DP83TD555J-Q1 Automotive 10BASE-T1S Multidrop OA SPI MAC-PHY Ethernet Transceiver

1 Features

- IEEE 802.3cg compliant 10Mbps 10BASE-T1S
  - Multidrop or point-to-point half-duplex
  - Supports >25m cable and >16 nodes depending on channel
- Host controller interface: OA TC10, TC14 compliant SPI up to 25MHz
- Integrated IEEE 802.3 half-duplex MAC with Ethertype, VLAN, and DMAC ingress filtering
- AEC-Q100 qualified for automotive applications:
  - Temperature: –40 to 125°C, T_A (grade 1)
- Physical Layer Collision Avoidance (PLCA) with burst mode support
- TSN with IEEE 802.1AS
- Remote PHY GPIO control
- Single supply operation from 3.3V with 1.8/2.5/3.3V options for I/O voltage
- OA TC10 local and remote wake-up support
  - Low power wake pins: VBAT, WAKE and INH
  - OA compliant ultra-low sleep current
  - 12/24/48V direct V_{BAT} support
- OA TC14 PHY features:
  - Topology discovery
  - Signal Quality Indicator (SQI)
  - Harness Defect Detection (HDD)
- Robust PHY architecture with protection and fault detection features
  - Bus wires short to GND or 48V VBAT protection
  - Overtemperature, undervoltage detection
  - ±8kV HBM ESD for MDI pins
  - ±8kV ISO10605 /IEC61000-4-2 ESD contact discharge on MDI pins
  - Extended CMV support for MDI pins
  - OA PMA, PCS, PLCA, and EMC compliant

2 Applications

- Automotive:
  - Body electronics and lighting
  - Automotive gateway
  - Short range radars
  - Robotics
  - Hybrid, electric, and powertrain systems
- Industrial:
  - Factory automation
  - HVAC systems
  - Motor drives

3 Description

The DP83TD555J-Q1 is an IEEE802.3cg 10BASE-T1S and Open Alliance (OA) TC10, TC14 compliant Serial Peripheral Interface (SPI) MAC-PHY Ethernet transceiver. The device supports 10Mbps multi-drop or point-to-point half-duplex communication over unshielded twisted pair cables with extended common mode voltage tolerance. The device communicates to a host controller or switch using OA SPI.

The DP83TD555J-Q1 integrates IEEE802.3 Media Access Controller (MAC) that enables microcontrollers with SPI to seamlessly connect to Ethernet networks using the 10BASE-T1S bus.

The DP83TD555J-Q1 incorporates TC10 wake/sleep features to enable efficient system-level power consumption. The device supports remote wake-up over the Ethernet data line. When a wake-up event is detected, the DP83TD555J-Q1 initiates system start-up by driving INH high. The device also integrates IEEE 1588v2 /802.1AS to enable accurate time synchronization and hardware timestamping for time-critical automotive and industrial applications.
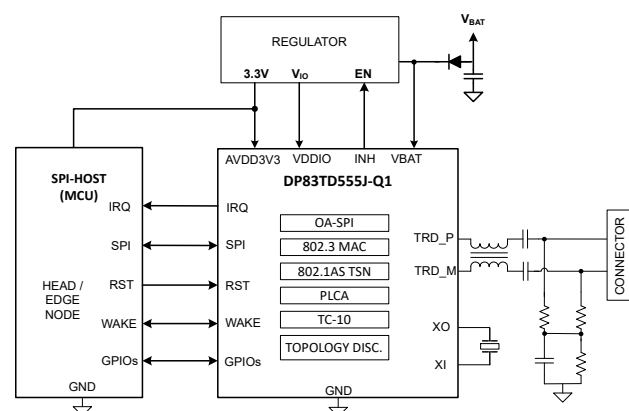
The DP83TD555J-Q1 is equipped with diagnostic features such as cable fault detection, undervoltage and overtemperature monitoring to streamline system development and maintenance.

Package Information

PART NUMBER	PACKAGE[1]	PACKAGE SIZE[2]
DP83TD555J-Q1	RGP (VQFN, 20)	4mm × 4mm

(1) For more information, see Section 7.
(2) The package size (length × width) is a nominal value and includes pins, where applicable.

