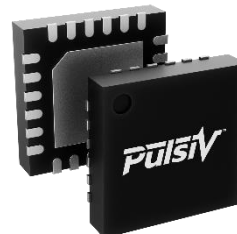


PSV-AD-250E-Q24IV

250W AC to DC Microcontroller

SPECIFICATION:

• Output Power:	250W
• Supply Voltage (Min):	1.8VDC
• Supply Voltage (Max):	3.6VDC
• Supply Current:	2.16mA
• Switching Frequency:	42kHz
• Operating Temperature (Min):	-40°C
• Operating Temperature (Max):	85°C
• Package:	VFQN24



SUPPORTED SYSTEM DESIGN FEATURES:

• Universal mains input:	85 – 265VAC
• HVDC Output:	65 – 380VDC
• Inrush Current:	Eliminated
• Input Voltage Derating:	Eliminated
• AC/DC Front-End Efficiency:	99.5% Peak

FEATURES:

• Grid Failure Detection:	✓
• Hold Up Control:	✓
• Power Consumption Indicator:	✓
• Grid Frequency Indicator:	✓
• GaN Compatible:	✓

PULSIV OSMIUM TECHNOLOGY:

Pulsiv OSMIUM technology is an AC to DC front-end conversion method that applies intelligence to an active valley fill approach and delivers a combination of game changing benefits in power electronics designs.

It significantly improves performance at low loads to increase overall average efficiency, reduce energy consumption and deliver a totally flat efficiency profile across all load conditions.

Pulsiv OSMIUM technology can be used with a variety of industry standard DC-DC converters including Flybacks, Forward Converters, & Asymmetric Half Bridge solutions. Wherever needed, it also delivers Power Factor Correction as standard.

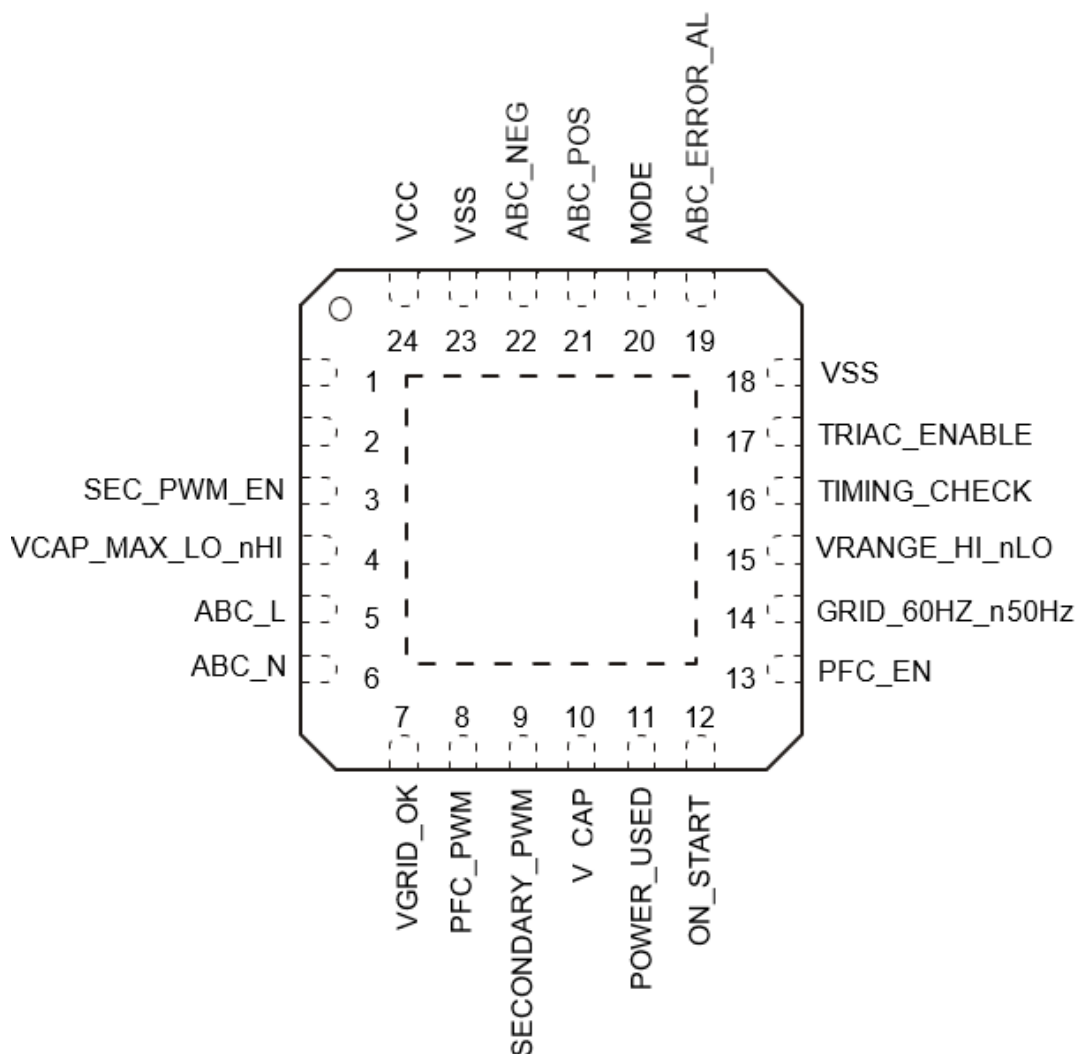
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1. MICROCONTROLLER DESCRIPTION

