Descriptions

The RLCS210 is a small, single channel load switch using P-Channel MOSFET for minimum power loss. Advanced gate control design supports operating voltages as low as 1.5 V with minimal increase in ON-Resistance and power loss. It is designed for load switching applications with ultra-low quiescent current (0.5uA) and ultra-low standby current (150nA).The RLCS210 offers industry leading True Reverse Current Blocking performance. It minimizes reverse current flow in the event that the VOUT pin voltage exceeds the VIN voltage. The device is controlled by external logic pin, allowing optimization of battery life, and portable device autonomy. The RLCS210 is available in WLCSP-4B package. Standard products are Pb-free and Halogen-free.

Features

- Input Voltage Range ： 1.5V~5.5V
- Main switch Ron ： 32mΩ (VIN=5.5V Typ.)
- Quiescent current ： 0.4uA
- Standby current ： 80nA
- Maximum Output current ： 2A
- Reverse Current Blocking（RCB）
- Controlled Rise Time：570us at 3.3VIN
- Quick Output Discharge (QOD) : 85Ω (Typ.)
- Compact package: WLCSP-4B

Applications

- Wearables
- Smartphones
- Tablets
- Portable Speakers

Typical Applications

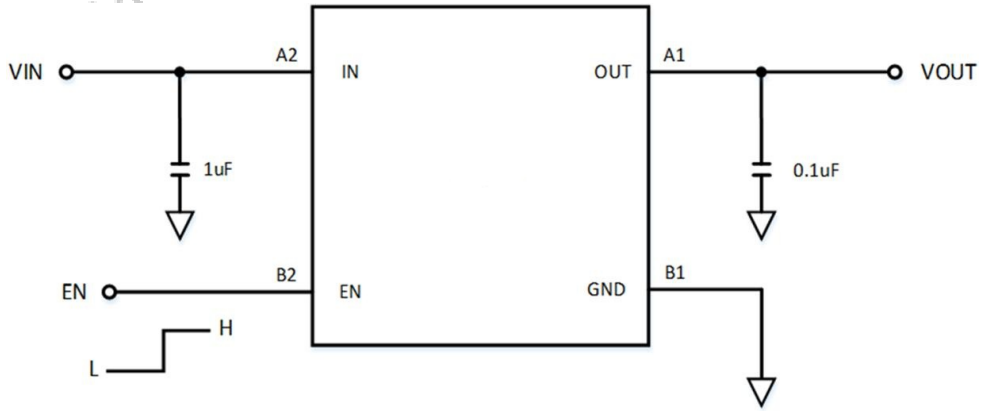


Fig. 1 Typical Applications

Pin Information

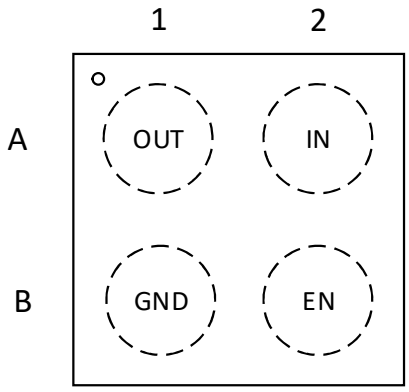


Fig. 2 Pin Information（Top-Through View）

Pin Description

Pin	Symbol	Description
A1	OUT	Output pin
A2	IN	Input pin
B1	GND	Ground
B2	EN	Enable (Active high)

Table 1

Order information

Package		Part Number	Quantity Per Reel
WLCSP 0.77×0.77-4Ball	Tape&Reel	RLCS210WL4/R6	3,000PCS

