

RS16520 – 5-Phase Dual-Output TLVR Controller with AVSBus and PMBus

Features

Flexible 5-Phase Dual-Output Architecture

- Up to 5 phases with dual-output operation
 - Configurations from 5 + 0 to 4 + 1
- Flexible phase-order assignment
- Compatible with Reed Smart Power Stages and power modules

Native TLVR & Fast Transient Performance

- Native Trans-Inductor Voltage Regulator (TLVR) support
 - No additional external passive components required
 - Integrated 1kΩ current-sense resistor
- Programmable overshoot and undershoot reduction
- Automatic phase add/drop with programmable thresholds
- Thermal phase balancing
- Up to 4MHz switching frequency
- Constant-on-time control
- Programmable DC load line

Wide operating range and high-accuracy regulation

- 4.5V to 16V input; 0.2V to 2.8V output
- $\pm 0.5\%$ output-voltage accuracy with differential sensing

Integrated telemetry

- $\pm 1.5\%$ voltage and current accuracy
- $\pm 2^\circ\text{C}$ temperature accuracy

Comprehensive protection

- UVLO, UVP, OVP, OCP, and OTP
- Cycle-by-cycle per-phase current limiting
- Programmable latch-off or auto-retry fault response

Digital Interfaces, Configuration & Diagnostics

- AVSBus compliant
- PMBus v1.4.1 compliant
- MTP with up to 31 configuration writes
- Black-box fault recording
- Internal compensation

Package

- 5mm × 5mm, 40-pin QFN package
- -40°C to 125°C operating temperature range
- RoHS compliant and green

Applications

- AI Accelerator, GPU, and CPU Core Power
- FPGA and ASIC Core Power
- Server, HPC, and Networking Systems
- High-Current Power Modules

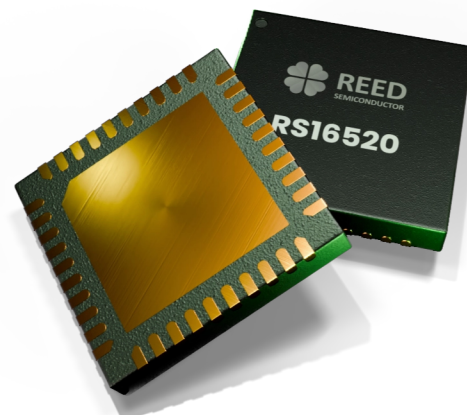
Description

The RS16520 is a high-performance, dual-output digital multiphase controller supporting up to 5 phases with configurations from 5 + 0 to 4 + 1. Designed for high-current computing, graphics, server, and telecom power applications, the device operates from 4.5V to 16V and supports output voltages from 0.2V to 2.8V with $\pm 0.5\%$ output-voltage accuracy.

