

LOW-INPUT, HIGH EFFICIENCY SYNCHRONOUS BUCK CONTROLLER

 Check for Samples: [TPS40007-DIE](#)

FEATURES

- Low Output Voltage
- Predictive Gate Drive™ N-Channel MOSFET Drivers for Higher Efficiency
- Externally Adjustable Soft-Start and Overcurrent Limit
- Frequency Voltage-Mode Control
- Source/Sink With V_{OUT} Prebias
- Thermal Shutdown
- Internal Bootstrap Diode

APPLICATIONS

- Networking Equipment
- Telecom Equipment
- Base Stations
- Servers
- DSP Power
- Power Modules

DESCRIPTION

The TPS40007-DIE is a controller for low-voltage, non-isolated synchronous buck regulators. This controller drives an N-channel MOSFET for the primary buck switch, and an N-channel MOSFET for the synchronous rectifier switch, thereby achieving very high-efficiency power conversion. In addition, the device controls the delays from main switch off to rectifier turn-on and from rectifier turn-off to main switch turn-on in such a way as to minimize diode losses (both conduction and recovery) in the synchronous rectifier with TI's proprietary Predictive Gate Drive technology. The reduction in these losses is significant and increases efficiency. For a given converter power level, smaller FETs can be used, or heat sinking can be reduced or even eliminated.

The current-limit threshold is adjustable with a single resistor connected to the device. The TPS40007-DIE controller implements a closed-loop soft-start function.

ORDERING INFORMATION⁽¹⁾

| PRODUCT | PACKAGE DESIGNATOR | PACKAGE | ORDERABLE PART NUMBER | PACKAGE QUANTITY |
|----------|--------------------|--|-----------------------|------------------|
| TPS40007 | TD | Bare die in waffle pack ⁽²⁾ | TPS40007TDA3 | 200 |
| | | | TPS40007TDA2 | 10 |

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.

(2) Processing is per the Texas Instruments commercial production baseline and is in compliance with the Texas Instruments Quality Control System in effect at the time of manufacture. Electrical screening consists of DC parametric and functional testing at room temperature only. Unless otherwise specified by Texas Instruments AC performance and performance over temperature is not warranted. Visual Inspection is performed in accordance with MIL-STD-883 Test Method 2010 Condition B at 75X minimum.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

Predictive Gate Drive is a trademark of Texas Instruments.



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.

BARE DIE INFORMATION

| DIE THICKNESS | BACKSIDE FINISH | BACKSIDE POTENTIAL | BOND PAD METALLIZATION COMPOSITION | BOND PAD THICKNESS |
|---------------|------------------------|--------------------|------------------------------------|--------------------|
| 15.5 mils. | Silicon with backgrind | Floating | PdNiCu | 18200 nm |

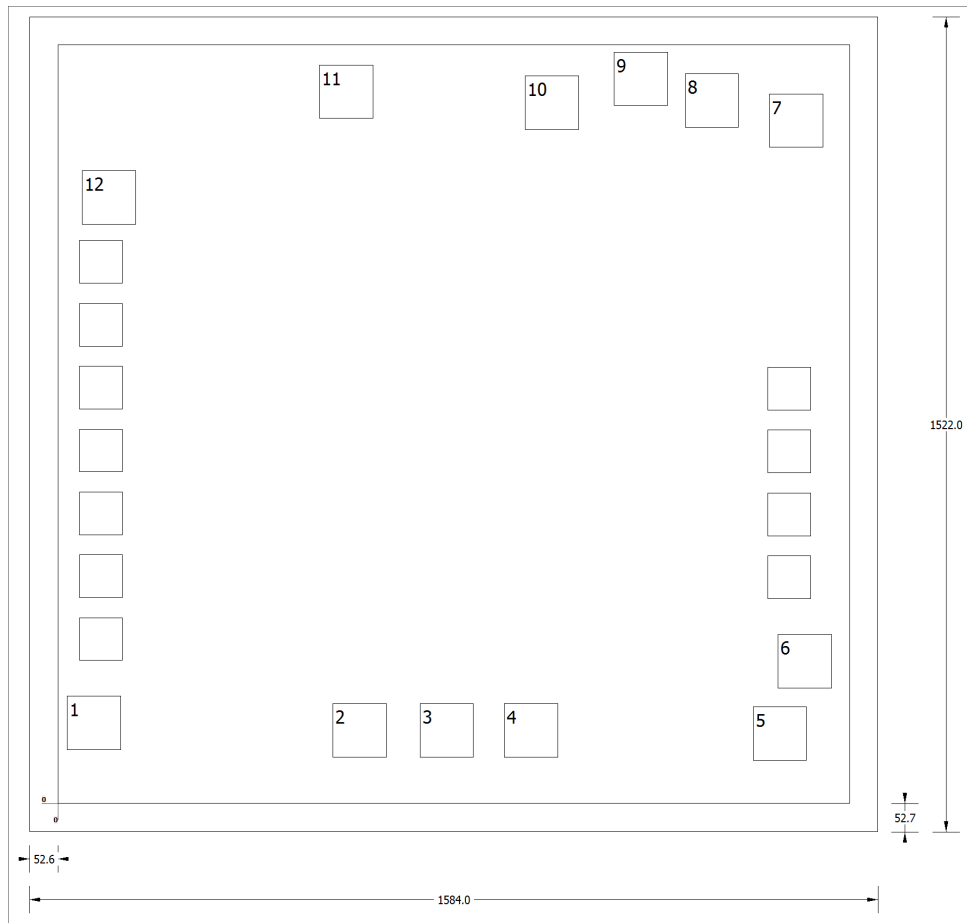


Table 1. Bond Pad Coordinates in Microns

| DESCRIPTION | PAD NUMBER | X MIN | Y MIN | X MAX | Y MAX |
|-------------|------------|---------|---------|---------|---------|
| ILIM | 1 | 16.74 | 100.26 | 117.54 | 201.06 |
| FB | 2 | 513.45 | 86.49 | 614.25 | 187.29 |
| COMP | 3 | 675.54 | 86.49 | 776.34 | 187.29 |
| SS/SD | 4 | 832.77 | 86.49 | 933.57 | 187.29 |
| GND | 5 | 1297.62 | 80.37 | 1398.42 | 181.17 |
| GND | 6 | 1344.42 | 215.46 | 1445.22 | 316.26 |
| LDRV | 7 | 1328.04 | 1224.54 | 1428.84 | 1325.34 |
| VDD | 8 | 1170.63 | 1262.25 | 1271.43 | 1363.05 |
| VDD | 9 | 1037.88 | 1302.66 | 1138.68 | 1403.46 |
| SW | 10 | 872.46 | 1257.93 | 973.26 | 1358.73 |
| HDRV | 11 | 488.07 | 1278.63 | 588.87 | 1379.43 |
| BOOT | 12 | 45.27 | 1080.81 | 146.07 | 1181.61 |

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|---------|
| TPS40007TDA2 | LIFEBUY | | | 0 | 10 | RoHS & Green | Call TI | N / A for Pkg Type | 25 to 25 | | |
| TPS40007TDA3 | LIFEBUY | | | 0 | 100 | RoHS & Green | Call TI | N / A for Pkg Type | 25 to 25 | | |

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSELETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices 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.

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