Table 2

Block Diagram

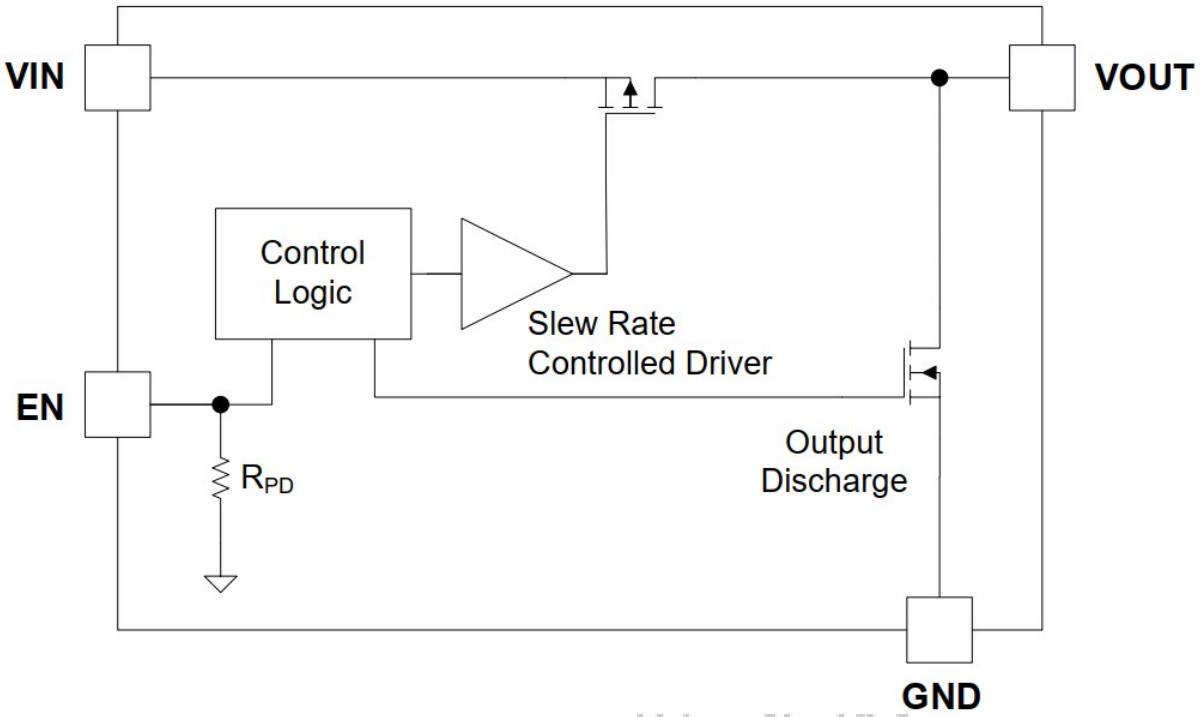


Fig. 3 Block Diagram

Absolute Maximum Ratings

The absolute maximum ratings are stress ratings only. Stresses exceeding the range in Table 3 might cause substantial damage to the device. Functional operation of the device under other conditions is not implied. Prolonged exposure to extreme conditions might affect device reliability.

Parameter	Symbol	Condition	Min.	Max.	Unit
Input voltage	V_{IN}		-0.3	6	V
Output voltage	V_{OUT}		-0.3	6	V
Enable voltage	V_{EN}		-0.3	6	W
Maximum continuous switch current	I_{MAX}			2	A
Maximum junction temperature	$T_{J,MAX}$			125	℃
Lead Temperature	T_{LEAD}	Soldering, 10 sec.		300	℃
Storage Temperature Range	T_{STG}		-65	150	℃
Human Body Model，JESD22-A114	HBM		4000		V
Charged Device Model, JESD22-C101	CDM		2000		V
MSL			Level 1		

Table 3

Thermal Information

Parameter	Symbol	Value	Unit
Junction-to-Ambient thermal resistance*1	$R_{\theta JA}$		℃/W

Table 4

*1: Surface mounted on FR-4 Board using 2 oz, 4 layer board, PCB board size is 3*3 square inches

Recommended Operation Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input Voltage	V_{IN}	1.5		5.5	V
Enable voltage	V_{EN}	0		5.5	V
Output voltage	V_{OUT}	0		5.5	V
Operating Junction Temperature	T_J	-40		125	℃
Operating Ambient Temperature	T_A	-40		85	℃

Table 5

Electrical Characteristics (Ta=25°C, VIN=3.3V unless otherwise noted)

