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.

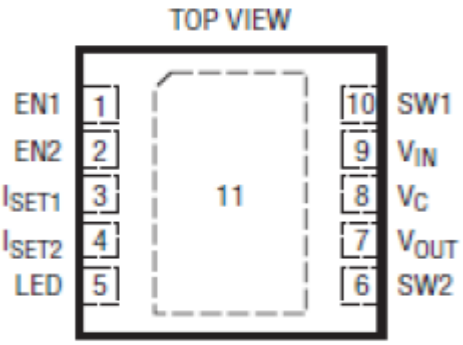
LED current is programmable to one of four levels,
Including shutdown, with dual external resistors and dual enable inputs. In shutdown no supply current is drawn.

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

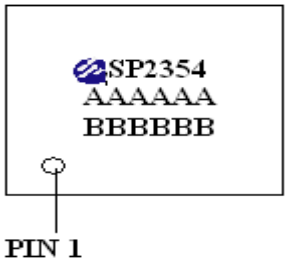
FEATURES
- Higher than 85% Efficiency
- Wide Input Voltage Range: 2.8V to 5.5V
- Faulty LED Protection
- Internal Soft Start
- Up to 1A continuous Output Current
- Zero Shutdown Current
- Over Temperature Protection
- Over Current Protection
- Constant Frequency 1.0MHz Operation
- DFN10 Package

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

PIN CONFIGURATION (DFN-10)



