

## 30V N-Channel Enhancement Mode MOSFET

### Description

The NP14N03 uses trench MOSFET technology that is uniquely optimized to provide the most efficient high frequency switching performance. Conduction and switching losses are minimized due to an extremely low combination of  $R_{DS(ON)}$  and  $C_{rss}$ .

### General Features

- ◆  $V_{DS} = 30V$   $I_D = 8A$   
 $R_{DS(ON)}(Typ.) = 24m\Omega$  @  $V_{GS} = 10V$   
 $R_{DS(ON)}(Typ.) = 30m\Omega$  @  $V_{GS} = 4.5V$
- ◆ Lead free product is acquired
- ◆ Surface mount package

### Application

- ◆ High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- ◆ Networking DC-DC Power System
- ◆ Load switch

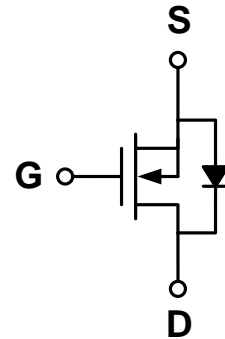
### Package

- ◆ SOP-8

*100% UIS TESTED!*

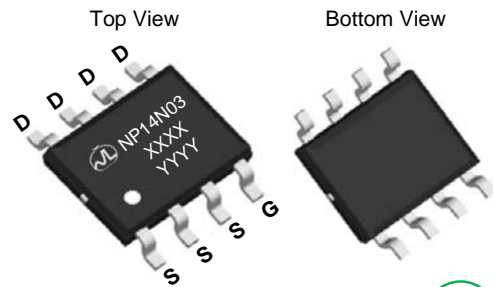
*100%  $\Delta V_{ds}$  TESTED!*

### Schematic diagram



### Marking and pin assignment

#### SOP-8



### Ordering Information

Part Number	Storage Temperature	Package	Devices Per Reel
NP14N03SR-R-G	-55°C to +150°C	SOP-8	4000

### Absolute Maximum Ratings (TA=25°C unless otherwise noted)

parameter	symbol	limit	unit
Drain-source voltage	$V_{DS}$	30	V
Gate-source voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$I_D$	TC=25°C	8
		TC=100°C	6
Pulsed Drain Current	$I_{DP}$	40	A
Avalanche energy( L=0.1mH)	EAS	14	mJ
Maximum power dissipation	$P_D$	TC=25°C	2.5
Power Dissipation – Derate above 25°C		TC=25°C	2
Operating junction Temperature range	$T_j$	-55—150	°C

**Electrical Characteristics** (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	30	-	-	V
BVDSS Temperature Coefficient	ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Reference to 25°C, I <sub>D</sub> =1mA		33		mV/°C
Zero gate voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V	-	-	1	μA
		T <sub>J</sub> =85°C	-	-	30	
Gate Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V	-	-	±100	nA
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.0	1.55	2.2	V
Drain-source on-state resistance <sup>1</sup>	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =8A	-	24	28	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =6A		30	36	
On Status Drain Current	I <sub>D(ON)</sub>	V <sub>DS</sub> =10V, V <sub>GS</sub> =10V	14	-	-	A
<b>Diode Characteristics</b>						
Diode Forward Voltage <sup>1</sup>	V <sub>SD</sub>	I <sub>SD</sub> =1A, V <sub>GS</sub> =0V	-	0.8	1.1	V
Diode Continuous Forward Current	I <sub>S</sub>		-	-	18	A
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =8A,	-	9	-	ns
Reverse Recovery Charge	Q <sub>rr</sub>	dI/dt=100A/us	-	15	-	nC
<b>Dynamic Characteristics<sup>2</sup></b>						
Gate Resistance	R <sub>G</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	-	3.3	-	Ω
Input capacitance	C <sub>ISS</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V f=1.0MHz	-	255	310	pF
Output capacitance	C <sub>OSS</sub>		-	45	60	
Reverse transfer capacitance	C <sub>RSS</sub>		-	35	50	
Turn-on delay time	t <sub>D(ON)</sub>	V <sub>GS</sub> =10V, V <sub>DD</sub> =15V, R <sub>L</sub> =20Ω, I <sub>D</sub> =8A, R <sub>G</sub> =3.3Ω	-	4.5	-	ns
Turn-on Rise time	t <sub>r</sub>		-	2.5	-	
Turn-off delay time	t <sub>D(OFF)</sub>		-	14.5	-	
Turn-off Fall time	t <sub>f</sub>		-	3.5	-	
Total gate charge	Q <sub>g</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =8A V <sub>DS</sub> =15V	-	5.2		nC
Gate-source charge	Q <sub>gs</sub>		-	2.5		
Gate-drain charge	Q <sub>gd</sub>		-	1	-	
<b>Drain-Source Diode Characteristics</b>						
Diode forward voltage	V <sub>SD</sub>	I <sub>SD</sub> =50A, V <sub>GS</sub> =0V	-	0.8	1.1	V

