SK6053 Low Noise, High PSRR, 500mA/1A Ultra Low Dropout LDO

GENERAL DESCRIPTION

The SK6053 series are ultra-low dropout, fast transient response, high current delivery, high PSRR CMOS LDO. The quiescent current consumed by the SK6053 is typically 120μA over the entire input voltage range, making it attractive for consumer, networking applications that demand high output current.

The SK6053 series are available in wide output voltage range from 1.2V to 3.3V. And it offers thermal shutdown protection (OTP) and current limit functions, to maintain the stability of chip and power system at abnormal conditions.

The SK6053 series LDOs have option for output current limit between 1.0A or 500mA by alternating the LCON pin between "H" or "L" for SK6053D8 version.

The SK6053 series are available in DFN1216-8L package.

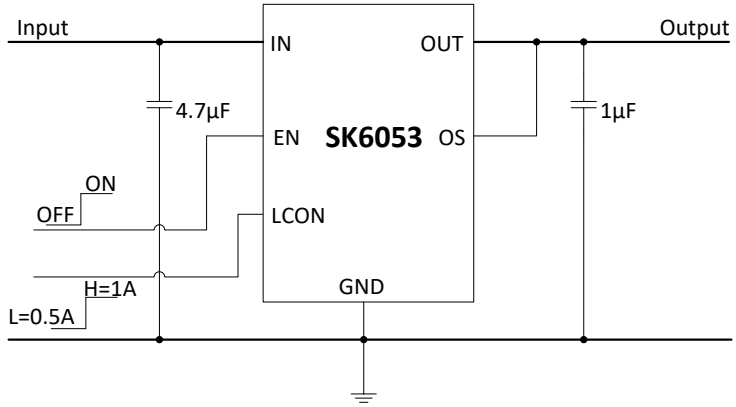
FEATURES

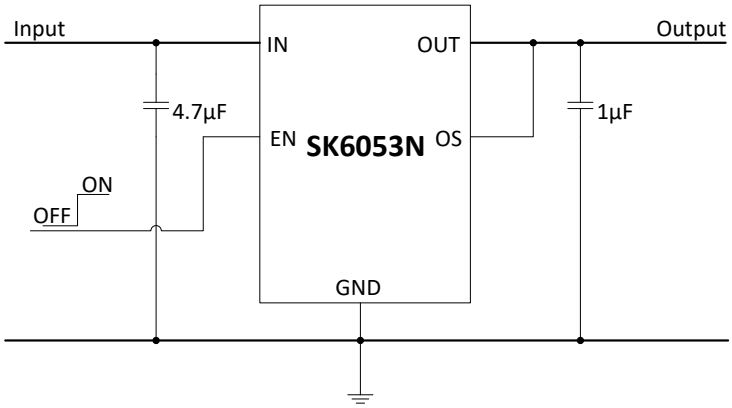
- Input Voltage: 2.5V~5.5V
- Fixed Output Range: 1.2V~3.3V
- Output Current: 500mA/1A
- Quiescent Current: 120μA (typ.)
- Dropout Voltage: 65mV (I_{OUT}=500mA, V_{OUT}=2.8V)
- High PSRR: 80dB@1kHz
- Reverse Current Protection

APPLICATIONS

- Portable Device , Tablets and Smartphone
- Cameras, VCRs and Car Dash Cameras
- Low Light & Low Noise Cam Application
- Communications and Infrastructure
- AR or VR Application

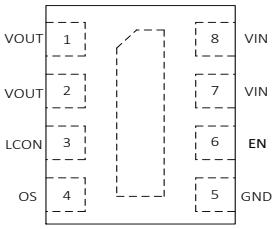
TYPICAL APPLICATION CIRCUITS





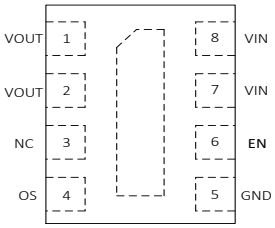
PIN CONFIGURATION

TOP VIEW



SK6053D8

TOP VIEW



SK6053ND8

PIN DESCRIPTION

PIN NO	SYMBOL	I/O	DESCRIPTTION
1	VOUT	O	Output
2	VOUT	O	Output
3	LCON/NC	I	For SK6053, it's output current limit alternate Pin ("H"≥1A, "L"≥500mA) and NC for SK6053N
4	OS	O	Output sense pin
5	GND	Ground	Ground
6	EN	I	Chip Enable, Active high, it is not allowed to be floating
7	VIN	Power	Input
8	VIN	Power	Input

