# WS3241C

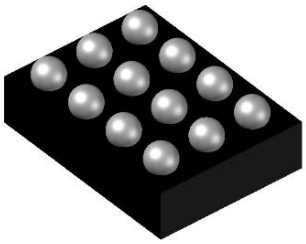
## Over-Voltage Protection Load Switch

http://www.ovt.com

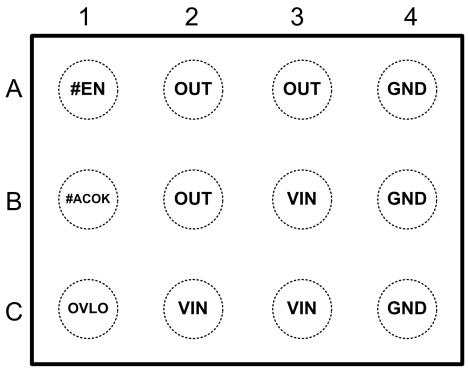
## Descriptions

The WS3241C features a low $R_{ON}$ internal high voltage switch and an input range of absolute maximum 29V. The WS3241C behaves Over-Voltage Protection (OVP) that shuts off the internal Switch if OVLO pin voltage exceeds the 1.2V reference voltage. External resistors divider could be used to set the input voltage OVP threshold. The off-state Switch would disconnect the input pin to output pin and protect output from the input high voltage stress. Also, an internal fixed 6.8V-OVP could set by connecting OVLO pin to ground without the external resistors. Integrated Over-Temperature Protection (OTP) also shuts off the Switch to protect the device.

The WS3241C is available in CSP-12L package. Standard product is Pb-free and Halogen-free.



**CSP-12L (Bottom View)**



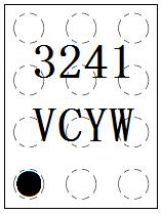

**Pin Configuration (Top View)**

## Features

- Surge Protection : 100V
- Absolute Maximum Input Voltage : 29V
- Low $R_{ON}$ Switch (@VIN=5V) : 30mΩ
- Adjustable OVP Threshold
- Fast OVP Response : 70ns
- Thermal Shutdown Protection
- Robust ESD Protection

## Applications

- Mobile Handsets and Tablets
- Portable Media Players
- Peripherals




**Marking**

**3241 = Device Name**

**VC = Device Code**

**Y = Year Code**

**W = Week Code**

## Order Information

| Device | Package | Shipping |
|---|---|---|
| WS3241C-12/TR | CSP-12L | 3000/Reel&Tape |



