

Description

The IDT P9242-R3 is a highly-integrated 15W magnetic induction wireless power transmitter with in-band, bi-directional data communication requiring no additional circuitry. The communication channel can be used for proprietary device authentication and secure system data transfer.

The P9242-R3 includes a 32-bit ARM®* Cortex®-M0 processor, foreign object detection (FOD), wide input voltage range operation, full bridge drivers, and on-chip simultaneous voltage and current demodulation.

In addition, the P9242-R3 features programmable over-current protection, programmable LED output blinking pattern, and I2C serial interface protocol to read back information such as voltage, current, and fault conditions. This standard device is compliant to the WPC-1.2 specification. Combined with the P9221-R3 receiver, the P9242-R3 forms a complete wireless power system solution for 15W applications with bi-directional data communication.

The P9242-R3 has a bootloader and application firmware pre-programmed into the internal one-time programmable (OTP) memory. The P9242-RB, which is pin-to-pin compatible with the P9242-R3, has only the bootloader pre-programmed into the internal OTP memory and uses external flash for the application firmware so that it can be changed for specific system requirements.

The P9242-R3 is available in a space-saving 48-VFQFPN package. It is rated for -40°C to +85°C ambient operating temperature range.

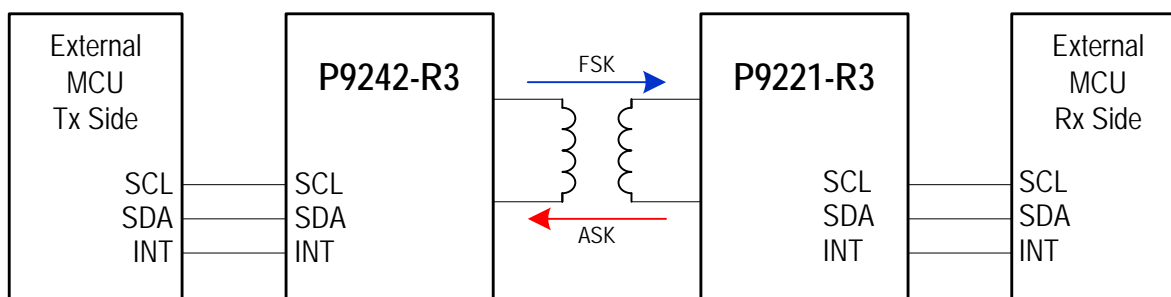
Features

- Supports bi-directional data communication
- Enables authentication and system data transfer
- Up to 15W of power transfer
- 87% end-to-end efficiency when combined with the P9221-R3
- VIN range: 4.25V to 21V
- Integrated drivers for external power FETs
- Integrated step-down switching regulator
- Simultaneous voltage and current demodulation
- Standard device compliant with the WPC-1.2 specification
- Supports the I2C interface protocol
- -40°C to +85°C ambient operating temperature range
- 6 × 6 mm, 48-VFQFPN package, Pb-free

