■ General Description

The OCH177 Omnipolar Hall-effect Sensor IC is fabricated from mixed signal CMOS technology. It is comprised of two Hall plates and a CMOS output driver, mainly designed for battery-operation, hand-held equipment (such as Cellular and Cordless Phone, PDA). The total power consumption in normal operation is typically 24μW with a 3V power source.
Either north or south poles of sufficient strength will turn the output on. The output will be turned off under no magnetic field. While the magnetic flux density (B) is larger than operating point (BOP), the output will be turned on (low), the output is held until B is lower than release point (BRP), and then turned off.

The OCH177 is available in many flexible packaging options, such as DFN1216-4L. Operating temperature range of the OCH177 is from -40°C to 85°C.

To minimize the BOM cost, capacitors of the MLCC type are supported, and only one external component are needed to complete the application circuit.

■ Features

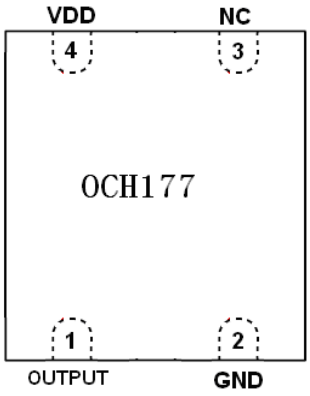
- Micro power consumption ideal for battery-powered applications
- Omnipolar (operation with magnetic field of either north or south pole), easy to use as output switches with both North and South pole
- Input Voltage Range: 2.4V to 5.5V
- Very High Sensitivity Hall Sensor
- Chopper stabilized amplifier stage
- Good RF noise immunity
- DFN1216-4L package
- ESD (HBM) ＞ 4KV
- Not need the push-high resistance

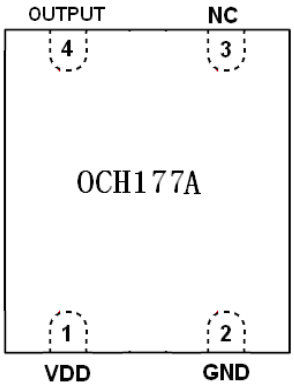
■ Applications

- Cover switch in clam-shell cellular phones
- Cover switch in Notebook PC/PDA
- Contact-less switch in consumer products
- Solid State Switch
- Handheld Wireless Handset Awake Switch
- Lid close sensor for battery-powered devise
- Magnet proximity sensor for reed switch replacement in low duty cycle applications

■ Pin Configuration

(1) DFN1216_4L (Top View)

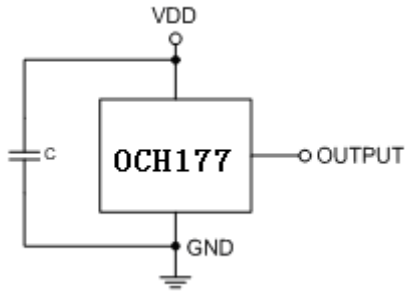




Pin Name	Pin No.		Pin Function
	OCH177	OCH177A	
VDD	4	1	Power Supply Input
GND	2	2	Ground
OUTPUT	1	4	Output Pin
N.C	3	3	Not Connected

