



SP2354

1A Buck-Boost LED Driver

DESCRIPTION

The SP2354 is a high efficiency synchronous buck/boost DC/DC converter for application using battery powered devices to drive a single power LED at current up to 1A. The regulator operates in either synchronous buck, boost or buck-boost mode depending on the input voltage and LED forward voltage. Efficiency greater than 90% can be achieved over the entire usable range of Li-Ion battery: 2.8V to 5.5V.

LED current is programmable to one of four levels,
Including shutdown, with dual external resistors and dual enable inputs. In shutdown no supply current is drawn.

A high operation frequency of 1MHz allows using of small external components. The SP2354 is offered in DFN10 package.

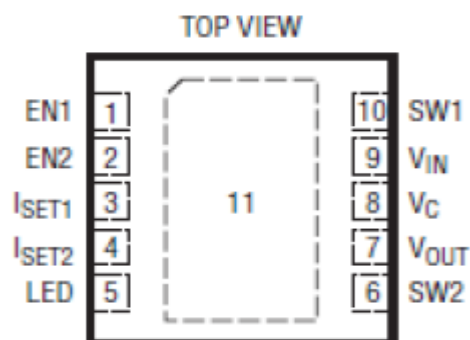
FEATURES

- Higher than 85% Efficiency
- Wide Input Voltage Range: 2.8V to 5.5V
- Faulty LED Protection
- Internal Soft Start
- Up to 1A continuous Output Current
- Zero Shutdown Current
- Over Temperature Protection
- Over Current Protection
- Constant Frequency 1.0MHz Operation
- DFN10 Package

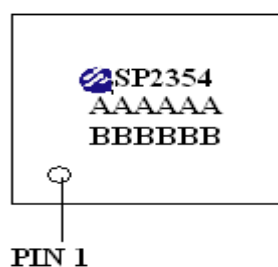
APPLICATIONS

- Digital Camera
- PDA
- Hand Held Communication Equipment
- Li-Ion LED Driver
- Cell Phone Camera Flash
- Cell Phone Torch Lighting

PIN CONFIGURATION (DFN-10)