ORDERING INFORMATION

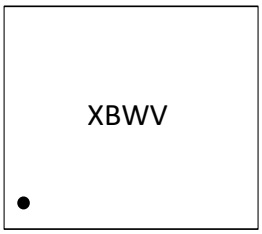
PART NO	PACKAGE	CURRENT LIMIT	TEMPERATURE	TAPE & REEL
SK6053D8-XX	DFN1216-8L	LCON=H, ≥1A LCON=L, ≥0.5A	-40°C ~ +85°C	4000 PCS
SK6053ND8-XX	DFN1216-8L	≥1A	-40°C ~ +85°C	4000 PCS

Note:

XX mean output voltage, for example, 28 means product outputs 2.8V, ADJ means adjustable.

SK6053 devices are Pb-free and RoHS compliant.

MARKING DESCRIPTION:



DFN1612-8L

"X": product code, "C" stands for "SK6053", "D" stands for "SK6053N".
"B": Internal Control Code.
"W": The week of manufacturing.
"A" stands for week 1, "Z" stands for week 26,
"a" stands for week 27, "z" stands for week 52.
"V": Output voltage code.

TYPICAL OUTPUT VOLTAGE CODE TABLE

VOUT	CODE	VOUT	CODE
1.2V	B	2.8V	M
1.5V	C	2.9V	N
1.8V	D	3.0V	G
2.5V	E	3.3V	H
2.6V	F		
2.7V	L		

ABSOLUTE MAXIMUM RATINGS

SYMBOL	ITEMS	VALUE	UNIT
V_{IN}	Input Voltage	-0.3~6.5	V
V_{CE}	CE voltage range	-0.3~V_{IN}	V
V_{LCON}	LCON voltage range	-0.3~V_{IN}	V
V_{OUT}	Output Voltage	-0.3~V_{IN}	V
P_{DMAX}	Power Dissipation	0.7	W
$R_{\theta JA}$	Thermal resistance	165	°C/W
T_J	Junction Temperature	150	°C
T_A	Ambient Temperature	-40~85	°C
T_{STG}	Storage Temperature	-55~150	°C
T_{SOLDER}	Package Lead Soldering Temperature	260°C, 10s	
ESD Ratings	HBM	±8	KV

Note: Exceed these limits may damage the device. Exposure to absolute maximum rating conditions may affect device reliability.

ELECTRICAL CHARACTERISTICS

T_A=25°C, V_{IN}=V_{OUT}+1V, C_{IN}=4.7uF, C_{OUT}=1uF, I_{OUT}=1mA, LCON=EN=V_{IN}, unless specified otherwise.

SYMBOL	ITEMS	CONDITIONS		MIN	TYP	MAX	UNIT
V_{IN}	Input Voltage			2.50		5.50	V
V_{UV}	UVLO	V_{IN} rising			2.05	2.25	V
V_{UV_HYS}		V_{IN} falling			0.15		V
V_{OUT}	Output Voltage Range	V_{OUT} ≥ 1.5V		-2		+2	%
		1.2V ≤ V_{OUT} < 1.5V		-30		30	mV
ΔV_{LOAD}	Load Regulation	V_{IN}=V_{OUT}+0.5V	LCON="H" 1mA ≤ I_{OUT} ≤ 1A		5		mV
			LCON="L" 1mA ≤ I_{OUT} ≤ 0.5A		3		
I_Q	Quiescent Current	I_{OUT} =0			120	160	µA
V_{DROP}	Dropout Voltage	LCON=0, V_{IN}=V_{SET}, I_{OUT}=0.5A V_{SET} ≥ 2.5V			65		mV
		LCON=1, V_{IN}=V_{SET}, I_{OUT}=1A V_{SET} ≥ 2.5V			130		
ΔV_{LINE}	Line Regulation	Vset+0.5V ≤ V_{IN} ≤ 5.5V (V_{IN} ≥ 2.5)				6	mV
I_{SHDN}	Shut-down Current	V_{CE}=0V			0.7		µA
$\Delta V_{OUT}/\Delta T_A$	V_{OUT} Temperature Coefficient	25℃ ≤ T_A ≤ 150℃			60		ppm/°C
I_{SC}	Short Current Limit	V_{OUT}=0V	LCON="H"		115		mA
			LCON="L"		78		
V_{CEH}	CE logic high voltage			1.2			V
V_{CEL}	CE logic low voltage					0.4	V
PSRR	Power Supply Ripple Rejection	V_{IN}=(V_{SET}+1V)+0.2V_{p-p}, f=1KHz, I_{OUT}=30mA			80		dB
e_{NO}	Output noise voltage*1	BW=10Hz to 100KHz I_{OUT}=10mA (V_{OUT}/Vfb*µVRMS)	V_{OUT}=3V		75		µVRMS
			V_{OUT}=1V		30		
T_{SD}	Thermal shutdown threshold				165		°C
ΔT_{SD}	Thermal shutdown hysteresis				25		°C
I_{REVMAX}	Reverse Current	V_{OUT}=$V_{OUT(SET)}$+1V, EN=0			10		µA
I_{OCP}	Over Current Protect	LCON= "H", or SK6050N		1			A
		LCON= "L"		0.5			
I_{OCPS}	Start Up Current Limit	LCON= "H"	Power On Start up Current Limit		600		mA
		LCON= "L"			300		mA
R_{OUT_DIS}	Discharge resistance	V_{IN}=4V, V_{CE}=0V, V_{OUT}=1V			60		Ω

