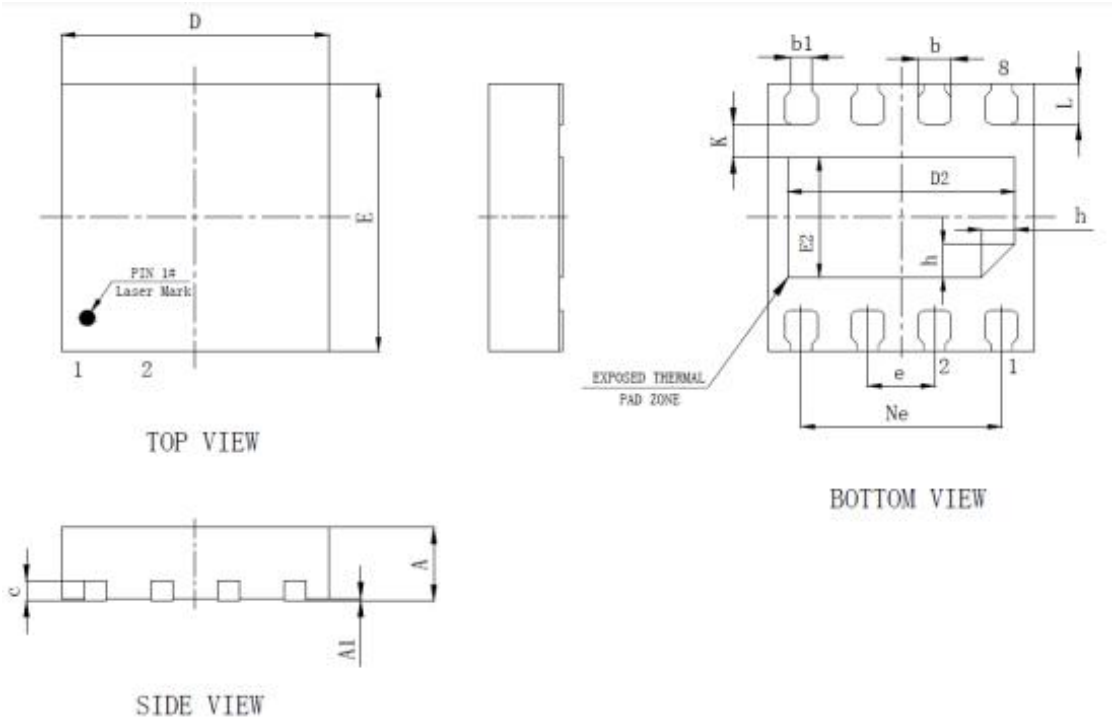
SYMBOL	MIN	NOM	MAX
A	1,35	1,55	1,75
A ₁	0,00	—	0,10
A ₂	1,25	1,40	1,65
A ₃	0,50	0,60	0,70
b	0,39	—	0,49
b ₁	0,28	—	0,48
c	0,10	—	0,25
c ₁	0,10	—	0,23
D	4,80	4,90	5,00
E	5,80	6,00	6,20
E ₁	3,80	3,90	4,00
e	1,27BSC		
L	0,45	—	1,00
L ₁	1,04REF		
L ₂	0,25BSC		
R	0,07	—	—
R ₁	0,07	—	—
h	0,3	0,4	0,5
θ ₁	0°	—	8°
θ ₂	11°	17°	19°
θ ₃	11°	13°	15°
θ ₄	15°	17°	19°
θ ₅	11°	13°	15°
EP1	2,40	—	—
EP2	3,30	—	—



SECTION A-A
6:1

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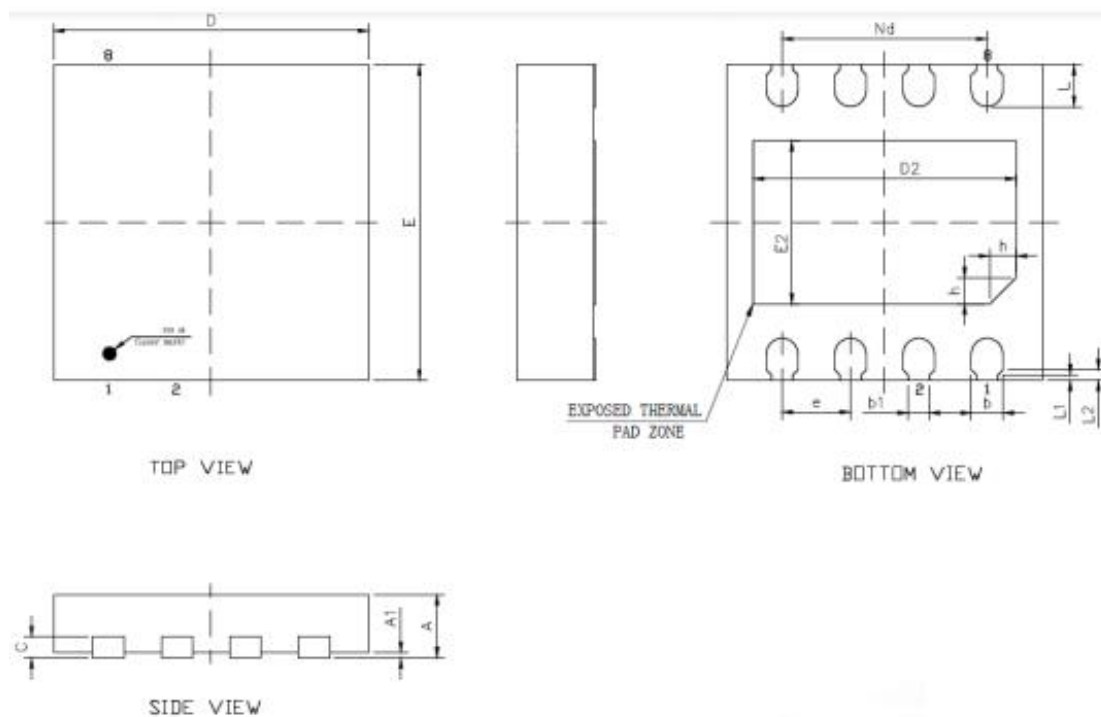
DFN8L-2×2



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.50	0.55	0.60
A1	0.00	0.02	0.05
b	0.20	0.25	0.30
b1	0.11	0.16	0.21
c	0.10	0.15	0.20
D	1.90	2.00	2.10
D2	1.60	1.70	1.80
e	0.50BSC		
Ne	1.50BSC		
E	1.90	2.00	2.10
E2	0.80	0.90	1.00
L	0.25	0.30	0.35
h	0.15	0.20	0.25
K	0.20	0.25	0.30

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DFN8L-3×3



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
b	0.25	0.30	0.35
b1	0.20REF		
c	0.18	0.20	0.25
D	2.90	3.00	3.10
D2	2.40	2.50	2.60
e	0.65BSC		
Ne	1.95BSC		
E	2.90	3.00	3.10
E2	1.45	1.55	1.65
L	0.30	0.40	0.50
L1	0.05REF		
L2	0.10REF		
h	0.20	0.25	0.30