PART MARKING



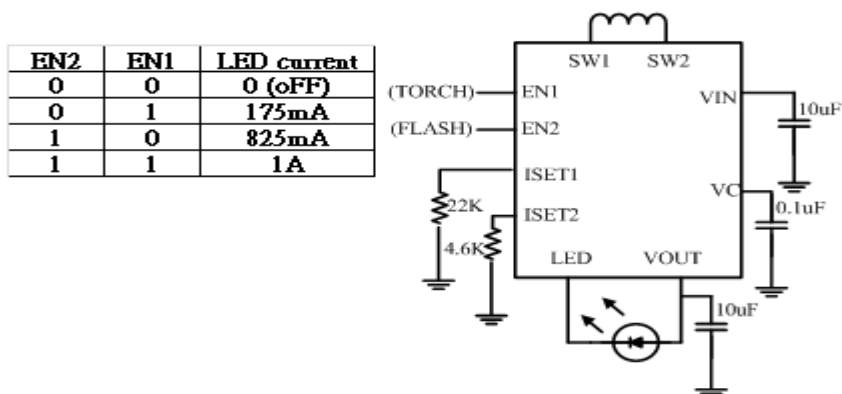
AAAAAA : Wafer lot no.
BBBBBB : YYMMDD



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TYPICAL APPLICATION CIRCUIT



PIN DESCRIPTION & ELECTRICAL CHARACTERISTICS

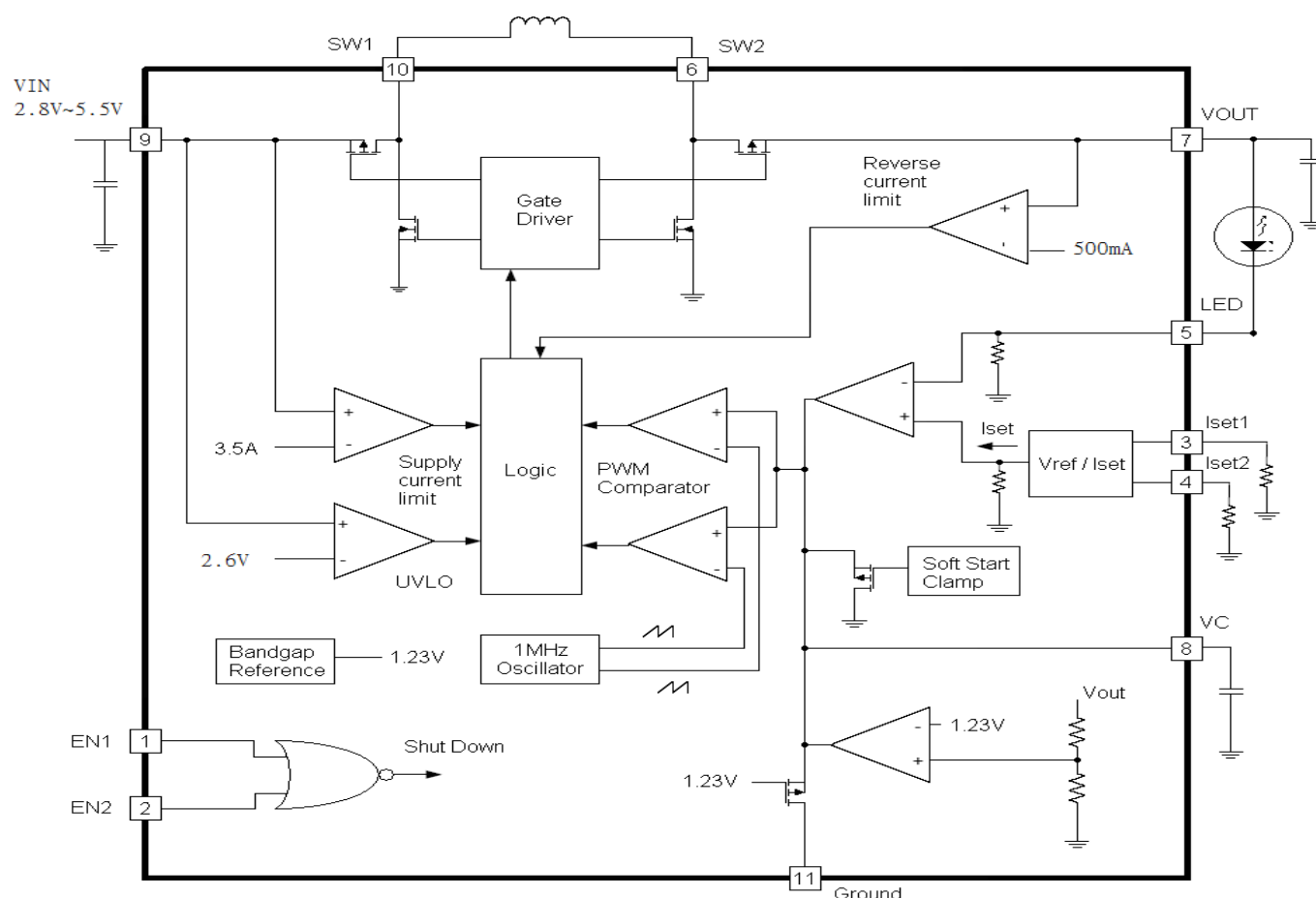
Pin	Symbol	Description	Operating Rating			
			Min.	Typ.	Max.	Unit
1	EN1	Enable Input for ISET1	-0.3		V _{IN} +0.3	V
2	EN2	Enable Input for ISET2	-0.3		V _{IN} +0.3	V
3	ISET1	LED Current Program 1	-0.3		V _{IN} +0.3	V
4	ISET2	LED Current Program 2	-0.3		V _{IN} +0.3	V
5	LED	Output for LED Current Biasing			1	A
6	SW2	Switching Node 1	-0.3		6	V
7	VOUT	Buck-Boost Output	-0.3		6	V
8	VC	Compensation Point for Internal Error Amplifier	-0.3		V _{IN} +0.3	V
9	VIN	Supply Voltage	-0.3		6	
10	SW1	Switching Node 2	-0.3		6	
11	GND	Ground, Exposed Pad				



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BLOCK DIAGRAM



ORDERING INFORMATION

Part Number	Package	Part Marking
SP2354DN10RGB	DFN-10	SP2354

※ SP2354DN10RGB : 7" Tape Reel; Pb – Free, Halogen-Free

ABSOLUTE MAXIMUM RATINGS (TA=25°C, unless otherwise specified.)

The following ratings designate persistent limits beyond which damage to the device may occur.