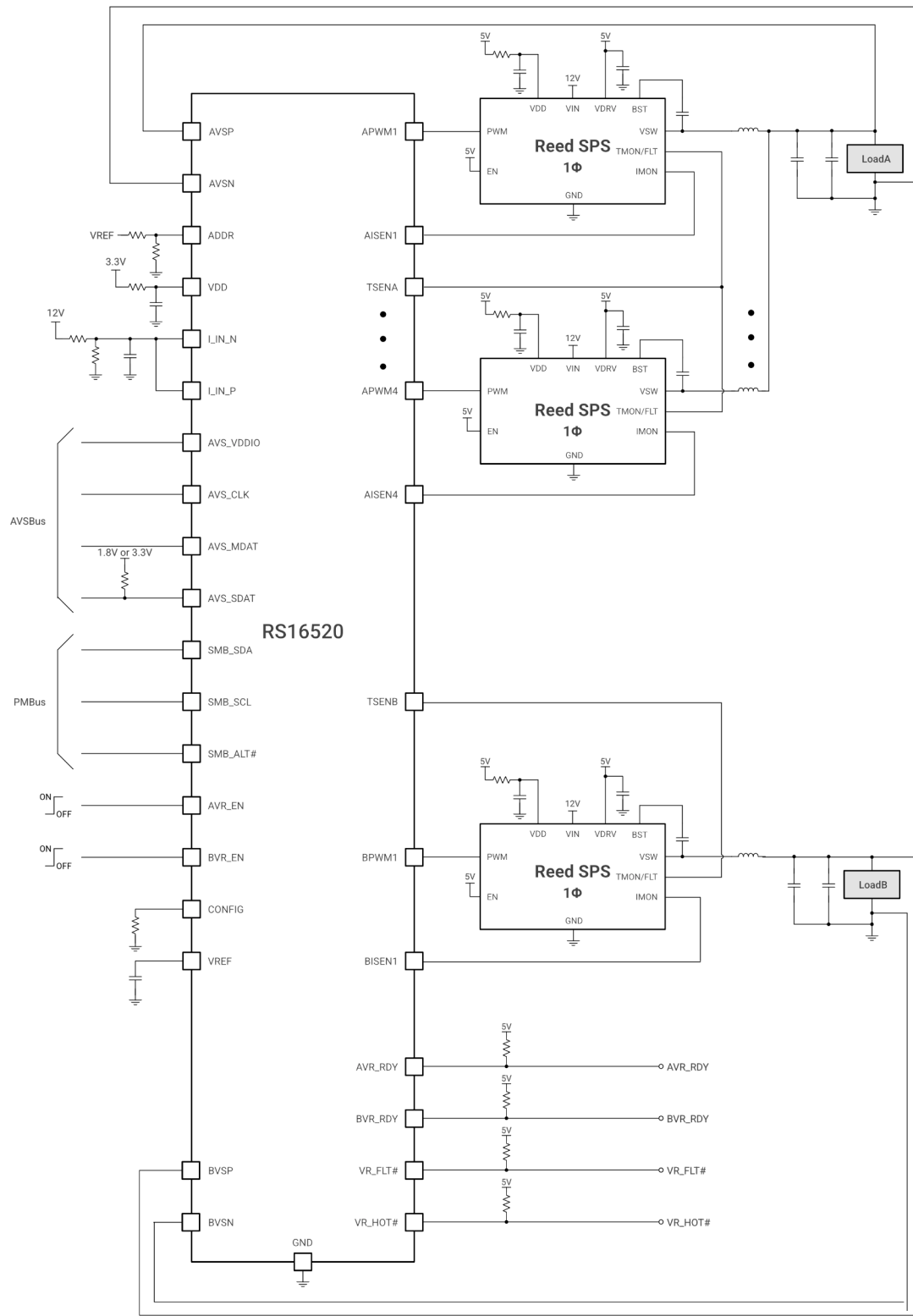
Native TLVR support, constant-on-time control, programmable load-line regulation, and automatic phase add/drop provide fast transient response and efficient operation across changing load conditions. Switching frequencies up to 4MHz enable high-density power conversion, while programmable overshoot and undershoot reduction and thermal phase balancing further optimize transient and thermal performance.

Integrated voltage, current, and temperature telemetry provides real-time system monitoring. The RS16520 supports AVSBus and PMBus v1.4.1 interfaces, with MTP configuration and black-box fault recording for system configuration and diagnostics. Integrated protection includes UVLO, UVP, OVP, OCP, OTP, and cycle-by-cycle per-phase current limiting.

When paired with Reed [Smart Power Stages](#) or [Smart Power Blocks](#), the RS16520 provides a compact, scalable multiphase power solution for demanding high-current applications. The device is offered in a 5mm × 5mm 40-pin QFN package and operates from -40°C to 125°C .



Typical Application Schematic (4 +1)



Ordering Information

PART NUMBER	PACKAGE	SIZE	MSL RATING	SHIPPING METHOD	PACKAGE MARKING
RS16520R	QFN-40	5 × 5mm		5000u Tape & Reel	R16520+

Top Marking

Line 1

- RS: Prefix of Reed Semiconductor (R is replaced by E for engineering lots)
- YY: Year code
- WW: Week code