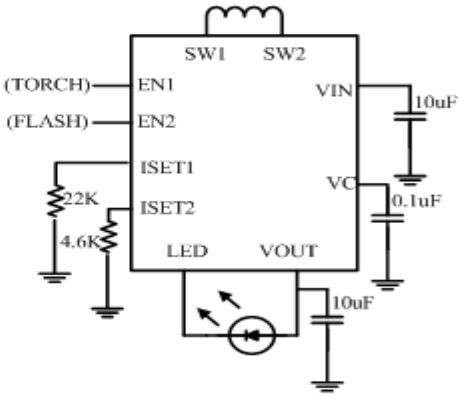
PART MARKING



AAAAAA : Wafer lot no.
BBBBBB : YYMMDD

TYPICAL APPLCATION CIRCUIT

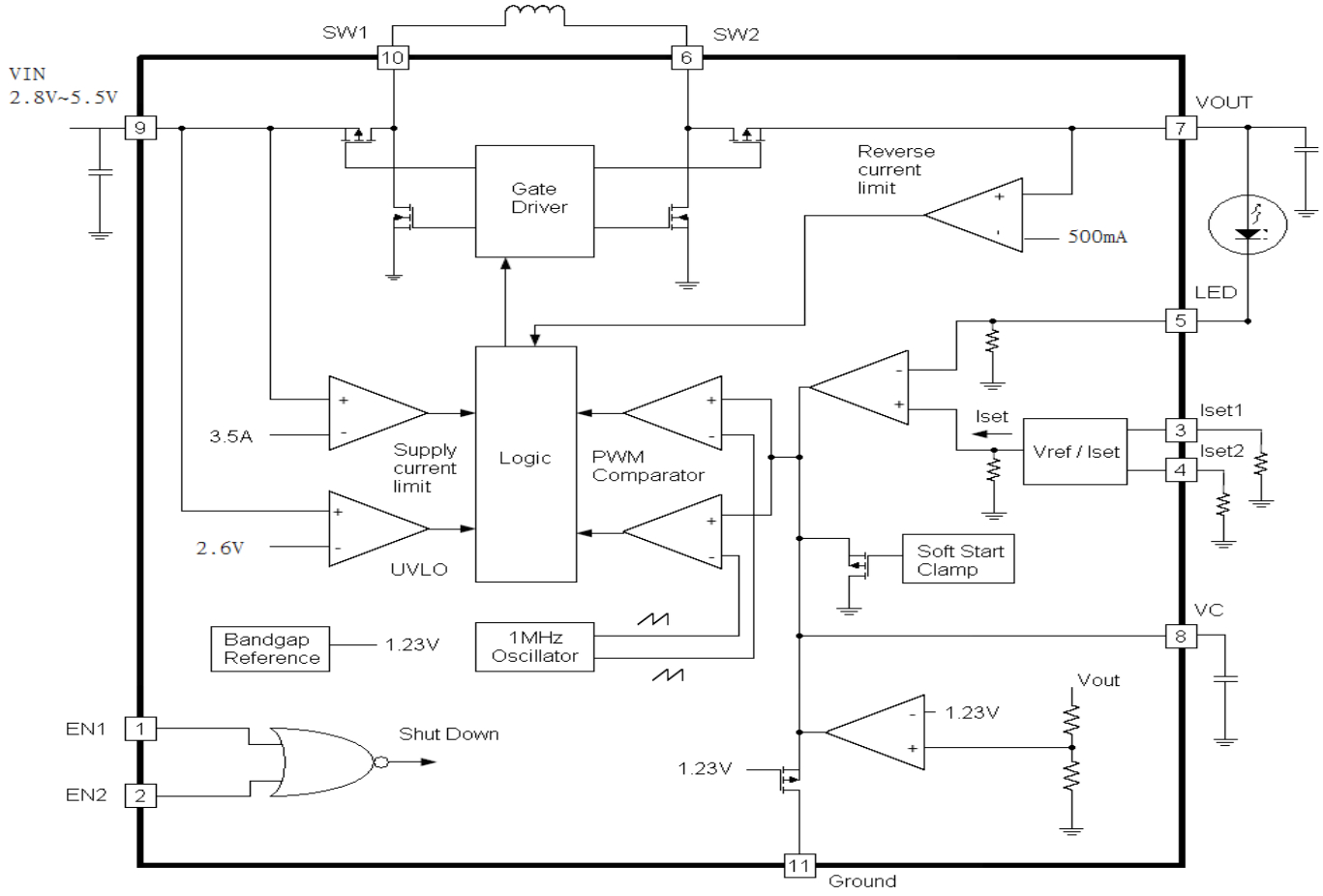
EN2	EN1	LED current
0	0	0 (oFF)
0	1	175mA
1	0	825mA
1	1	1A



PIN DESCRIPTION & ELECTRICAL CHARACTERISTICS

Pin	Symbol	Description	Operating Rating			
			Min.	Typ.	Max.	Unit
1	EN1	Enable Input for I_{SET1}	-0.3		V_{IN}+0.3	V
2	EN2	Enable Input for I_{SET2}	-0.3		V_{IN}+0.3	V
3	I_{SET1}	LED Current Program 1	-0.3		V_{IN}+0.3	V
4	I_{SET2}	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	V_{OUT}	Buck-Boost Output	-0.3		6	V
8	V_C	Compensation Point for Internal Error Amplifier	-0.3		V_{IN}+0.3	V
9	V_{IN}	Supply Voltage	-0.3		6	
10	SW1	Switching Node 2	-0.3		6	
11	GND	Ground, Exposed Pad				

BLOCK DIAGRAM



ORDERING INFORMATION

Part Number	Package	Part Marking
SP2354DN10RGB	DFN-10	SP2354

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

ABSOULTE MAXIMUM RATINGS (TA=25℃, 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	℃
T_{STG}	Storage Temperature Range	-40 to 125	℃
T_{LEAD}	Lead Soldering Temperature for 5 sec.	260	℃
Tope	Operation Temperature Range	-40 ~ 85	℃
$R_{\Theta JC}$	Thermal Resistance Junction – Case (*)	10	℃/W