The **PSV-AD-250-Q24IV** microcontroller monitors real-time grid conditions, manages power factor correction (PFC) and regulates a high-voltage DC output to support a wide range of compatible DC-DC converters. It maintains a flat efficiency profile over the full load range and complies with strict EMC/THD regulations. Quality, reliability, performance and availability have been addressed by combining our unique intellectual property with industry standard devices from carefully selected global tier 1 chip manufacturers.

2. PIN CONNECTIONS:



3. PIN FUNCTIONS:

Pin No.	Pin Name	Pin Type	Description
1	Not Connected		
2	Not Connected		
3	SEC_PWM_EN	Digital Input	Enables SECONDARY_PWM output (low to disable)
4	VCAP_MAX_LO_nHI	Digital Input	Set max Cch capacitor voltage (High=150V Low=180V)
5	ADC_L	ADC Input	Scaled line voltage
6	ADC_N	ADC Input	Scaled neutral voltage
7	VGRID_OK	Digital Output	High when grid voltage is above 50V, low otherwise
8	PFC_PWM	Digital Output	PWM control for PFC
9	SECONDARY_PWM	Digital Output	Additional PWM for an auxiliary power supply or boost stage
10	V_CAP	ADC Input	Scaled storage capacitor voltage
11	POWER_USED	Digital Output	Switching frequency indicates power consumption
12	ON_START	Digital Output	This signal and TIMING_CHECK indicate controller state
13	PFC_EN	Digital Input	Enable normal operation (low to disable)
14	GRID_60HZ_n50HZ	Digital Output	Grid frequency indicator (60Hz, high; 50Hz, low)
15	VRANGE_HI_nLO	Digital Output	Indicates grid voltage (230V high; 115V low)
16	TIMING_CHECK	Digital Output	This signal and ON_START indicate controller state
17	TRIAC_ENABLE	Digital Output	Drives external thyristor holdup circuit (if required)
18	VSS	Ground	
19	ABC_ERROR_AL	Digital Input	Active Bridge error detected (low signals an error)
20	MODE	Digital Input	Enable X Capacitor discharge during shutdown (active high)
21	ABC_POS	Digital Output	Active bridge waveform, positive cycle switch
22	ABC_NEG	Digital Output	Active bridge waveform, negative cycle switch
23	VSS	Ground	
24	VCC	Power	Operating supply voltage

4. PART NUMBER CONFIGURATION

Part Number	PSV	-	AD	-	xx	xx	xx	-	Q	24	I	V	x
Descriptor	1		2		3	4	5		6	7	8	9	10

Descriptor		Meaning
1	Brand	PSV = Pulsiv
2	Type	AD = AC to DC microcontroller
3	Power (W)	Maximum Output Power (W)
4	Options	Blank = No options E = No input voltage derating
5	Frequency	Blank = 45kHz G = 125kHz
6	Package	Q = QFN
7	Pin count	24 pins
8	Temp range	-40°C to 85°C
9	Revision	
10	Packaging	S = Small reel 250pcs R = Large Reel 3000pcs Blank = Tube or tray

EXAMPLE PART NUMBER:

PSV-AD-250-Q24IVR

EXAMPLE PART NUMBER DESCRIPTION:

Pulsiv AC to DC microcontroller with 250W with a QFN24 package in a large reel of 3000pcs.

