WS3210

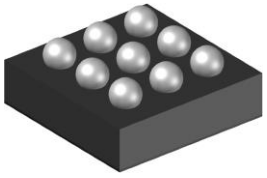
http://www.sh-willsemi.com

Over-Voltage Protection Load Switch

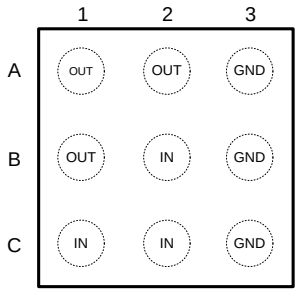
Descriptions

The WS3210 features a low R_{ON} internal High Voltage Switch and an input range of absolute maximum 30V. An internal input clamp is capable of shunting surge voltage >80V, protecting downstream components and enhancing system robustness. The WS3210 features Over-Voltage Protection (OVP) that shuts off the internal Switch if input voltage exceeds the Fixed OVP threshold 5.85V / 10.5V / 14.0V. The off-state Switch can disconnect the input pin to output pin and protect output from the input high voltage stress. Integrated Over-Temperature Protection (OTP) also shuts off the Switch to protect the device.

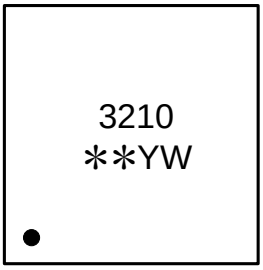
The WS3210 is available in 1.4mm x 1.4mm WLCSP-9B package. Standard product is Pb-free and Halogen-free.



WLCSP-9B (Bottom View)



Pin Configuration (Top View)



Marking

3210 = Device code
**** = Special code**
Y = Year code
W = Week Code

Features

- Absolute Maximum Input Voltage : 30V
- Surge Protection : >80V
- Low R_{ON} Switch (@V_{IN}=5V/9V/12V) : 45mΩ
- Fixed OVP Threshold
  - WS3210C : 5.85V
  - WS3210CB : 10.5V
  - WS3210CD : 14.0V
- Fast OVP Response : 100ns
- Thermal Shutdown Protection
- Robust ESD Protection
  -Human Body Model (HBM) : 8000V
  -Machine Model (MM) : 800V

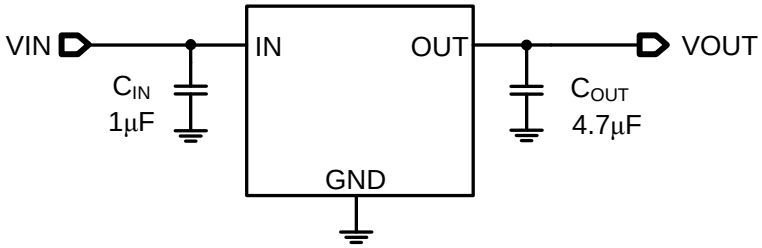
Applications

- Mobile Handsets and Tablets
- Portable Media Players
- Peripherals

Order information

Device	Package	Mark	Shipping
WS3210C-9/TR	WLCSP-9B	WC	3000/reel&Tape
WS3210CB-9/TR	WLCSP-9B	CB	3000/reel&Tape
WS3210CD-9/TR	WLCSP-9B	CD	3000/reel&Tape