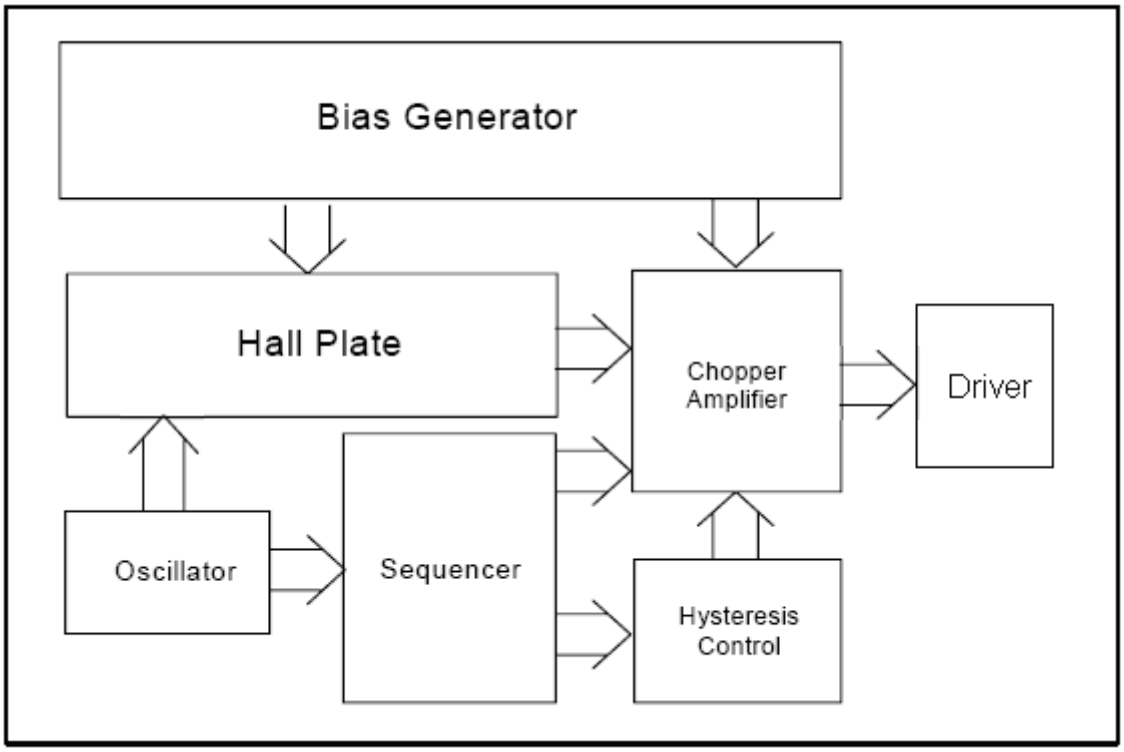
Note: NC is “No Connection” which is recommended to be tied to ground.

■ Typical Application Circuit



Note: C is for power stabilization and to strengthen the noise immunity, the recommended capacitance is 10nF~100nF.

■ Block Diagram



■ Absolute Maximum Ratings (T_A=25°C unless otherwise noted)

Parameter	Symbol	Rating	Unit
VDD to GND	V_{DD}	-0.3 to 5.5	V
Magnetic Flux Density	B	Unlimited	
Storage Temperature Range	T_S	-65 to +150	℃
Operating Junction Temperature Range	T_J	-40 to 150	℃
Package Power Dissipation	P_D	230	mW

■ Recommended Operating Conditions (T_A=25°C unless otherwise noted)

Parameter	Symbol	Conditions	Rating	Unit
Supply Voltage	V_{DD}	Operating	2.4 ~ 5.5	V
Operating Temperature Range	T_A	Operating	-40 ~ +85	℃

■ Electrical Characteristics

(Unless otherwise noted，typical values are at T_A=25℃, V_{DD}=3V)

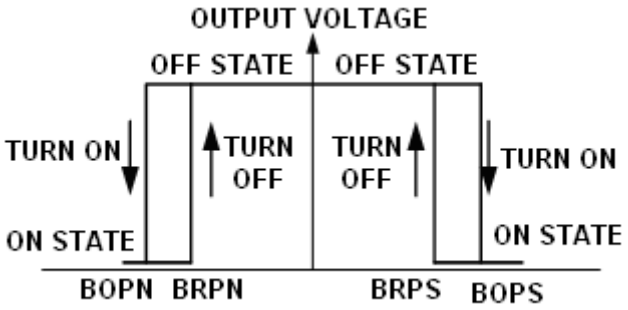
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_{OH}	Output On Voltage (High side)	I_{OUT}=+1mA	VDD-0.3	VDD-0.1	VDD+-0.3	V
V_{OL}	Output On Voltage (Low side)	I_{OUT}=-1mA	-0.3	0.1	0.3	V
I_{OFF}	Output Leakage Current	V_{OUT}=5.5V, Output off	-	<0.1	1	μA
I_{DD}(EN)	Supply Current	Chip enable, T_A=25℃, V_{DD} = 3V	-	3	6	mA
I_{DD}(EN)		Chip enable, T_A=-40~85℃, V_{DD} = 2.4~5.5V	-	3	9	mA
I_{DD}(DIS)		Chip disable, T_A=25℃,V_{DD} = 3V	-	5	10	μA
I_{DD}(DIS)		Chip disable, T_A=-40~85℃, V_{DD} = 2.4~5.5V	-	5	15	μA
I_{DD}(AVG)		Average supply current, T_A=25℃, V_{DD} = 3V	-	8	16	μA
I_{DD}(AVG)		Average supply current, T_A=-40~85℃, V_{DD} = 2.4~5.5V	-	8	24	μA
T_{awake}	Awake Time	-	-	75	125	μs
T_{period}	Period	-	-	75	125	ms
D.C.	Duty Cycle	-	-	0.1	-	%