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## Typical Applications

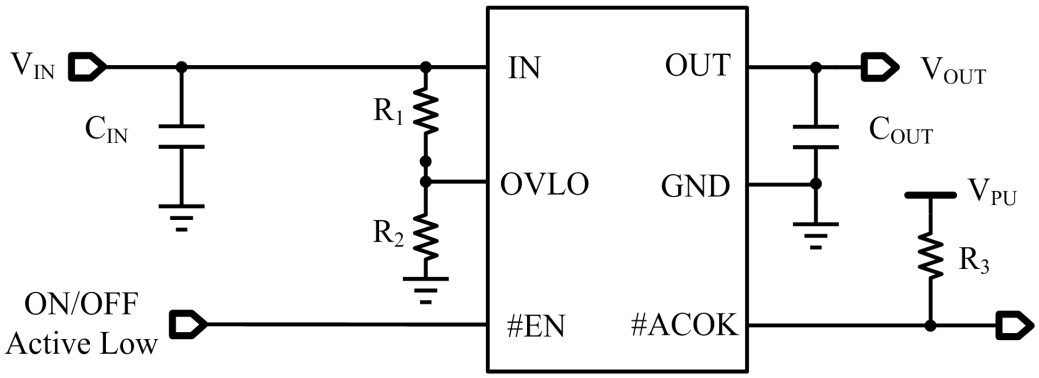


Fig1. Typical application

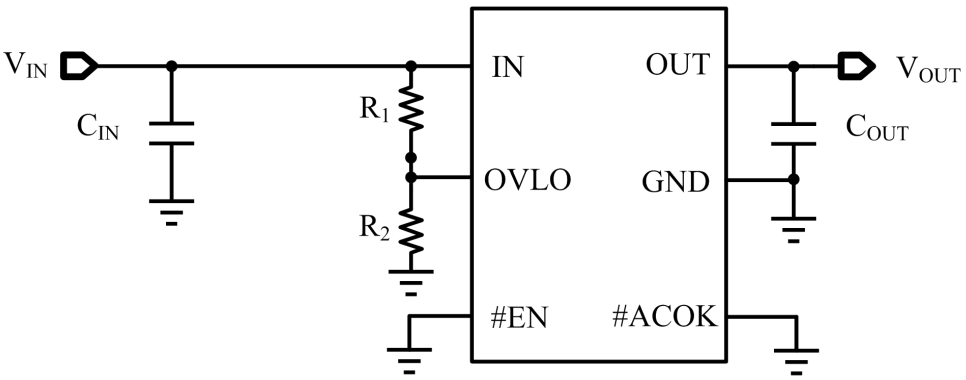


Fig2. Typical application with #EN=0

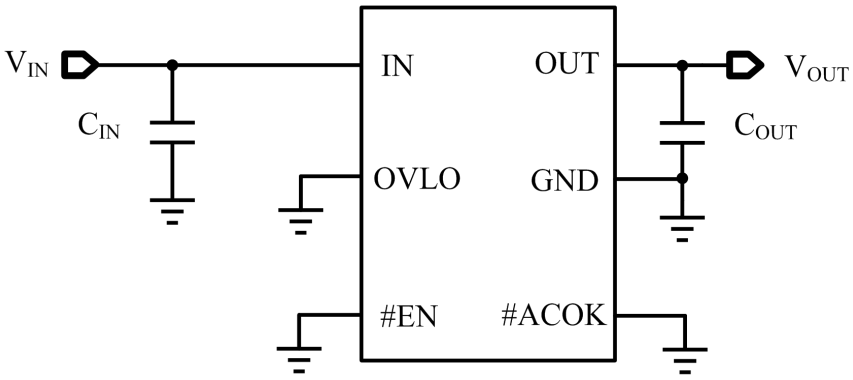


Fig3. Typical application with internal default OVP threshold 6.8V

**Note1:** $R_1$ and $R_2$ are only required for external OVP, otherwise connect OVLO to GND.

**Note2:** $V_{OVP} = V_{OVLOTH} \times (R_1+R_2) / R_2$. Recommended selection: $10K \le R_2 \le 50K$.



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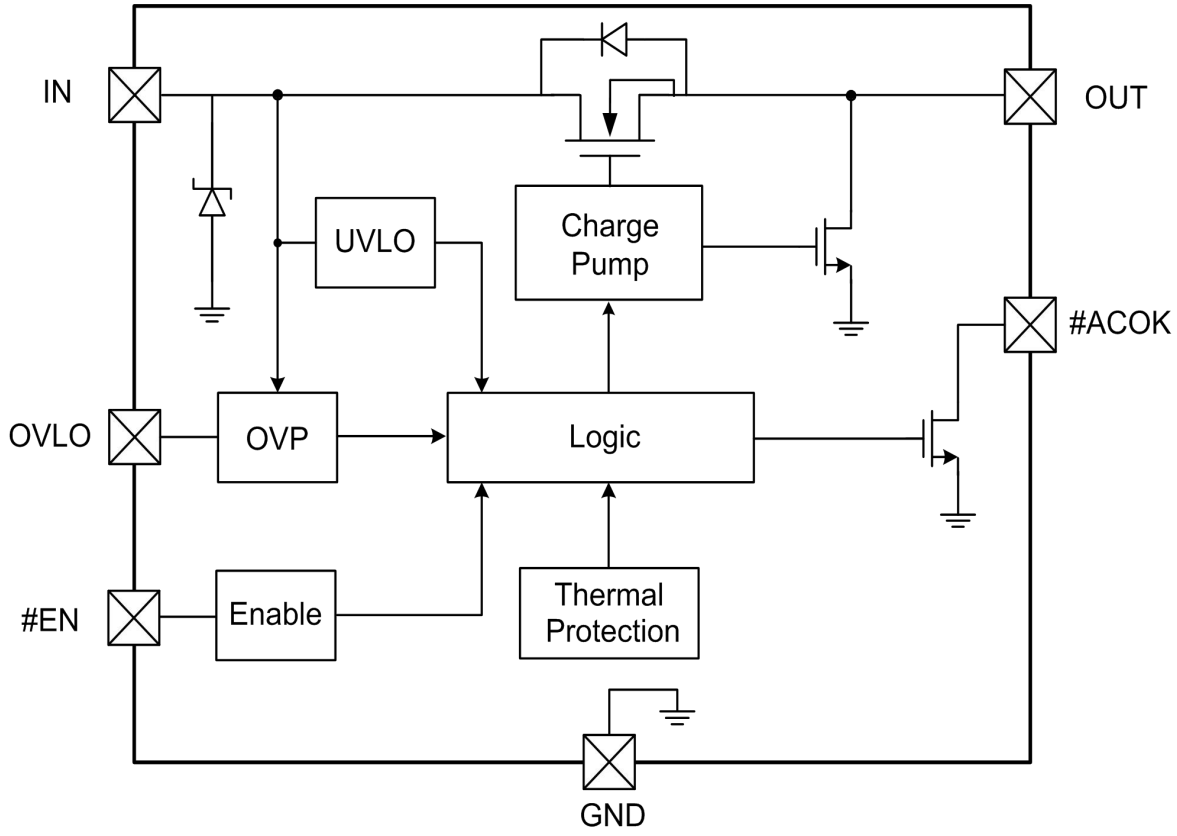
## Pin Descriptions