Simplified Application Diagram

Table of Contents

Product Folder Links: *DP83TD555J-Q1*

4 Related Products

PART NUMBER	PACKAGE	10BASE-T1S PHY TYPE
DP83TD555J-Q1	QFN-20, 4mm × 4mm	OA SPI MAC-PHY transceiver
DP83TD535-Q1	VSON-14, 4.5mm × 3mm	OA PMD transceiver with MDIO and TC10 pins
DP83TD530-Q1	VSON-8, 3mm × 3mm	OA PMD transceiver

ADVANCE INFORMATION

5 Device and Documentation Support

5.1 Documentation Support

5.1.1 Related Documentation

- Open Alliance SIG, "10BASE-T1S Transceiver Interface Rev 1.5," 2021.
- EEE Computer Society, "IEEE Std 802.3cg™-2019, Amendment 5: Physical Layer Specifications and Management Parameters for 10 Mb/s Operation and Associated Power Delivery over a Single Balanced Pair of Conductors," New York, 2019.
- Open Alliance SIG, Advanced diagnostic features for 10BASE-T1S automotive Ethernet PHYs, 2021.
- Open Alliance SIG, "TC14_TC10_JWG_10BASE-T1S Sleep Wake-up Specification Rev 1.0," 2022.
- IEEE Computer Society, "IEEE Standard for Ethernet," New York, 2018.
- Open Alliance SIG, "10BASE-T1S PLCA Management Registers Rev 1.2," 2022.

5.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

5.3 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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5.4 Trademarks

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5.5 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

5.6 Glossary

TI Glossary   This glossary lists and explains terms, acronyms, and definitions.

6 Revision History

DATE	REVISION	NOTES
December 2025	*	Initial Release

7 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.
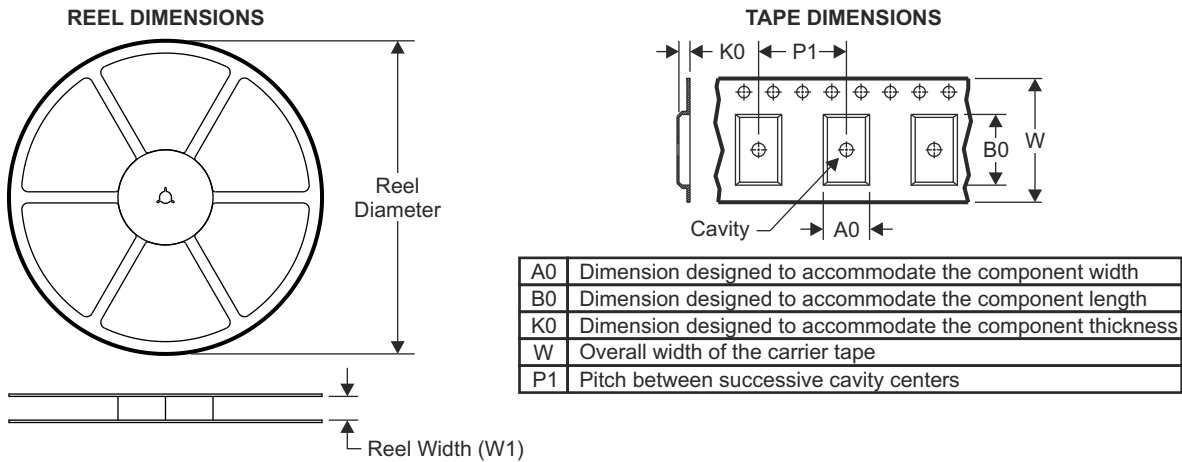
ADVANCE INFORMATION

PACKAGE OPTION ADDENDUM

PACKAGING INFORMATION

Orderable part number	Status [1]	Material type [2]	Package | Pins	Package qty | Carrier	RoHS [3]	Lead finish/Ball material [4]	MSL rating/Peak reflow [5]	Op temp (°C)	Part marking [6]
PDP83TD555JRGPRQ1	Active	Preproduction	VQFN(RGP)|20	3000 | large T&R	-	Call TI	Call TI	-40 to 125°C	P555TC / Z194301

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.
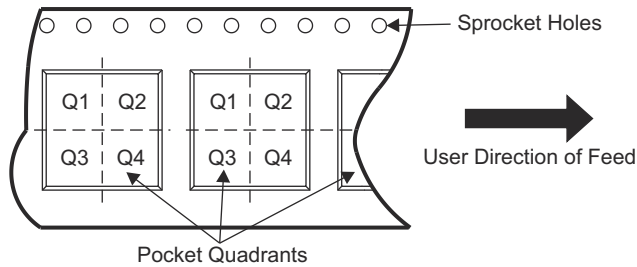
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7.1 Tape and Reel Information