■ Magnetic Characteristics

(Unless otherwise noted, typical values are at T_A=25℃, V_{DD}=3V) (1mT=10Gauss)

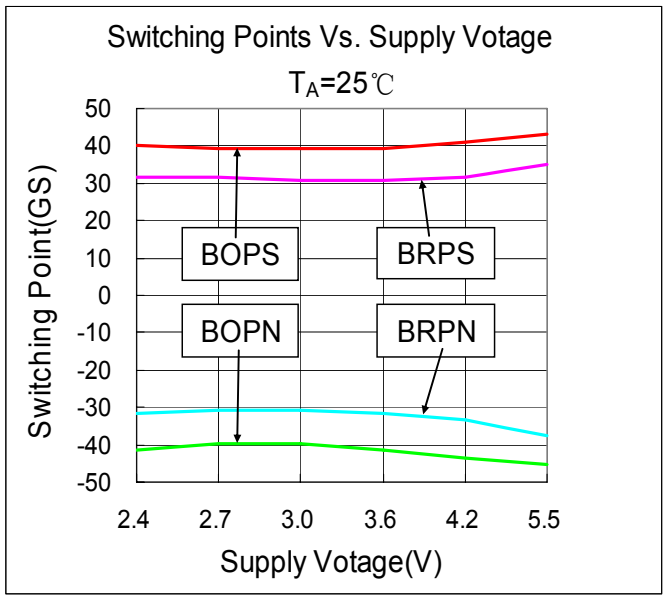
Symbol	Parameter	Min.	Typ.	Max.	Unit
BOPS (south pole to brand side)	Operate Point		40	60	Gauss
BOPN (north pole to brand side)		-60	-40		
BRPS (south pole to brand side)	Release Point	10	30		
BRPN (north pole to brand side)			-30	-10	
BHY (|BOPX-BRPX|)	Hysteresis		10		

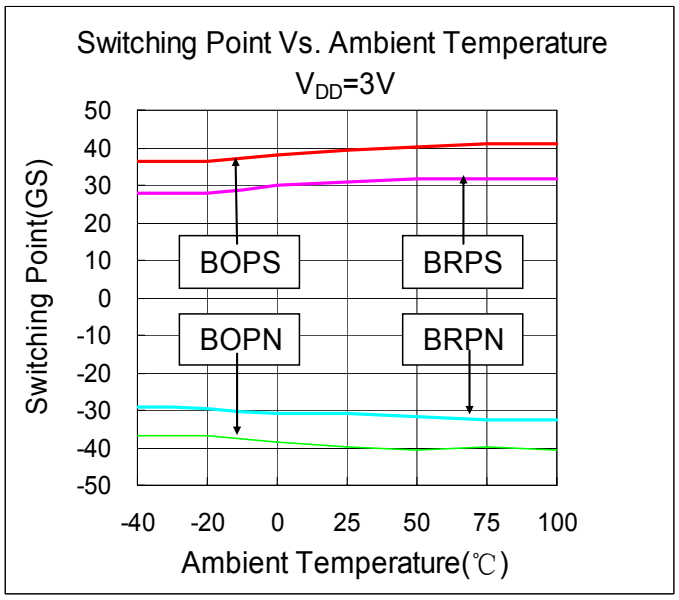
Notes: Operating point and release point will vary with supply voltage and operating temperature.