| Pin | Symbol | Type | Descriptions | | |
|---|---|---|---|---|---|
| B3, C2, C3 | IN | Supply | Switch Input Pin and Device Power Supply. | | |
| A2, A3, B2 | OUT | Output | Switch Output Pin to Load. | | |
| A4, B4, C4 | GND | Ground | Device Ground Pin. | | |
| C1 | OVLO | Input | Over-Voltage Lockout Adjustment Pin. | | |
| A1 | #EN | Input | Active Low. Connect to GND to enable the device. | | |
| B1 | #ACOK | Output | Power Good Index. Open drain connected to a resistor. If not used, connect to GND or floating. | 1 | UVLO or OVP |
| | | | | 0 | Supply stable |

## Block Diagram



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## Absolute maximum ratings

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| V_IN voltage range | $V_{IN}$ | -0.3~29 | V |
| V_OUT voltage range | $V_{OUT}$ | $V_{IN}$+0.3 | V |
| V_OVLO voltage range | $V_{OVLO}$ | -0.3~16 | V |
| V_#ACOK voltage range | $V_{\#ACOK}$ | -0.3~6 | V |
| V_#EN voltage range | $V_{\#EN}$ | -0.3~6 | V |
| Switch I/O Continuous Current | $I_{IN}$ | 4.5 | A |
| Junction temperature | $T_J$ | 150 | °C |
| Lead temperature(Soldering, 10s) | $T_L$ | 260 | °C |
| Storage temperature | Tstg | -55~150 | °C |
| Surge Protection | Surge | 100 | V |

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 | $V_{cc}$ | 2.9~25 | V |
| Operating ambient temperature | $T_A$ | -40~85 | °C |
| Thermal Resistance *1 | $R_{\theta JA}$ | 85 | °C/W |

*1 Surface mounted on FR-4 Board using 2 oz, 1*1 square inch Cu area. PCB board size 1.5*1.5 square inches.



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## Electrical Characteristics