ELECTRICAL CHARACTERISTICS

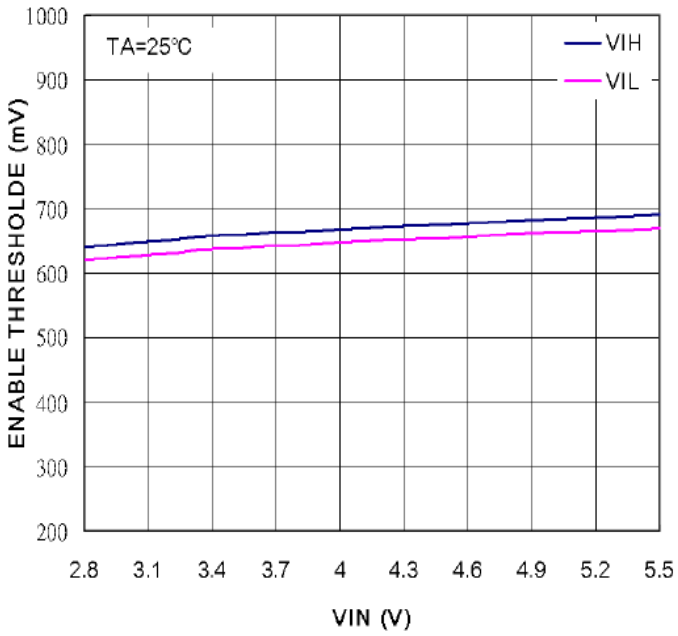
(Unless otherwise stated, these specifications apply T_A=25°C; V_{IN}=3.6V, R_{ISET}=22K)

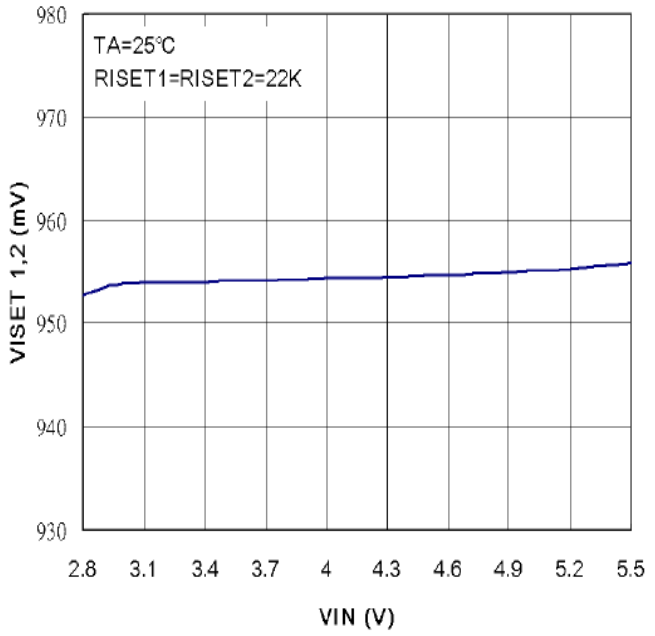
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
SUPPLY						
V_{IN}	Supply Voltage		2.8		5.5	V
I_{IN}	Supply Current	2.9V <= V_{IN} <= 5.5V		1000	1350	uA
		2.9V <= V_{IN} <= 5.5V, V_{EN1} = V_{EN2} = 0V			1	uA
		V_{IN} < UVLO, V_{EN1} = V_{EN2} = V_{IN}		5	10	uA
UVLO	Under Voltage Lockout Threshold	V_{IN} 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_{LED} = 1A	5	5.2	5.4	V
V_{ISET}	I_{SET1} and I_{SET2} Voltage	3.08K <= R_{ISET} <=20.5K	934	954	967	mV
V_{LED}	LED Pin Voltage	I_{LED} = 1A		140		mV
I_{RATIO}*	LED Output Current to Programmed Current Ratio	I_{LED} = 500mA	3150	3550	3800	
ENABLE						
V_{EN}	Enable Shutdown Voltage		0.2	0.66		V
$V_{EN(NOR)}$	Enable Voltage Normal Operation			0.68	1.2	V
I_{EN}	Enable 1 and Enable 2 Current		-1		1	uA
SOFT START						
T_{SS}	Soft-Start Period	0.9V to 2.1V		300		uS
SWITCHING REGULATOR						
R_{PMOS}**	$R_{DS(on)}$ for Switch A and D	V_{OUT} = 3.6V		170		mΩ
R_{NMOS}**	$R_{DS(on)}$ for Switch B and C			130		mΩ
I_{LPMOS}	Leakage Current for Switch A and D		-1		1	uA
I_{LNMOS}	Leakage Current for Switch B and C		-1		1	uA
I_F	Forward Switch Current Limit	Switch A	2.5	3.5		A
I_R	Reverse Switch Current Limit	Switch D, V_{OUT} = 3.6V		500		mA