ADVANCE INFORMATION

REEL DIMENSIONS

Reel Diameter

Reel Width (W1)

TAPE DIMENSIONS

K0   P1

B0   W

Cavity   A0

A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

Sprocket Holes

Q1 Q2   Q1 Q2
Q3 Q4   Q3 Q4

User Direction of Feed

Pocket Quadrants

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
PDP83TD555JRGPRQ1	VQFN	RGP	20	3000	330.0	12.4	4.25	4.25	1.15	8.0	12.0	2

Product Folder Links: *DP83TD555J-Q1*

7.2 Mechanical Data

PACKAGE OUTLINE

RGP0020M

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD

PREVIEW

ADVANCE INFORMATION

4231134/B 12/2024

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.

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ADVANCE INFORMATION

EXAMPLE BOARD LAYOUT

RGP0020M

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD
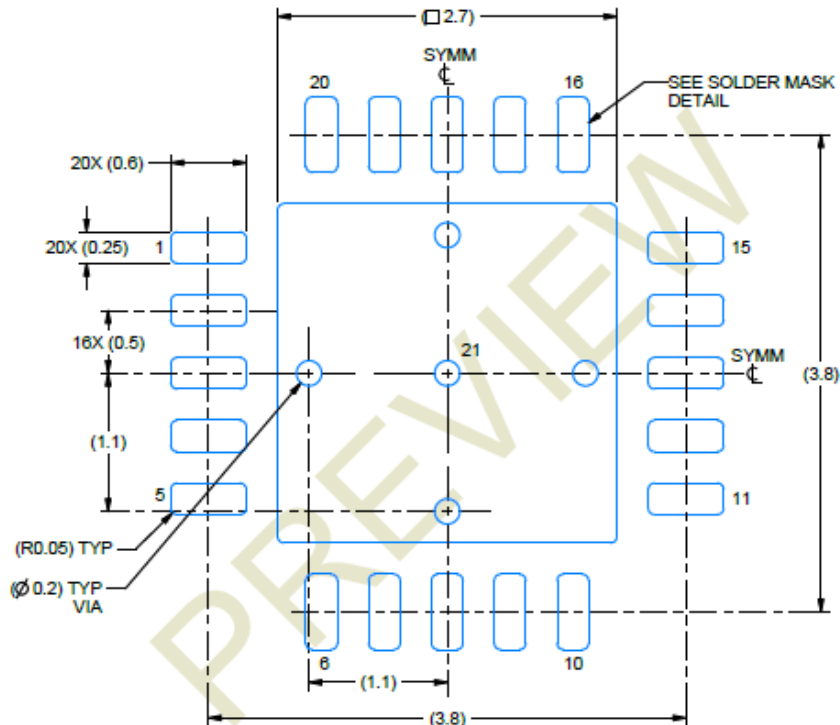
LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 20X
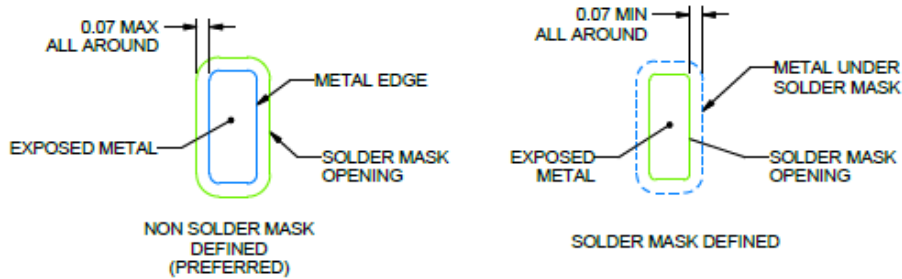
SOLDER MASK DETAILS

4231134/B   12/2024

NOTES: (continued)

4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

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Product Folder Links: *DP83TD555J-Q1*

