

HM9772

Nano Current Consumed I_Q , Ultra Small Package Load Switch with True Reverse Current Blocking

Descriptions

The HM9772 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 HM9772 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 HM9772 is available in SOT23-5 package. Standard products are Pb-free and Halogen-free.

Order information

Package		Part Number	Quantity per Reel	Top-Side Marking
SOT23-5L	Tape and Reel	HM9772	3,000PCS	A72S/AJYW

Features

- Pin-to-Pin: SGM2576, SY6280
- Input Voltage Range : 1.5V~5.5V
- Main switch R_{on} : 32m Ω ($V_{IN}=5.5V$ Typ.)
- Quiescent current : 0.4uA
- Standby current : 80nA
- Maximum Output current : 2A
- Reverse Current Blocking (RCB)
- Controlled Rise Time: 570us at 3.3V_{IN}
- Quick Output Discharge (QOD) : 85 Ω (Typ.)
- Compact package: SOT23-5

Applications

- Wearables
- Smartphones
- Tablets
- Portable Speakers

Pin Information

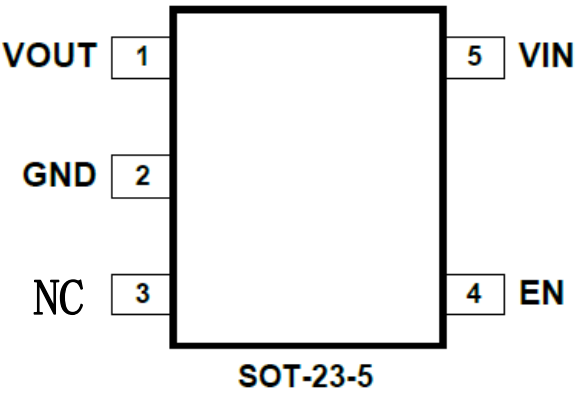


Fig. 1 Pin Information (Top View)

Pin	Symbol	Description
1	VOUT	Output pin
2	GND	Ground
3	NC	Not Connection
4	EN	Enable (Active high)
5	VIN	Input pin