($T_A$ = 25°C, $V_{IN}$ = 5V, $C_{IN}$ = 1µF, $C_{OUT}$ = 1µF, for 5V application, unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| **Basic Operation** | | | | | | |
| Input Clamp Voltage | $V_{IN\_CLAMP}$ | $I_{IN}$=10mA | 33.8 | 36.5 | 40.2 | V |
| Quiescent Supply Current | $I_Q$ | $V_{IN}$ = 5V, #EN=0V, No Load | | 100 | 210 | µA |
| | | $V_{IN}$ = 5V, #EN=1.8V, No Load | | 25 | | |
| OVLO Supply Current (No Load) | $I_{OV}$ | $V_{IN}$=5V, #EN=0V, $V_{OVLO}$=2V | | 80 | | µA |
| | | $V_{IN}$=5V, #EN=5V, $V_{OVLO}$=2V | | 25 | | µA |
| UVLO Threshold Voltage | $V_{UVLO}$ | $V_{IN}$ Rising | | 2.2 | 2.8 | V |
| UVLO Hysteresis Voltage | $V_{UVLO\_HYS}$*3 | $V_{IN}$ Falling | | 0.14 | | V |
| Debounce Time | $T_{DEB}$ | Time from $V_{IN}$ rise above $V_{UVLO}$ to $V_{OUT}$ = 0.1 x $V_{IN}$ | | 20 | | ms |
| Soft-Start Time | $T_{SS}$ | Time from $V_{IN}$ rise above $V_{UVLO}$ to #ACOK goes Low | | 40 | | ms |
| Switch Turn-On Time | $T_{ON}$ | $R_L$=100Ω, $C_L$=22µF, $V_{OUT}$ from 0.1x$V_{IN}$ to 0.9x$V_{IN}$ | | 2 | | ms |
| Main Switch ON-Resistance | $R_{ON}$ | $V_{IN}$ = 5V, $I_{OUT}$ = 1A | | 30 | 39 | mΩ |
| #ACOK Output Low Voltage | $V_{OL}$ | $I_{SINK}$=1mA | | 0.1 | 0.4 | V |
| #ACOK Leakage Current | $I_{\#ACOK\_LEAK}$ | $V_{\#ACOK}$ = 3V | -0.1 | | 0.1 | µA |
| Enable High Voltage | $V_{IH\_\#EN}$ | $V_{IN}$ = 5V | 1.4 | | | V |
| Enable Low Voltage | $V_{IL\_\#EN}$ | $V_{IN}$ = 5V | | | 0.4 | V |
| #EN Input Leakage Current | $I_{\#EN}$ | $V_{IN}$ = 5V, $V_{\#EN}$=5V | | 2 | | µA |
| | | $V_{IN}$ = 5V, $V_{\#EN}$=0V | -1 | | 1 | |
| **Over-Voltage Protection** | | | | | | |
| OVLO Set Threshold | $V_{OVLO\_TH}$ | OVLO Voltage Rising | 1.17 | 1.2 | 1.23 | V |
| OVLO Set Hysteresis | $V_{OVLO\_Hys}$ *2*3 | OVLO Voltage Hysteresis | | 40 | | mV |
| Adjustable IN OVP threshold range | $V_{OVLO\_range}$ | | 4 | | 25 | V |
| External OVLO Select Threshold | $V_{OVLO\_E}$ | OVLO Voltage Rising | | 0.25 | | V |
| OVLO Select Hysteresis | $V_{OVLO\_Ehys}$*3 | | | 20 | | mV |



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## Electrical Characteristics

($T_A$ = 25°C, $V_{IN}$ = 5V, $C_{IN}$ = 1µF, $C_{OUT}$ = 1µF, for 5V application, unless otherwise noted)

| | | | | | | |
|---|---|---|---|---|---|---|
| Internal OVP Threshold | $V_{OVLO\_I}$ | $V_{IN}$ Rising | 6.5 | 6.8 | 7.1 | V |
| | | $V_{IN}$ Hysteresis*3 | | 0.3 | | |
| OVLO Response Time | $t_{OVLO}$ *3 | $V_{IN}$ rising at 1V/0.1µs, Vovp=6.8V | | 70 | | ns |
| OVLO Input Current | $I_{OVLO}$ | $V_{OVLO}$= 2V | -0.1 | | 0.1 | µA |
| Output discharge resistance | $R_{DCHG}$ | $V_{OVLO}$ = 2V, $V_{OUT}$ = 5V | | 150 | | Ω |
| **Thermal Protection** | | | | | | |
| Thermal Shutdown | $T_{SD}$ | | | 150 | | °C |
| OTP Hysteresis | $T_{HYS}$ | | | 25 | | °C |

*2 If connect a resistor-divider to set different OVLO threshold, then $V_{OVLO\_HYS}$ = 40 x (1+R1/R2) mV.

