



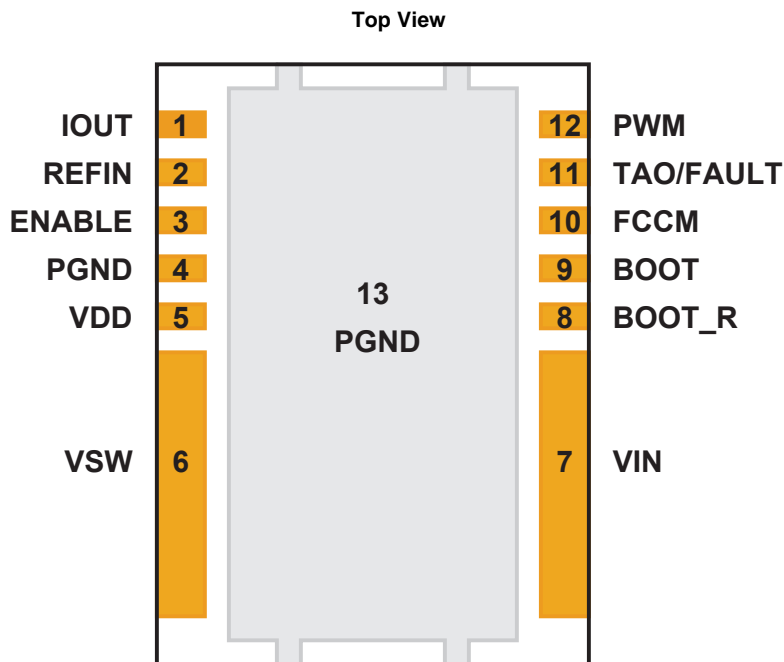
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## 4 修订历史记录

日期	修订版本	注释
2 月 2016	*	最初发布。

## 5 Pin Configuration and Functions



**Pin Functions**

PIN		DESCRIPTION
NUMBER	NAME	
1	IOUT	Output of current sensing amplifier. $V(\text{IOUT}) - V(\text{REFIN})$ is proportional to the phase current.
2	REFIN	External reference voltage input for current sensing amplifier.
3	ENABLE	Enables device operation. If ENABLE = logic HIGH, turns on device. If ENABLE = logic LOW, the device is turned off and both MOSFET gates are actively pulled low. An internal 100 k $\Omega$ pull-down resistor will pull the ENABLE pin LOW if left floating.
4	P <sub>GND</sub>	Power ground, connected directly to pin 13.
5	V <sub>DD</sub>	Supply voltage to gate driver and internal circuitry.
6	V <sub>SW</sub>	Phase node connecting the HS MOSFET source and LS MOSFET drain – pin connection to the output inductor.
7	V <sub>IN</sub>	Input voltage pin. Connect input capacitors close to this pin.
8	BOOT_R	Return path for HS gate driver, connected to V <sub>SW</sub> internally.
9	BOOT	Bootstrap capacitor connection. Connect a minimum of 0.1 $\mu\text{F}$ 16 V X7R ceramic capacitor from BOOT to BOOT_R pins. The bootstrap capacitor provides the charge to turn on the control FET. The bootstrap diode is integrated.
10	FCCM	This pin enables the diode emulation function. When this pin is held LOW, diode emulation mode is enabled for sync FET. When FCCM is HIGH, the device is operated in forced continuous conduction mode. An internal 5 $\mu\text{A}$ current source will pull the FCCM pin to 3.3 V if left floating.
11	TAO/ FAULT	Temperature Analog Output. Reports a voltage proportional to the die temperature. An ORing diode is integrated in the IC. When used in multiphase application, a single wire can be used to connect the TAO pins of all the ICs. Only the highest temperature will be reported. TAO will be pulled up to 3.3 V if thermal shutdown occurs. TAO should be bypassed to P <sub>GND</sub> with a 1 nF 16 V X7R ceramic capacitor.
12	PWM	Pulse width modulated tri-state input from external controller. Logic LOW sets control FET gate low and sync FET gate high. Logic HIGH sets control FET gate high and sync FET gate low. Open or High Z sets both MOSFET gates low if greater than the tri-state shutdown hold-off time ( $t_{3HT}$ ).
13	P <sub>GND</sub>	Power ground.