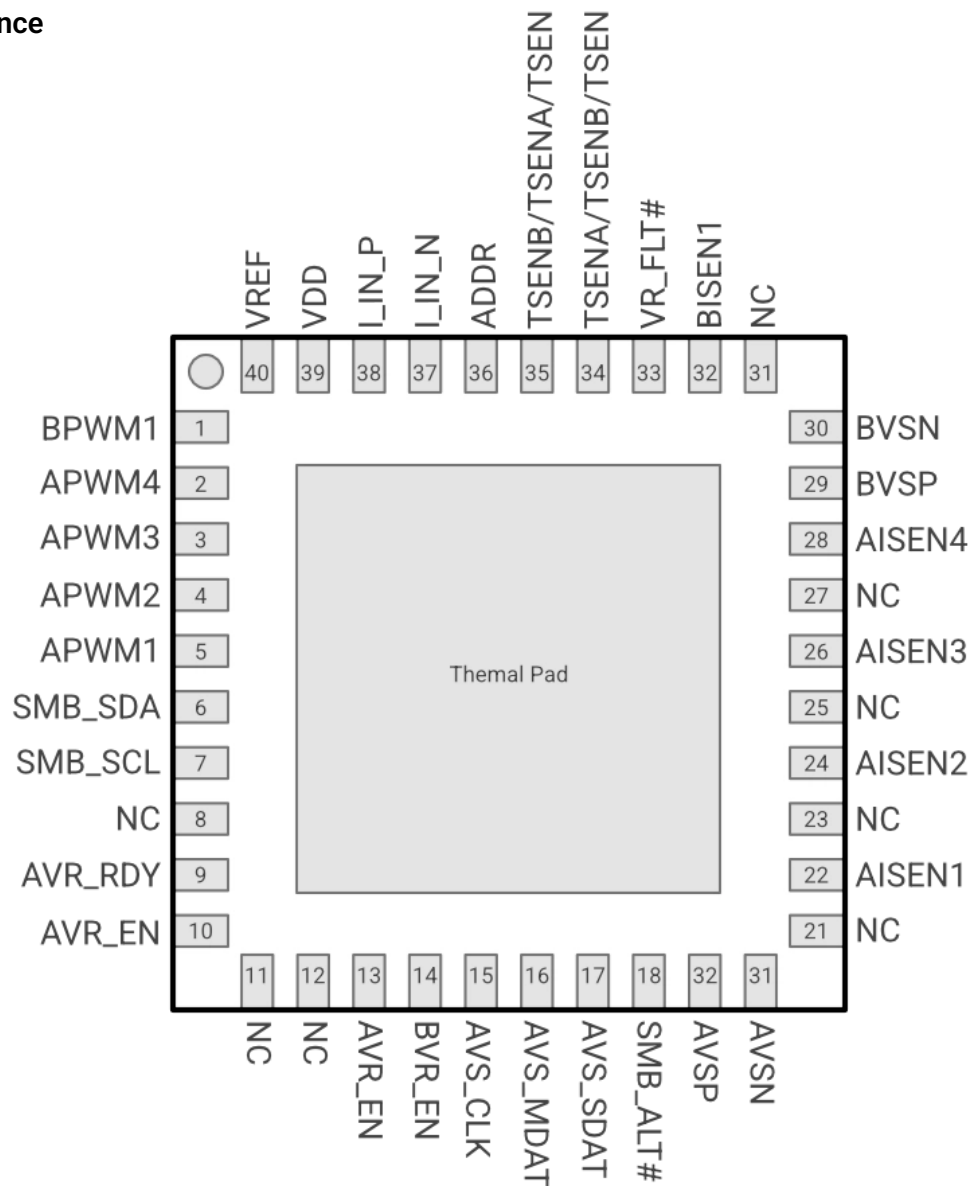
Line 2

- PPPPP: Truncated part number

Line 3

- LLLLL: Lot code
- S: Assembly site code

Package Reference



QFN-40 (5 × 5mm)

Pin Descriptions

PIN	NAME	TYPE	DESCRIPTION
1	BPWM1	O	PWM output for Rail B Phase 1.
2	APWM4	O	PWM output for Rail A Phase 4.
3	APWM3	O	PWM output for Rail A Phase 3.
4	APWM2	O	PWM output for Rail A Phase 2.
5	APWM1	O	PWM output for Rail A Phase 1.
6	SMB_SDA	I/O	PMBus bidirectional serial data.
7	SMB_SCL	I	PMBus serial clock input.
8	NC	—	No Internal connection.
9	AVR_RDY	O	Active-high Power Good output. Asserts when the Rail A output voltage is in regulation.
10	AVR_EN	I	Active-high enable input for Rail A.
11, 12	NC	—	No Internal connection.
13	BVR_RDY	O	Active-high Power Good output. Asserts when the Rail B output voltage is in regulation.
14	BVR_EN	I	Active-high enable input for Rail B.
15	AVS_CLK	I	AVSBus clock input.
16	AVS_MDAT	I	AVSBus command data input.
17	AVS_SDAT	O	AVSBus response data output. Requires an external pull-up resistor to 1.8V or 3.3V.
18	SMB_ALT#	O	Active-low, open-drain PMBus ALERT# output.
19	AVSP	I	Rail A positive remote-sense input. Connect to the output voltage at the point of regulation.
20	AVSN	I	Rail A negative remote-sense input. Connect to the load ground at the point of regulation.
21	NC	—	No Internal connection.
22	AISEN1	I	Current-sense input for Rail A Phase 1.
23	NC	—	No Internal connection.
24	AISEN2	I	Current-sense input for Rail A Phase 2.
25	NC	—	No Internal connection.
26	AISEN3	I	Current-sense input for Rail A Phase 3.
27	NC	—	No Internal connection.
28	AISEN4	I	Current-sense input for Rail A Phase 4.
29	BVSP	I	Rail B positive remote-sense input. Connect to the output voltage at the point of regulation.
30	BVSN	I	Rail B negative remote-sense input. Connect to the load ground at the point of regulation.