*3 Guaranteed by design

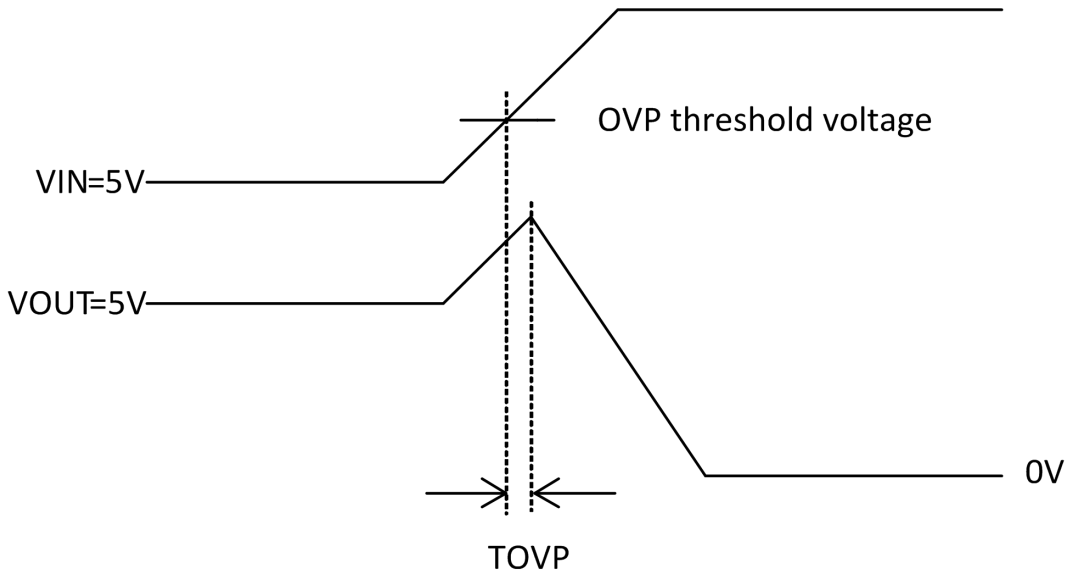


**Fig. OVP Response Time Test**



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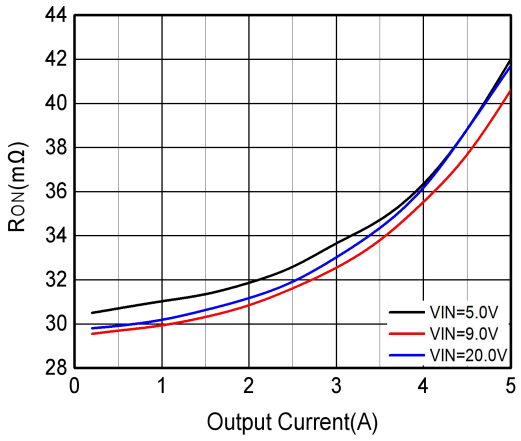
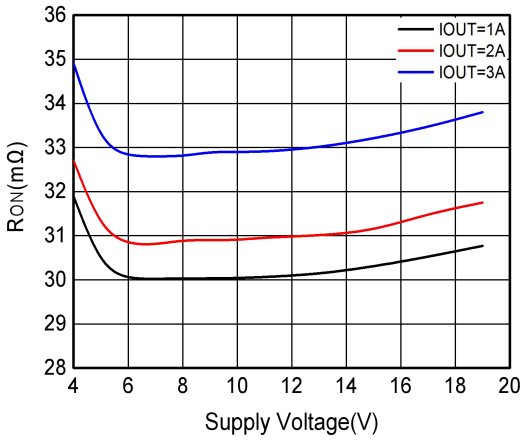
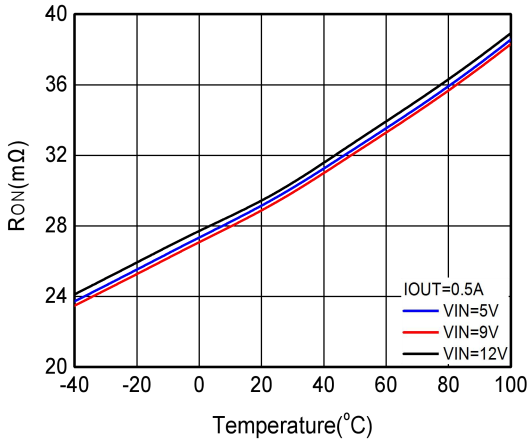
## Typical Characteristics ($T_A$ = 25°C, $C_{IN}$ = 1µF/50V, $C_{OUT}$ = 1µF/50V, unless otherwise noted)