ELECTRICAL CHARACTERISTICS (Continued)

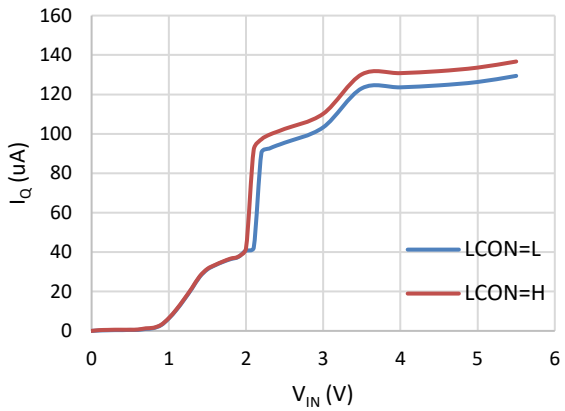
SYMBOL	ITEMS	CONDITIONS	MIN	TYP	MAX	UNIT
V_{REV_DET}	Detector offset voltage in reverse current protection mode	V_{OUT}=Voset-0.1V, V_{CE}=0 V_{IN} from high to low $V_{REV\_DET} = V_{OUT}-V_{IN}$		0.23		V
V_{REV_REL}	Release offset voltage in reverse current protection mode	V_{OUT}=Voset-0.1V, V_{CE}=0 V_{IN} from low to high $V_{REV\_REL} = V_{OUT}-V_{IN}$		0.07		V
V_{LCON_H}	LCON logic high voltage		1.2			V
V_{LCON_L}	LCON logic low voltage				0.4	V
I_{CE}	CE pull-down current			0.25	1	μA
I_{LCON}	LCON pull-down current			0.25	1	μA

Note1: Guaranteed by design

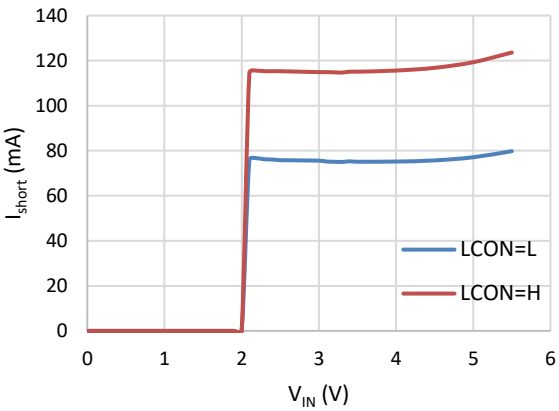
TYPICAL PERFORMANCE CHARACTERISTICS

T_A=25°C, V_{IN}=4.3V, Vset=3.3V, C_{IN}=4.7uF, C_{OUT}=1uF, I_{OUT}=1mA, LCON=EN=VIN, unless specified otherwise.