## 6 Specifications

### 6.1 Absolute Maximum Ratings

 $T_A = 25^\circ\text{C}$  (unless otherwise noted)<sup>(1)</sup>

	MIN	MAX	UNIT
$V_{IN}$ to $P_{GND}$	-0.3	20	V
$V_{IN}$ to $V_{SW}$	-0.3	20	V
$V_{IN}$ to $V_{SW}$ (10 ns)		23	V
$V_{SW}$ to $P_{GND}$	-0.3	20	V
$V_{SW}$ to $P_{GND}$ (10 ns)	-7	23	V
$V_{DD}$ to $P_{GND}$	-0.3	7	V
ENABLE, PWM, FCCM, TAO, IOU, REFIN to $P_{GND}$ <sup>(2)</sup>	-0.3	$V_{DD} + 0.3\text{ V}$	V
BOOT to BOOT_R <sup>(2)</sup>	-0.3	$V_{DD} + 0.3\text{ V}$	V
$P_D$ Power dissipation		12	W
$T_J$ Operating junction	-55	150	$^\circ\text{C}$
$T_{stg}$ Storage temperature	-55	150	$^\circ\text{C}$

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) Should not exceed 7 V.

### 6.2 ESD Ratings

	VALUE	UNIT
$V_{(ESD)}$ Electrostatic discharge	Human body model (HBM)	$\pm 2000$
	Charged device model (CDM)	$\pm 500$
		V

### 6.3 Recommended Operating Conditions

 $T_A = 25^\circ$  (unless otherwise noted)

	MIN	MAX	UNIT
$V_{DD}$ Gate drive voltage	4.5	5.5	V
$V_{IN}$ Input supply voltage <sup>(1)</sup>		16	V
$V_{OUT}$ Output voltage		5.5	V
$I_{OUT}$ Continuous output current	$V_{IN} = 12\text{ V}$ , $V_{DD} = 5\text{ V}$ , $V_{OUT} = 1.2\text{ V}$ , $f_{SW} = 500\text{ kHz}$ , $L_{OUT} = 0.225\text{ }\mu\text{H}$ <sup>(2)</sup>	60	A
$I_{OUT-PK}$ Peak output current <sup>(3)</sup>		90	A
$f_{SW}$ Switching frequency	$C_{BST} = 0.1\text{ }\mu\text{F}$ (min)	1250	kHz
On time duty cycle	$f_{SW} = 1\text{ MHz}$	85%	
Minimum PWM on time	40		ns
Operating temperature	-40	125	$^\circ\text{C}$

- (1) Operating at high  $V_{IN}$  can create excessive AC voltage overshoots on the switch node ( $V_{SW}$ ) during MOSFET switching transients. For reliable operation, the switch node ( $V_{SW}$ ) to ground voltage must remain at or below the *Absolute Maximum Ratings*.
- (2) Measurement made with six 10  $\mu\text{F}$  (TDK C3216X5R1C106KT or equivalent) ceramic capacitors placed across  $V_{IN}$  to  $P_{GND}$  pins.
- (3) System conditions as defined in Note 1. Peak Output Current is applied for  $t_p = 50\text{ }\mu\text{s}$ .