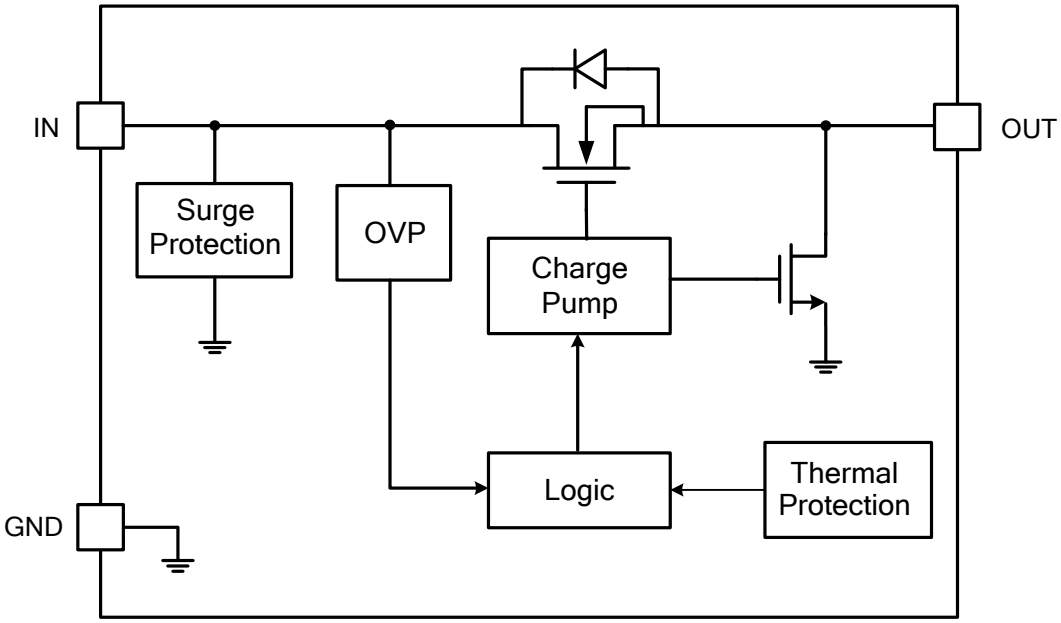
Typical Applications



Pin Descriptions

Pin Number	Symbol	Descriptions
1C, 2B, 2C	IN	Switch Input Pin and Device Power Supply.
1A, 1B, 2A	OUT	Switch Output Pin to Load.
3A, 3B, 3C	GND	Device Ground Pin.

Block Diagram



Absolute maximum ratings

Parameter		Symbol	Value	Unit
V_IN voltage range		V_{IN}	-0.3~30	V
V_OUT voltage range		V_{OUT}	-0.3~16	V
Switch I/O Continuous Current		I_{IN}	3	A
Switch FET Body Diode Continuous Current		I_{DIODE}	1.5	A
Body Diode Forward Peak Pulse Current *1	Pulse Width = 10ms	I_{PP}	20	A
	Pulse Width = 20μs		50	A
Junction temperature		T_J	150	°C
Lead temperature(Soldering, 10s)		T_L	260	°C
Storage temperature		Tstg	-55~150	°C
ESD Ratings		HBM	8000	V
		MM	800	V

***1 Single Pulse**

These are stress ratings only. Stresses exceeding the range specified under “Absolute Maximum Ratings” may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

Recommend Operating Conditions

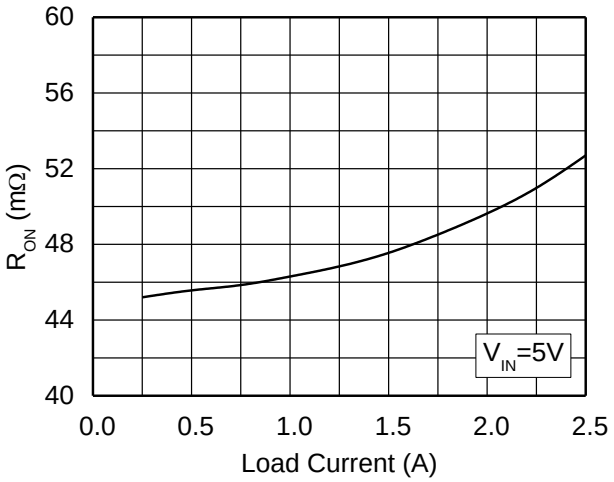
Parameter		Symbol	Value	Unit
VIN supply input voltage range	WS3210C	V_{cc}	3.2~28, typical=5	V
	WS3210CB		3.2~28, typical=9	
	WS3210CD		3.2~28, typical=12	
Operating ambient temperature		T_A	-40~85	°C
Thermal Resistance		$R_{\theta JA}$	95	°C/W

Electrical Characteristics (T_A = 25°C, C_{IN} = 1uF, C_{OUT} = 4.7uF, unless otherwise noted)