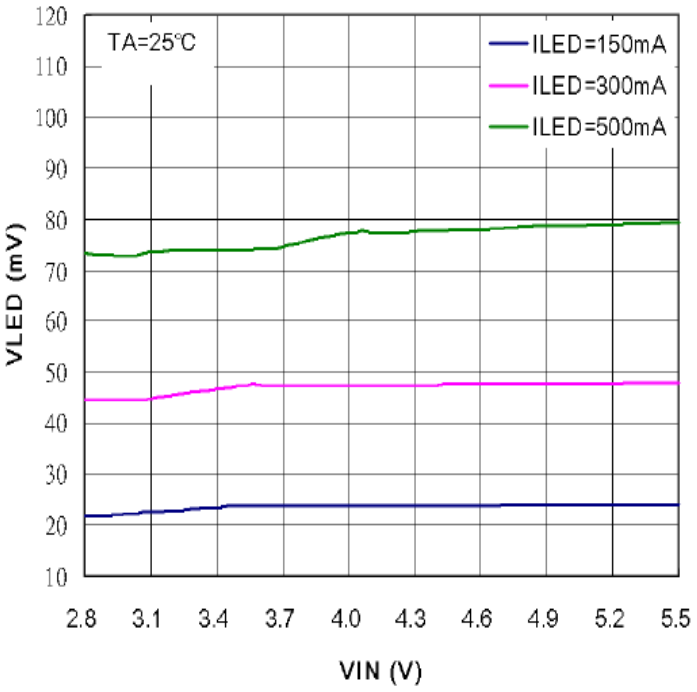
* I_{RATIO} = I_{LED}/(I_{ISET1} + I_{ISET2})