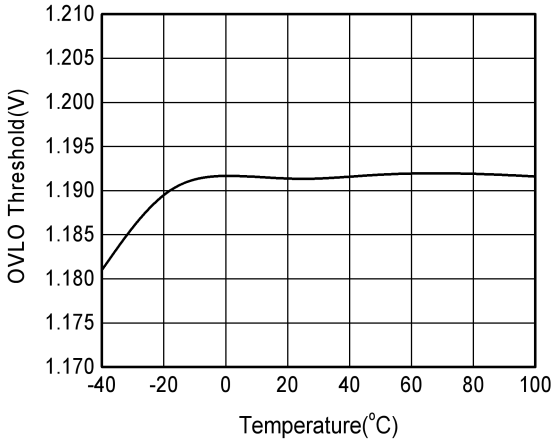

$R_{ON}$ vs. Output Current



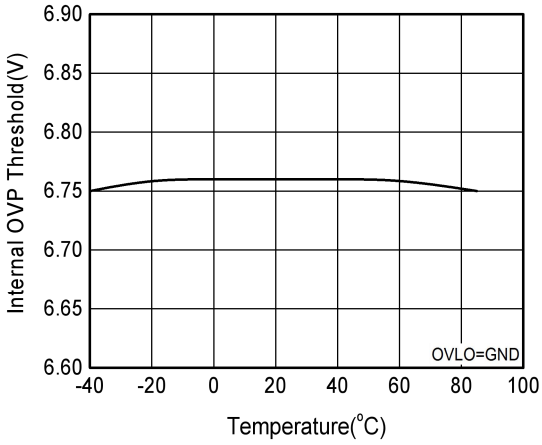

$R_{ON}$ vs. Supply Voltage



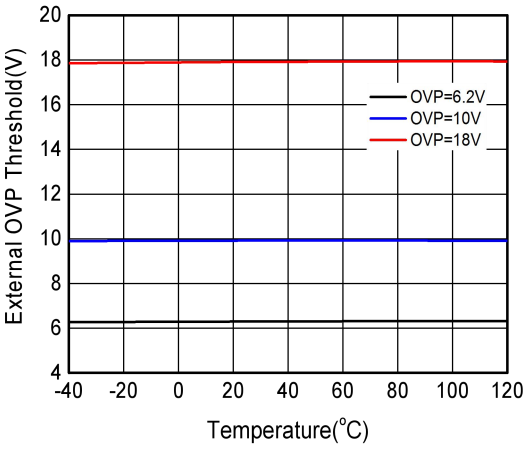

$R_{ON}$ vs. Temperature




OVLO Threshold Voltage vs. Temperature




Internal OVP Threshold Voltage vs. Temperature




External OVP Threshold Voltage vs. Temperature



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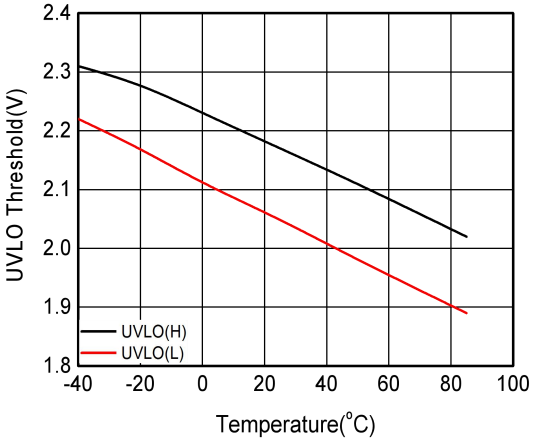
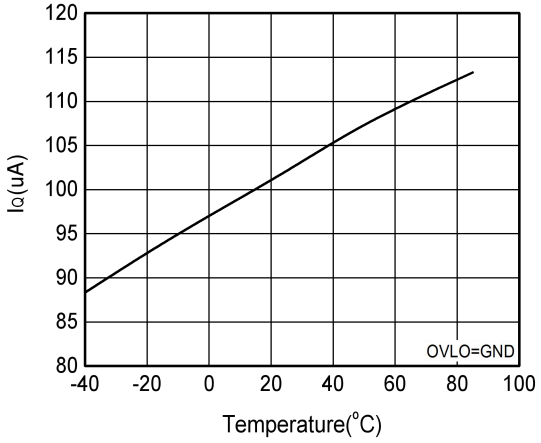
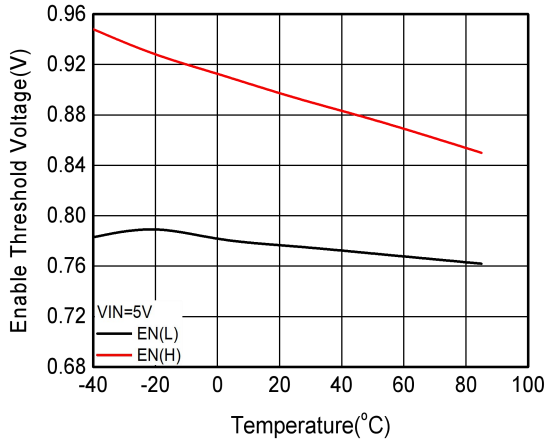