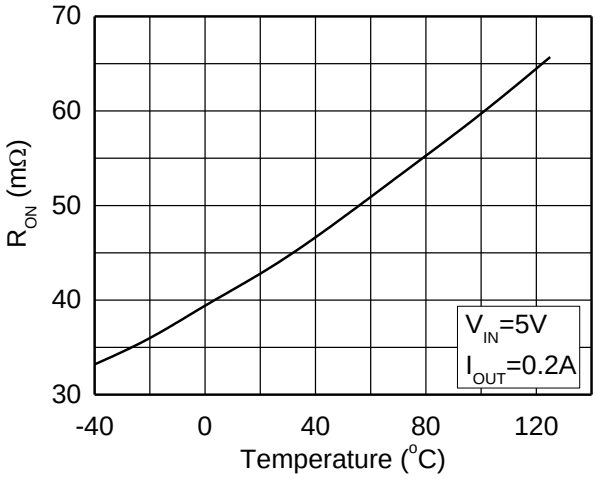
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Basic Operation						
Quiescent Supply Current	I_Q	WS3210C, V_{IN} = 5V, No Load		135	200	uA
		WS3210CB, V_{IN} = 9V, No Load		150	210	
		WS3210CD, V_{IN} =12V, No Load		160	220	
UVLO Threshold Voltage	V_{UVLO}	V_{IN} rising		2.4	3.2	V
Start-up Delay Time	T_{START_DLY}	V_{IN} = 0-> 5V / 9V / 12V to output on		7.5		ms
Main Switch ON-Resistance	R_{ON}	V_{IN} = 5V / 9V / 12V, I_{OUT} = 1A		45		mΩ
Surge and Over-Voltage Protection						
Surge Voltage Protection	V_{SURGE}			88		V
VIN OVP Threshold	V_{OVP}	V_{IN} rising, WS3210C	5.60	5.85	6.05	V
		V_{IN} rising, WS3210CB	10.0	10.5	11.0	V
		V_{IN} rising, WS3210CD	13.5	14.0	14.5	V
OVP Response Time	t_{OVP}	V_{IN} rising at 1V / 0.1μs *1		100		ns
OVP Hysteresis Voltage	V_{HYS_OVP}	V_{IN} falling, WS3210C		0.1		V
		V_{IN} falling, WS3210CB		0.35		
		V_{IN} falling, WS3210CD		0.5		
OVP Recovery Time	t_{R_OVP}	V_{IN} recovery from OVP to output on		7.5		ms
Output discharge resistance	R_{DCHG}	OVP, V_{OUT} = 5V		120		Ω
		OVP, V_{OUT} = 9V		200		
		OVP, V_{OUT} = 12V		255		
Thermal Protection						
Over-Temperature Protection Threshold	T_{SD}			140		°C
Over-Temperature Protection Hysteresis	T_{HYS}			20		°C

***1: Guaranteed by design**

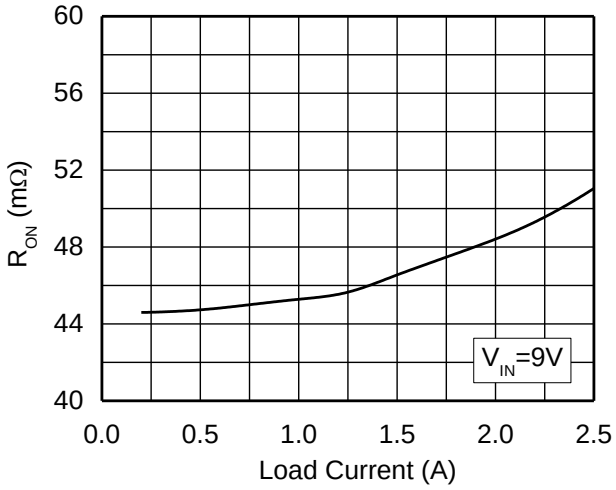
Typical Characteristics (T_A=25°C, unless otherwise noted)