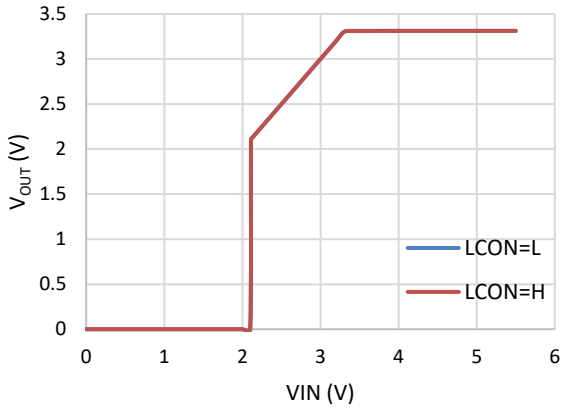
I_Q vs V_{IN}



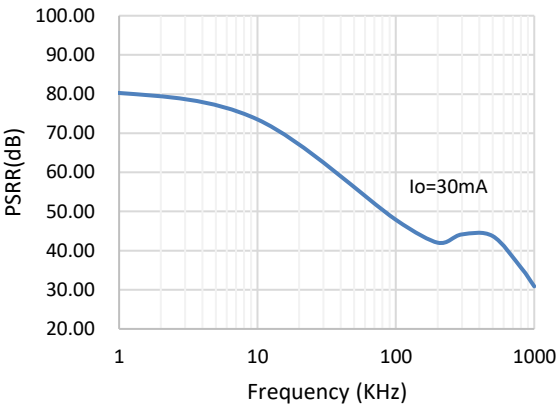
I_{short} vs V_{IN}



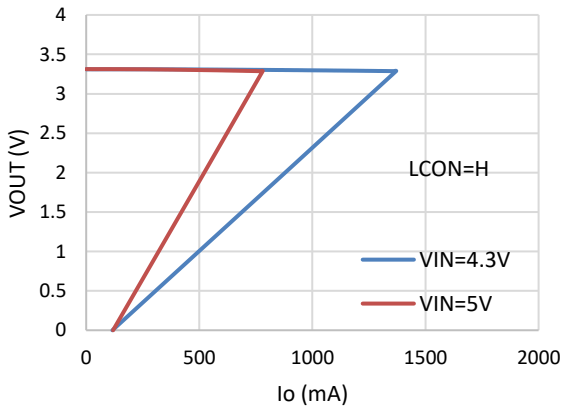
Line Regulation



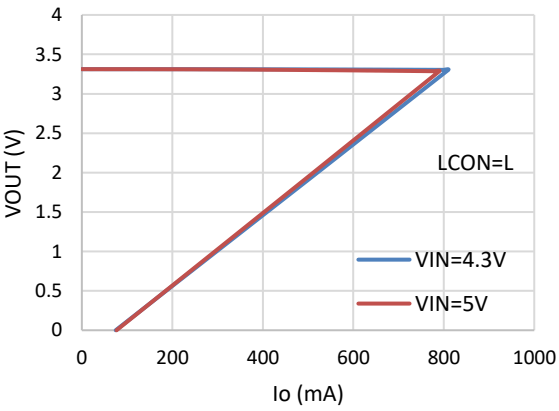
PSRR



Load Regulation



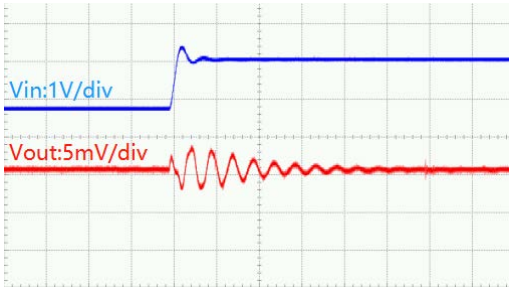
Load Regulation



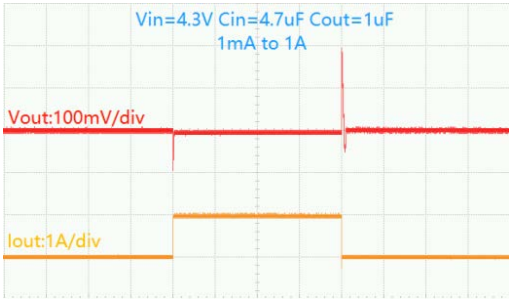
TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

T_A=25°C, V_{IN}=4.3V, V_{SET}=3.3V, C_{IN}=4.7uF, C_{OUT}=1uF, I_{OUT}=1mA, LCON=EN=VIN, unless specified otherwise.