PWM outputs (Pins 1–5): 3.3V CMOS tri-state outputs. Low: low-side FET ON; High: high-side FET ON; Tri-state: both FETs OFF. If unused, leave floating.

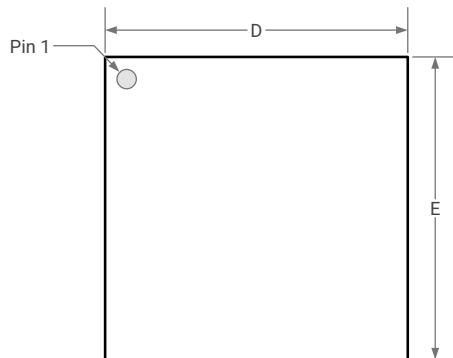
Type: I = Input, O = Output, I/O = Bidirectional, P = Power, G = Ground, — = No Connect.

Pin Descriptions

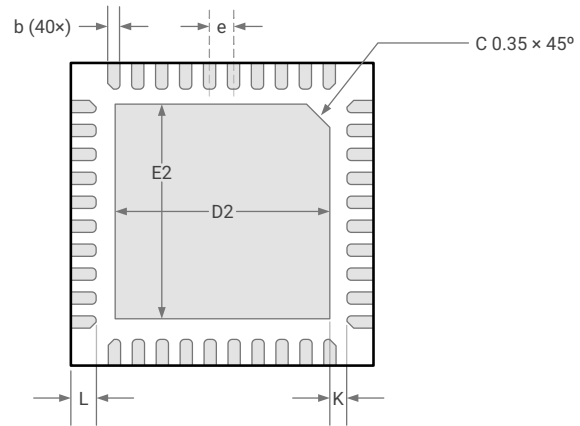
PIN	NAME	TYPE	DESCRIPTION
31	NC	—	No internal connection.
32	BISEN1	I	Current-sense input for Rail B Phase 1.
33	VR_FLT#	O	Active-low, open-drain catastrophic fault output. Asserts low when a catastrophic fault occurs and the controller stops regulating.
34	TSENA/ TSENB/ TSEN	O	Multifunction temperature-sense inputs configurable through MTP as TSENA, TSENB, or TSEN. TSENA: Connect to the wired-OR temperature-monitor outputs of the power stages on Rail A. TSENB: Connect to the temperature-monitor output of the power stage on Rail B. TSEN: Connect to the wired-OR temperature-monitor outputs of the power stages on Rails A and B.
35	TSENB/ TSENA/ TSEN	O	
36	ADDR	I	PMBus address-select input. Connect to GND through a resistor and to VREF through a resistor to set the PMBus address. The address is latched at VDD power-up.
37	I_IN_N	I	Negative input-current-sense input. Connect to the negative side of an external current-sense resistor through a 6:1 resistor divider. Also configurable as an input-voltage-sense input (VINSEN); decouple with a 0.1µF capacitor to GND.
38	I_IN_P	I	Positive input-current-sense input. Connect to the positive side of an external current-sense resistor through a 6:1 resistor divider.
39	VDD	P	3.3V supply input. Connect a 1µF or larger ceramic bypass capacitor to GND.
40	VREF	O	1.5V reference-voltage output. Connect a 1µF to 4.7µF decoupling capacitor to GND.
—	Thermal Pad	G	Exposed thermal pad. Connect to the GND plane with multiple thermal vias.

Type: I = Input, O = Output, I/O = Bidirectional, P = Power, G = Ground, — = No Connect.