Note: 1: Pulse test; pulse width ≤ 300ns, duty cycle ≤ 2%.

2: Guaranteed by design, not subject to production testing.

**Thermal Characteristics**

Parameter	Symbol	Typical	Unit
Thermal Resistance-Junction to Case	Rθjc	1.7	°C/W
Thermal Resistance junction-to ambient	Rθja	62.5	

## Typical Performance Characteristics

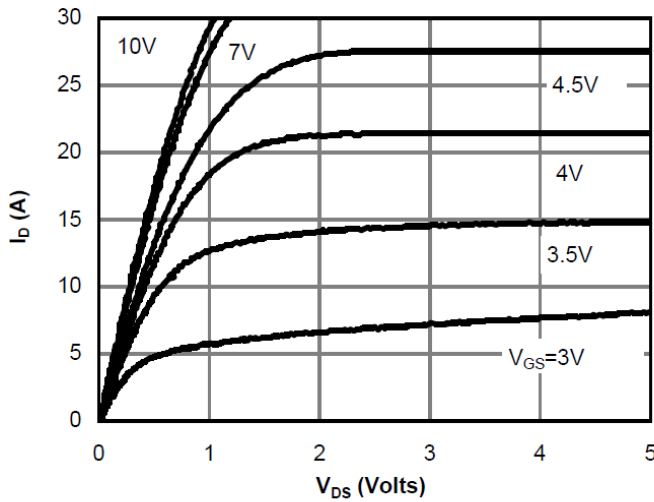


Fig 1: On-Region Characteristics

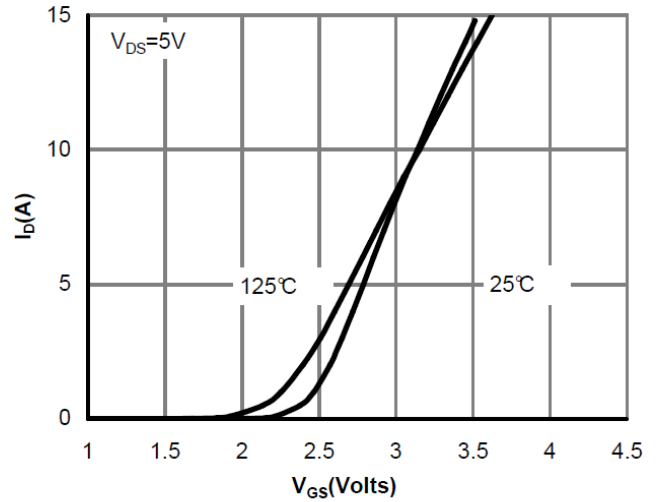


Figure 2: Transfer Characteristics