Symbol	Parameter	Value	Unit
V _{IN}	DC Supply Voltage	-0.3 ~ 6	V
I _{OUT}	Output Current, Source or Sink	1	A
T _J	Operating Junction Temperature Range	125	°C
T _{STG}	Storage Temperature Range	-40 to 125	°C
T _{LEAD}	Lead Soldering Temperature for 5 sec.	260	°C
T _{ope}	Operation Temperature Range	-40 ~ 85	°C
R _{θJC}	Thermal Resistance Junction – Case (*)	10	°C/W



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ELECTRICAL CHARACTERISTICS

(Unless otherwise stated, these specifications apply $T_A=25^{\circ}\text{C}$; $V_{\text{IN}}=3.6\text{V}$, $R_{\text{ISET}}=22\text{K}$)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
SUPPLY						
V_{IN}	Supply Voltage		2.8		5.5	V
I_{IN}	Supply Current	$2.9\text{V} \leq V_{\text{IN}} \leq 5.5\text{V}$		1000	1350	μA
		$2.9\text{V} \leq V_{\text{IN}} \leq 5.5\text{V}$, $V_{\text{EN1}} = V_{\text{EN2}} = 0\text{V}$			1	μA
		$V_{\text{IN}} < \text{UVLO}$, $V_{\text{EN1}} = V_{\text{EN2}} = V_{\text{IN}}$		5	10	μA
UVLO	Under Voltage Lockout Threshold	V_{IN} Rising		2.6	2.8	V
		V_{IN} Falling	2.15	2.35		V
OSC	Oscillator Frequency		825	925	1050	KHz
OUTPUT						
V_{OUT}	Maximum V_{OUT}	LED Pin Open, $I_{\text{LED}} = 1\text{A}$	5	5.2	5.4	V
V_{ISET}	I_{SET1} and I_{SET2} Voltage	$3.08\text{K} \leq R_{\text{ISET}} \leq 20.5\text{K}$	934	954	967	mV
V_{LED}	LED Pin Voltage	$I_{\text{LED}} = 1\text{A}$		140		mV
I_{RATIO}^*	LED Output Current to Programmed Current Ratio	$I_{\text{LED}} = 500\text{mA}$	3150	3550	3800	
ENABLE						
V_{EN}	Enable Shutdown Voltage		0.2	0.66		V
$V_{\text{EN(NOR)}}$	Enable Voltage Normal Operation			0.68	1.2	V
I_{EN}	Enable 1 and Enable 2 Current		-1		1	μA
SOFT START						
T_{SS}	Soft-Start Period	0.9V to 2.1V		300		μs
SWITCHING REGULATOR						
R_{PMOS}^{**}	$R_{\text{DS(on)}}$ for Switch A and D	$V_{\text{OUT}} = 3.6\text{V}$		170		m Ω
R_{NMOS}^{**}	$R_{\text{DS(on)}}$ for Switch B and C			130		m Ω
I_{LPMOS}	Leakage Current for Switch A and D		-1		1	μA
I_{LNMOS}	Leakage Current for Switch B and C		-1		1	μA
I_{F}	Forward Switch Current Limit	Switch A	2.5	3.5		A
I_{R}	Reverse Switch Current Limit	Switch D, $V_{\text{OUT}} = 3.6\text{V}$		500		mA