5. ABSOLUTE MAXIMUM RATINGS

Over operating free-air temperature range (unless otherwise noted).

Symbol	Parameter	Min.	Max.	Unit
V_{SS}	Applied voltage to any pin except GND	-0.3	4.1	V
I_{max}	Current to any pin		± 2	mA
T_{stg}	Storage temperature ⁽²⁾	-40	125	°C
T_j	Maximum junction temperature		85	°C
$V_{(ESD)}$	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽³⁾		± 1000	V
	Charged-device model (CDM), per JEDEC specification JESD22-C101 ⁽⁴⁾		± 2	V

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) Higher temperature may be applied during board soldering according to the current JEDEC J-STD-020 specification with peak reflow temperatures not higher than classified on the device label on the shipping boxes or reels.

(3) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process. Pins listed as ± 1000 V may actually have higher performance.

(4) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process. Pins listed as ± 250 V may actually have higher performance.

6. THERMAL DATA

Symbol	Parameter	VQFN24	Unit
$R_{th\ j-amb}$	Thermal Resistance Junction-to-Ambient	32.6	°C/W

7. RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min.	Nom.	Max.	Unit
V_{CC}	Supply voltage ⁽¹⁾⁽²⁾	1.8		3.6	V
V_{SS}	Supply voltage ground		0		V
T_A	Operating free-air temperature	-40		85	°C
T_J	Operating junction temperature	-40		85	°C
C_{DVCC}	Recommended capacitor at V_{CC} ⁽³⁾	4.7	10		mF

(1) Supply voltage changes faster than 0.2 V/μs can trigger a reset even within the recommended supply voltage range. Following the data sheet recommendation for capacitor CDVCC limits the slopes accordingly.

(2) Pulsiv recommends that power to the DVCC pin must not exceed the limits specified in Recommended Operating Conditions. Exceeding the specified limits can cause malfunction of the device.

(3) A capacitor tolerance of ±20% or better is required. A low-ESR ceramic capacitor of 100 nF (minimum) should be placed as close as possible (within a few millimetres) to the respective pin pair.

7.1 DIGITAL INPUTS

Parameter	Test Conditions	Vcc	Min	Typ.	Max	Unit
V_{IT+}	Positive-going input threshold voltage	2 V	0.90		1.50	V
		3 V	1.35		2.25	
V_{IT-}	Negative-going input threshold voltage	2 V	0.50		1.10	V
		3 V	0.75		1.65	
V_{hys}	Input voltage hysteresis ($V_{IT+} - V_{IT-}$)	2 V	0.3		0.8	V
		3 V	0.4		1.2	
R_{Pull}	Pullup or pulldown resistor	For pullup: $V_{IN} = V_{SS}$ For pulldown: $V_{IN} = V_{CC}$		20	35 50	kΩ
$C_{I,dig}$	Input capacitance, digital only port pins	$V_{IN} = V_{SS}$ or V_{CC}		3		pF
$C_{I,ana}$	Input capacitance, port pins with shared analogue functions	$V_{IN} = V_{SS}$ or V_{CC}		5		pF
$I_{lkg(Px.y)}$	High-impedance leakage current	See (1) (2)	2 V, 3 V	-20	20	nA

(1) The leakage current is measured with VSS or VCC applied to the corresponding pins, unless otherwise noted.

(2) The leakage of the digital port pins is measured individually. The port pin is selected for input and the pullup or pulldown resistor is disabled.

7.2 DIGITAL OUTPUTS

Parameter		Test Conditions	Vcc	Min	Typ.	Max	Unit
V _{OH}	High-level output voltage	I(OHmax) = -3 mA(1)	2 V	1.4		2.0	V
		I(OHmax) = -5 mA(1)	3 V	2.4		3.0	
V _{OL}	Low-level output voltage	I(OLmax) = 3 mA(1)	2 V	0.0		0.60	V
		I(OHmax) = 5 mA(1)	3 V	0.0		0.60	

