

## Power Management

### Features

- Supports portable wireless charging applications
- Wireless power systems up to 5W output
- Integrated gate driver and output stage
- Single pin control for switching the output stage
- Low external component count

### Applications

- Low-power wireless chargers for:
  - ♦ Smart Watches
  - ♦ Wearables
  - ♦ Toys
  - ♦ Portable Lighting
  - ♦ Medical Devices

### Description

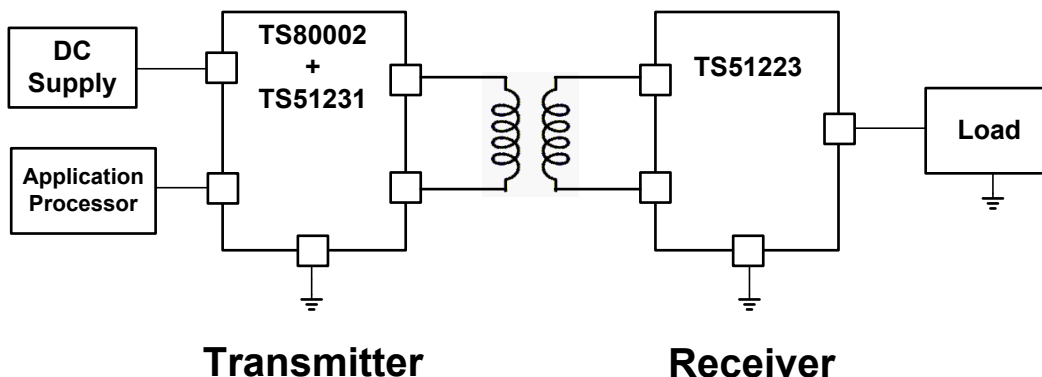
The TS51231 is a transmitter driver and output stage for wireless charging applications. The TS51231 can support systems up to 5W output and proprietary applications.

Switching of the TS51231 is controlled by the wireless power transmitter controller (TS80002 or similar).

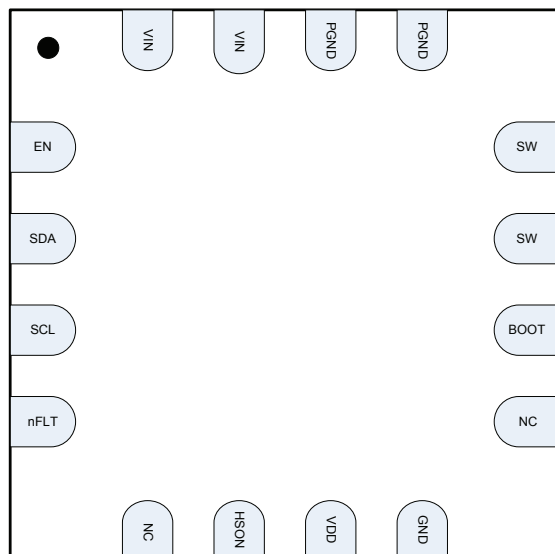
### Specification

- 16 pin 3x3 QFN

## Typical Application Circuit



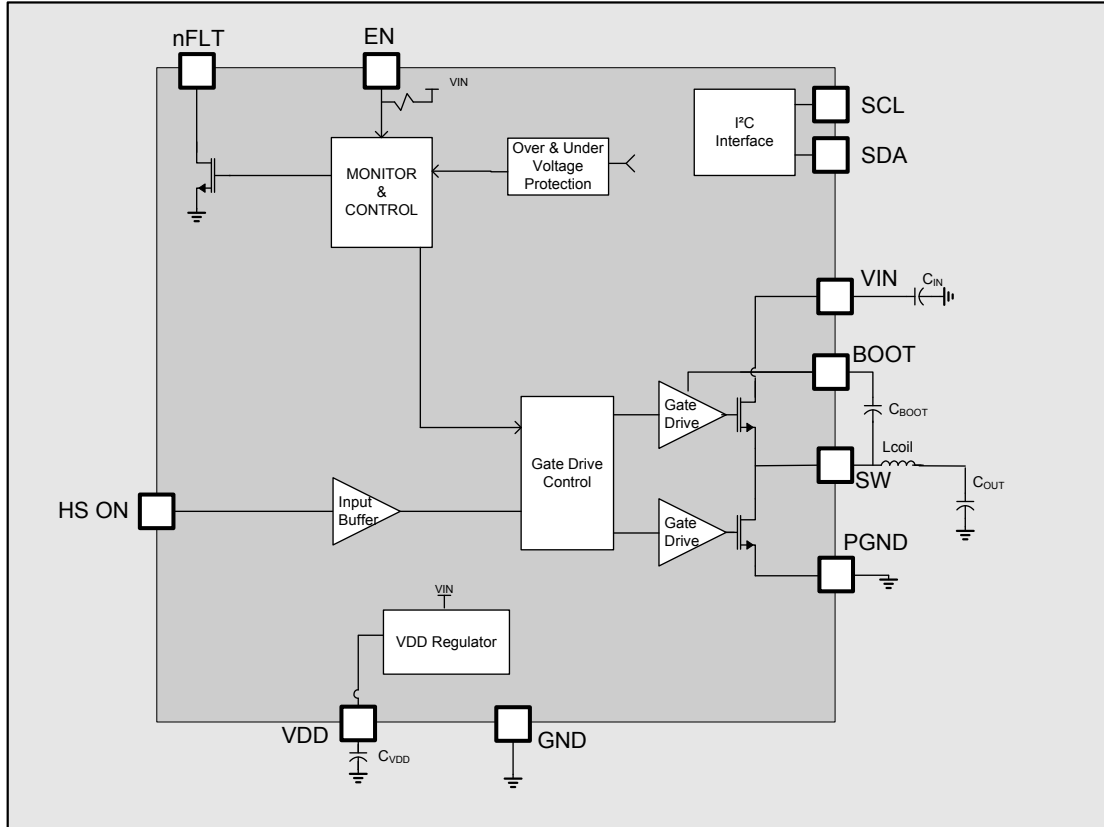
## Pin-out (Top view)