Typical Applications

- Industrial Equipment
- Consumer Electronics
- Medical Equipment

Typical Application Circuit



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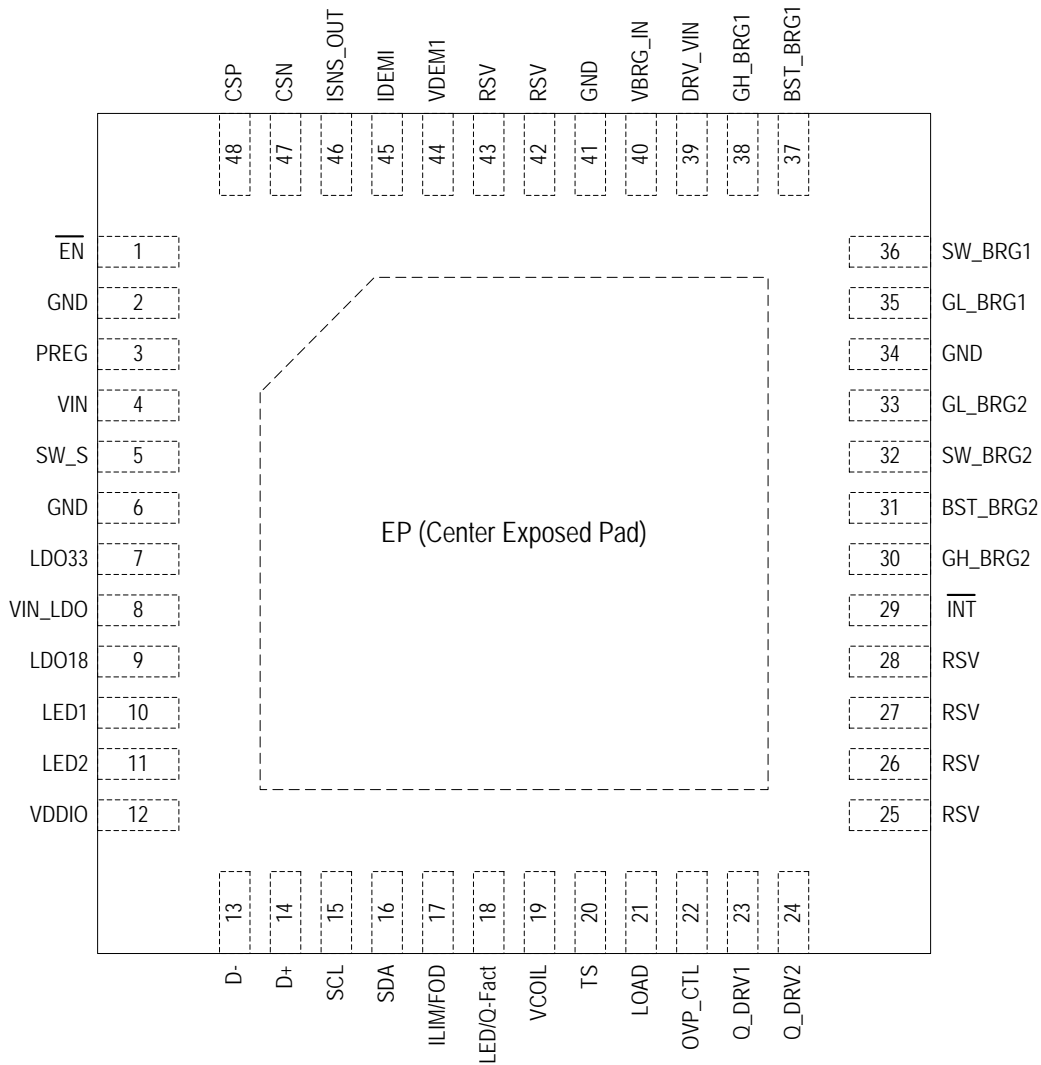
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1. Pin Assignments

Figure 1. Pin Assignments



12.4 Bill of Materials (BOM)

Table 27. P9242-R3-EVK Evaluation Kit V2.1 Bill of Materials

Item	Quantity	Reference	Value	Description	Part Number	PCB Footprint
1	12	C1, C2, C3, C4, C13, C15, C21, C26, C29, C30, C33, C34	0.1 μ F	CAP CER 0.1 μ F 25V 10% X7R 0402	C1005X7R1E104K050BB	0402
2	7	C5, C14, C31, C37, C38, C40, C41	10 μ F	CAP CER 10 μ F 25V 20% X5R 0603	C1608X5R1E106M080A C	0603
3	4	C6, C12, C16, C27	1 μ F	CAP CER 1 μ F 25V 20% X5R 0402	C1005X5R1E105M050B C	0402
4	2	C7, C9	56pF	CAP CER 56PF 50V NP0 0402	CL05C560JB5NNNC	0402
5	1	C8	6.8nF	CAP CER 6800PF 25V X7R 0402	GRM155R71E682KA01D	0402
6	2	C10, C11	22nF	0.022 μ F 50V Ceramic Capacitor X7R 0603	GCM188R71H223KA37D	0603
7	1	C17	680pF	CAP CER 680PF 50V X7R 0402	CL05B681KB5NNNC	0402
8	1	C18	1nF	CAP CER 1000pF \pm 10% 50V X7R 0402	GRM155R71H102KA01D	0402
9	3	C19, C35, C39	5.6nF	5600pF 100V Ceramic Capacitor C0G, NP0 0603	C1608C0G2A562J080AC	0603
10	1	C20	100nF	CAP CER 0.1 μ F 100V C0G 1206	C3216C0G2A104K160AC	1206
11	1	C22	22nF	CAP CER 0.022 μ F 50V 10% X7R 0402	GRM155R71H223KA12D	0402
12	1	C23	68nF	CAP CER 0.068 μ F 100V NP0 1206	C3216C0G2A683K160AC	1206
13	1	C24	47nF	CAP CER 0.047 μ F 100V NP0 1206	C3216C0G2A473J115AC	1206
14	1	C25	NP	CAP CER 10000PF 100V C0G 1206	C3216C0G2A103J115AA	1206
15	2	C28, C32	22 μ F	CAP CER 22 μ F 25V 20% X5R 1206	GRM31CR61E226KE15L	1206
16	1	C36	0.1 μ F	CAP CER 0.1 μ F 25V 10% X7R 0402	C1005X7R1E104K050BB	0402
17	1	C42	0.1 μ F	0.10 μ F 50V Ceramic Capacitor X7R 0603	GRM188R71H104KA93D	0603
18	1	C43	1 μ F	1 μ F 25V Ceramic Capacitor X5R 0603	GRM188R61E105KA12D	0603
19	1	C44	4.7 μ F	4.7 μ F 25V Ceramic Capacitor X5R 0603	GRM188R61E475KE11D	0603
20	2	D1, D2	BAV21W	DIODE GEN PURP 80V 125MA DFN	BAV21W-7-F	sod123