Table 2

Block Diagram

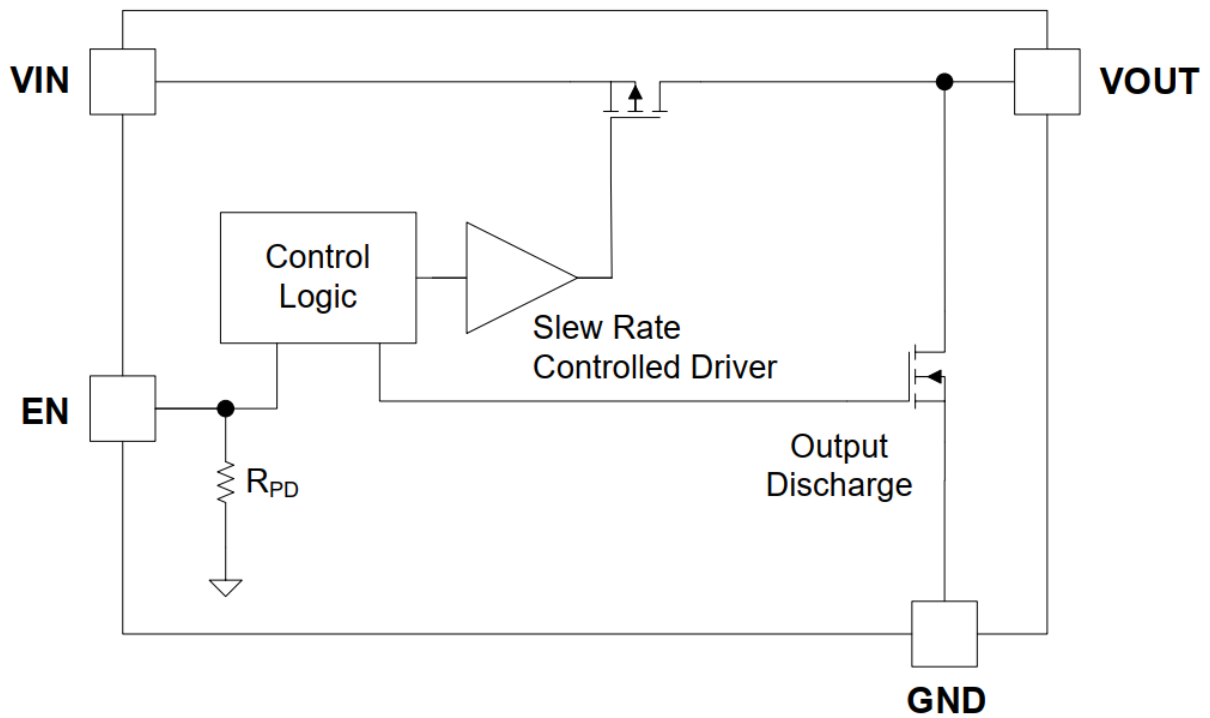


Fig. 2 Block Diagram

Typical Applications

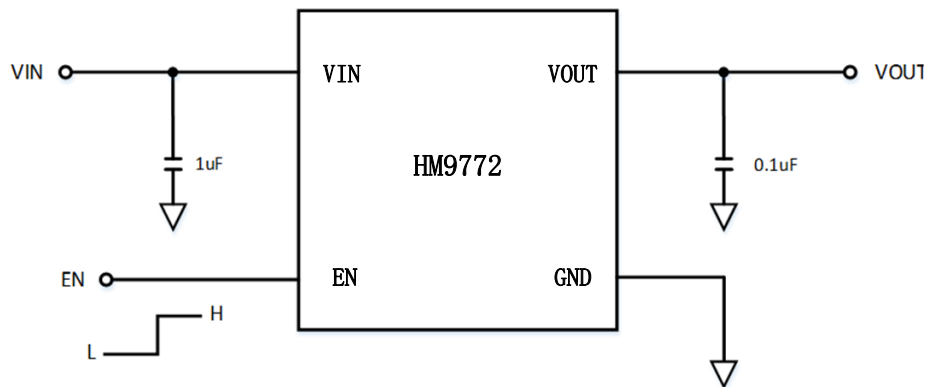


Fig. 3 Typical Applications

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	V
Maximum continuous switch current	I _{MAX}			2	A
Maximum junction temperature	T _{J,MAX}			125	°C
Lead Temperature	T _{LEAD}	Soldering, 10 sec.		300	°C
Storage Temperature Range	T _{STG}		-65	150	°C
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 _{θJA}		°C/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	°C
Operating Ambient Temperature	T _A	-40		85	°C

Table 5

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
Basic Operation						
IQ	Quiescent Current (1)	EN = Enable, IOUT=0 mA, VIN = VEN=5.5 V		0.4		uA
		EN=Enable, IOUT=0 mA, VIN=VEN=5.5 V, Ta=85 °C		0.7		
ISD	Shut Down Current	EN = Disable, IOUT=0 mA, VIN=1.5 V		65		nA
		EN = Disable, IOUT=0 mA, VIN=3.3 V		70		
		EN = Disable, IOUT=0 mA, VIN=4.2 V		75		
		EN = Disable, IOUT=0 mA, VIN=5.5 V		80		
		EN = Disable, IOUT=0 mA, VIN=5.5 V, Ta=55 °C (5)		140		
RON	On-Resistance	VIN=5.5 V, IOUT= 500 mA	Ta=25 °C	80		mΩ
			Ta=85 °C (5)	85		
		VIN=3.3 V, IOUT= 500 mA	Ta=25 °C	90		
			Ta=85 °C (5)	96		
		VIN=1.8 V, IOUT= 300 mA	Ta=25 °C (5)	100		
		VIN=1.5 V, IOUT= 100 mA	Ta=25 °C	120		
RDSC	Output Discharge Resistance	EN=Low , IFORCE= 10 mA		85		Ω
VIH	EN Input	VIN=1.5-5.5 V	1.2			V
VIL	Logic High Voltage	VIN=1.5-5.5 V			0.4	V
REN	EN pull down resistance	Internal Resistance		10		MΩ
IEN	EN Current	EN=VIN or GND		0.5		uA
VRCB_TH	RCB Protection Threshold Voltage	VOUT – VIN		39		mV
VRCB_RL	RCB Protection Release Voltage	VIN – VOUT		30		mV
Switching Characteristics						
t _{dON}	Turn-On Delay (2)	RL=150 Ω, COUT=0.1 μF		430		us
t _R	VOUT Rise Time (2)			570		
t _{dOFF}	Turn-Off Delay (3), (5)	RL=150 Ω, COUT=0.1 μF		17		us
t _F	VOUT Rise Time (3), (5)			15		