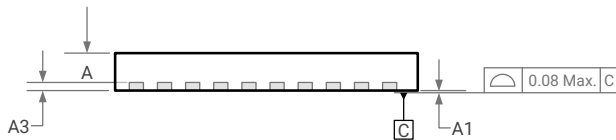
Package Dimensions



TOP VIEW



BOTTOM VIEW



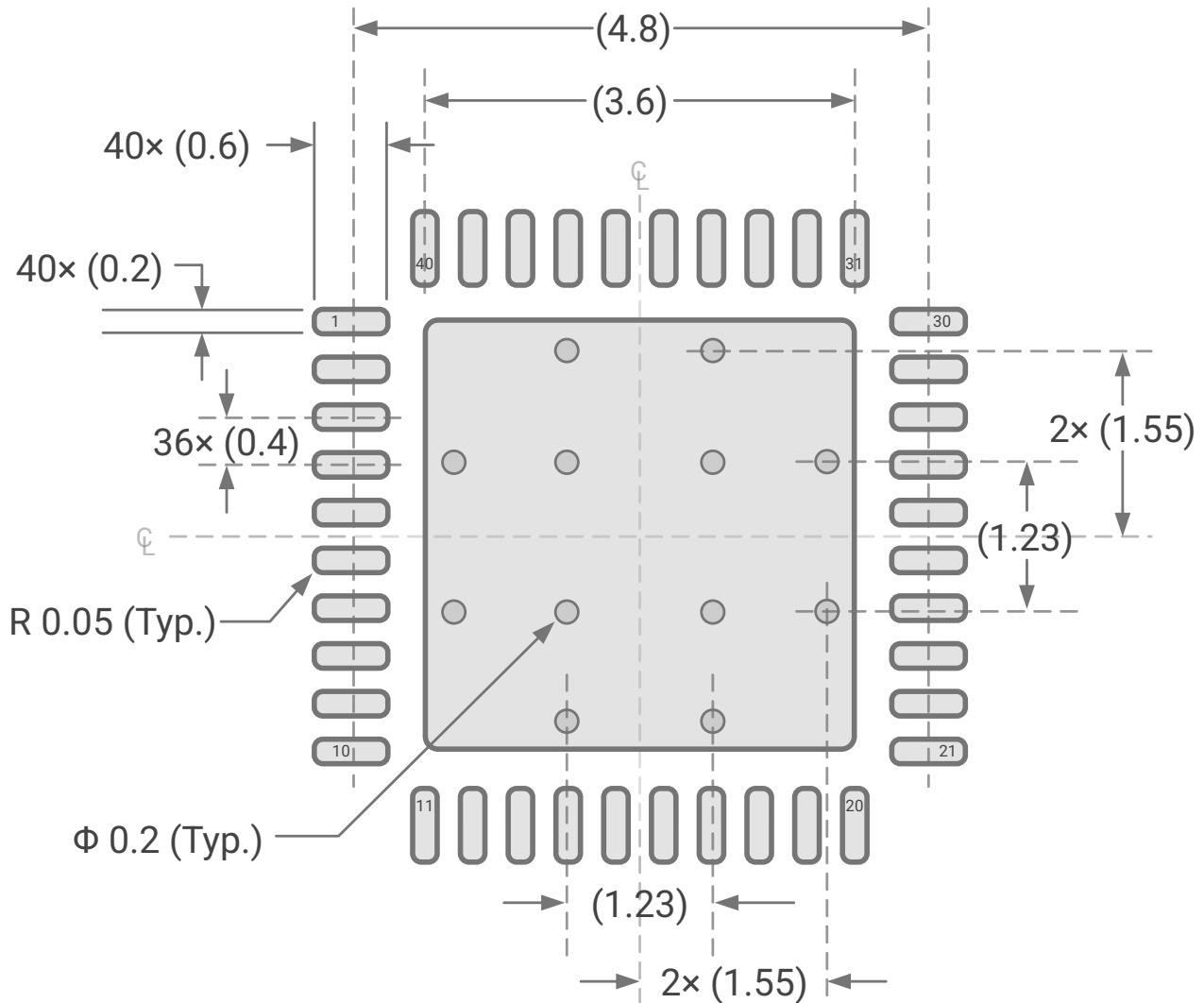
SIDE VIEW

REF	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A3	0.203 Ref.		
D	4.90	5.00	5.10
E	4.90	5.00	5.10
D2	3.55	3.60	3.65
E2	3.55	3.60	3.65
b	0.15	0.20	0.25
e	0.40 BSC		
L	0.35	0.40	0.45
K	0.20	—	—