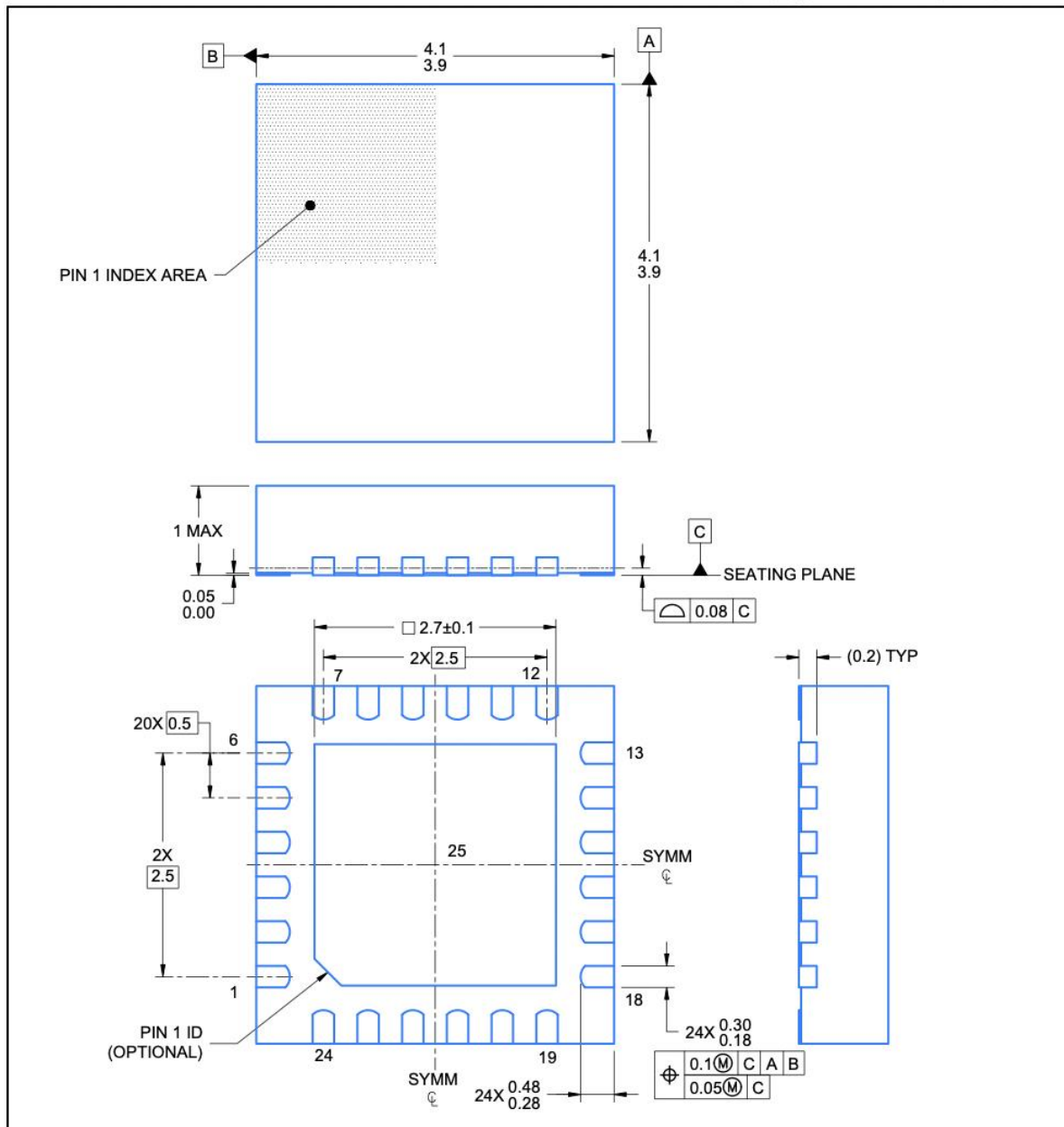
- (1) The maximum total current, I(OHmax) and I(OLmax), for all outputs combined should not exceed ±48 mA to hold the maximum voltage drop specified.
- (2) The port can output frequencies at least up to the specified limit and might support higher frequencies

7.3 ADC POWER SUPPLY AND INPUT RANGE CONNECTIONS

	Parameter	Test Conditions	Vcc	Min	Typ.	Max	Unit
DV _{CC}	ADC supply voltage			2.0		3.6	V
V _(AX)	Analogue input voltage range	All ADC pins		0		DV _{CC}	V
C _I	Input capacitance		2.2 V		1.6	2.0	pF