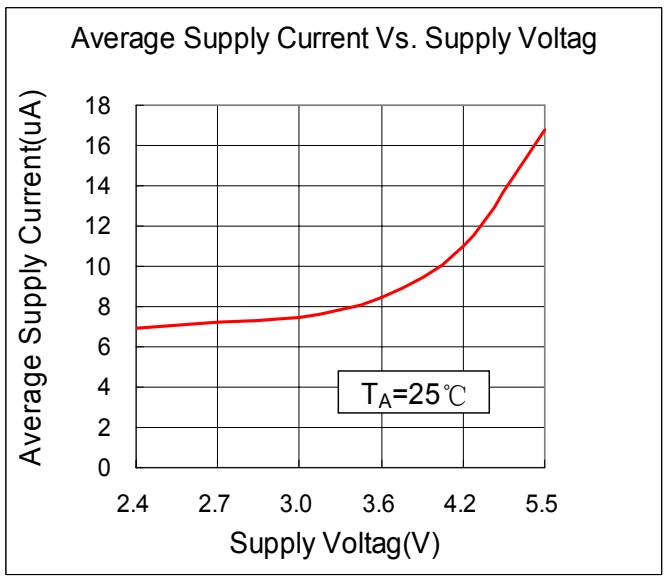


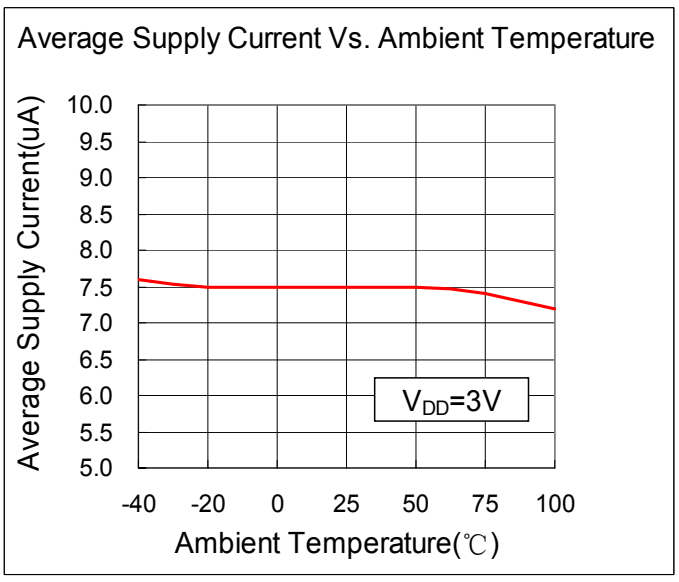
■ Typical Characteristics—OCH177

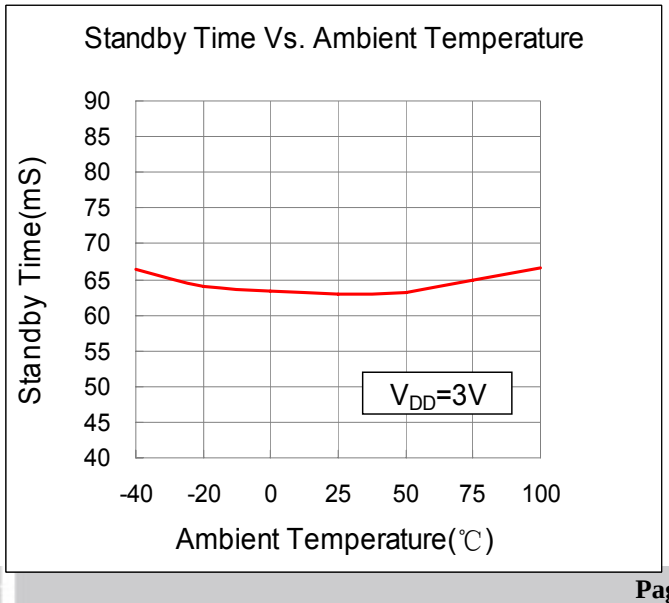
(Unless otherwise noted, V_{DD} = 3V, T_A = 25℃)