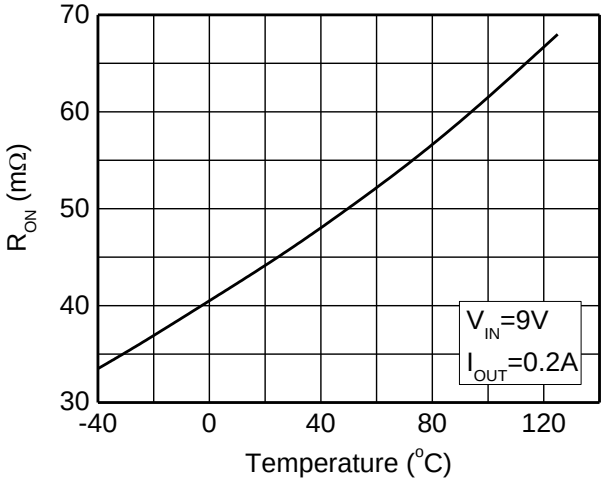
ON Resistance vs. Load Current



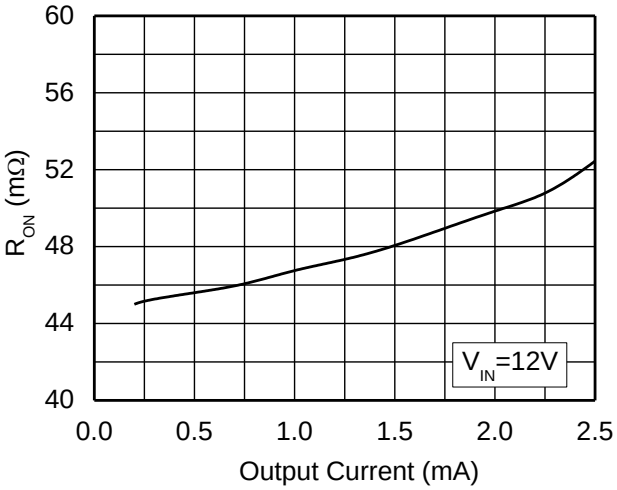
ON Resistance vs. Temperature



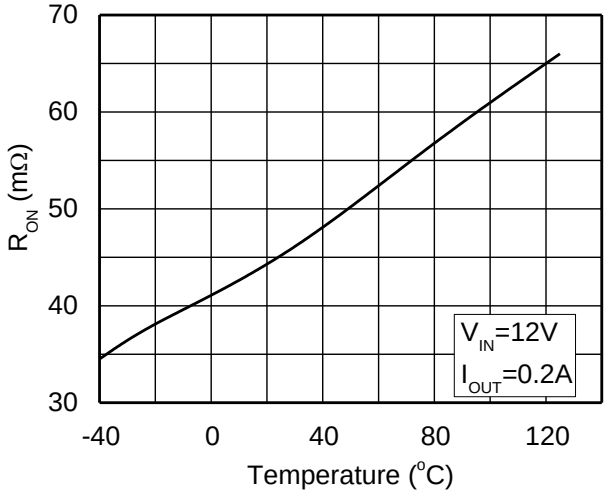
ON Resistance vs. Load Current



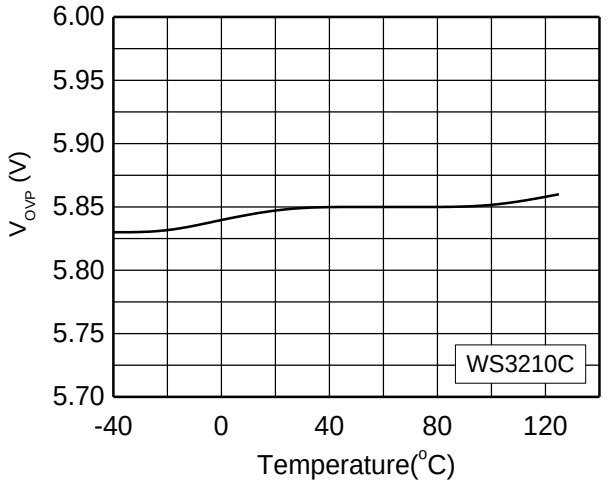
ON Resistance vs. Temperature



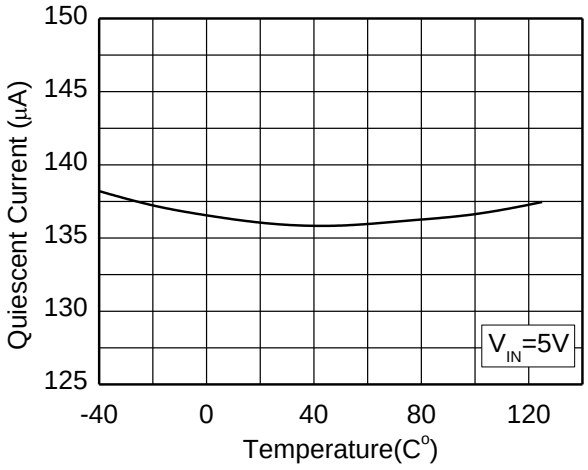
ON Resistance vs. Load Current



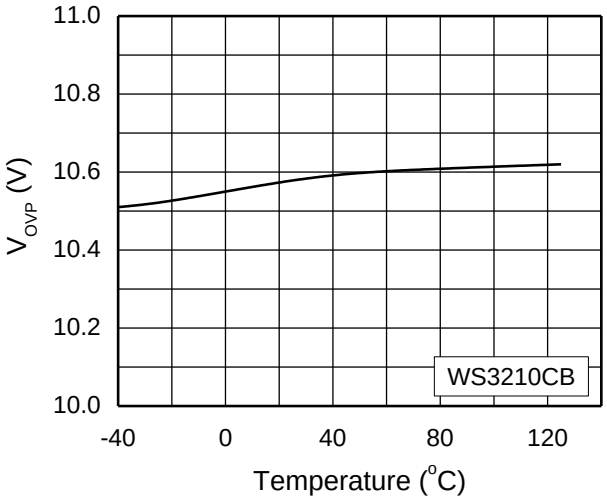
ON Resistance vs. Temperature



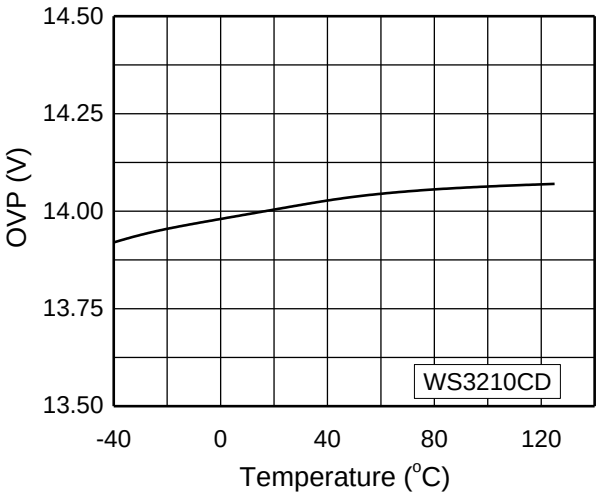