Notes

1. All dimensions are in millimeters.
2. Lead coplanarity shall be 0.1mm maximum.
3. Drawing is not to scale.

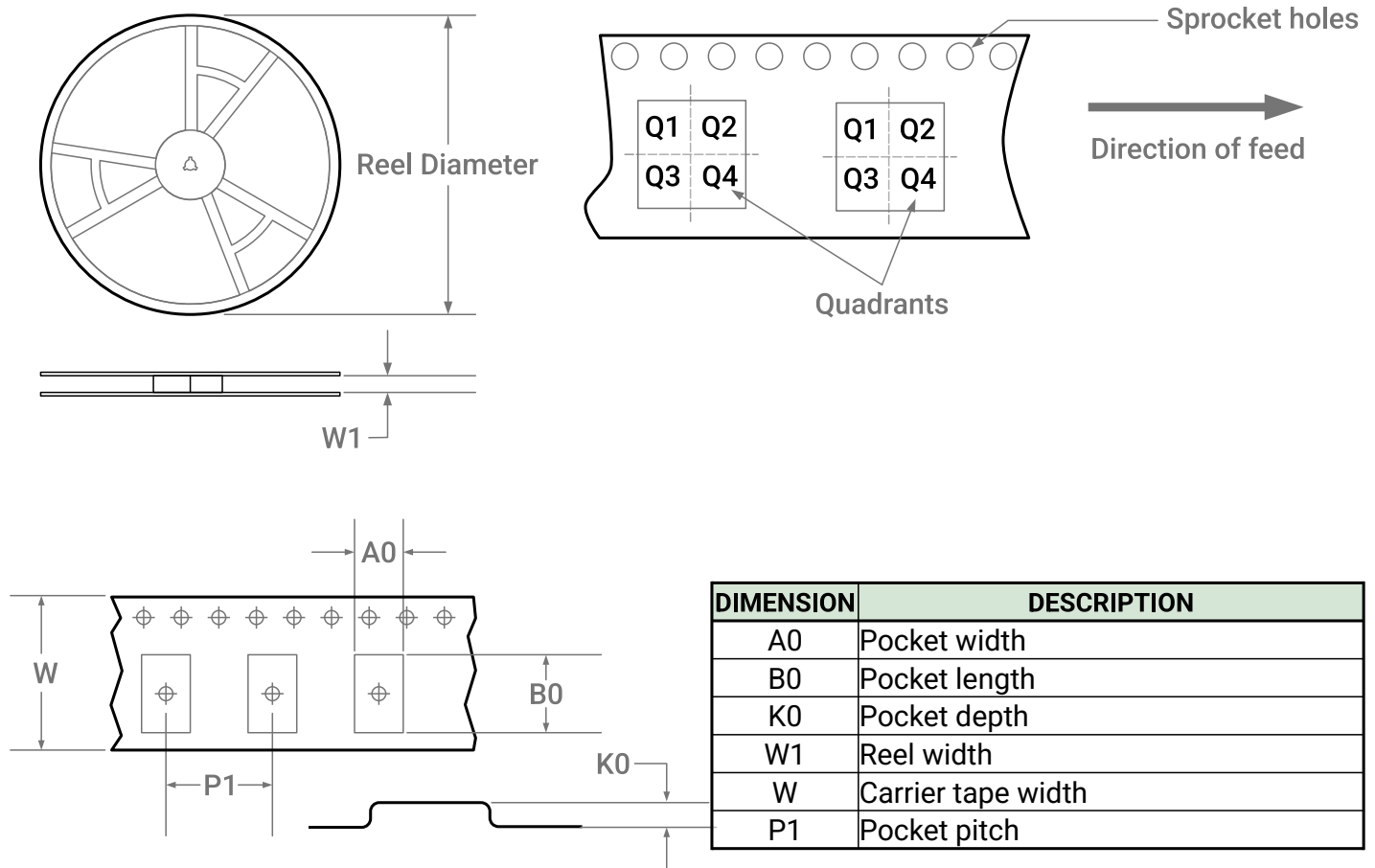
Recommended Land Pattern



Note:

1. All dimensions are in millimeters.
2. Drawing is not to scale.

Tape and Reel Information

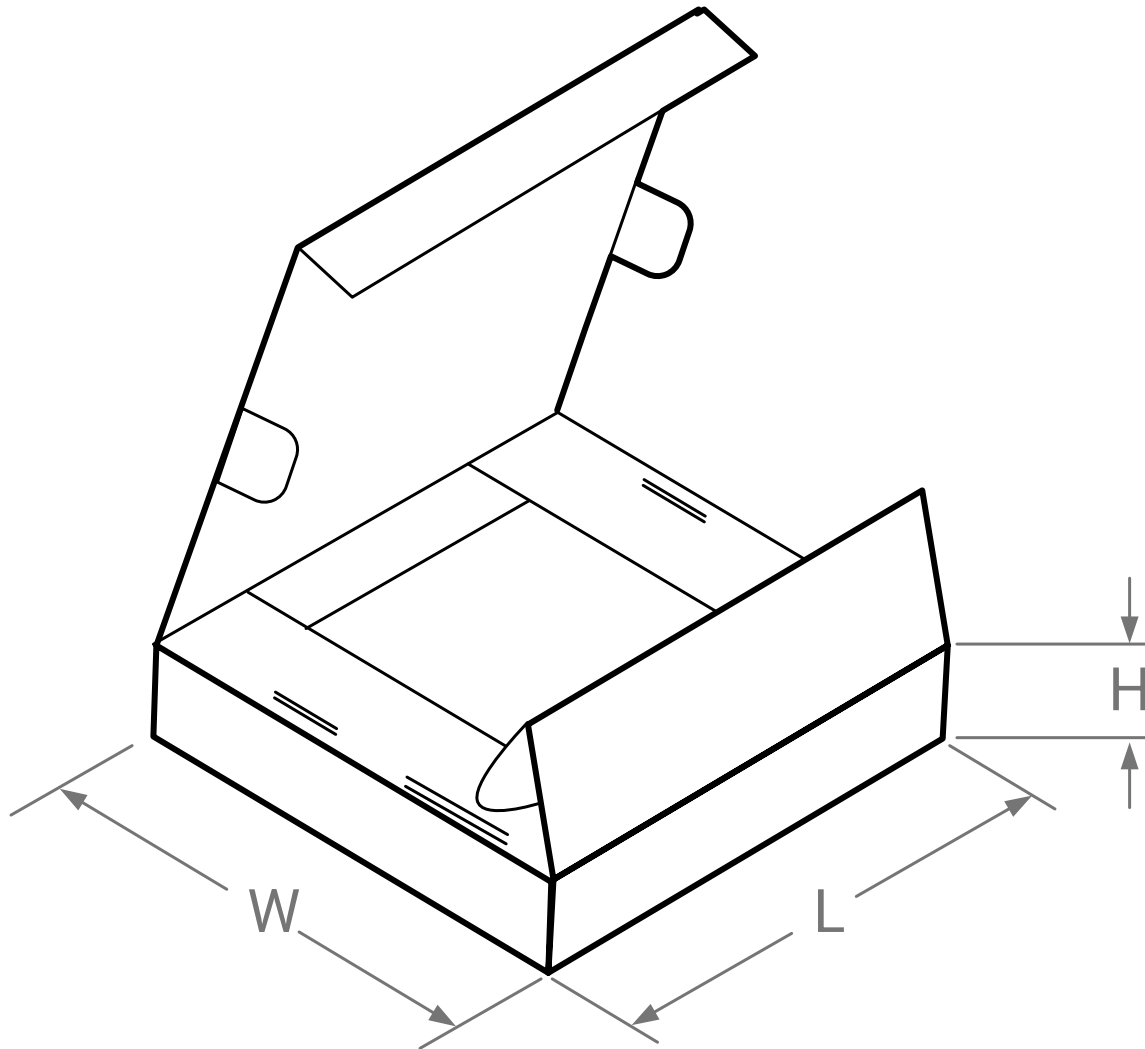


PACKAGE SIZE	REEL DIAMETER	W1	A0	B0	K0	P1	W	QUADRANT
5 × 5	330	12.8	5.25	5.25	1.10	8.00	12.00	Q2

Note:

1. All dimensions are nominal
2. All dimensions are in millimeters (mm)

Pizza Box Dimensions



PACKAGE SIZE	UNITS / BOX	LENGTH	WIDTH	HEIGHT
5 × 5	5000	367	367	38

Notes:

1. All measurements are in millimeters;
2. All measurements are nominal.