Table 6

Notes:

1. IQ 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

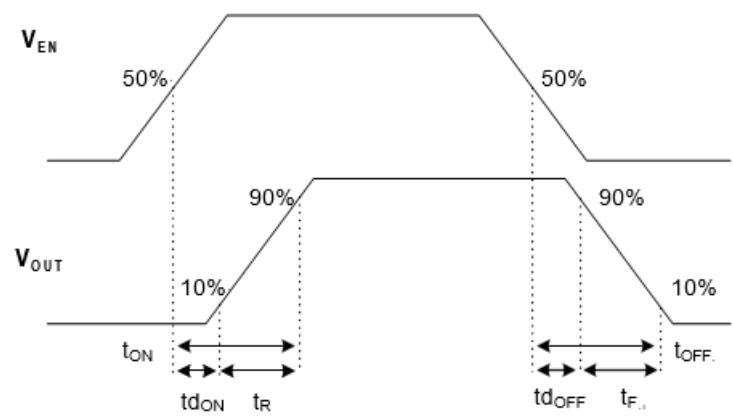
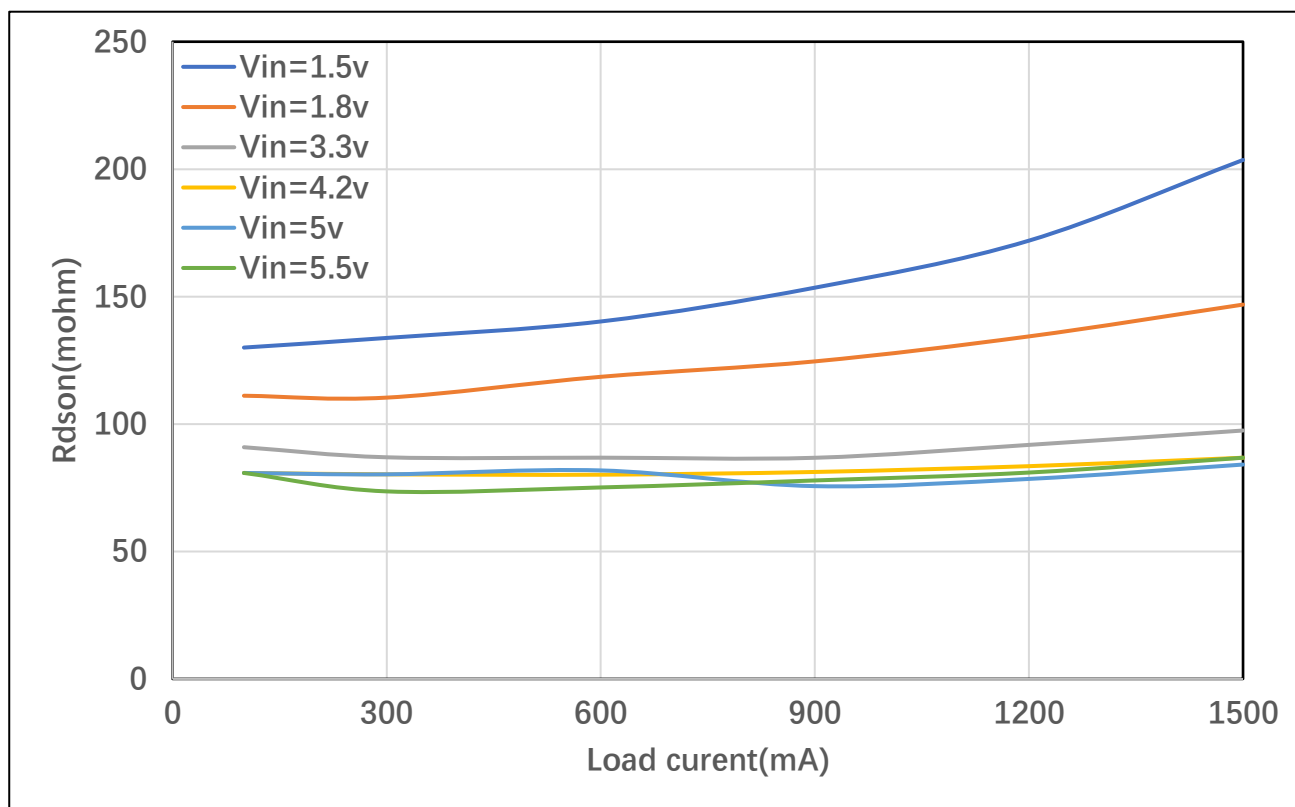
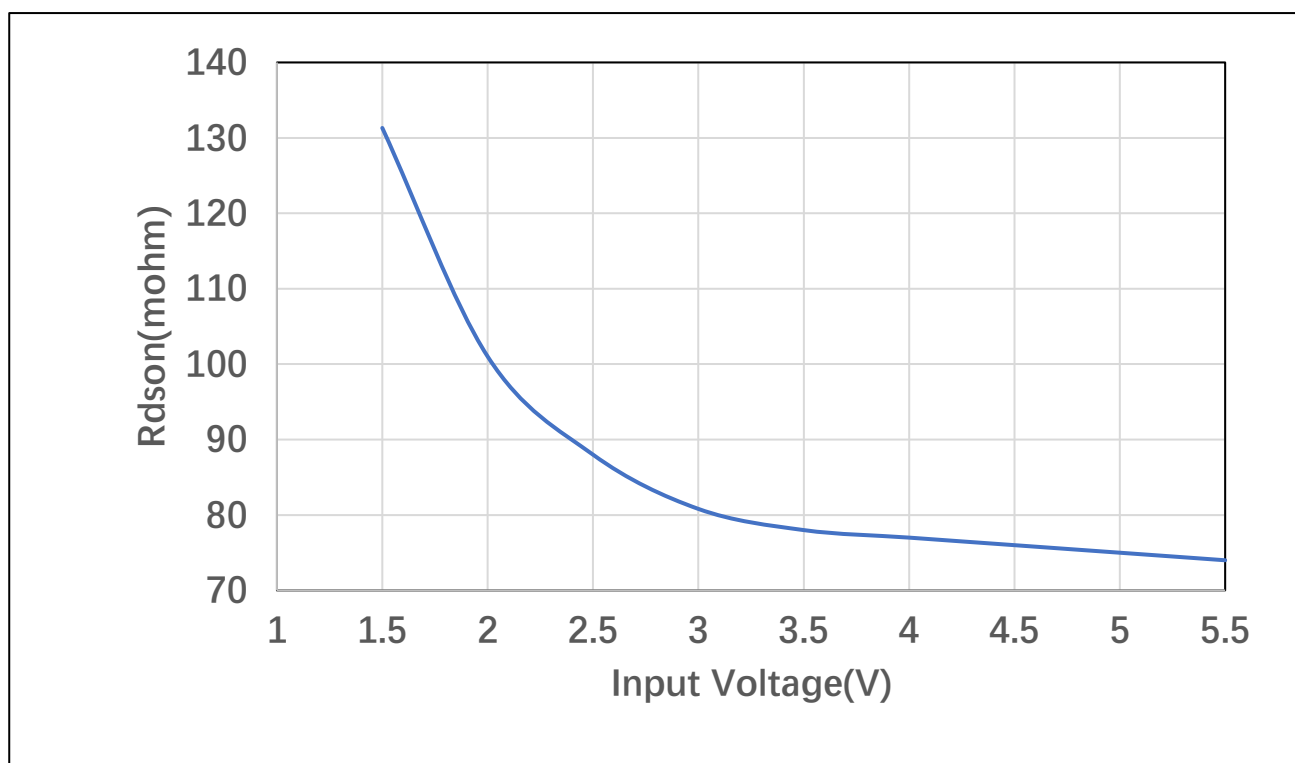