8. MECHANICAL DIMENSIONS

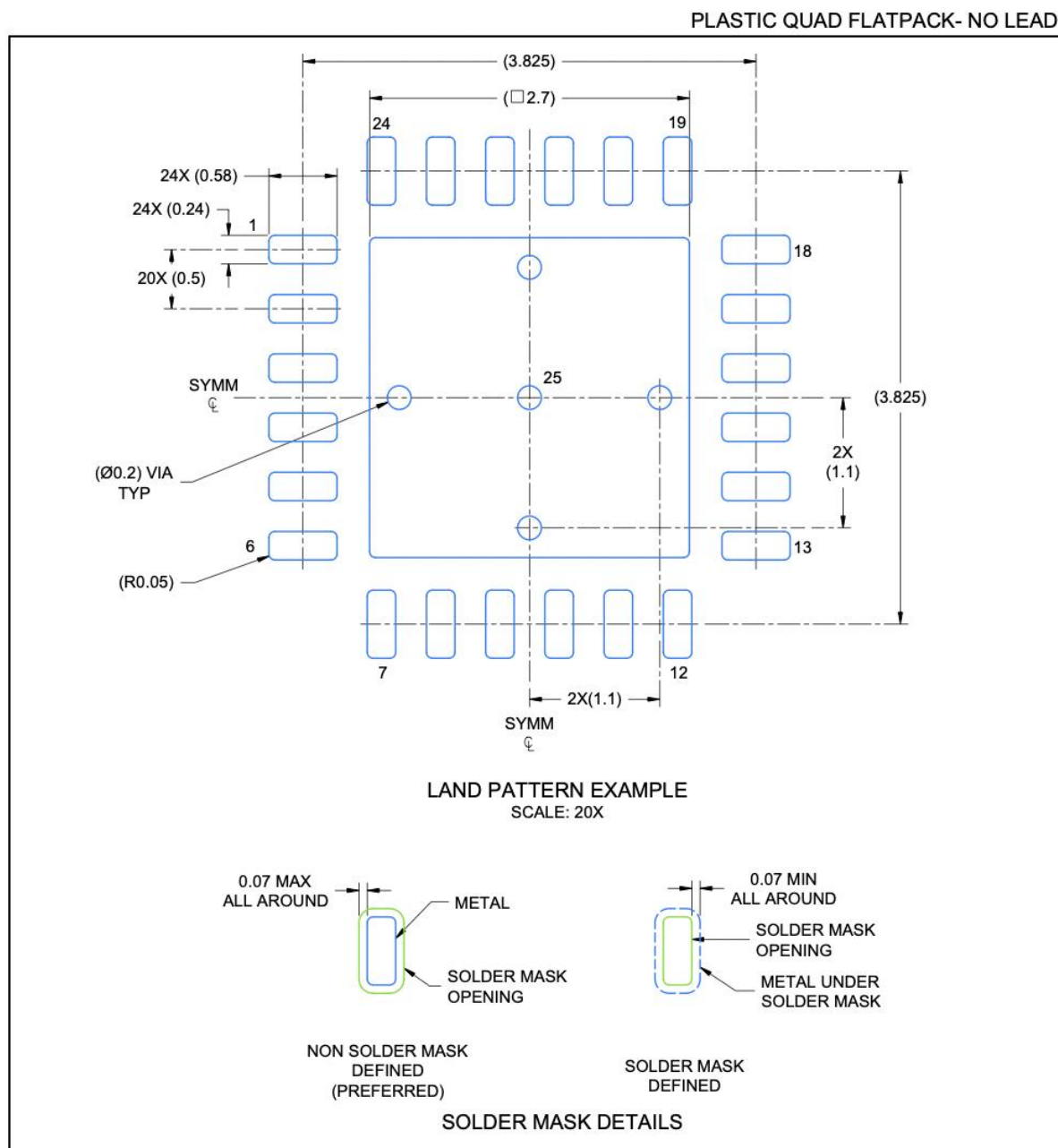
PLASTIC QUAD FLATPACK- NO LEAD



NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

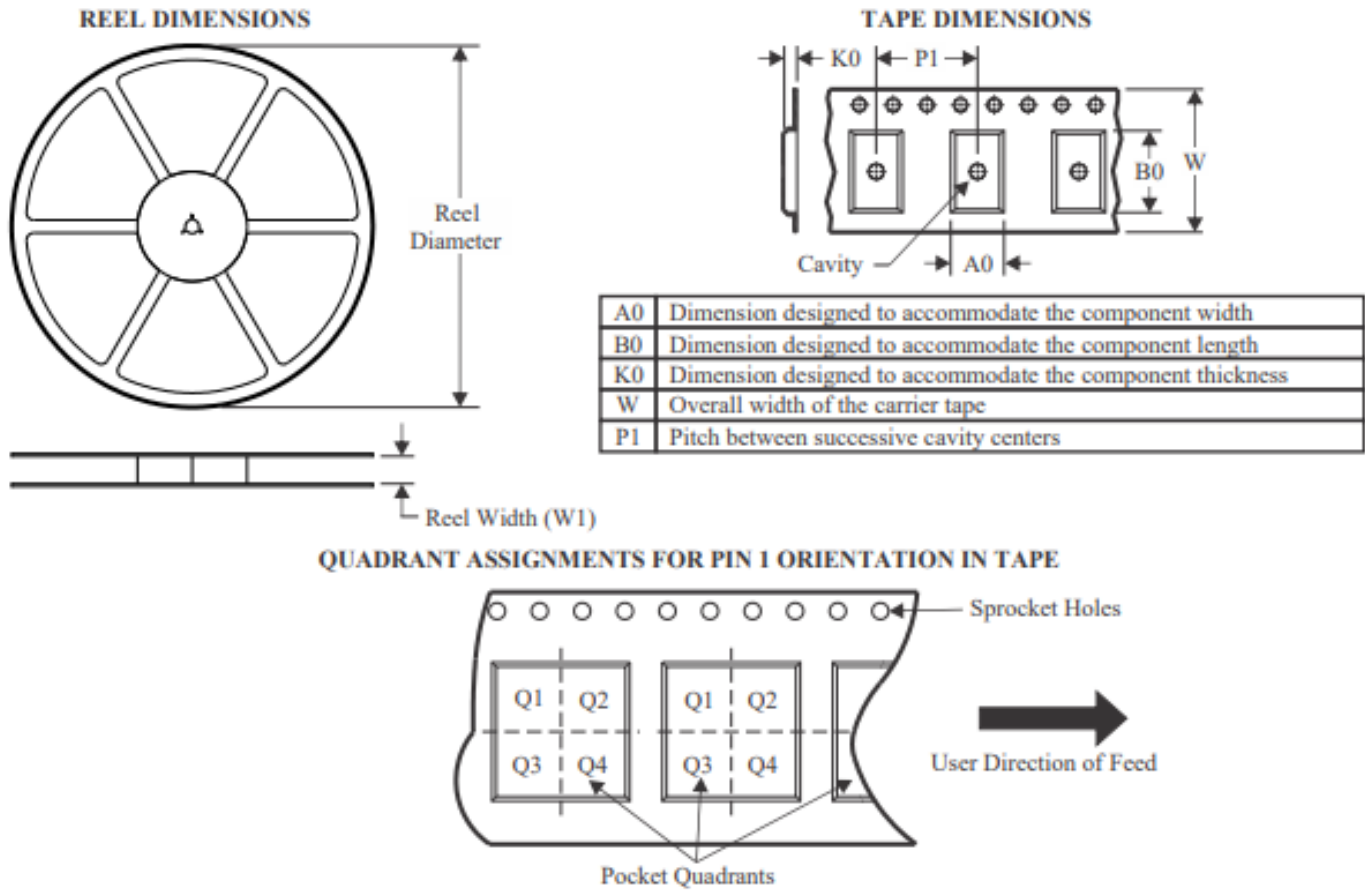
9. LAYOUT INFORMATION



NOTES: (continued)