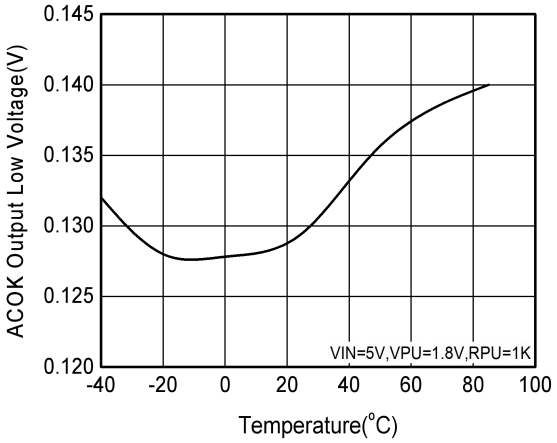

UVLO Threshold Voltage vs. Temperature



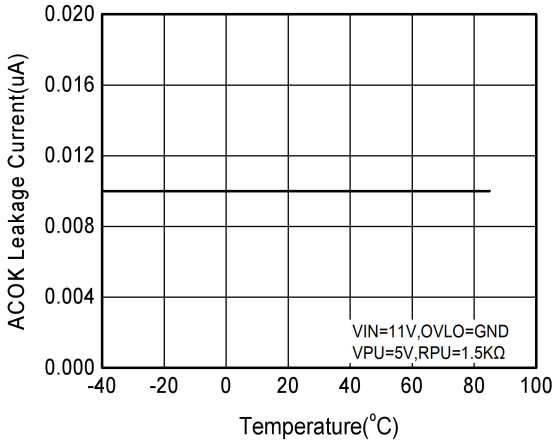

Quiescent Supply Current vs. Temperature



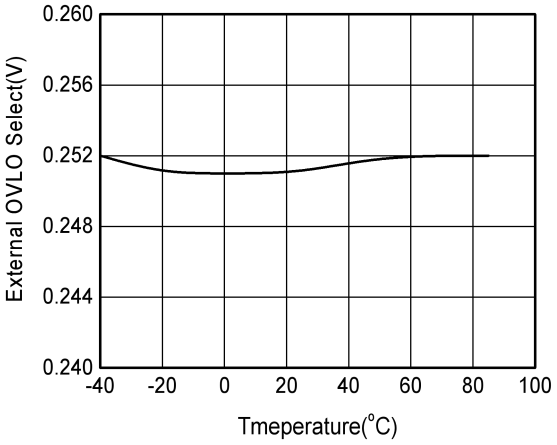

EN Threshold Voltage vs. Temperature




ACOK Output Low Voltage vs. Temperature




ACOK Leakage Current vs. Temperature




External OVLO Select Voltage vs. Temperature



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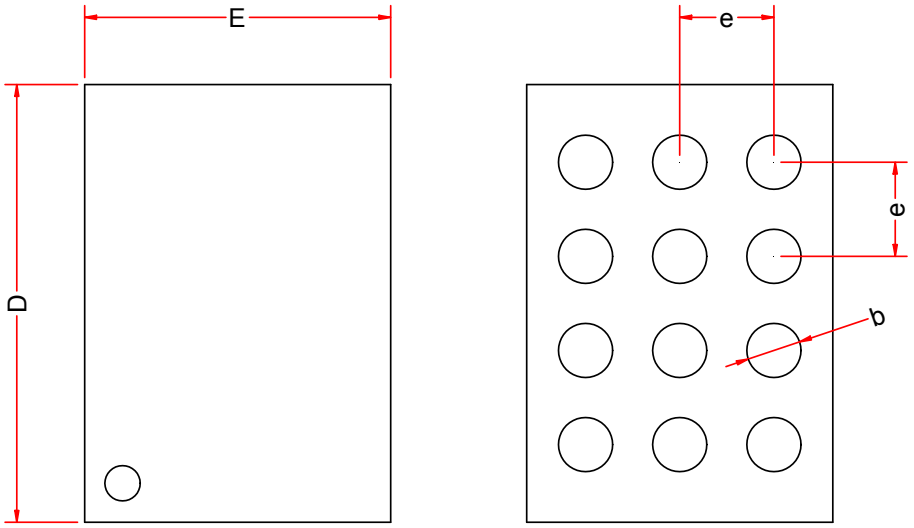
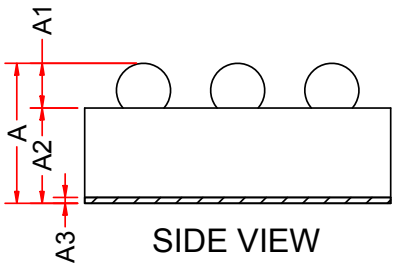
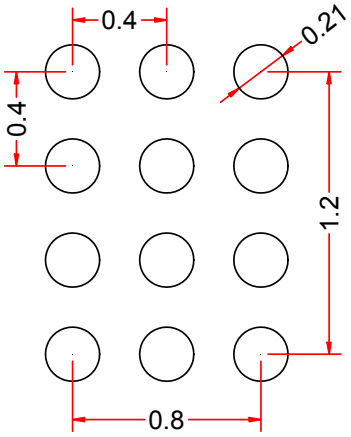
## PACKAGE OUTLINE DIMENSIONS