## Pin-out Configuration

Pin #	Pin Symbol	Function	Description
1	EN	Enable	Enable
2	SDA	I2C Serial Data	I2C Serial Data
3	SCL	I2C Serial Clock	I2C Serial Clock
4	nFLT	Status	Fault Status
5	NC	Reserved	Reserved
6	HSON	Driver	Driver high-side control
7	VDD	Supply	Device Supply
8	GND	GND	Device GND
9	NC	Reserved	Reserved
10	BOOT	Bootstrap Pin	Connected through 22nF capacitor to SW pin
11	SW	Switching Node	Connected to transmitter coil
12	SW	Switching Node	Connected to transmitter coil
13	PGND	Power GND	Power GND
14	PGND	Power GND	Power GND
15	VIN	Power Supply	Power Supply
16	VIN	Power Supply	Power Supply
17	PAD	Power PAD	Power GND

# Functional Block Diagram



## Absolute Maximum Ratings

Over operating free-air temperature range unless otherwise noted<sup>(1,2)</sup>

Parameter	Value	Unit
VDD, EN, NFLT, SCL, SDA, HSON	-0.3 to 5.5	V
VIN	-0.3 to 20	V
BOOT	-0.3 to 25	V
SW	-1 to 20	V
Electrostatic Discharge – Human Body Model	+/-2k	V
Electrostatic Discharge – Charge Device Model	+/-500	V
Peak IR Reflow Temperature (10 to 30 seconds)	260	°C

- (1) Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltage values are with respect to network ground terminal.

## Thermal Characteristics

Symbol	Parameter	Value	Units
$\Theta_{JA}$	Thermal Resistance Junction to Air (Note 1)	33 - 36	°C/W
$\Theta_{JC}$	Thermal Resistance Junction to Case (Note 1)	1.2 - 3.9	°C/W
$T_{STG}$	Storage Temperature Range	-65 to 150	°C
$T_{JMAX}$	Maximum Junction Temperature	150	°C
$T_J$	Operating Junction Temperature Range	-40 to 125	°C

Note 1: Assumes 16LD 3x3 QFN with hi-K JEDEC board and 13.5 inch<sup>2</sup> of 1 oz Cu and 4 thermal vias connected to PAD

## Recommended Operating Conditions

Symbol	Parameter	Min	Typ	Max	Unit
VCC	Input Operating Voltage	4.2	12	16.5	V
L <sub>OUT</sub>	Transmitter Coil		6.0		μH
C <sub>OUT</sub>	Output Filter Capacitor		100		nF
C <sub>IN</sub>	Input Bypass Capacitor		100		nF
C <sub>VDD</sub>	Internal Bypass Capacitor		100		nF
C <sub>BOOT</sub>	Bootstrap Capacitor		22		nF

## Electrical Characteristics (T=25°C unless otherwise specified)

Electrical Characteristics, T<sub>J</sub> = -40C to 125C (unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
<b>Output Stage</b>						
High Side Switch On Resistance	RDSON	ISW = -1A, T <sub>J</sub> =25C			100	mΩ
Low Side Switch On Resistance		ISW = 1A, T <sub>J</sub> =25C			100	mΩ
Max Output Current	IOUT			2.0		A
Over Current Detect	IOCD	HS switch current	2.5			A
<b>VDD LDO Output</b>						
LDO Output Voltage	VLDO		4.75	5.0	5.25	V
LDO Output Current	ILDO				50	mA
Drop Out Voltage	LDODO	V <sub>in</sub> =5V, I <sub>out</sub> =50mA			400	mV

## Functional Description

Switching of the TS51231 transmitter driver is controlled by the wireless transmitter controller via the HSON pin. When the HSON pin is high, the high-side FET is switched on and the low-side FET is switched off. When the HSON pin is low, the high-side FET is switched off and the low-side FET is switched on.

