TS51231

High Efficiency Transmitter Driver for Wireless Power Systems

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

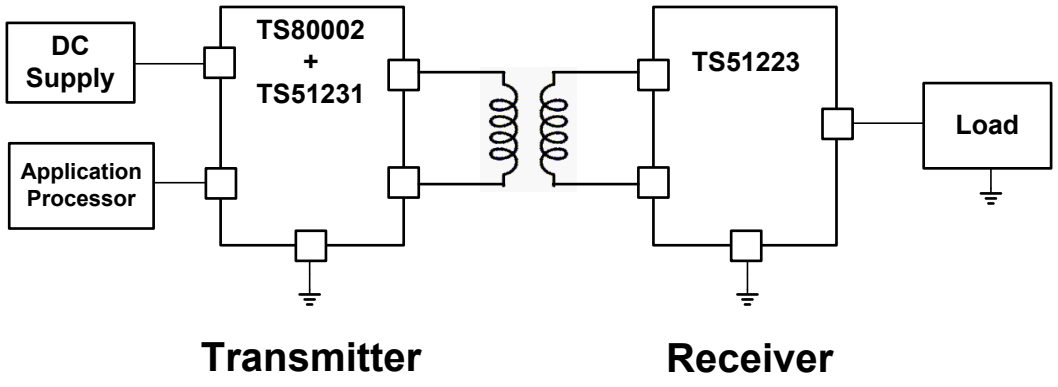
The TS51231 is a transmitter driver and output stage for wireless charging applications. The TS51231 can support systems up to 5W output and proprietary applications.

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

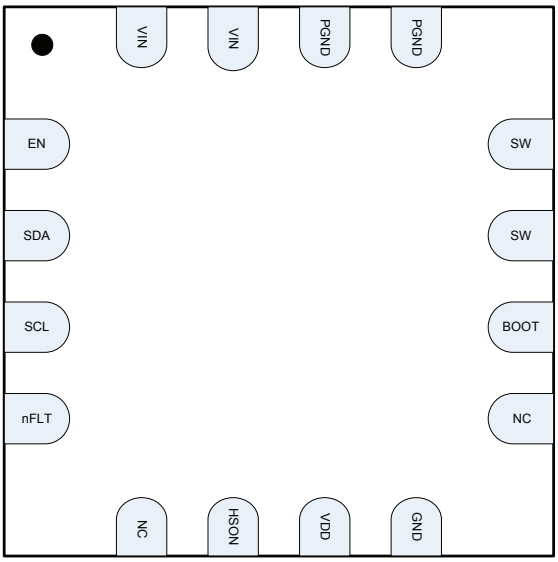
Specification

- 16 pin 3x3 QFN

Typical Application Circuit



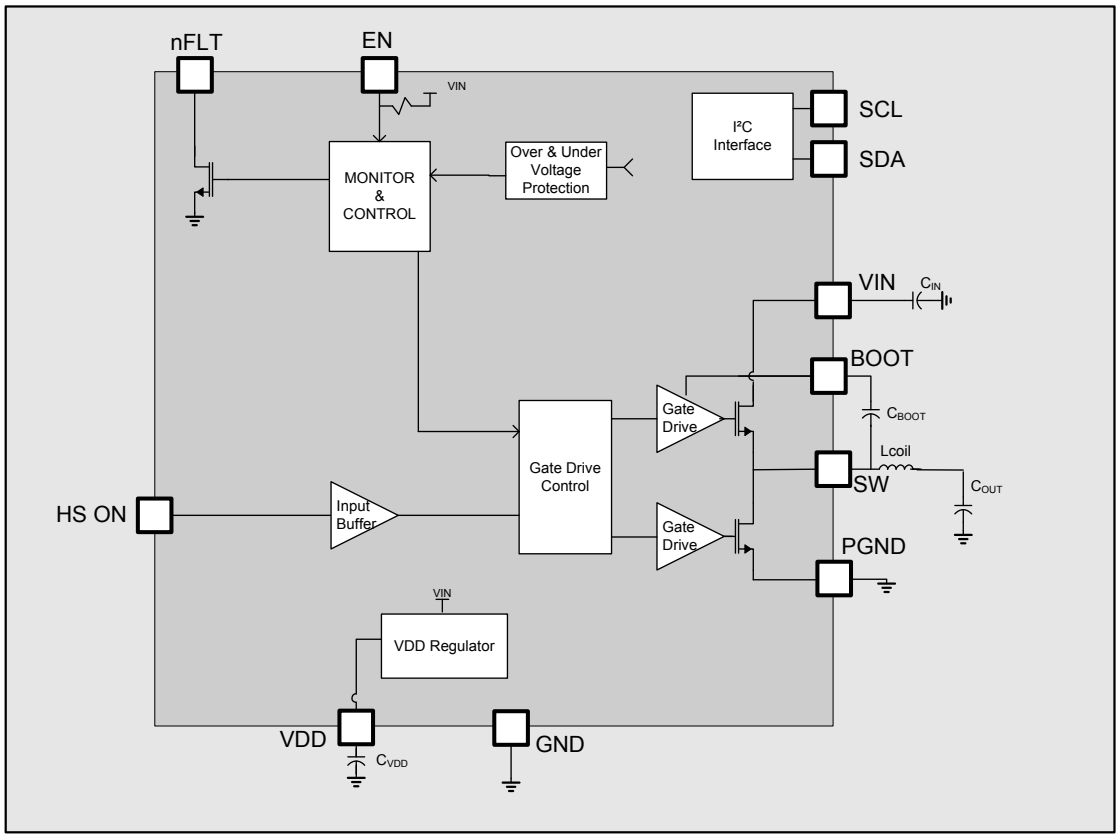
Pin-out (Top view)