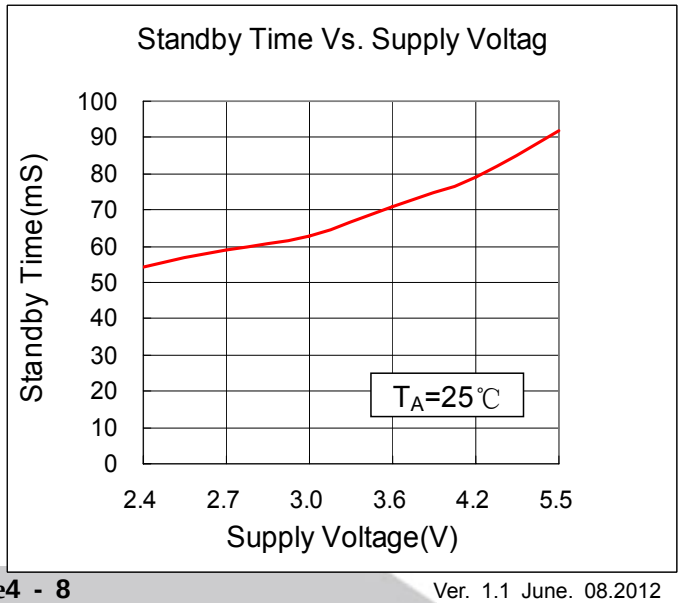




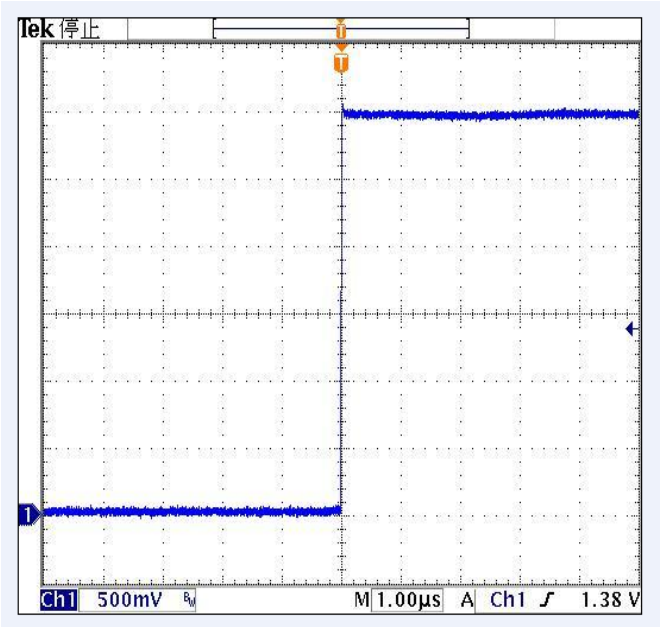




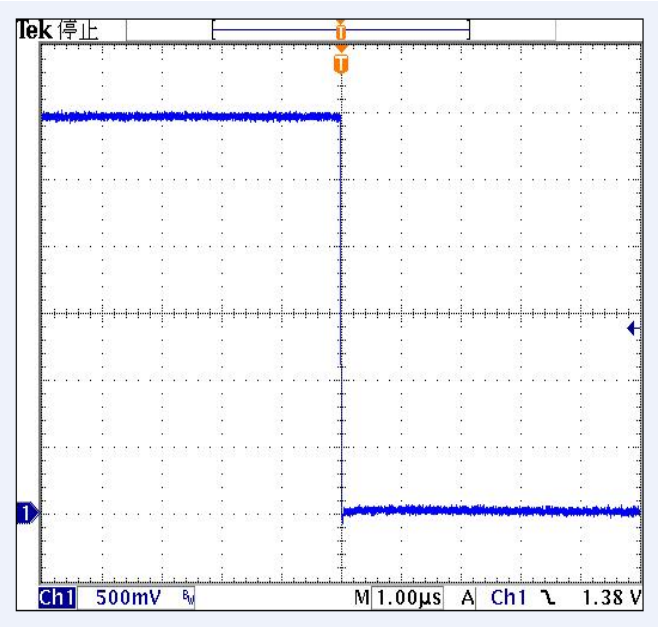




Positive Edge



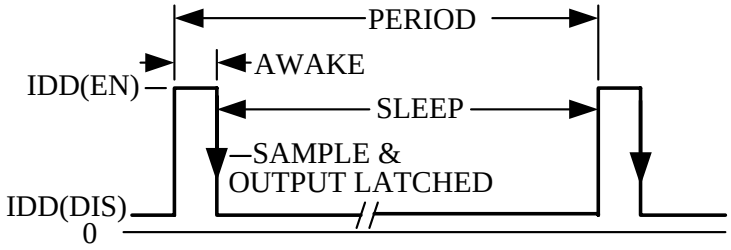
Negative Edge



■ Functional Description

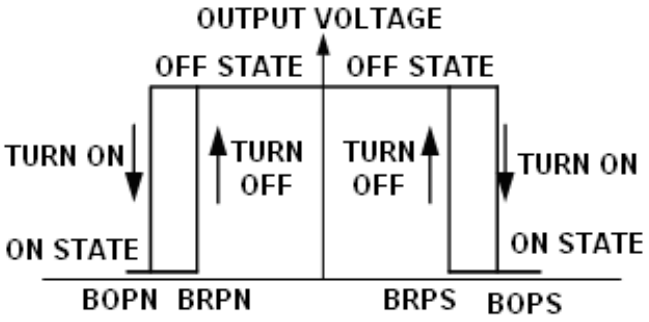
Low Average Power

Internal timing circuitry activates the sensor for 75µs and deactivates it for the remainder of the period (125ms). A short "awake" time allows for stabilization prior to the sensor sampling and data latching on the falling edge of the timing pulse. The output during the "sleep" time is latched in the last sampled state. The supply current is not affected by the output state.



Chopper-Stabilized Technique

The Hall element can be considered as a resistor array similar to a Wheatstone bridge. A large portion of the offset is a result of the mismatching of these resistors. These devices use a proprietary dynamic offset cancellation technique, with an internal high-frequency clock to reduce the residual offset voltage of the Hall element that is normally caused by device over-molding, temperature dependencies, and thermal stress. The chopper-stabilizing technique cancels the mismatching of the resistor circuit by changing the direction of the current flowing through the Hall plate using CMOS switches and Hall voltage measurement taps, while maintains the Hall voltage signal that is induced by the external