Fig. 6 Timing Diagram

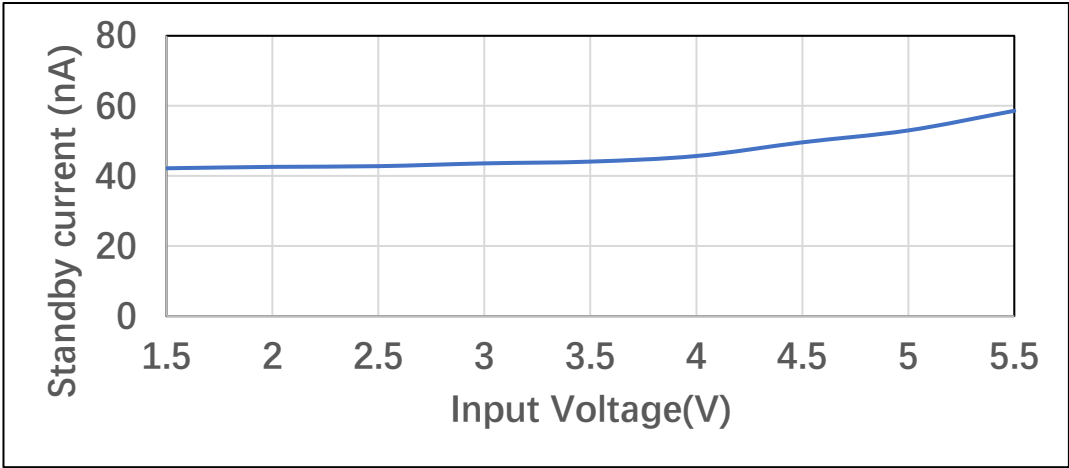
Typical characteristics ($T_a=25^{\circ}\text{C}$, $V_{IN}=5\text{V}$, $I_{OUT}=500\text{mA}$, $C_{IN}=1\mu\text{F}$, $C_{OUT}=0.1\mu\text{F}$, unless otherwise noted)



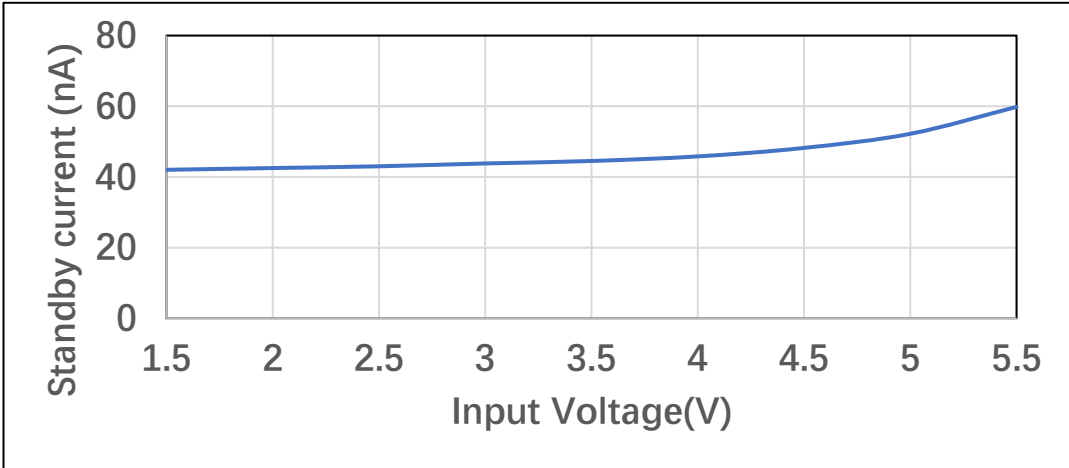
R_{ON} vs. Load current ($V_{EN}=H$)



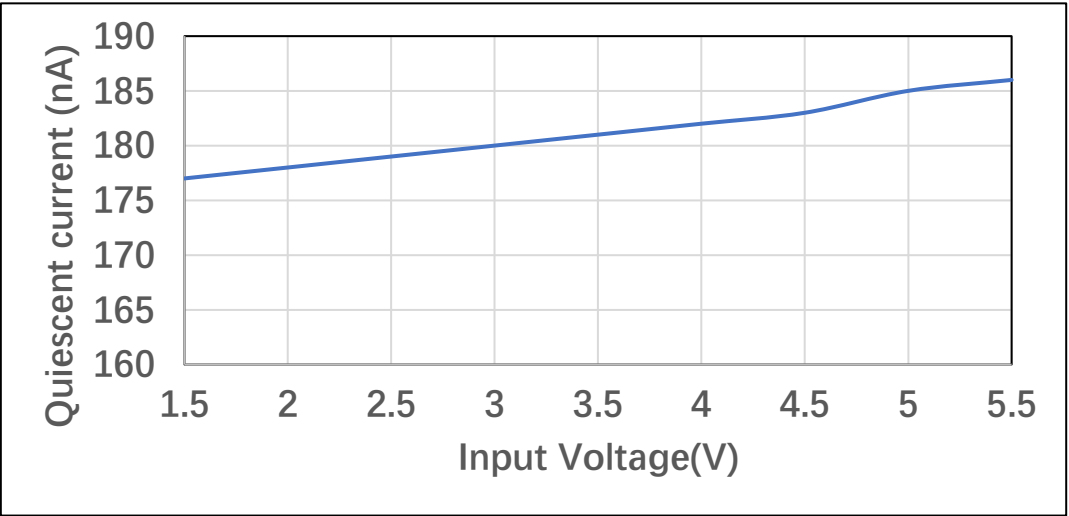
R_{ON} vs. V_{IN} ($V_{EN}=V_{IN}$, $I_{LOAD}=200\text{mA}$)