Symbol	Parameter	Conditions		Min.	Typ.	Max.	Units
Basic Operation							
I_Q	Quiescent Current (1)	EN = Enable, I_{OUT}=0 mA, V_{IN} = V_{EN} =5.5 V			0.4		uA
		EN=Enable, I_{OUT}=0 mA, V_{IN}=V_{EN}=5.5 V, Ta=85 °C			0.7		
I_{SD}	Shut Down Current	EN = Disable, I_{OUT}=0 mA, V_{IN}=1.5 V			65		nA
		EN = Disable, I_{OUT}=0 mA, V_{IN}=3.3 V			70		
		EN = Disable, I_{OUT}=0 mA, V_{IN}=4.2 V			75		
		EN = Disable, I_{OUT}=0 mA, V_{IN}=5.5 V			80		
		EN = Disable, I_{OUT}=0 mA, V_{IN}=5.5 V, Ta=55 °C (5)			140		
R_{ON}	On-Resistance	V_{IN}=5.5 V, I_{OUT}= 500 mA	Ta=25 °C		32		mΩ
			Ta=85 °C (5)		36		
		V_{IN}=3.3 V, I_{OUT}= 500 mA	Ta=25 °C		42		
			Ta=85 °C (5)		48		
		V_{IN}=1.8 V, I_{OUT}= 300 mA	Ta=25 °C (5)		72		
		V_{IN}=1.5 V, I_{OUT}= 100 mA	Ta=25 °C		100		
R_{DSC}	Output Discharge Resistance	E_N=Low , I_{FORCE}= 10 mA			85		Ω
V_{IH}	EN Input Logic High Voltage	V_{IN}=1.5-5.5 V		1.2			V
V_{IL}		V_{IN}=1.5-5.5 V				0.4	V
REN	EN pull down resistance	Internal Resistance			10		MΩ
I_{EN}	EN Current	E_N=V_{IN} or GND			0.5		uA
V_{RCB_TH}	RCB Protection Threshold Voltage	V_{OUT} – V_{IN}			25		mV
V_{RCB_RL}	RCB Protection Release Voltage	V_{IN} – V_{OUT}			30		mV
Switching Characteristics							
t_{dON}	Turn-On Delay (2)	R_L=150 Ω, C_{OUT}=0.1 μF			430		us
t_R	V_{OUT} Rise Time (2)				570		
t_{dOFF}	Turn-On Delay (3), (5)	R_L=150 Ω, C_{OUT}=0.1 μF			17		us
t_F	V_{OUT} Rise Time (3), (5)				15		

Table 6

Notes:

1. I_Q does NOT include Enable pull down current through the pull down resistor R_{PD}.
2. t_{ON} = t_{dON} + t_R
3. t_{OFF} = t_{dOFF} + t_F
4. Output discharge path is enabled during off.
5. By design; characterized, not production tested.