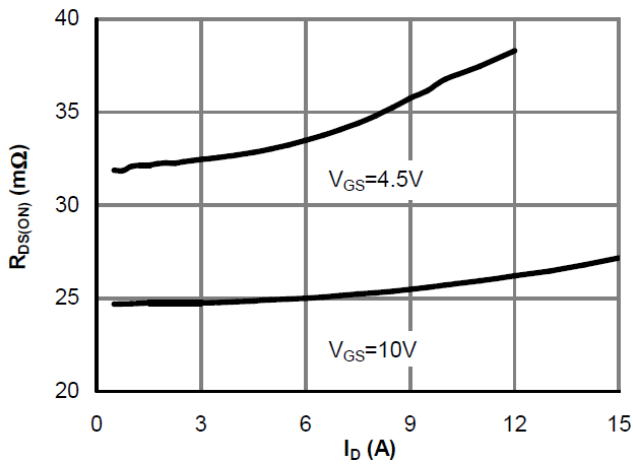


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

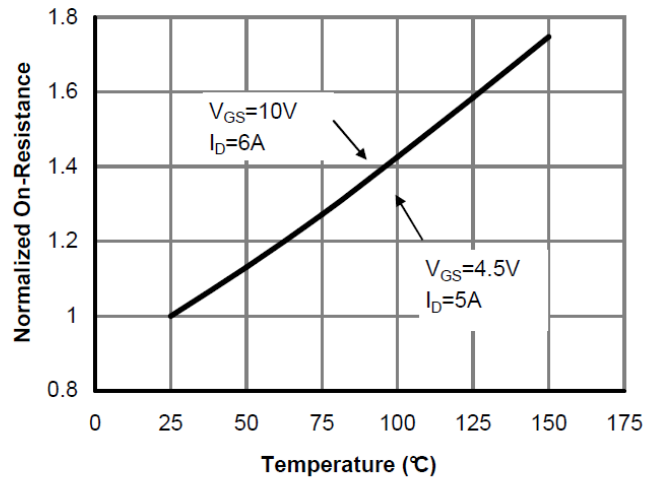


Figure 4: On-Resistance vs. Junction Temperature

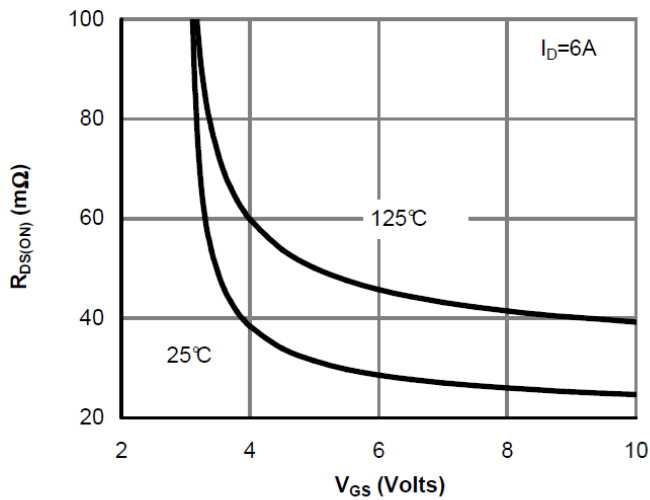


Figure 5: On-Resistance vs. Gate-Source Voltage

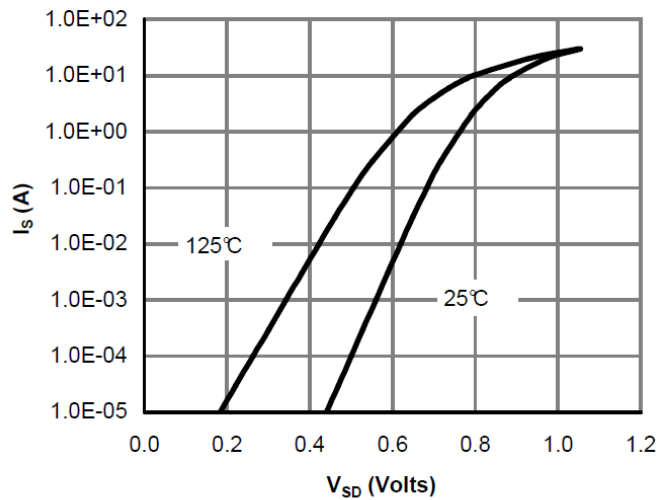
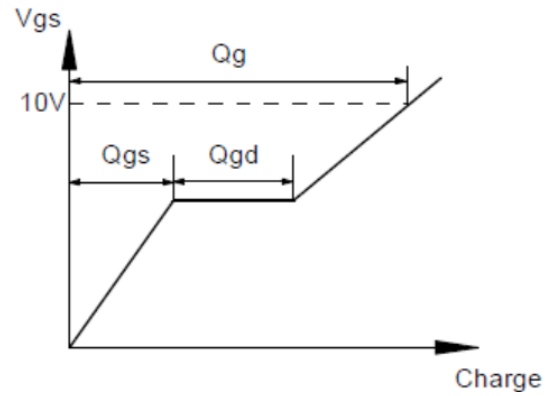
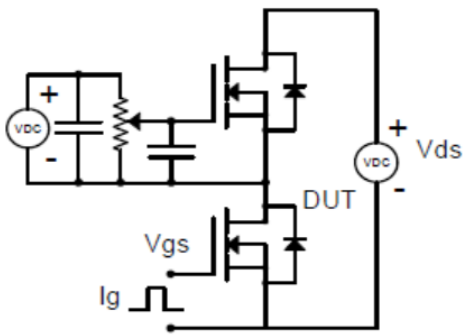
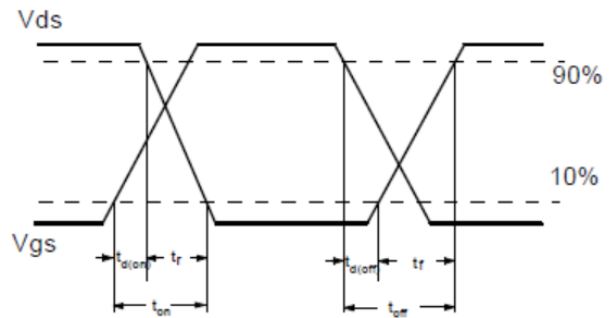
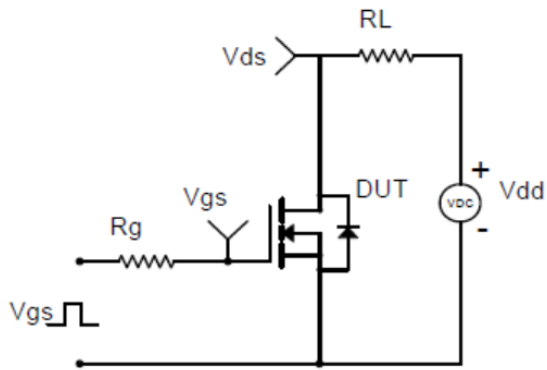