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

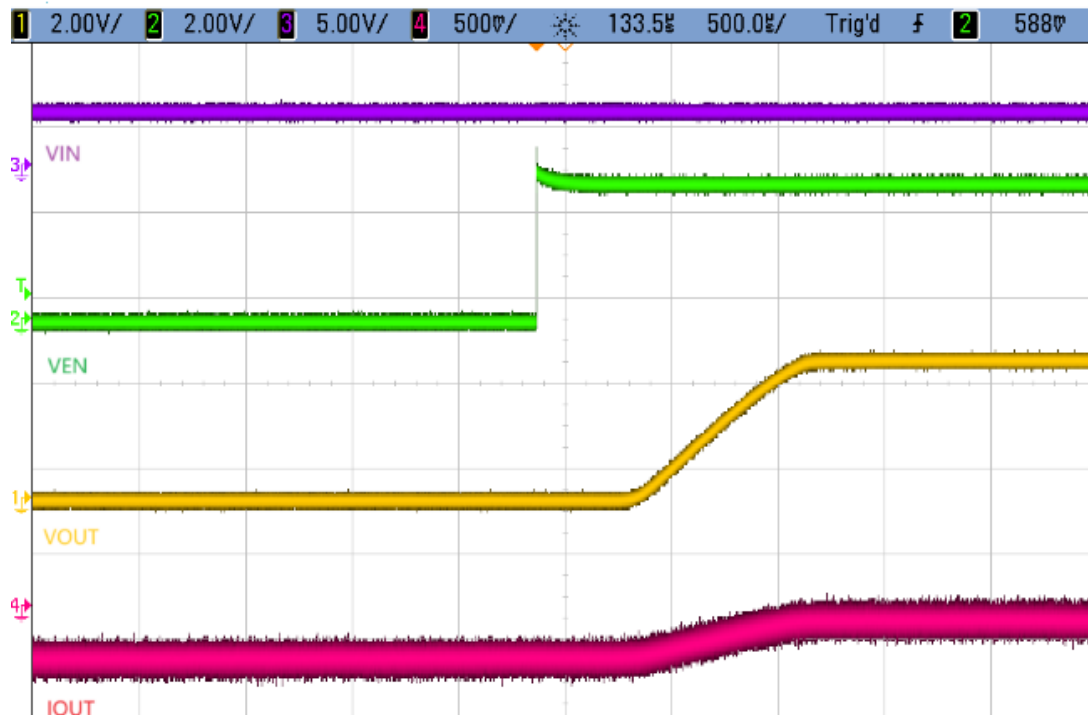


Standby current vs. V_{IN} (V_{OUT} =GND)