Timing Diagram

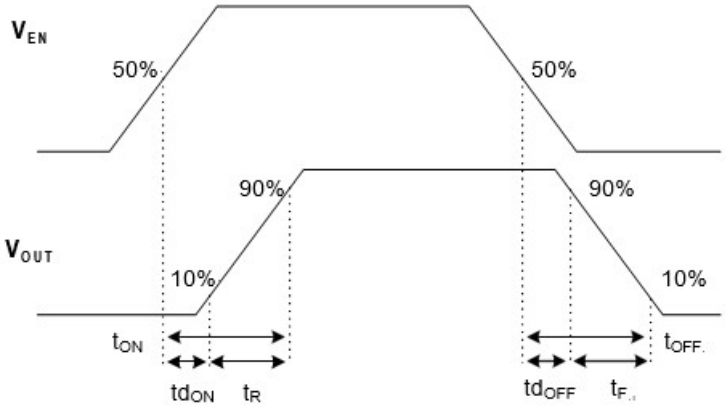
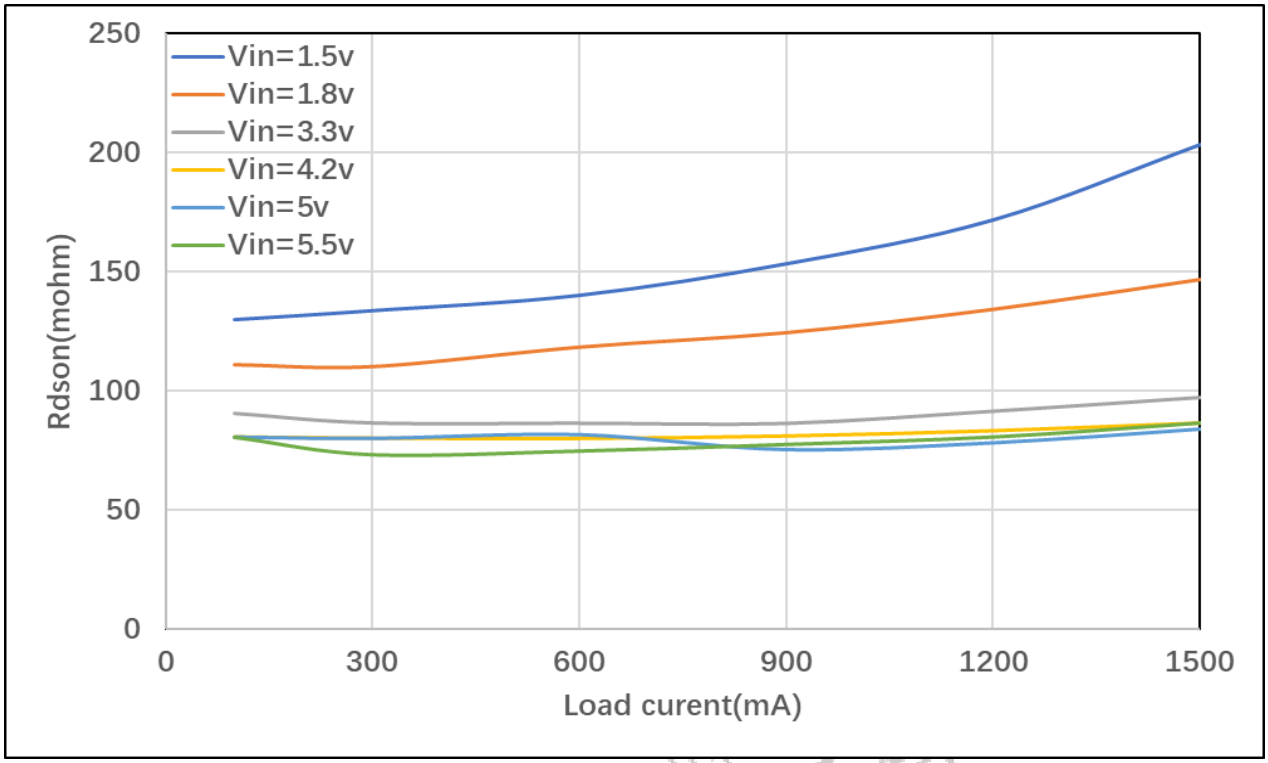
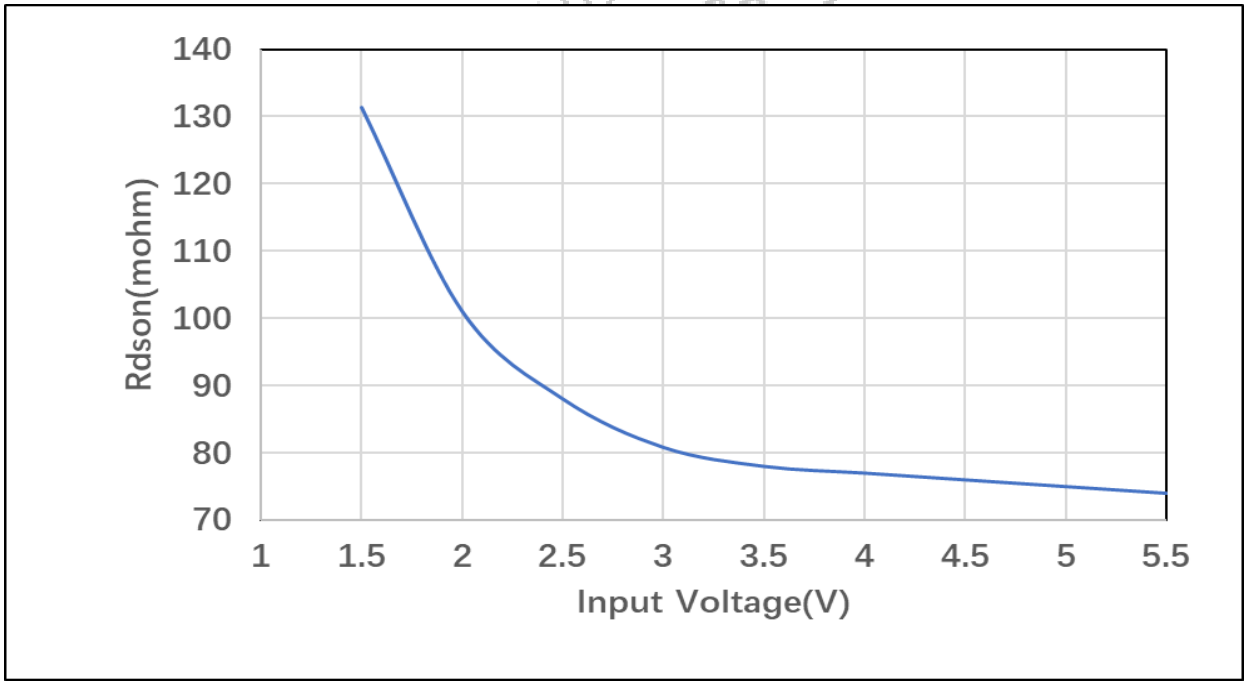