# Application Schematic

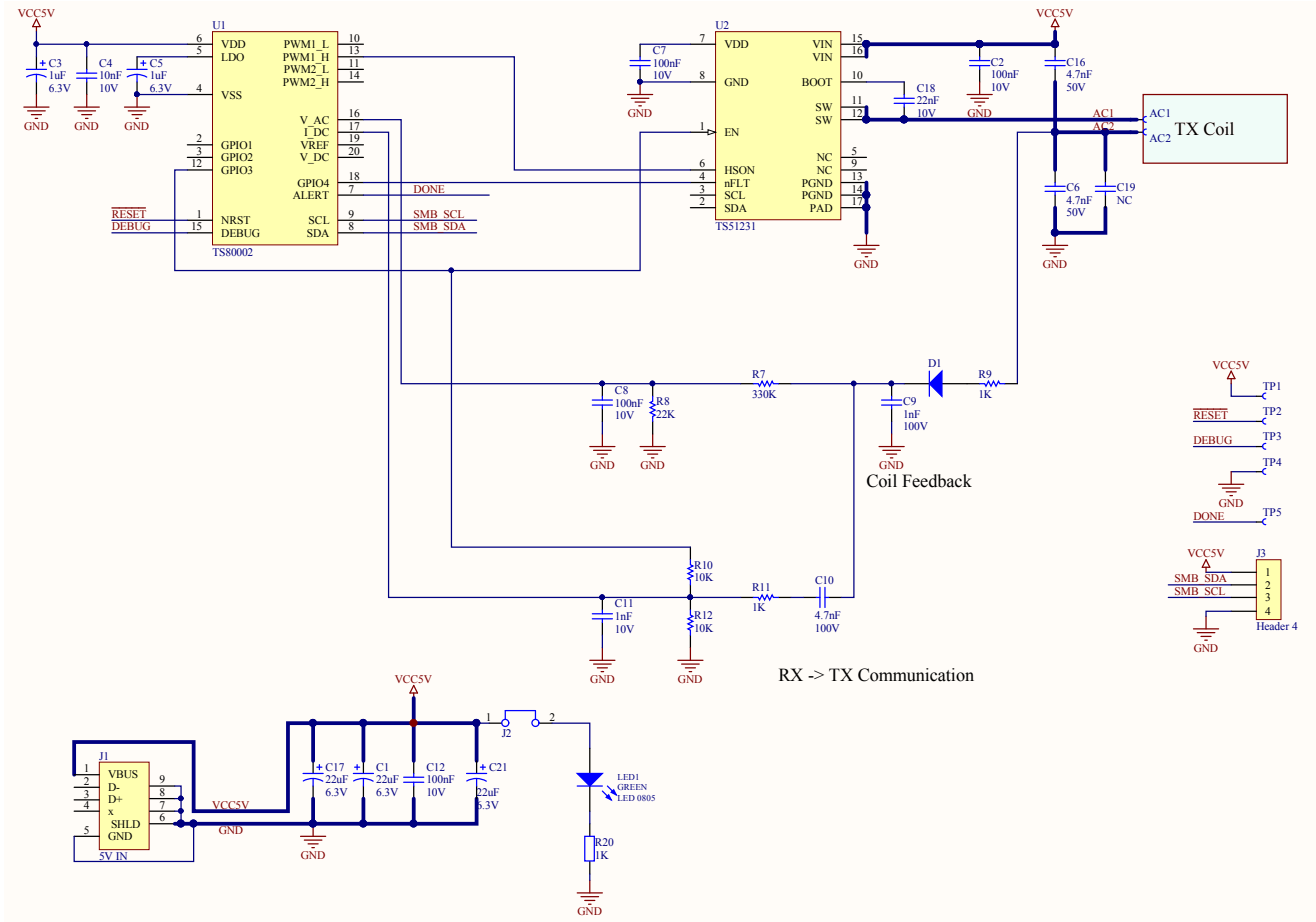
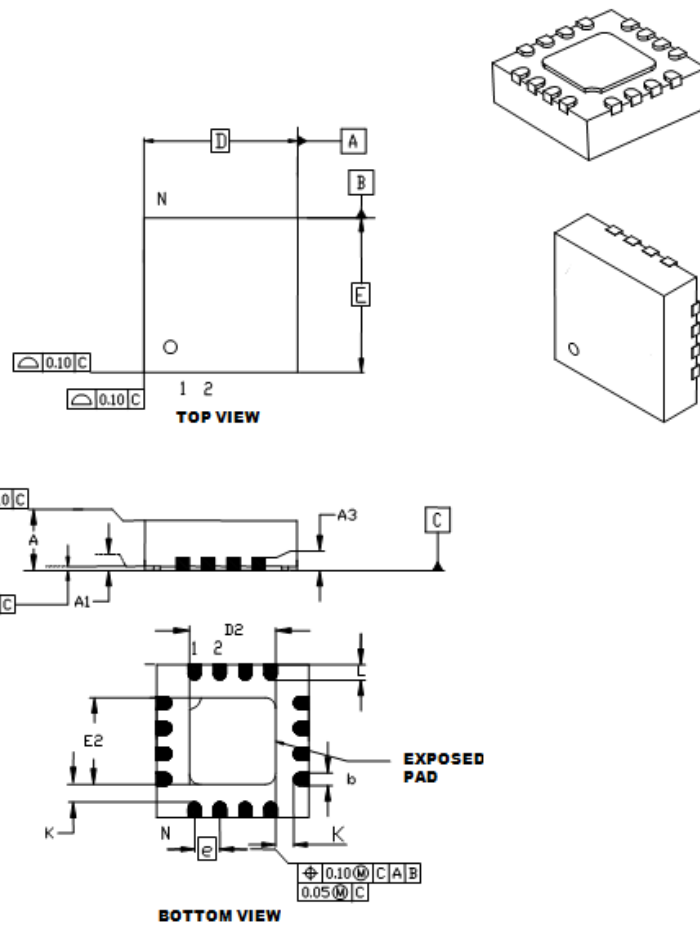