EXAMPLE STENCIL DESIGN

RGP0020M
VQFN - 1 mm max height
PLASTIC QUAD FLATPACK - NO LEAD

SOLDER PASTE EXAMPLE
BASED ON 0.125 MM THICK STENCIL
SCALE: 20X

EXPOSED PAD 21
78% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE

4231134/B   12/2024
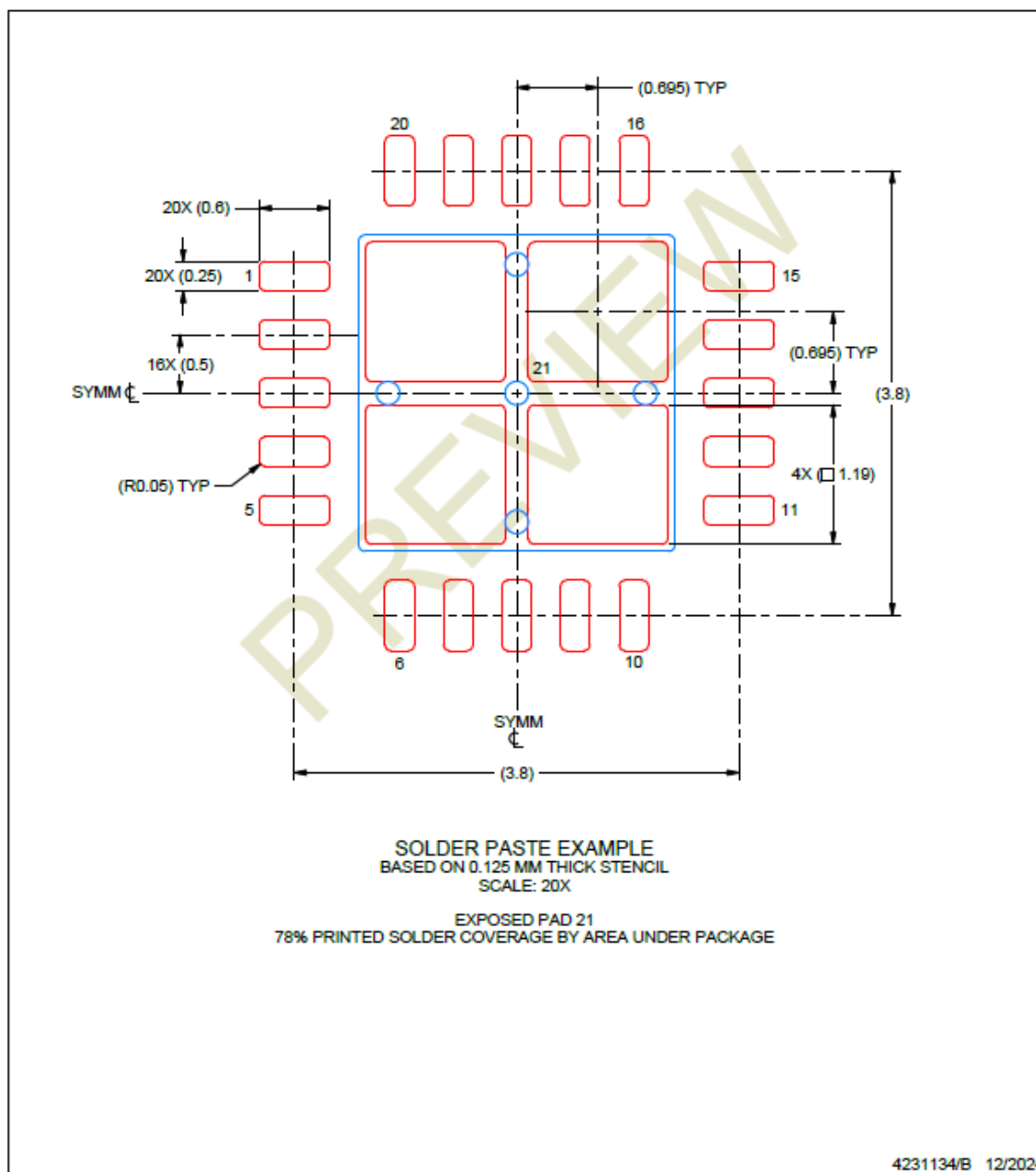
NOTES: (continued)

6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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Figure 7-1.

ADVANCE INFORMATION

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
PDP83TD555JRGPRQ1	Active	Preproduction	null (null) |	3000 | LARGE T&R	-	Call TI	Call TI	-40 to 125	

(1) Status: For more details on status, see our product life cycle.

(2) Material type: When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

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