Fig. 4 Timing Diagram

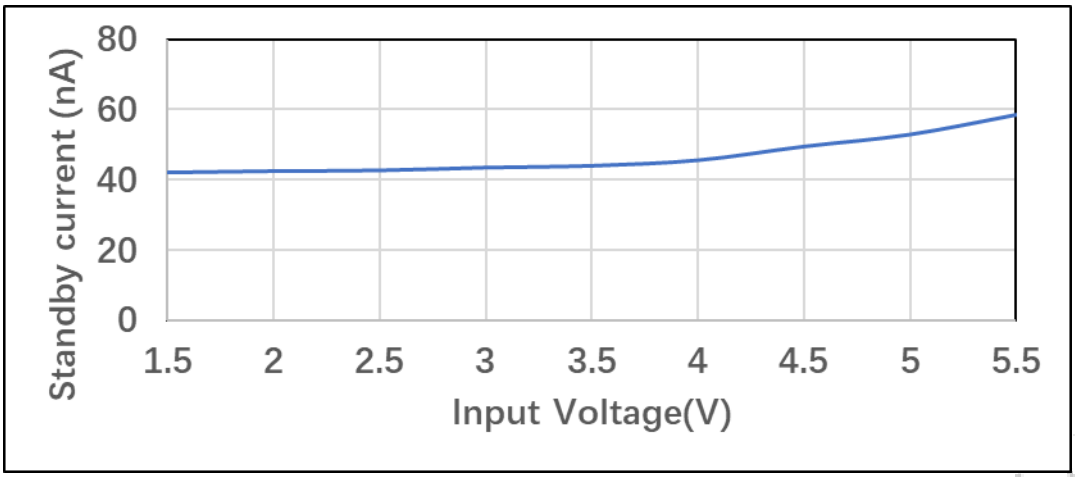
Typical characteristics (Ta=25°C, VIN=5V ， IOUT=500mA, CIN=1μF, COUT=0.1μF, unless otherwise noted)



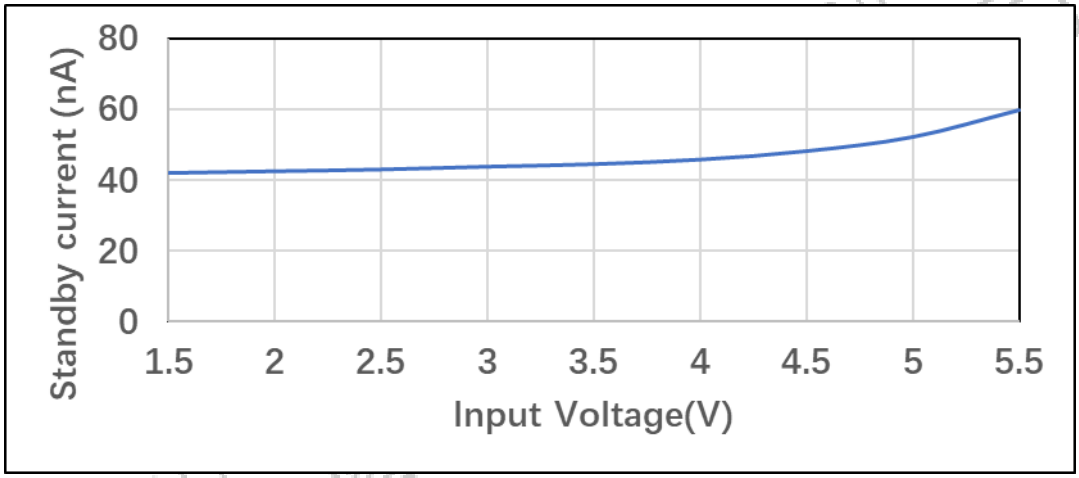
RON vs. Load current (VEN=H)