magnetic flux. The signal is then captured by a sample-and-hold circuit and further processed using low-offset bipolar circuitry. This technique produces devices that have an extremely stable quiescent Hall output voltage, are immune to thermal stress, and have precise recoverability after temperature cycling. A relatively high sampling frequency is used for faster signal processing capability can be processed.

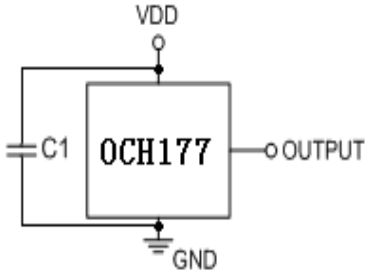


Operation

The output of this device switches low (turns on) when a magnetic field perpendicular to the Hall sensor exceeds the operate point BOPS (or is less than BOPN). After turn-on, the output is capable of sinking up to 1mA and the output voltage is VOUT(ON). When the magnetic field is reduced below the release point BRPS (or increased above BRPN), the device output switches high (turns off). The difference between the magnetic operates and release points are the hysteresis (Bhys) of the device. This built-in hysteresis allows clean switching of the output even in the presence of external mechanical vibration and electrical noise.

Applications:

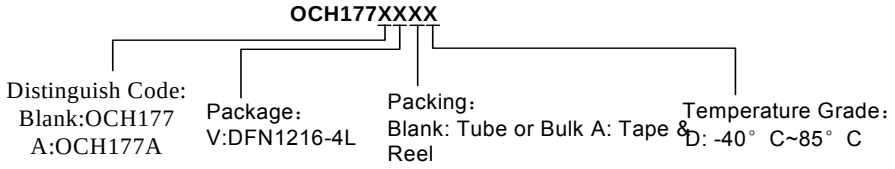
OCH177's pole-independent sensing technique allows for operation with either a north or south poles magnet orientation, enhancing the manufacturability of the device. The state-of-the-art technology provides the same output polarity for either pole face.



