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 Boostrap 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.

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

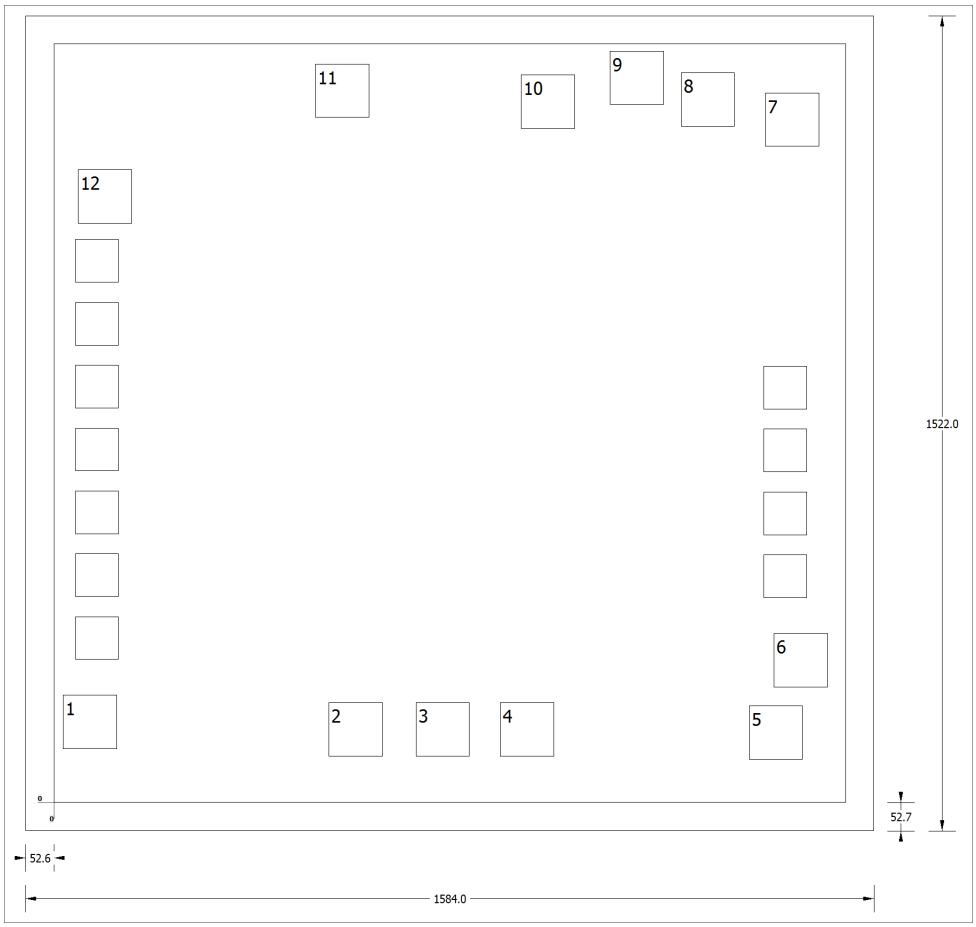

Table 1. Bond Pad Coordinates in Microns

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/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TPS40007TDA2	ACTIVE			0	10	TBD	Call TI	N / A for Pkg Type	25 Only		Samples
TPS40007TDA3	ACTIVE			0	100	TBD	Call TI	N / A for Pkg Type	25 Only		Samples

(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.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
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Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(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/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

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