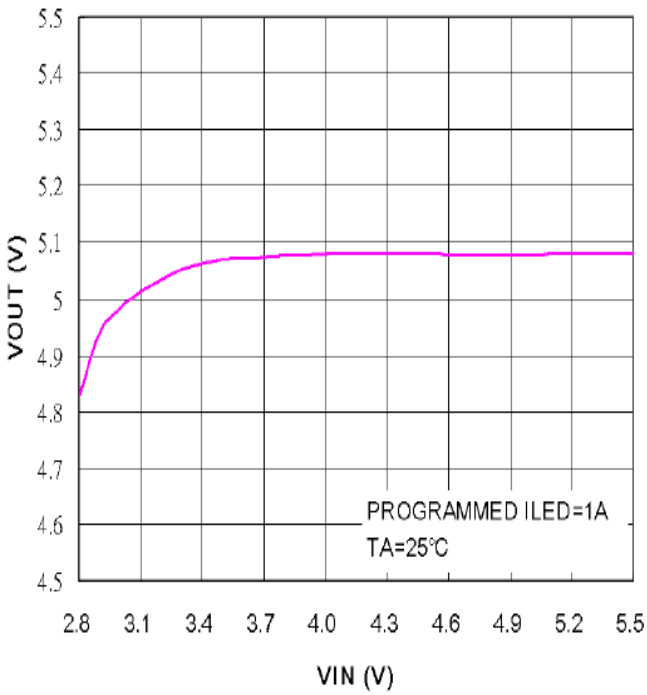
** Guaranteed by Design

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









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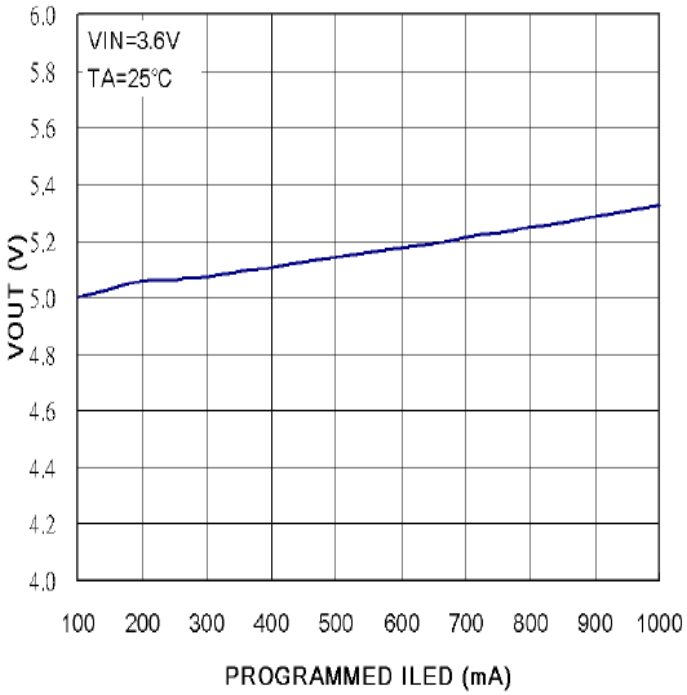
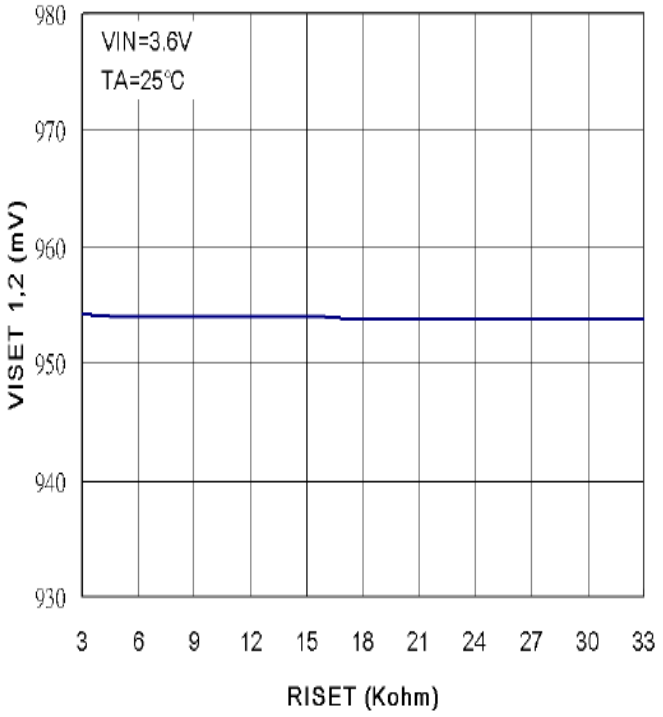
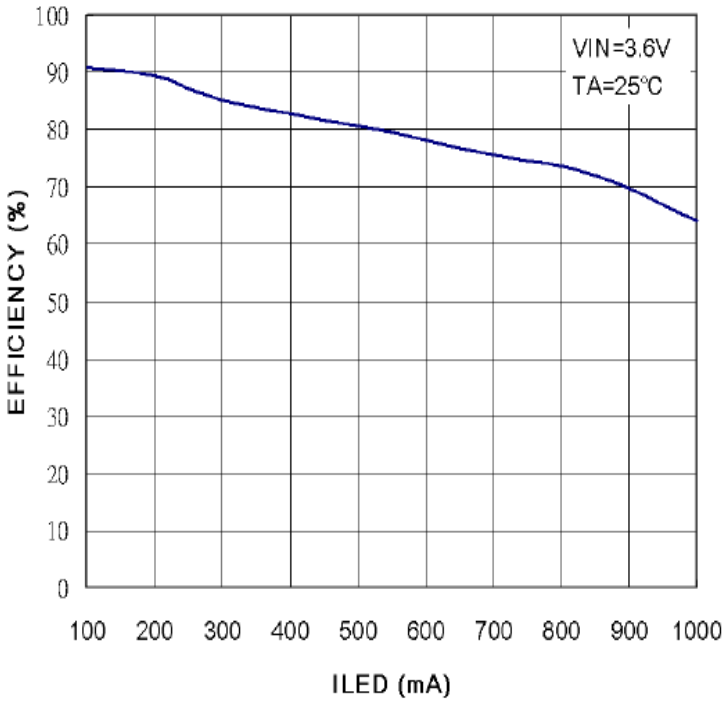