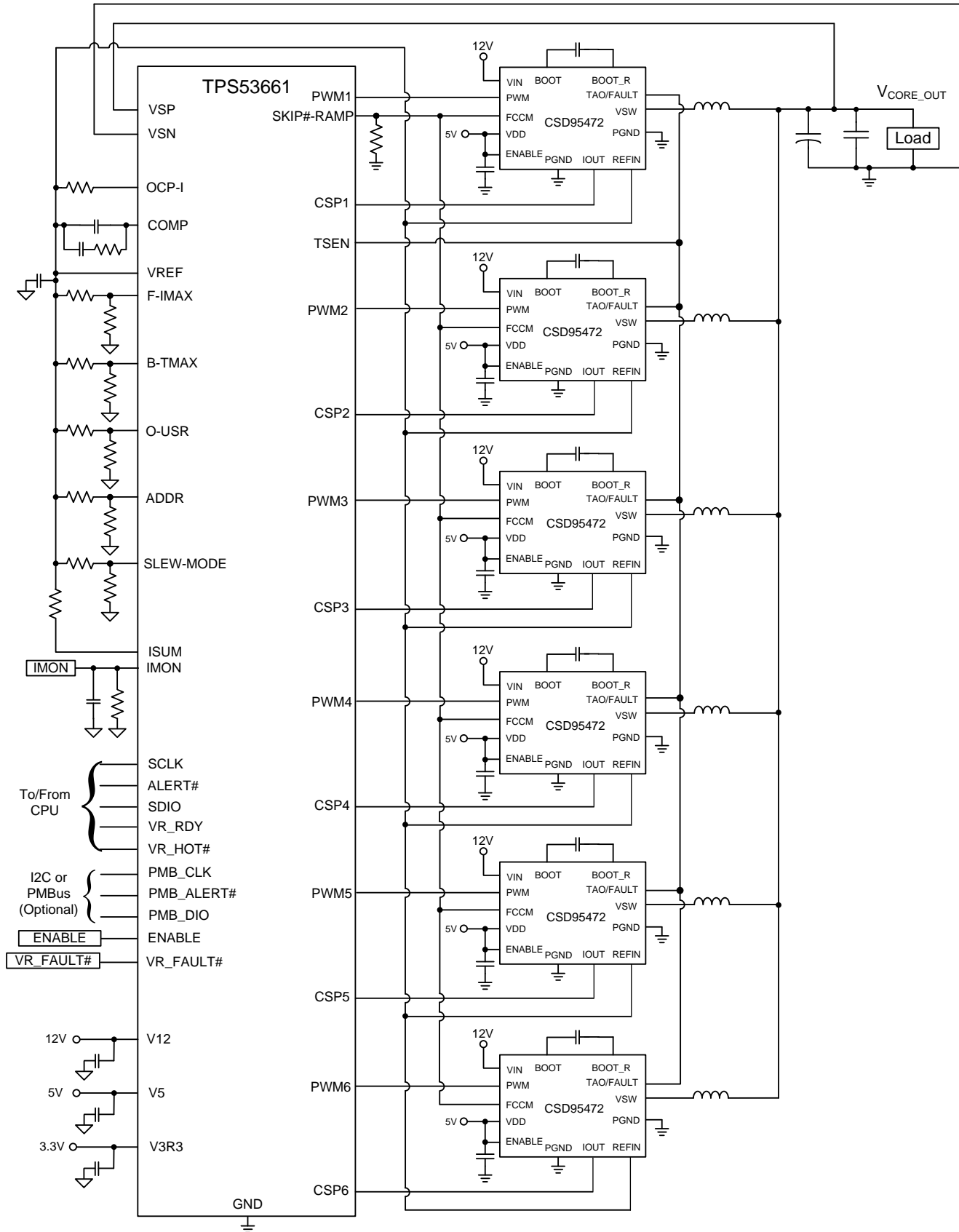
### 6.4 Thermal Information

 $T_A = 25^\circ\text{C}$  (unless otherwise noted)

THERMAL METRIC	MIN	TYP	MAX	UNIT
$R_{\theta JC(top)}$ Junction-to-case (top of package) thermal resistance <sup>(1)</sup>			5	$^\circ\text{C/W}$
$R_{\theta JB}$ Junction-to-board thermal resistance <sup>(2)</sup>			1.5	

- (1)  $R_{\theta JC(top)}$  is determined with the device mounted on a 1 inch<sup>2</sup> (6.45 cm<sup>2</sup>), 2-oz (0.071 mm thick) Cu pad on a 1.5 inches x 1.5 inches, 0.06-inch (1.52-mm) thick FR4 board.
- (2)  $R_{\theta JB}$  value based on hottest board temperature within 1 mm of the package.

## 7 Application Schematic



## 8 器件和文档支持

### 8.1 社区资源

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

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**Design Support *TI's Design Support*** Quickly find helpful E2E forums along with design support tools and contact information for technical support.