* $I_{\text{RATIO}} = I_{\text{LED}} / (I_{\text{ISET1}} + I_{\text{ISET2}})$

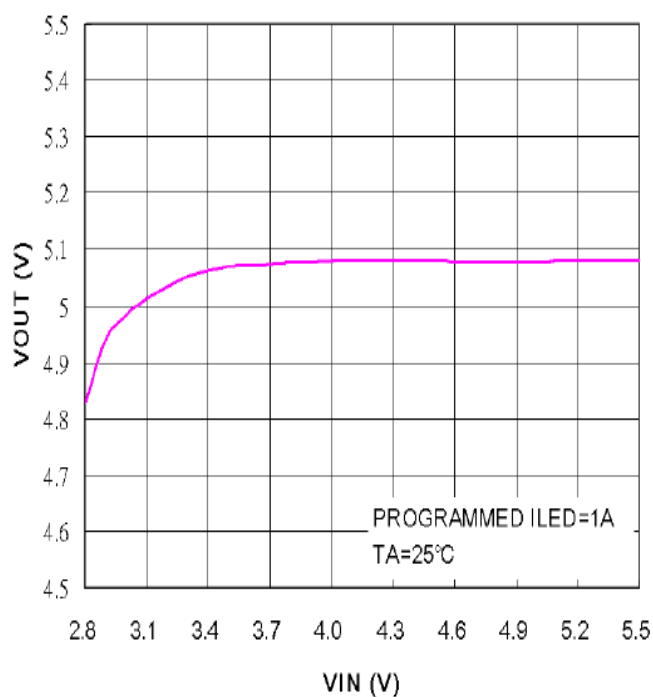
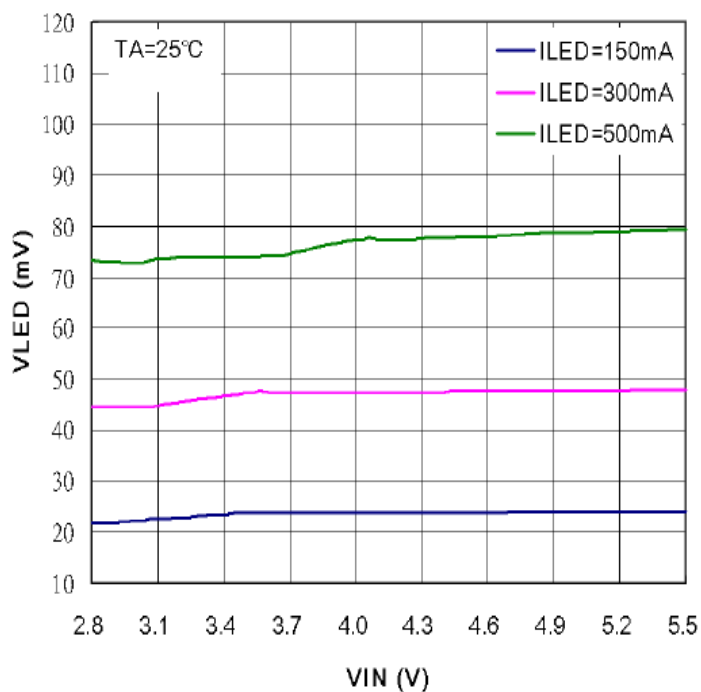
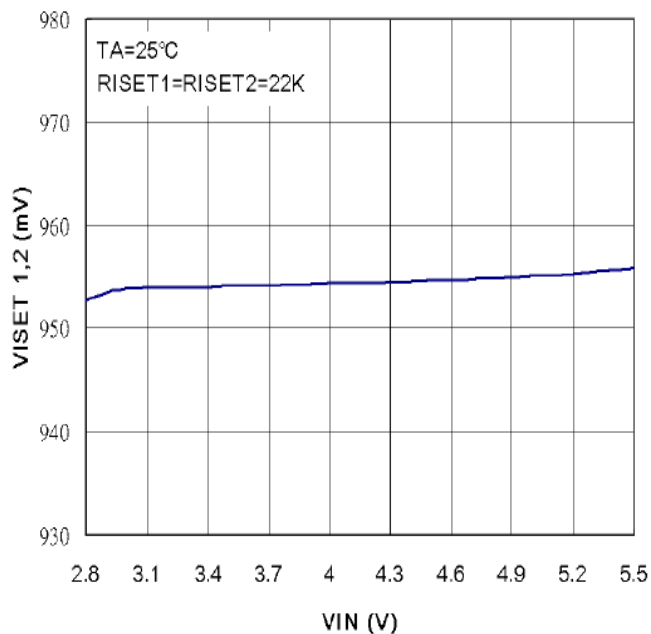
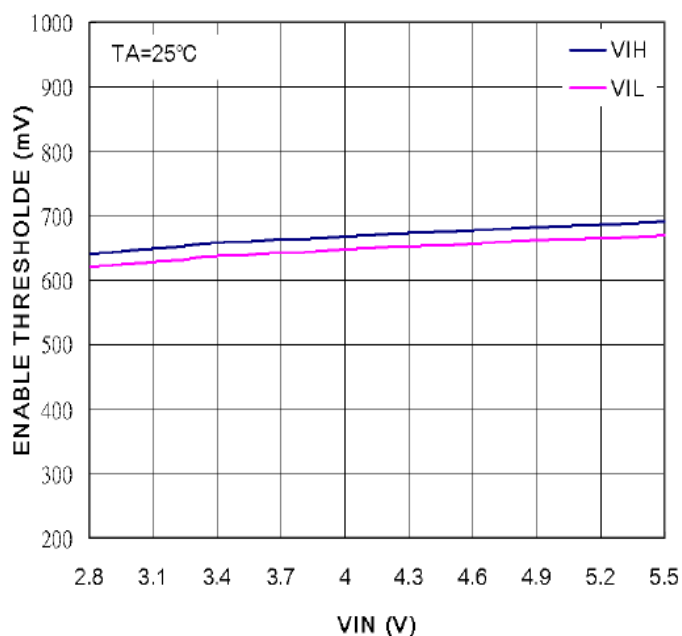
** Guaranteed by Design



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PERFORMANCE CHARACTERISTICS ($T_A=25^{\circ}\text{C}$, unless otherwise specified.)