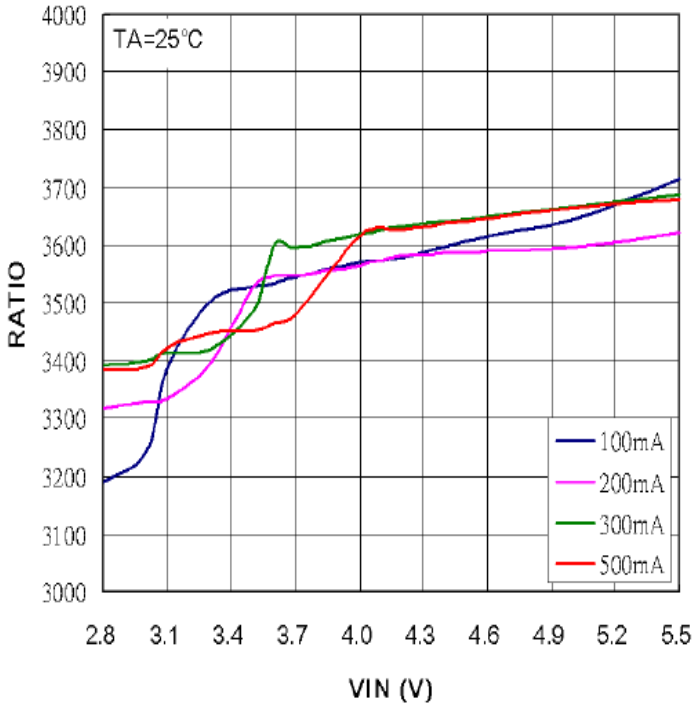
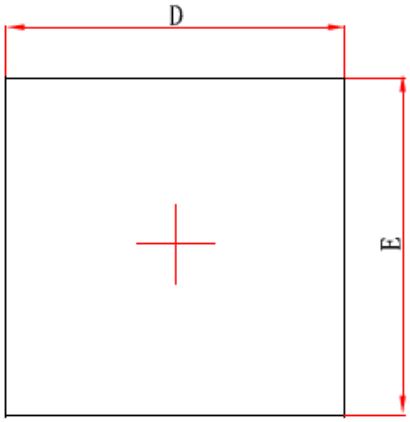




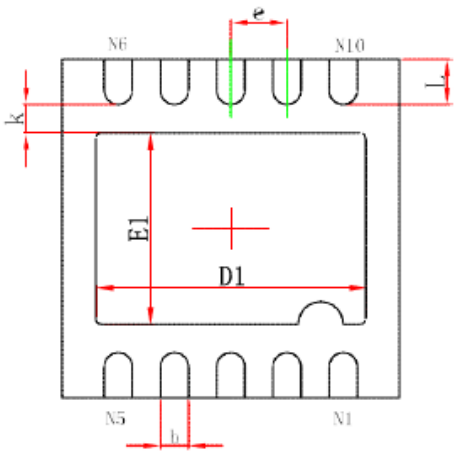




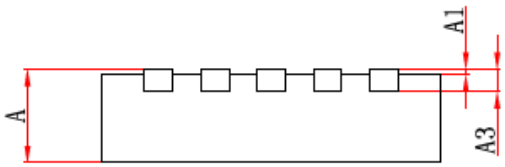
DFN-10 PACKAGE OUTLINE



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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