### CSP-12L




RECOMMENDED LAND PATTERN(unit:mm)

| Symbol | Dimensions in Millimeters | | |
|---|---|---|---|
| | Min. | Typ. | Max. |
| A | 0.54 | 0.59 | 0.63 |
| A1 | 0.17 | 0.19 | 0.21 |
| A2 | 0.37 | 0.40 | 0.42 |
| A3 | | 0.025 Ref. | |
| E | 1.14 | 1.17 | 1.20 |
| D | 1.54 | 1.57 | 1.60 |
| b | 0.21 | 0.23 | 0.25 |
| e | | 0.40BSC | |



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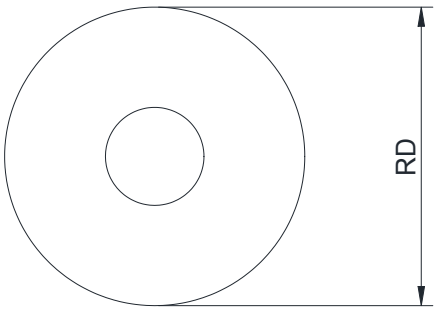
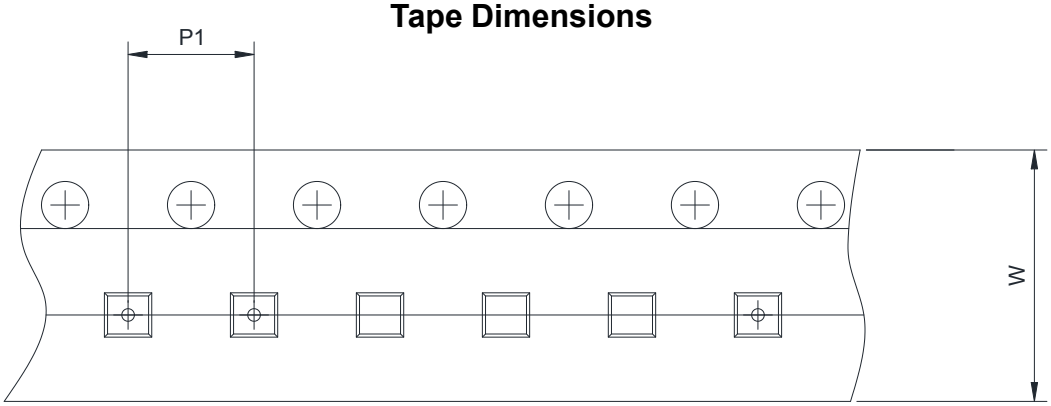
## TAPE AND REEL INFORMATION

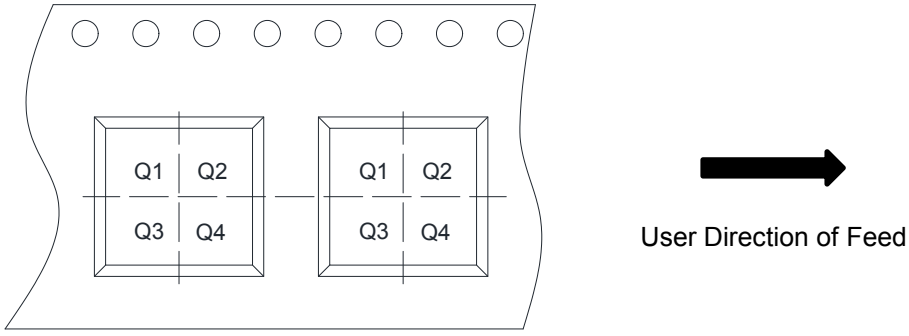
### Reel Dimensions




### Tape Dimensions




### Quadrant Assignments For PIN1 Orientation In Tape




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



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