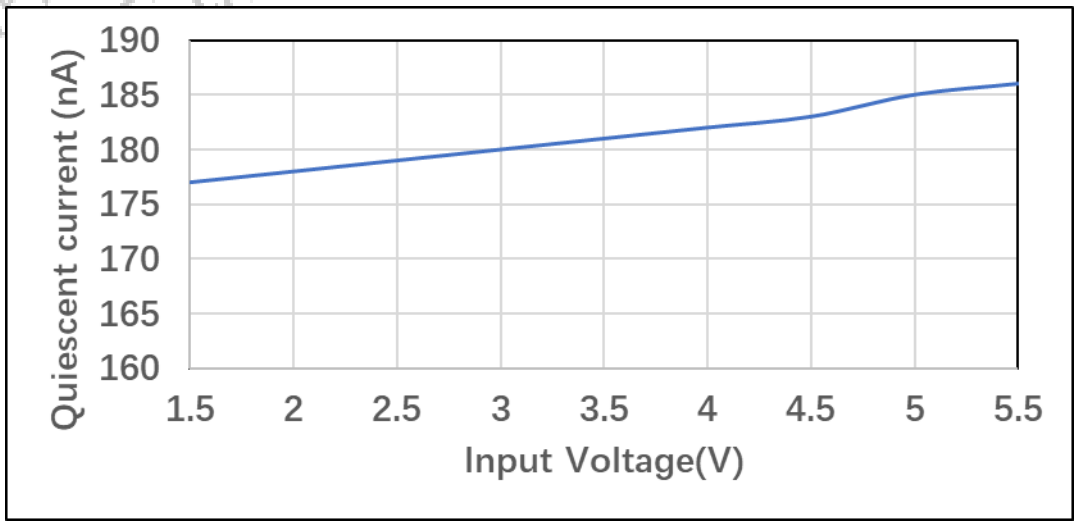
RON vs. VIN (VEN=VIN,ILOAD=200mA)



Standby current vs. V_{IN} (V_{OUT}=OPEN)

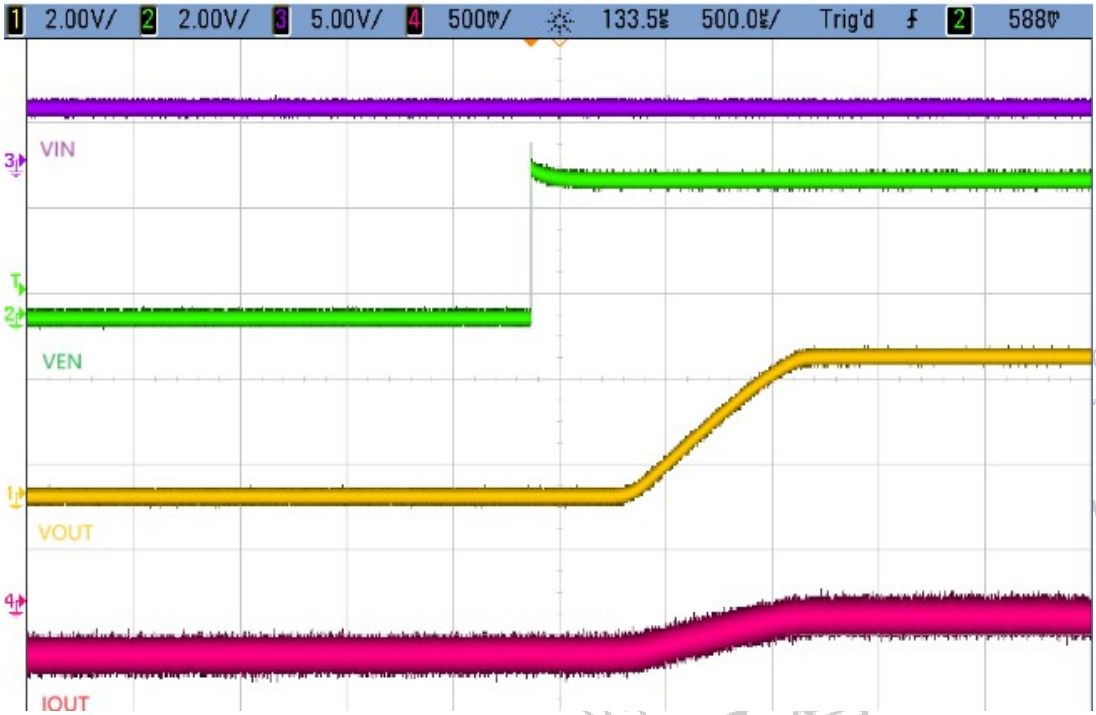


Standby current vs. V_{IN} (V_{OUT}=GND)