Figure 6: Body-Diode Characteristics

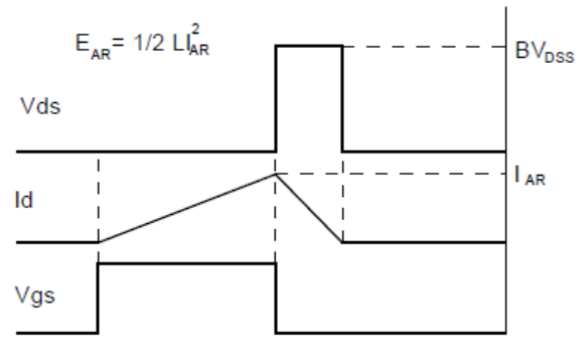
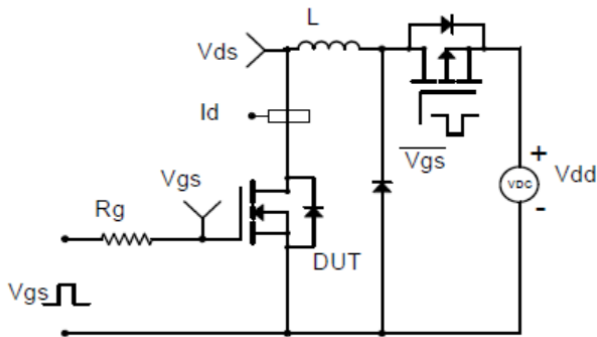
Gate Charge Test Circuit & Waveform



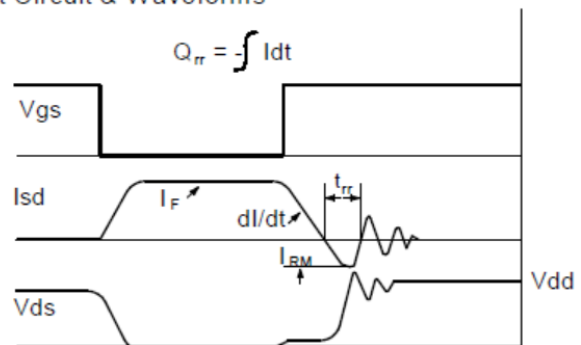
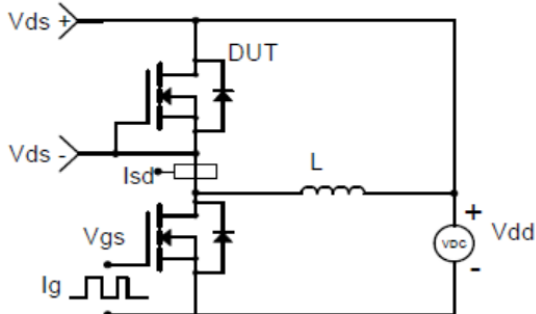
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