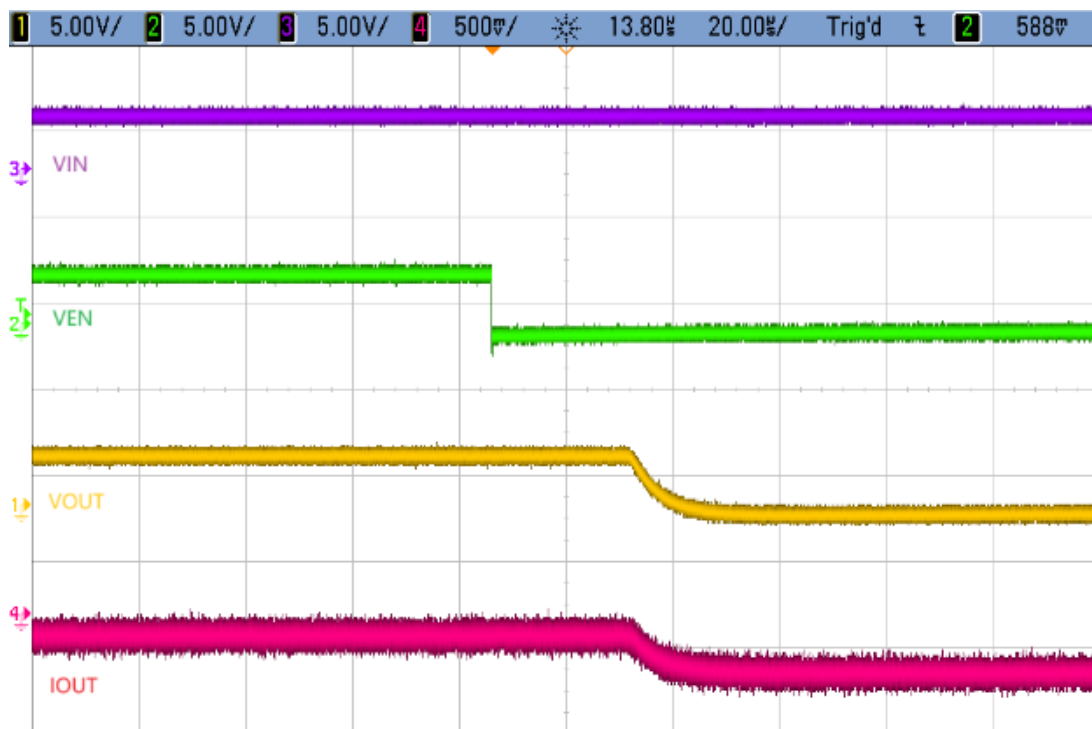


Quiescent current vs. V_{IN} (V_{EN} =H, NO LOAD)

Turn on transient ($C_{in}=1\mu F, C_{out}=0.1\mu F, R_{LOAD}=150\Omega, V_{IN}=3.3V$)