Item	Quantity	Reference	Value	Description	Part Number	PCB Footprint
21	30	VLX1, VINT1, IO_B1, IO_A1, GNDT1, vs2, VLX2, VINT2, IO_B2, GNDT2, vs3, IO_B3, IO_B4, IO_A4, VCC5V, IO_B5, IO_A5, IO_B6, IO_A6, IO_B7, IO_A7, IO_B8, LDO18, LDO33, VSNS_IN, VCOIL, VBRG, IO_B0, IO_A0, ENB	PTH_TP	30 GAUGE WIRE PAD	NP	TEST_PT30DPAD
22	7	VIN1, GND1, GND2, GND3, GND4, VIN, GND	TP	TEST POINT PC MINIATURE SMT	5015	test_pt_sm_135x70
23	1	J1	5P	CONN RCPT MCR USB AB SMD TH SHLL	ZX62D-AB-5P8	usb_micro_ab
24	1	J2	68000-105HLF	BERGSTIK II .100" SR STRAIGHT	68000-105HLF	sip5
25	1	J3	AC Adapter	CONN POWER JACK 2.5X5.5MM HI CUR	PJ-002AH	CONN_POWER_JACK5_5MM
26	1	J4	TP	CONN HEADER 3POS .100" STR GOLD	901200763	sip3
27	1	J5	SIP con	4-position header	961104-6404-AR	sip-4
28	1	LED1	LED	LED RED CLEAR 0603 SMD	150060RS75000	0603_diode
29	1	LED2	LED	LED GREEN CLEAR 0603 SMD	150060GS75000	0603_diode
30	2	LX1, LX2	NP	Tx coil assemble through hole	NA	TP_TXCoil
31	1	L1	4.7μH	FIXED IND 4.7μH 620MA 500 MOHM	CIG10W4R7MNC	L0603
32	1	L2	NP	Common mode EMI choke	ACM4520-901-2P-T-000	EMI_TDK_ACM4520L
33	1	PZ1	NP	BUZZER PIEZO 4KHZ 12.2MM PC MNT	PS1240P02CT3	9235_buzzer
34	4	Q1, Q2, Q3, Q4	DMG7430LFG	MOSFET N-CH 30V 10.5A PWRDI3333	DMG7430LFG-7	powerdi3333_8ld_fet
35	3	Q5, Q7, Q8	2N7002	N-Channel 60-V (D-S) MOSFET	2N7002KT1G	SOT23_3
36	1	Q6	MOSFET	MOSFET P-CH 30V SC-70-6	SIA449DJ-T1-GE3	sc70_6ld_fet
37	1	RTH1	NP	NTC thermistor 10k bead	NTCLE203E3103JB0	0805
38	3	R1, R3, R7	1kΩ	RES SMD 1K OHM 5% 1/16W 0402	RC0402JR-071KL	0402
39	1	R4	680Ω	RES SMD 680 OHM 5% 1/16W 0402	RC0402JR-07680RL	0402
40	1	R5	NP	RES SMD 0.0 OHM JUMPER 1/10W	RC0402JR-070RL	0402
41	9	R6, R13, , R16, R20, R23, R41, R42, R43, R48	10kΩ	RES SMD 10K OHM 1% 1/10W 0402	RC0402FR-0710KL	0402
42	5	R8, R26, R30, R31, R32	100kΩ	RES SMD 100K OHM 5% 1/10W 0402	ERJ-2GEJ104X	0402
43	1	R24	100kΩ	RES SMD 100K OHM 5% 1/10W 0402	ERJ-2GEJ104X	0402