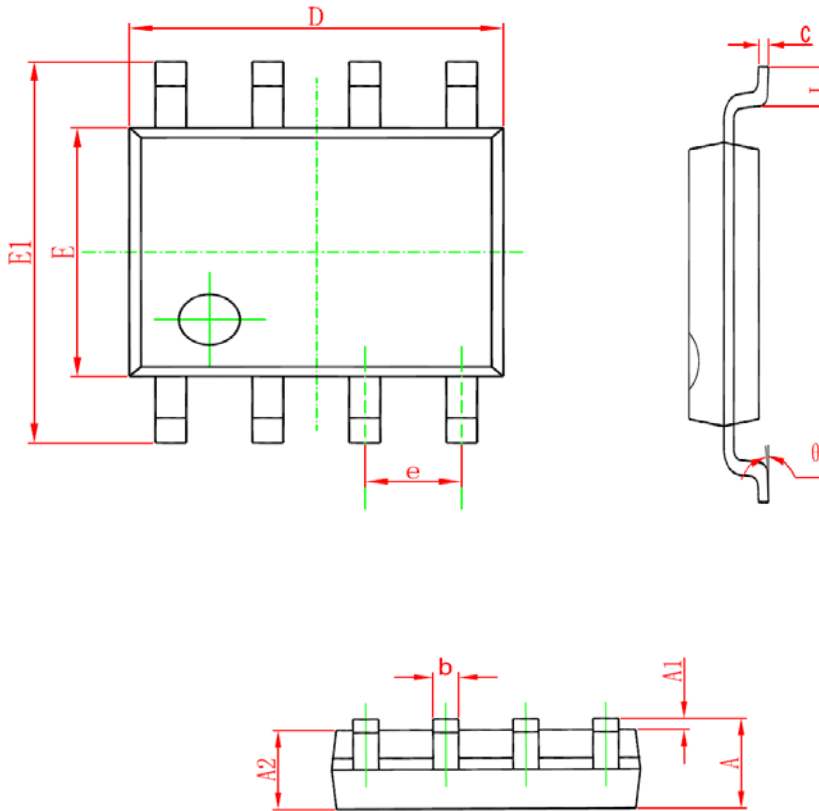


Diode Recovery Test Circuit & Waveforms



## Package Information

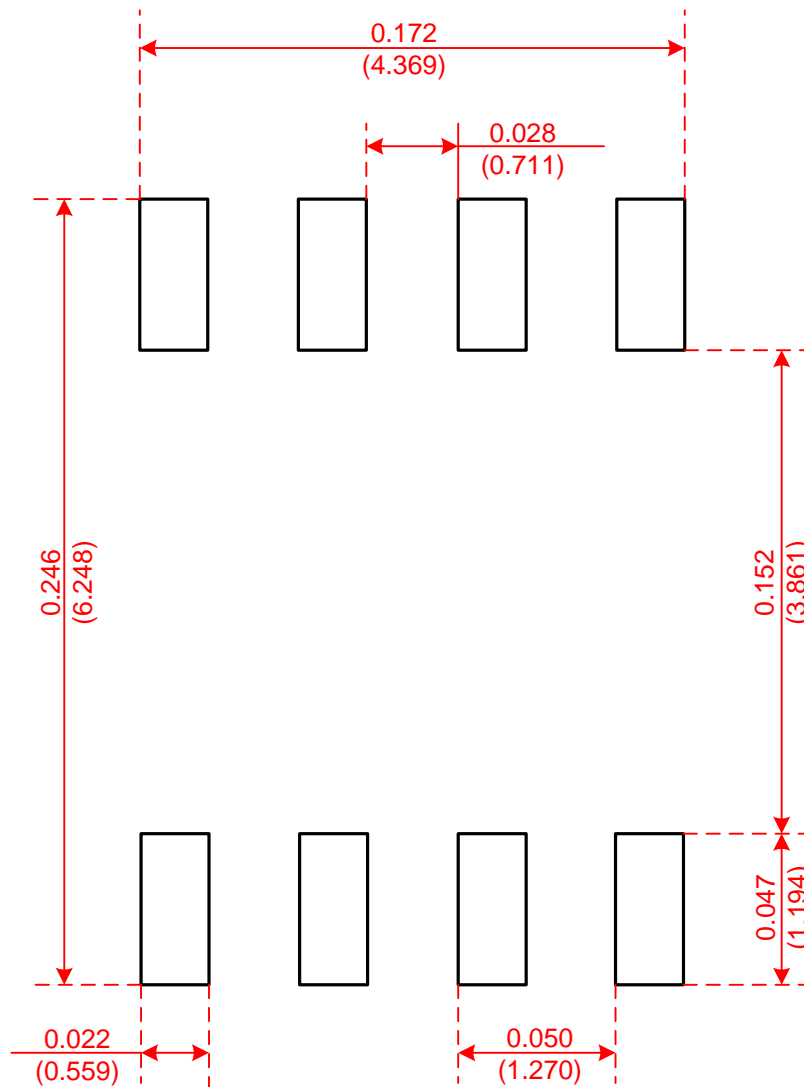
- SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