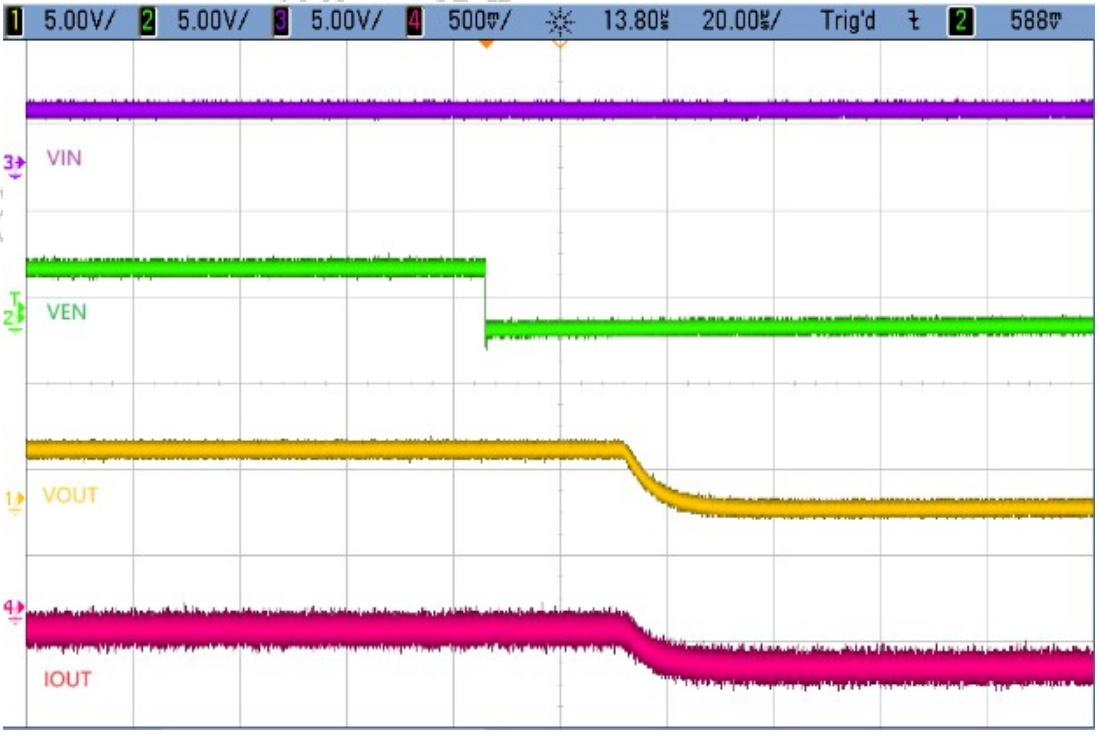


Quiescent current vs. V_{IN} (V_{EN}=H,NO LOAD)

Turn on transient (Cin=1uF,Cout=0.1uF, R_{LOAD}=150Ω,VIN=3.3V)

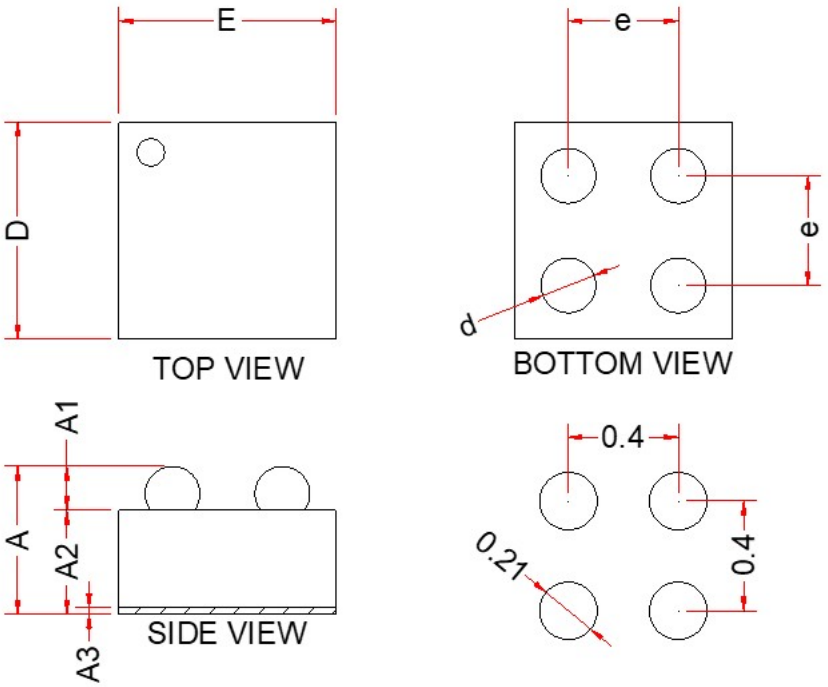


Turn off transient (Cin=1uF,Cout=0.1uF, R_{LOAD}=150Ω,VIN=3.3V)