Item	Quantity	Reference	Value	Description	Part Number	PCB Footprint
44	1	R9	NP	RES SMD 100 OHM 5% 1/10W 0603	RC0603JR-07100RL	0603
45	2	R10, R12	390k Ω	RES SMD 390K OHM 5% 1/10W 0603	ERJ-3GEYJ394V	0603
46	1	R14	2.4k Ω	RES SMD 2.4K OHM 5% 1/10W 0402	ERJ-2GEJ242X	0402
47	2	R11, R35	200k Ω	RES SMD 200K OHM 1% 1/10W 0603	RC1608F204CS	0603
48	2	R15, R21	10 Ω	RES SMD 10 OHM 1% 1/10W 0402	ERJ-2RKF10R0X	0402
49	1	R18	0.02 Ω	RES SMD 0.02 OHM 1% 1/8W 0805	WSL0805R0200FEA	0805
50	4	R19, R22, R40, R44	NP	RES SMD 10K OHM 1% 1/10W 0402	RC0402FR-0710KL	0402
51	4	R25, R27, R28, R29	12 Ω	RES SMD 12 OHM 5% 1/10W 0402	ERJ-2GEJ120X	0402
52	1	R33	3 Ω	RES SMD 3 OHM 1% 1/8W 0805	RC0805FR-073RL	0805
53	1	R34	100k Ω	RES SMD 100K OHM 1% 1/10W 0603	ERJ-3EKF1003V	0603
54	2	R36, R37	0.1 Ω	RES SMD 0.1 OHM 5% 1/6W 0402	ERJ-2BSJR10X	0402
55	2	R38, R39	0 Ω	RES SMD 0.0 OHM JUMPER 1/10W	RC0402JR-070RL	0402
56	1	R45	220 Ω	RES SMD 220 OHM 1% 0.4W 0805	RC1206FR-07220RL	1206
57	2	R46, R47	5.1k Ω	RES SMD 5.1K OHM 5% 1/16W 0402	MCR01MRTJ512	0402
58	1	U1	P9242-RB	Medium Power Transmitter	P9242-RB	socketqfn_48_6x6_0p4
59	1	U2	W25X2 0CLUXI G	SPIFLASH 2M-BIT 4KB UNIFORM SECT	W25X20CLUXIG TR	uson_2x3_8LD

13. Package Outline Drawing

The package outline drawings are appended at the end of this document and are accessible from the link below. The package information is the most current data available.

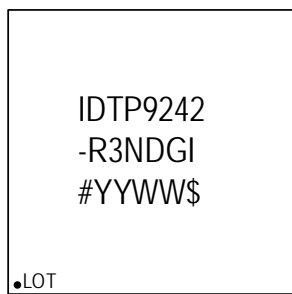
www.idt.com/document/psc/48-vfqfn-package-outline-drawing-60-x-60-x-090-mm-body-epad-42-x-42-mm-040mm-pitch-ndg48p2

14. Special Notes: NDG 48-VFQFPN Package Assembly

Unopened dry packaged parts have a one-year shelf life.

The HIC indicator card for newly-opened dry packaged parts should be checked. If there is any moisture content, the parts must be baked for a minimum of 8 hours at 125°C within 24 hours prior to the assembly reflow process.

15. Marking Diagrams



- Line 1: Company name and part number.
- Line 2: -R3 is part of the part number, which is followed by the package code.
- Line 3: "YYWW" is the last two digits of the year and two digits for the week that the part was assembled. # is the device step. "\$" denotes the mark code.



- Line 1: Company name and part number.
- Line 2: -RB is part of the part number, which is followed by the package code.
- Line 3: "YYWW" is the last two digits of the year and two digits for the week that the part was assembled. # is the device step. "\$" denotes the mark code.

16. Ordering Information

Orderable Part Number	Description and Package	MSL Rating	Shipping Package	Ambient Temperature
P9242-R3NDGI	P9242-R3 Wireless Power Receiver for 15W Applications, 48-VFQFPN (6 x 6 mm) package (NDG48P2)	MSL1	Tray	-40°C to +85°C
P9242-R3NDGI8	P9242-R3 Wireless Power Receiver for 15W Applications, 48-VFQFPN (6 x 6 mm) package (NDG48P2)	MSL1	Reel	-40°C to +85°C
P9242-RBNDGI ^[a]	P9242-RB Wireless Power Transmitter for 15W Applications with only bootloader pre-programmed, 48-VFQFPN (6 × 6 mm) package	MSL1	Tray	-40°C to +85°C
P9242-RBNDGI8 ^[a]	P9242-RB Wireless Power Transmitter for 15W Applications with only bootloader pre-programmed, 48-VFQFPN (6 × 6 mm) package	MSL1	Reel	-40°C to +85°C
WP15WBD-RK	WP15WBD-RK Bi-directional Data Transfer Evaluation Kit including P9242-R3-EVK Transmitter Evaluation Board, P9221-R3-EVK Receiver Evaluation Board, two USB to I2C dongles, and one 12V/2A AC adapter.			

[a] The P9242-R3 has the bootloader and application firmware pre-programmed into internal one-time programmable (OTP) memory. The P9242-RB, which is pin compatible with the P9242-R3, has only the bootloader pre-programmed into OTP memory. The P9242-RB must be used in conjunction with an external flash; however, there is no functionality difference of the P9242-R3 IC or the P9242-RB with external flash.

17. Revision History

Revision Date	Description of Change
May 17, 2019	Added P9242-RB information. Updated Package Outline Drawings section.
October 20, 2017	Initial release.