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[1, 2]

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	^{O}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
Θ_{JA}	Thermal Resistance Junction to Air (Note 1)	33 - 36	°C/W
Θ_{JC}	Thermal Resistance Junction to Case (Note 1)	1.2 - 3.9	°C/W
T_{STG}	Storage Temperature Range	-65 to 150	°C
$T_{J\ MAX}$	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 inch2 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
LOUT	Transmitter Coil		6.0		µH
COUT	Output Filter Capacitor		100		nF
CIN	Input Bypass Capacitor		100		nF
CVDD	Internal Bypass Capacitor		100		nF
CBOOT	Bootstrap Capacitor		22		nF

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

Electrical Characteristics, TJ = -40C to 125C (unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Output Stage						
High Side Switch On Resistance	RDSON	ISW = -1A, TJ=25C			100	mΩ
Low Side Switch On Resistance		ISW = 1A, TJ=25C			100	mΩ
Max Output Current	IOUT			2.0		A
Over Current Detect	IOCD	HS switch current	2.5			A
VDD LDO Output						
LDO Output Voltage	VLDO		4.75	5.0	5.25	V
LDO Output Current	ILDO				50	mA
Drop Out Voltage	LDODO	Vin=5V, Iout=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

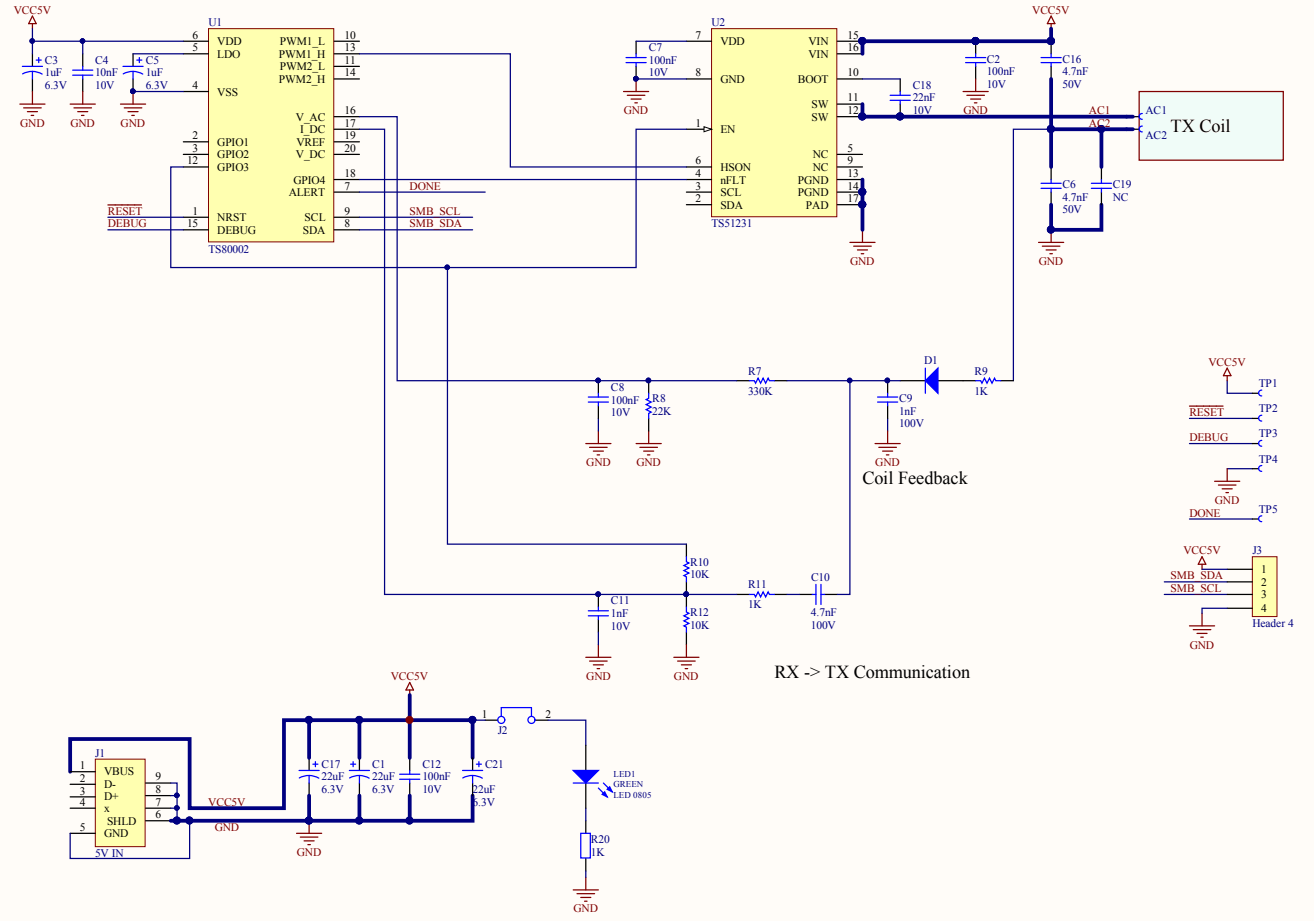
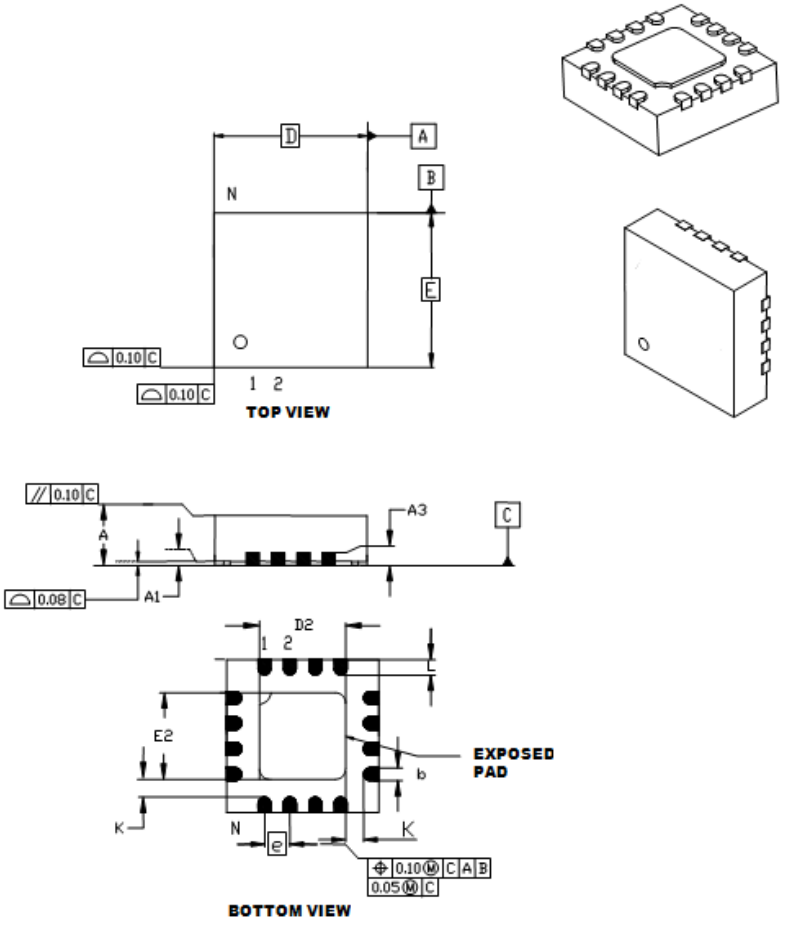


Figure 1: TS80002 Application Schematic

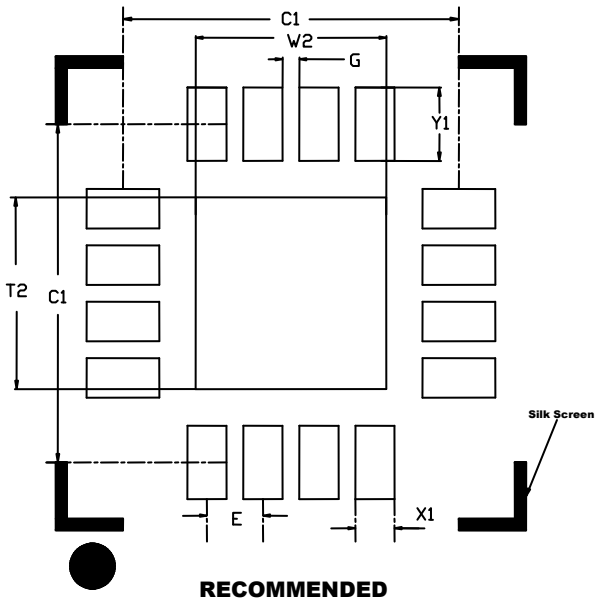
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Package Mechanical Drawings (all dimensions in mm)



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



RECOMMENDED 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

Ordering Information

Part Number	Description
TS51231-QFNR	Transmitter Driver

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- Hydrochlorofluorocarbons (HCFCs)
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- Polybrominated Diphenyl Ethers (PBDEs)



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