C1 serves two purposes: minimizing ripples on the input voltage and enhancing immunity from RF transmission noises within close proximity. Recommended values are between 10nF and 100nF. The larger the capacitance, the better the noise immunity is for the OCH177.

It is strongly recommended that an external bypass capacitor be connected (in close proximity to the Hall sensor) between the supply and ground of the device to reduce both external noise and noise generated by the chopper-stabilization technique. This is especially true due to the relatively high impedance of battery supplies. The simplest form of magnet that will operate these devices is a bar magnet with either pole near the branded surface of the device.

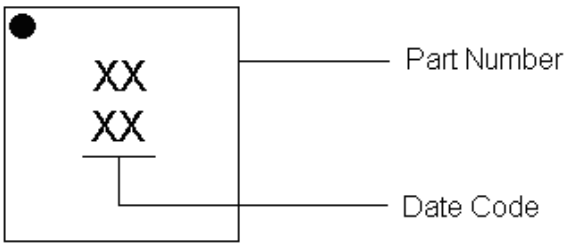
■ Ordering Information



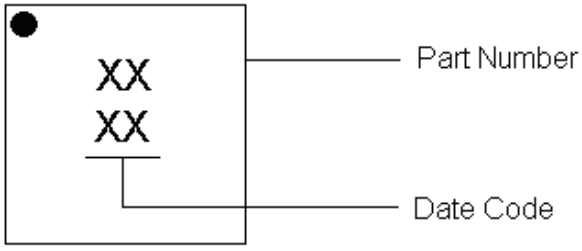
Part Number	Package Type	Package Qty	Brp (Gauss)	Bop (Gauss)	Temperature	Eco Plan	Lead/Ball Finish
OCH177VAD	DFN1216-4L	7-in reel 3000pcs/reel	±10 ~ ±50	±20 ~ ±60	-40～85℃	Green	Cu NIPDAU
OCH177AVAD	DFN1216-4L	7-in reel 3000pcs/reel	±10 ~ ±50	±20 ~ ±60	-40～85℃	Green	Cu NIPDAU

■ Marking Information

(1) DFN1216-4L(OCH177)