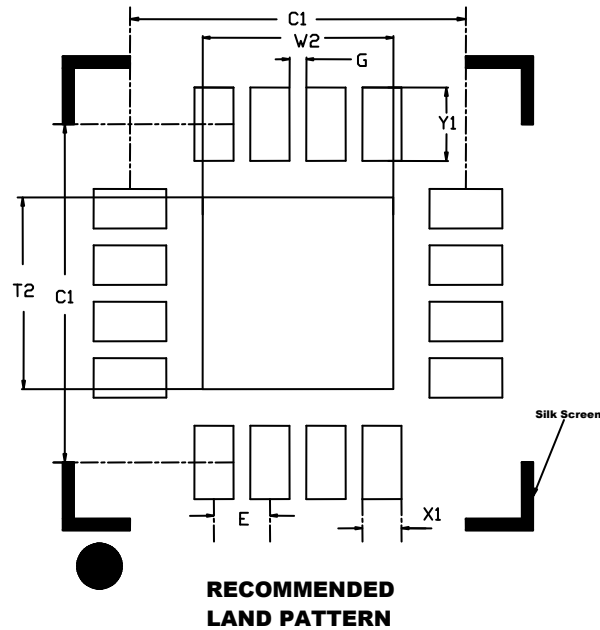
Figure 1: TS80002 Application Schematic

# Package Mechanical Drawings (all dimensions in mm)



Units		Millimeters		
Dimensions Limits		MIN	NOM	MAX
Number of Pins	N	16		
Pitch	e	0.50 BSC		
Overall Height	A	0.80	0.90	1.00
Standoff	A1	0.00	0.02	0.05
Contact Thickness	A3	0.20 REF		
Overall Length	D	3.00 BSC		
Exposed Pad Width	E2	1.55	1.70	1.80
Overall Width	E	3.00 BSC		
Exposed Pad Length	D2	1.55	1.70	1.80
Contact Width	b	0.20	0.25	0.30
Contact Length	L	0.20	0.30	0.40
Contact-to-Exposed Pad	K	0.20	-	-

## Recommended PCB Land Pattern



Units		Millimeters		
Dimensions Limits		MIN	NOM	MAX
Contact Pitch	E	0.50 BSC		
Optional Center Pad Width	W2	-	-	1.70
Optional Center Pad Length	T2	-	-	1.70
Contact Pad Spacing	C1	-	3.00	-
Contact Pad Spacing	C2	-	3.00	-
Contact Pad Width (X16)	X1	-	-	0.35
Contact Pad Length (X16)	Y1	-	-	0.65
Distance Between Pads	G	0.15	-	-

**Notes:**

Dimensions and tolerances per ASME Y14.5M.

BSC: Basic Dimension. Theoretically exact values shown without tolerances.

REF: Reference Dimension, usually without tolerance, for information only



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## Ordering Information

Part Number	Description
TS51231-QFNR	Transmitter Driver

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- Hydrochlorofluorocarbons (HCFCs)
- Lead (Pb)
- Mercury (Hg)
- Perfluorocarbons (PFCs)
- Polybrominated biphenyls (PBB)
- Polybrominated Diphenyl Ethers (PBDEs)



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