PACKAGE OUTLINE DIMENSIONS

WLCSP-4L

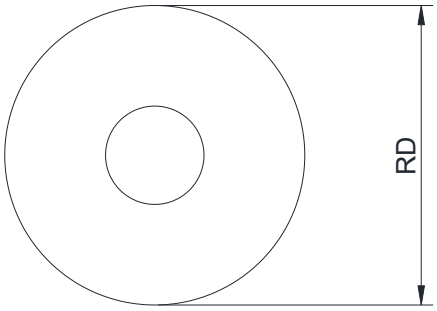


RECOMMENDED LAND PATTERN(unit:mm)

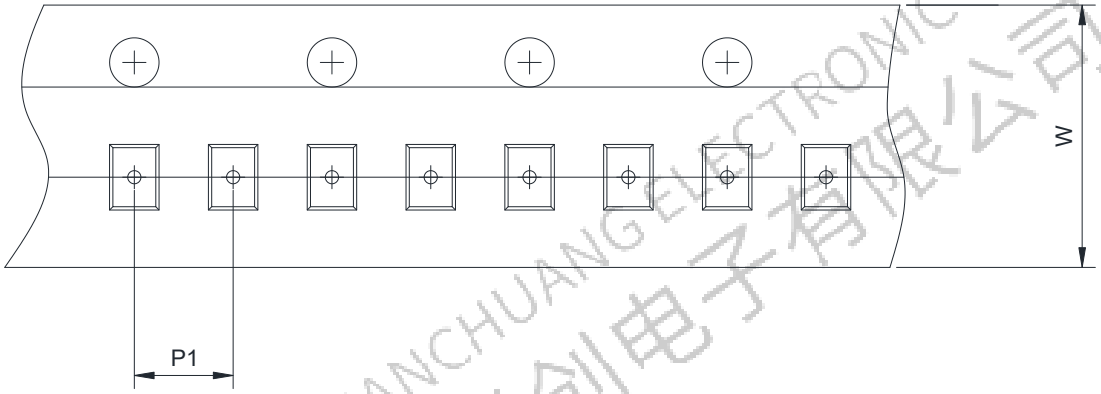
Symbol	Dimensions in Millimeters		
	Min.	Typ.	Max.
A	0.395	0.445	0.495
A1	0.144	0.160	0.176
A2	0.255	0.285	0.315
A3	0.020	0.025	0.030
D	0.755	0.770	0.785
E	0.755	0.770	0.785
e	0.350	0.400	0.450
d	0.190	0.210	0.230

TAPE AND REEL INFORMATION

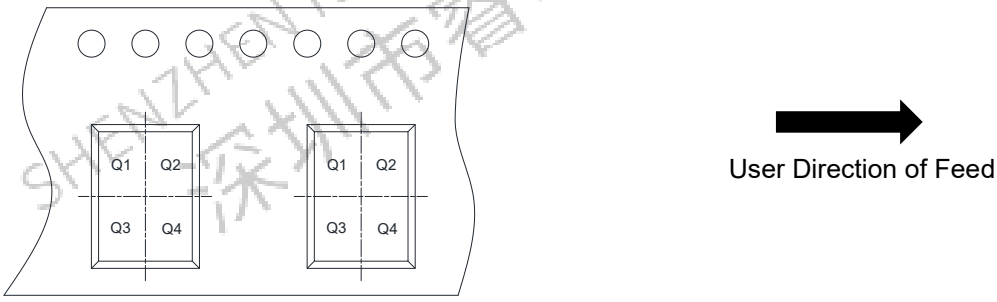
Reel Dimensions



Tape Dimensions



Quadrant Assignments For PIN1 Orientation In Tape



RD	Reel Dimension	☑ 7inch	☐ 13inch		
W	Overall width of the carrier tape	☑ 8mm	☐ 12mm	☐ 16mm	
P1	Pitch between successive cavity centers	☐ 2mm	☑ 4mm	☐ 8mm	
Pin1	Pin1 Quadrant	☑ Q1	☑ Q2	☐ Q3	☐ Q4

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