OVP Threshold vs. Temperature



Quiescent Current vs. Temperature

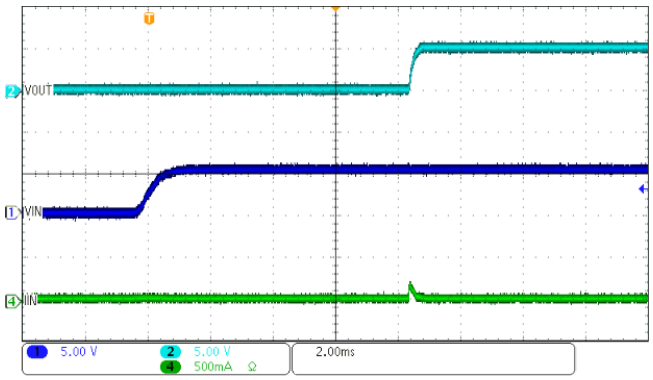


OVP Threshold vs. Temperature

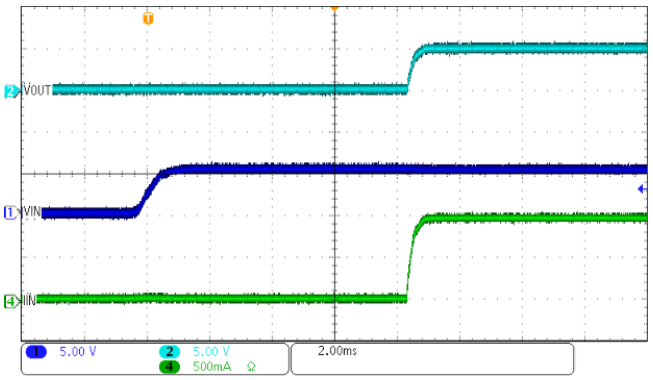


OVP Threshold vs. Temperature

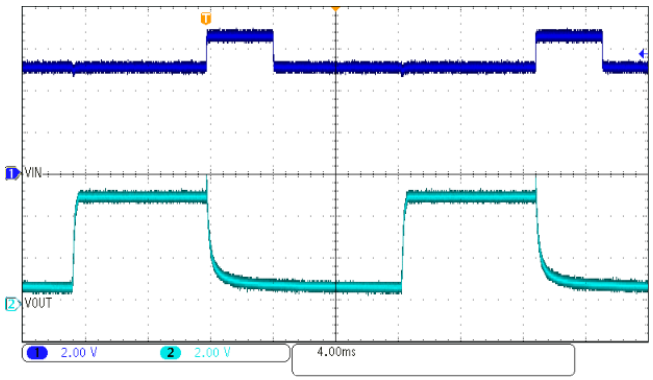
Power-On with No Load



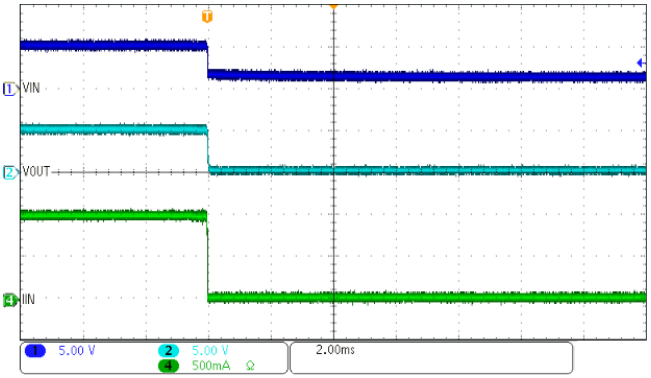
Power-On with R_L=5Ω



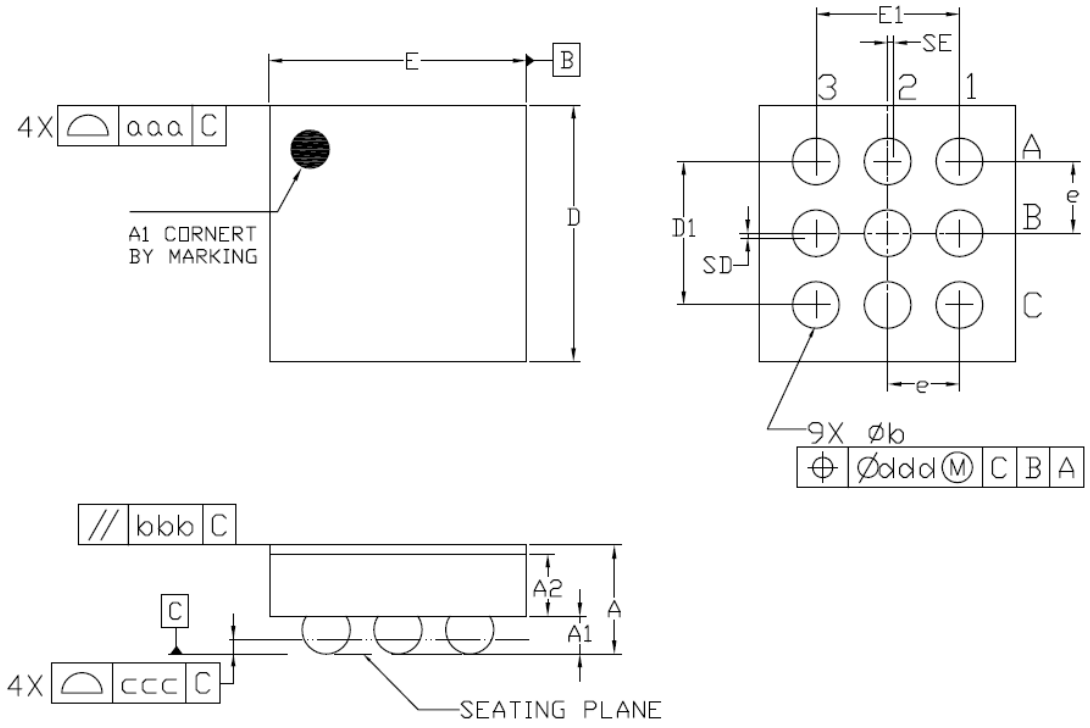
OVP and Recovery from OVP (5.85V)



Power-Off with R_L=5Ω



Package Outline Dimensions



Notes

1. All DIMENSIONS ARE IN MILLIMETERS (ANGLES IN DEGREES).
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

Dimensional Ref.			
REF.	**Min.**	**Nom.**	**Max.**
A	0.536	0.586	0.636
A1	0.185	0.210	0.235
A2	0.331	0.356	0.381
D	1.385	1.400	1.415
E	1.385	1.400	1.415
D1	0.750	0.800	0.850
E1	0.750	0.800	0.850
b	0.220	0.260	0.300
e	0.400 BSC		
SD	0.000 BSC		
SE	0.000 BSC		
Tol. of Form & Position			
aaa	0.10		
bbb	0.10		
ccc	0.05		
ddd	0.05		