## Recommended Minimum Pads

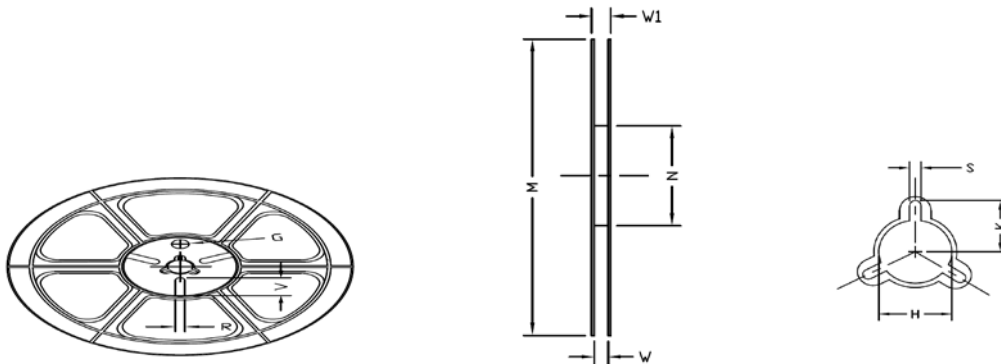
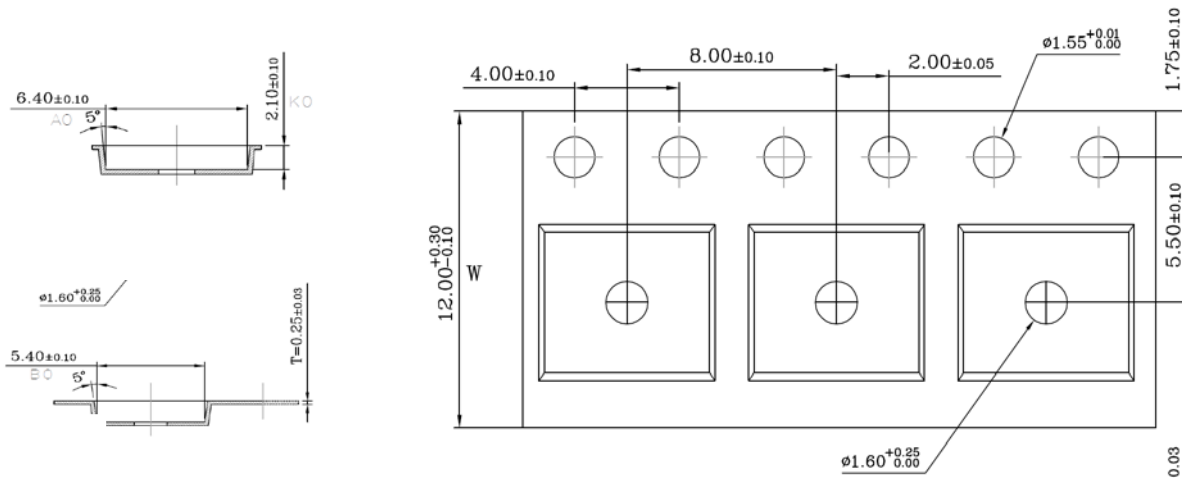
- SOP-8



**Recommended Minimum Pads  
Dimensions in Inches/(mm)**

## Tape and Reel

- SOP-8



Tape Size	Reel Size	M	N	W	W1	H	K	S	G	R	V
12mm	Φ330	Φ330.00 ±0.50	Φ97.00 ±0.30	13.00 ±0.30	17.40 ±1.00	Φ13.00 ±0.5	10.6	2.00 ±0.50	—	—	—

Unit Per Reel:  
4000pcs