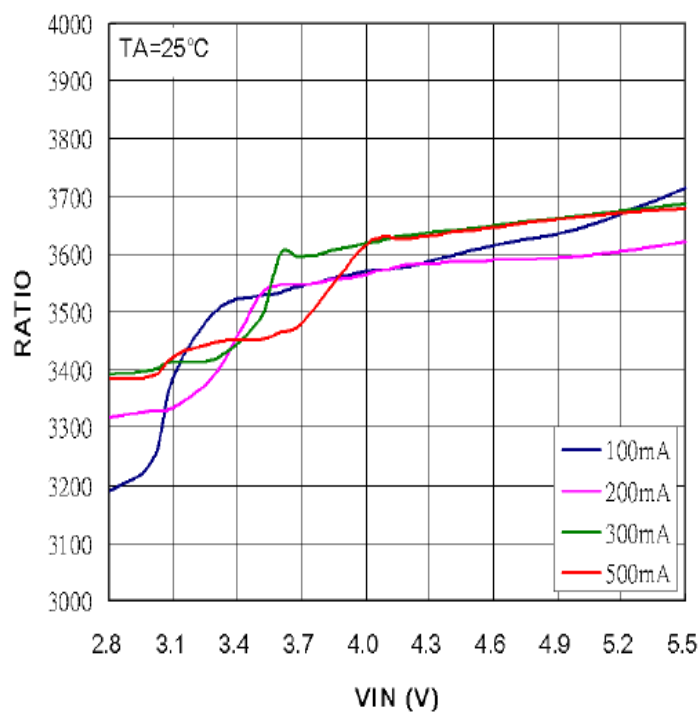
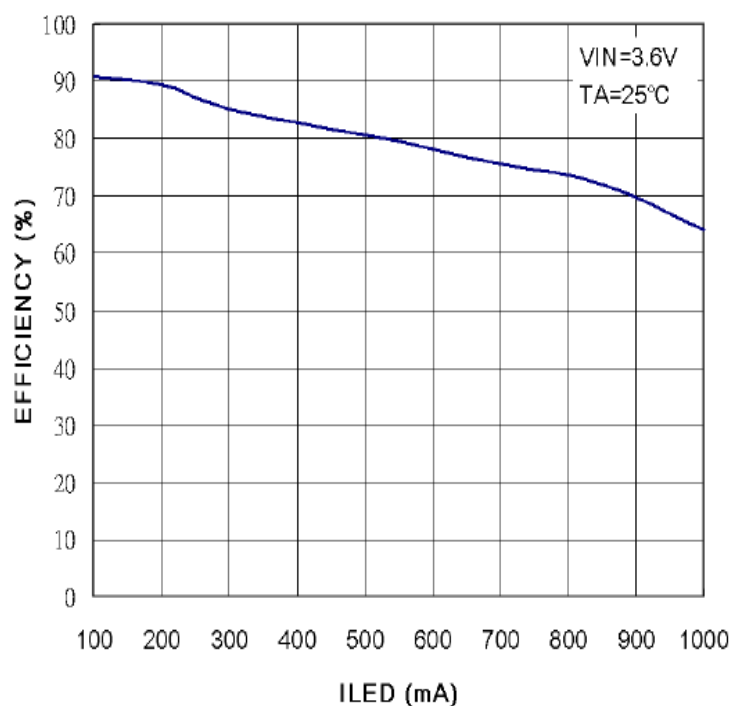
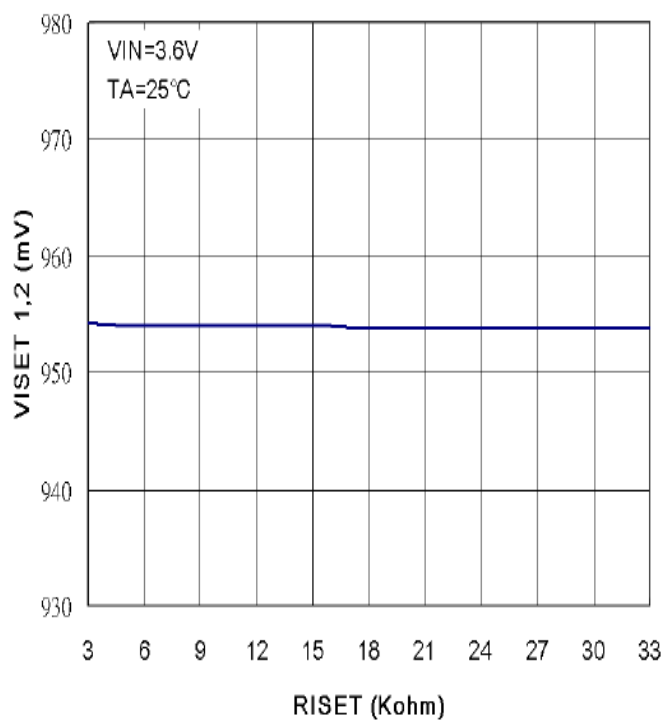
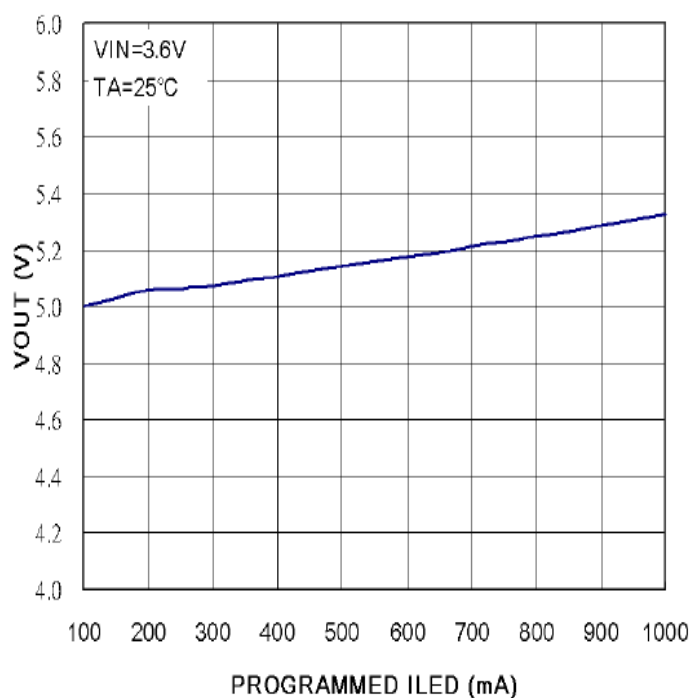