### 8.2 商标

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### 8.3 静电放电警告



这些装置包含有限的内置 ESD 保护。存储或装卸时，应将导线一起截短或将装置放置于导电泡棉中，以防止 MOS 门极遭受静电损伤。

### 8.4 Glossary

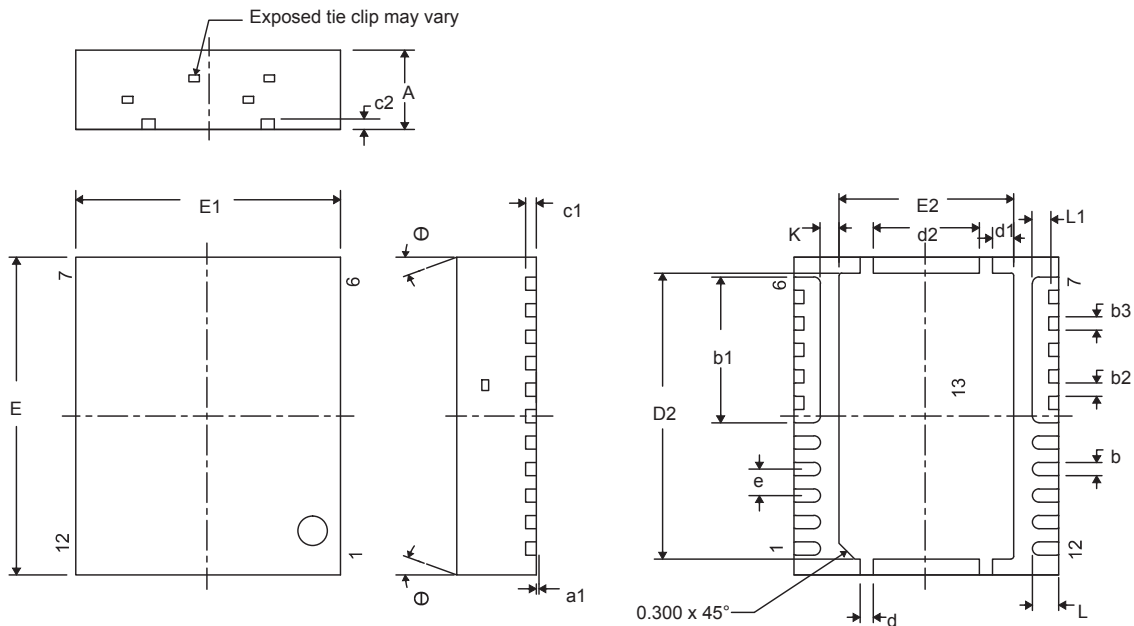
[SLYZ022](#) — *TI Glossary*.

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

## 9 机械、封装和可订购信息

以下页中包括机械、封装和可订购信息。这些信息是针对指定器件可提供的最新数据。这些数据会在无通知且不对本文档进行修订的情况下发生改变。欲获得该数据表的浏览器版本，请查阅左侧的导航栏。

### 9.1 机械制图





DIM	毫米			英寸		
	最小值	标称值	最大值	最小值	标称值	最大值
A	0.950	1.000	1.050	0.037	0.039	0.041
a1	0.000	0.000	0.050	0.000	0.000	0.002
b	0.200	0.250	0.320	0.008	0.010	0.013
b1	2.750 典型值			0.108 典型值		
b2	0.200	0.250	0.320	0.008	0.010	0.013
b3	0.250 典型值			0.010 典型值		
c1	0.150	0.200	0.250	0.006	0.008	0.010
c2	0.200	0.250	0.300	0.008	0.010	0.012
D2	5.300	5.400	5.500	0.209	0.213	0.217
d	0.200	0.250	0.300	0.008	0.010	0.012
d1	0.350	0.400	0.450	0.014	0.016	0.018
d2	1.900	2.000	2.100	0.075	0.079	0.083
E	5.900	6.000	6.100	0.232	0.236	0.240
E1	4.900	5.000	5.100	0.193	0.197	0.201
E2	3.200	3.300	3.400	0.126	0.130	0.134
e	0.500 典型值			0.020 典型值		
K	0.350 典型值			0.014 典型值		
L	0.400	0.500	0.600	0.016	0.020	0.024
L1	0.210	0.310	0.410	0.008	0.012	0.016
θ	0.00	—	—	0.00	—	—





**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
CSD95472Q5MC	ACTIVE	VSON-CLIP	DMC	12	2500	RoHS-Exempt & Green	SN	Level-2-260C-1 YEAR	-55 to 150	95472MC	
CSD95472Q5MCT	ACTIVE	VSON-CLIP	DMC	12	250	RoHS-Exempt & Green	SN	Level-2-260C-1 YEAR	-55 to 150	95472MC	

(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) **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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