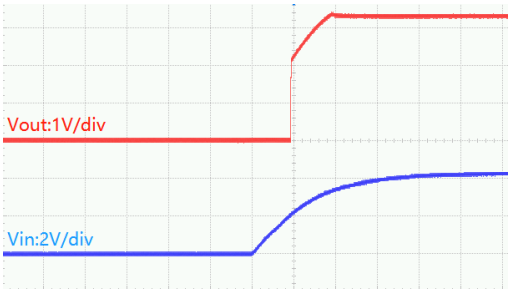
Line Transient Response



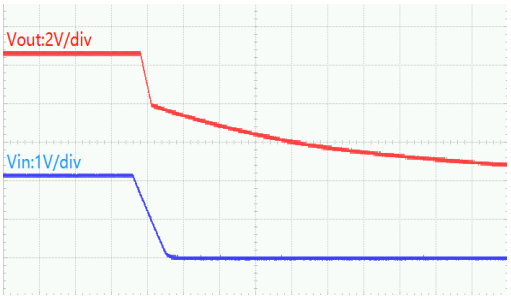
Load Transient Response



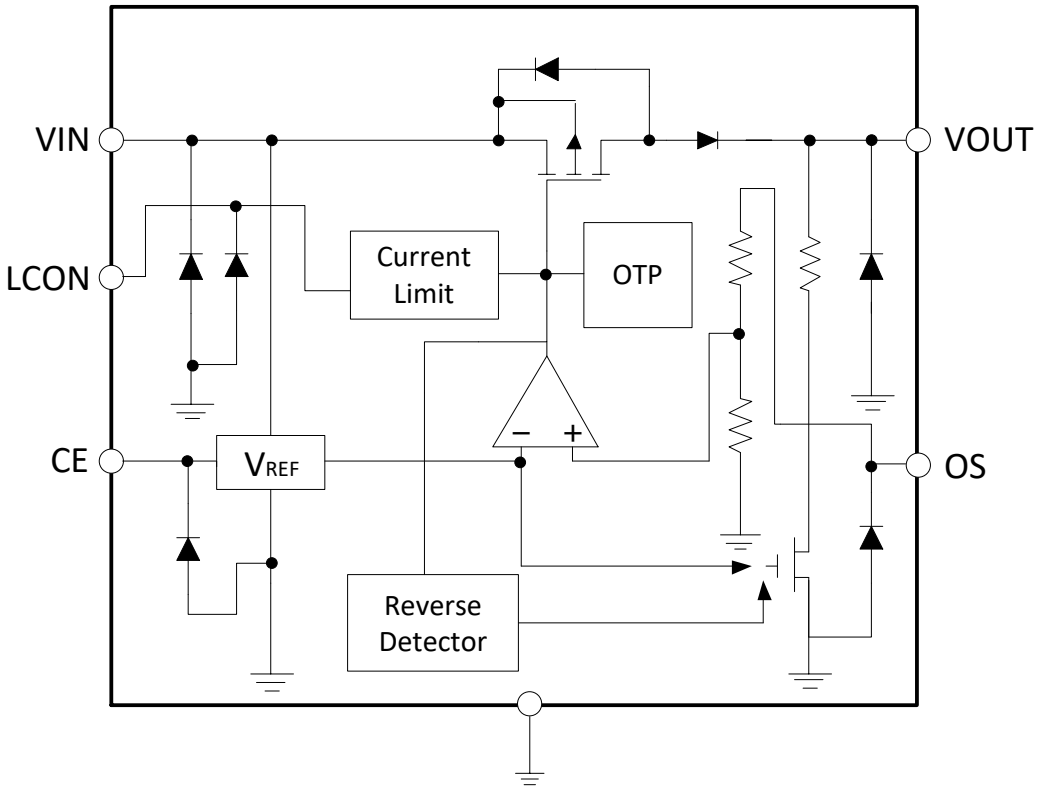
Power ON



Power Off



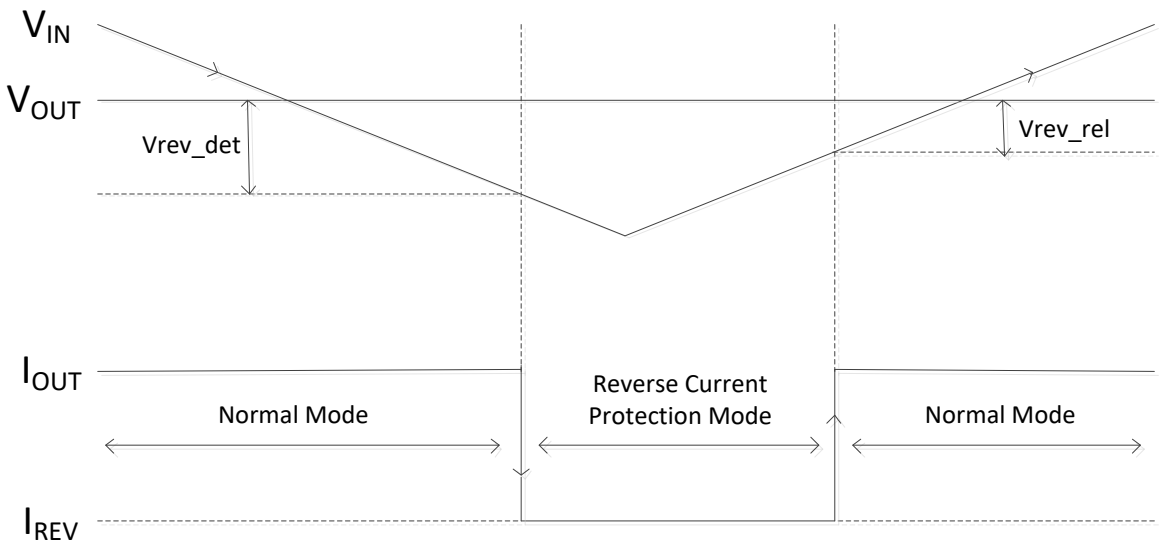
BLOCK DIAGRAM



REVERSE CURRENT PROTECTION CIRCUIT

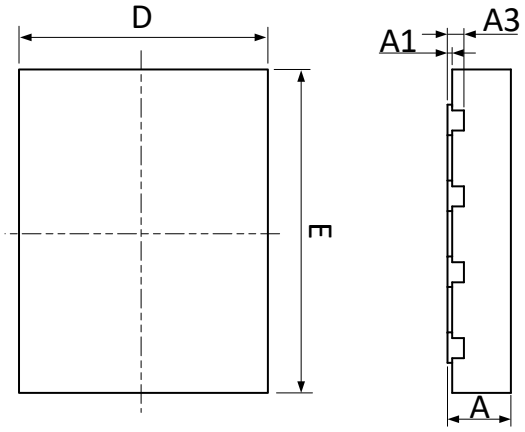
The SK6053 include a Reverse Current Protection Circuit, which stop the reverse current from V_{OUT} pin to V_{IN} pin or GND pin when V_{OUT} becomes higher than V_{IN}.

Following figure shows the load characteristics of each mode. When giving the VOUT pin a constant voltage and decreasing the V_{IN} voltage, the V_{IN} voltage will become lower than V_{OUT}-V_{rev_det}, the reverse current protection starts to function to stop the load current. By increasing the V_{IN} voltage higher than V_{OUT}-V_{rev_rel}, the