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PERFORMANCE CHARACTERISTICS (TA=25°C, unless otherwise specified.)

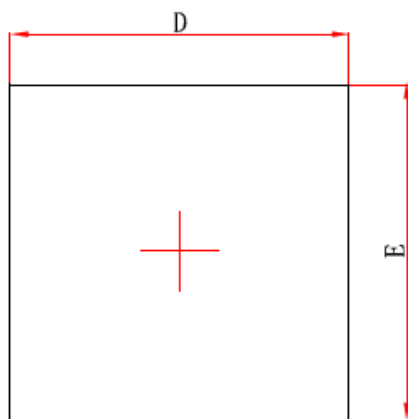




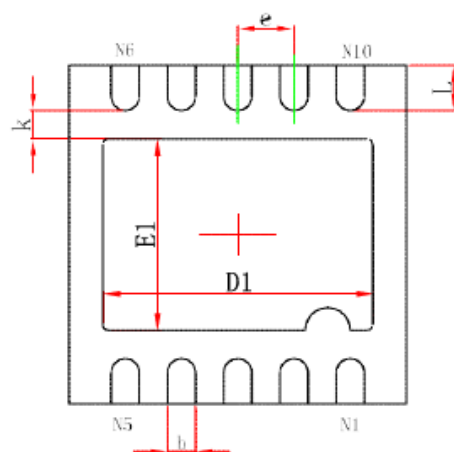
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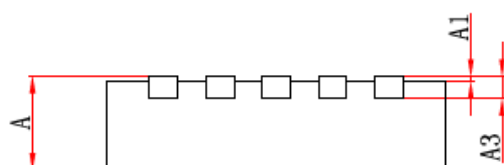
DFN-10 PACKAGE OUTLINE



Top View



Bottom View



Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
D1	2.300	2.500	0.091	0.098
E1	1.600	1.800	0.063	0.071
k	0.200MIN.		0.008MIN.	
b	0.180	0.300	0.007	0.012
e	0.500TYP.		0.020TYP.	
L	0.300	0.500	0.012	0.020



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