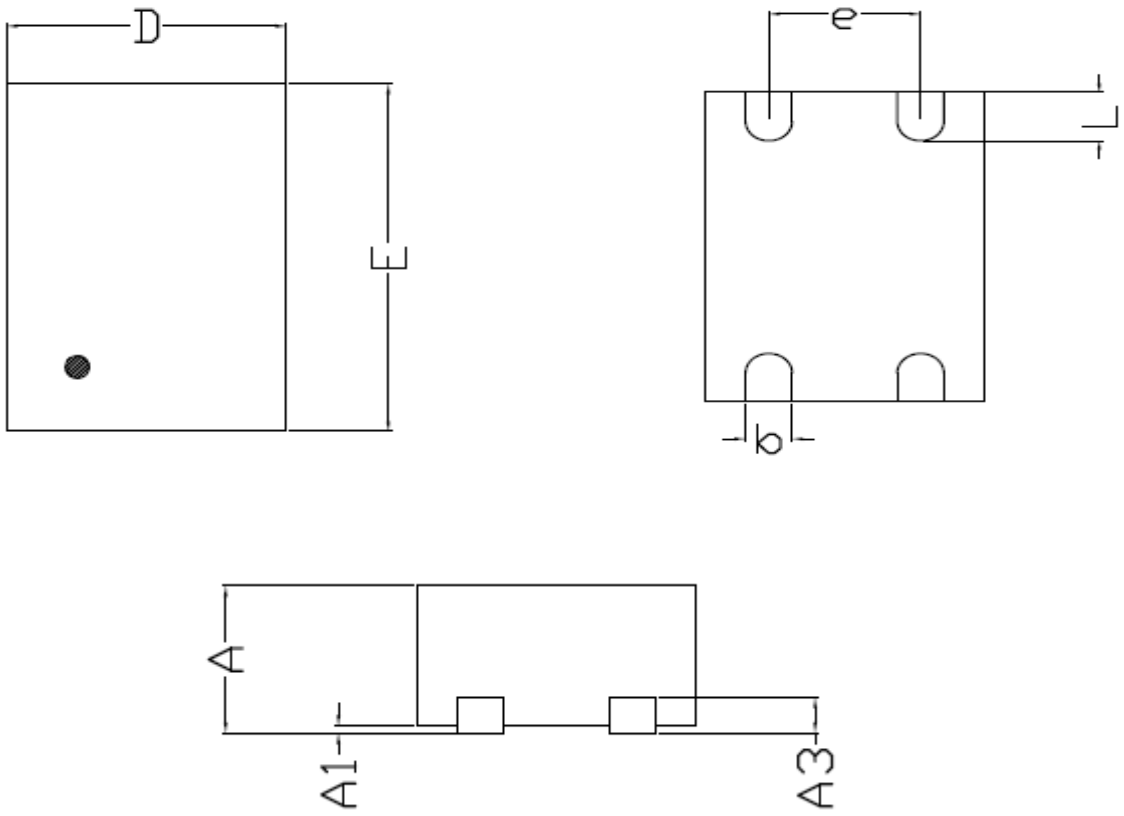


(2)DFN1216-4L(OCH177A)



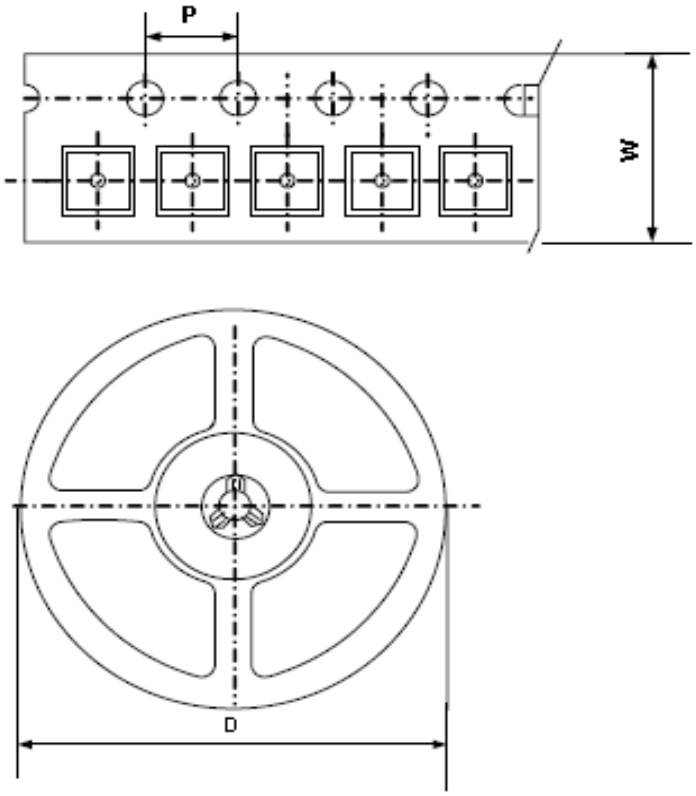
■ Package Information

(1) DFN1216-4L



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	0. 50	0.55	0.60	0.020	0.022	0.024
A1	0.00	-	0.05	0.000	-	0.002
A3	0.150 (BSC)			0.006 (BSC)		
D	1.15	1.20	1.25	0.045	0.047	0.049
E	1.55	1.60	1.65	0.061	0.063	0.065
L	0.20	0.25	0.30	0.008	0.010	0.011
b	0.15	0.20	0.25	0.006	0.008	0.010
e	0.65 (BSC)			0.026 (BSC)		

■ Packing information



Package Type	Carrier Width(W)	Pitch(P)	Reel Size(D)	Packing Minimum
DFN1216-4L	8.0±0.1 mm	4.0±0.1 mm	180±1 mm	3000pcs

Note: Carrier Tape Dimension, Reel Size and Packing Minimum