protection mode will be released to let the load current to flow. When V_{IN} voltage is between V_{OUT} and V_{rev_det}, the parasitic diode between V_{IN} pin and V_{OUT} pin becomes forward direction. As a result, the current flows from V_{OUT} pin to V_{IN} pin, and the maximum of the current is I_{revmax}.

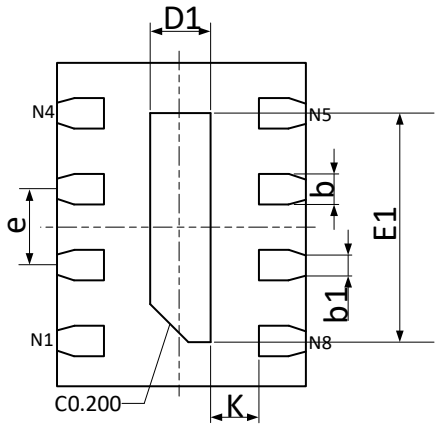


Detection/Release Threshold value of Reverse Current Protection

PACKAGE DIMENSIONS: DFN1216-8L



TOP VIEW SIDE VIEW



BOTTOM VIEW

Unit:mm

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.320	0.400	0.013	0.016
A1	0.000	0.050	0.000	0.002
A3	0.102REF.		0.004REF.	
D	1.100	1.300	0.043	0.051
E	1.500	1.700	0.059	0.067
D1	0.200	0.400	0.008	0.016
E1	1.100	1.300	0.043	0.051
k	0.200REF.		0.008REF.	
b	0.130	0.230	0.005	0.009
b1	0.120REF.		0.005REF.	
e	0.400BSC.		0.016BSC.	
L	0.200	0.300	0.008	0.012