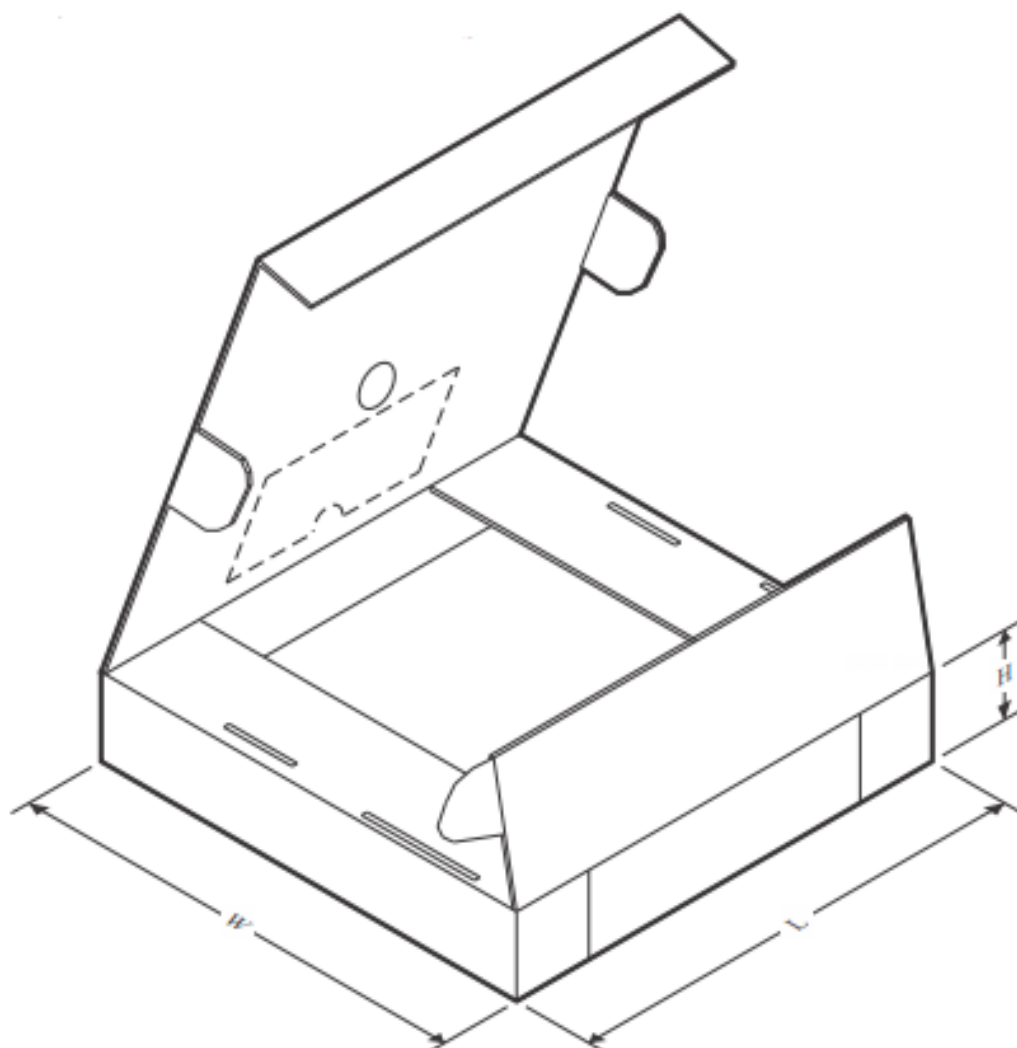
4. This package is designed to be soldered to a thermal pad on the board.
5. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

10. TAPE & REEL INFORMATION



Part Number	Package	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin 1 Quadrant
PSV-AD-250-Q24IVR	VQFN	24	3000	330.0	12.4	4.25	4.25	1.15	8.0	12.0	Q2
PSV-AD-250-Q24IVS	VQFN	24	250	180.0	12.4	4.25	4.25	1.15	8.0	12.0	Q2

11. TAPE AND REEL BOX DIMENSIONS



Part Number	Package	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
PSV-AD-250-Q24IVR	VQFN	24	3000	346.0	346.0	33.0
PSV-AD-250-Q24IVS	VQFN	24	250	210.0	185.0	35.0

12. IMPORTANT NOTICE & DISCLAIMER

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13. USEFUL LINKS

- Technical Support: [CLICK HERE](#)
- Evaluation Boards: AC to DC Front-End Only [CLICK HERE](#)
- Evaluation Boards: Full AC to DC Power Supplies [CLICK HERE](#)
- Reference Designs: AC to DC Front-End Only [CLICK HERE](#)
- Reference Designs: Full AC to DC Power Supplies [CLICK HERE](#)
- White Papers [CLICK HERE](#)
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