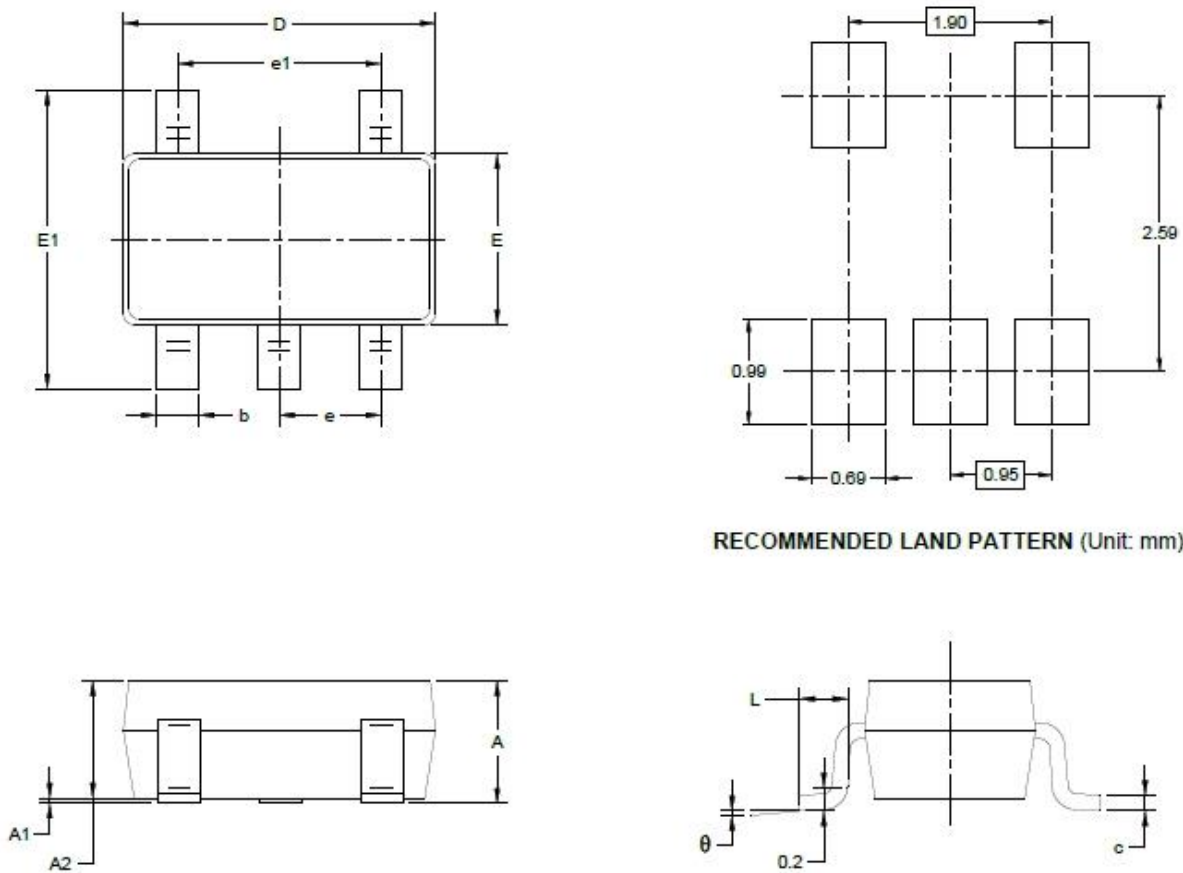


Turn off transient ($C_{in}=1\mu F, C_{out}=0.1\mu F, R_{LOAD}=150\Omega, V_{IN}=3.3V$)



PACKAGE OUTLINE DIMENSIONS

SOT23-5L

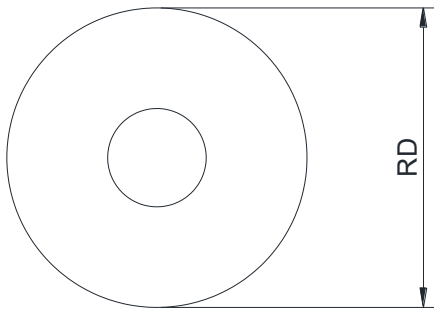


RECOMMENDED LAND PATTERN (Unit: mm)

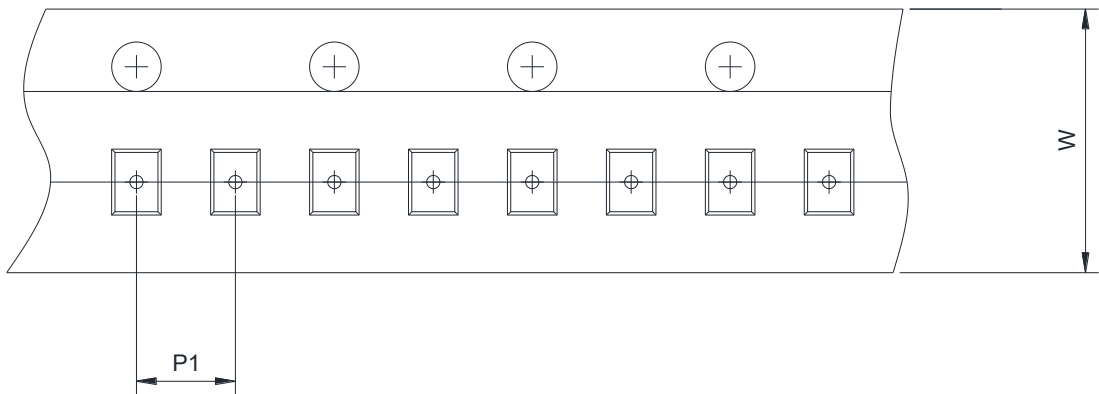
Symbol	Dimension in Millimeters		
	Min.	Typ.	Max.
A	-	-	1.30
A1	0.03	-	0.15
A2	1.05	1.10	1.15
b	0.28	-	0.45
c	0.12	-	0.23
D	2.82	2.92	3.02
E	1.50	1.60	1.70
E1	2.60	2.80	3.00
e	0.95BSC		
e1	1.90BSC		
L	0.35	-	0.55
θ	0°	-	8°

TAPE AND REEL INFORMATION

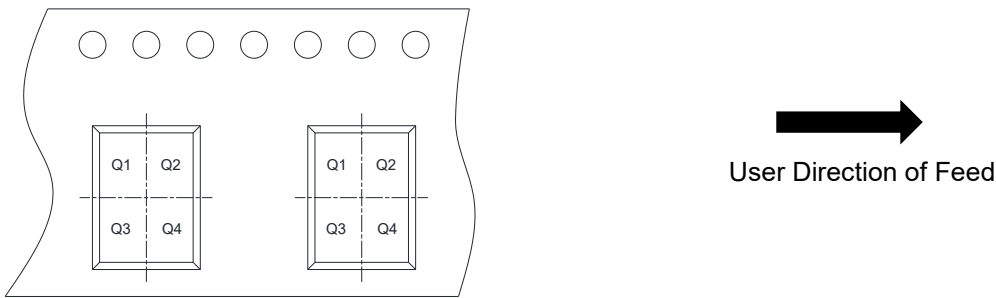
Reel Dimensions



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