ASH Transceiver 10 mW Power Amplifier Circuit Board

ETSI SRD regulations allow up to 10 mW of transmitter power at 433.92 MHz, and up to 25 mW of transmitter power at 868.35 MHz. For those applications where maximum range is of primary important and low operating current is not a priority, a 10 mW power amplifier circuit can be utilized in conjunction with the ASH transceiver.

Referring to the schematic and PCB layout, note that the circuit board is general purpose and can be used with either a TR3000 for 433.92 MHz operation or with a TR1001 for 868.35 MHz operation. The circuit board can also be configured for OOK or ASK operation, along with many other options. Depending on the configuration chosen, some components will be left out or replaced with zero-ohm jumpers.

Bills of material are provided for both 433.92 and 868.35 MHz, set-up for OOK operation at 1200 bps. This set-up emphasizes maximum sensitivity and range. Component values can be adjusted for other data rates and/or for ASK operation as explained in the ASH Transceiver Designer's Guide. The power amplifier circuitry does not have to be changed for operation at different data rates or for ASK operation.

The circuit board includes a voltage regulator to support operation from a 5 to 15 Vdc supply. The circuit with draw up to 50 mA peak in transmit. A Vcc ON/OFF pin is provided to allow the circuit board to be powered down. The Transmit Data Input line is buffered by Q4 to reduce modulation drive current requirements, and is set-up for a 0 to 3 V modulation input. Q3 buffers the data output line, and can be configured as either a non-inverting or inverting buffer (see the Designer's Guide for information on buffer circuit component values.) The data output signal from Q3 is nominally 0 to 3 V.

The Transmit/Receive Select pin controls the ASH mode control pins and the antenna switch. For OOK operation, R6 and R9 are left unpopulated, and for ASK operation R7 and R8 are left unpopulated.

The Gerber files for this PCB is on RFM's web site, *www.rfm.com*. The file name is *10mWpcb.zip*, and can be found in the Application Notes section under *PCB Gerber Files*.

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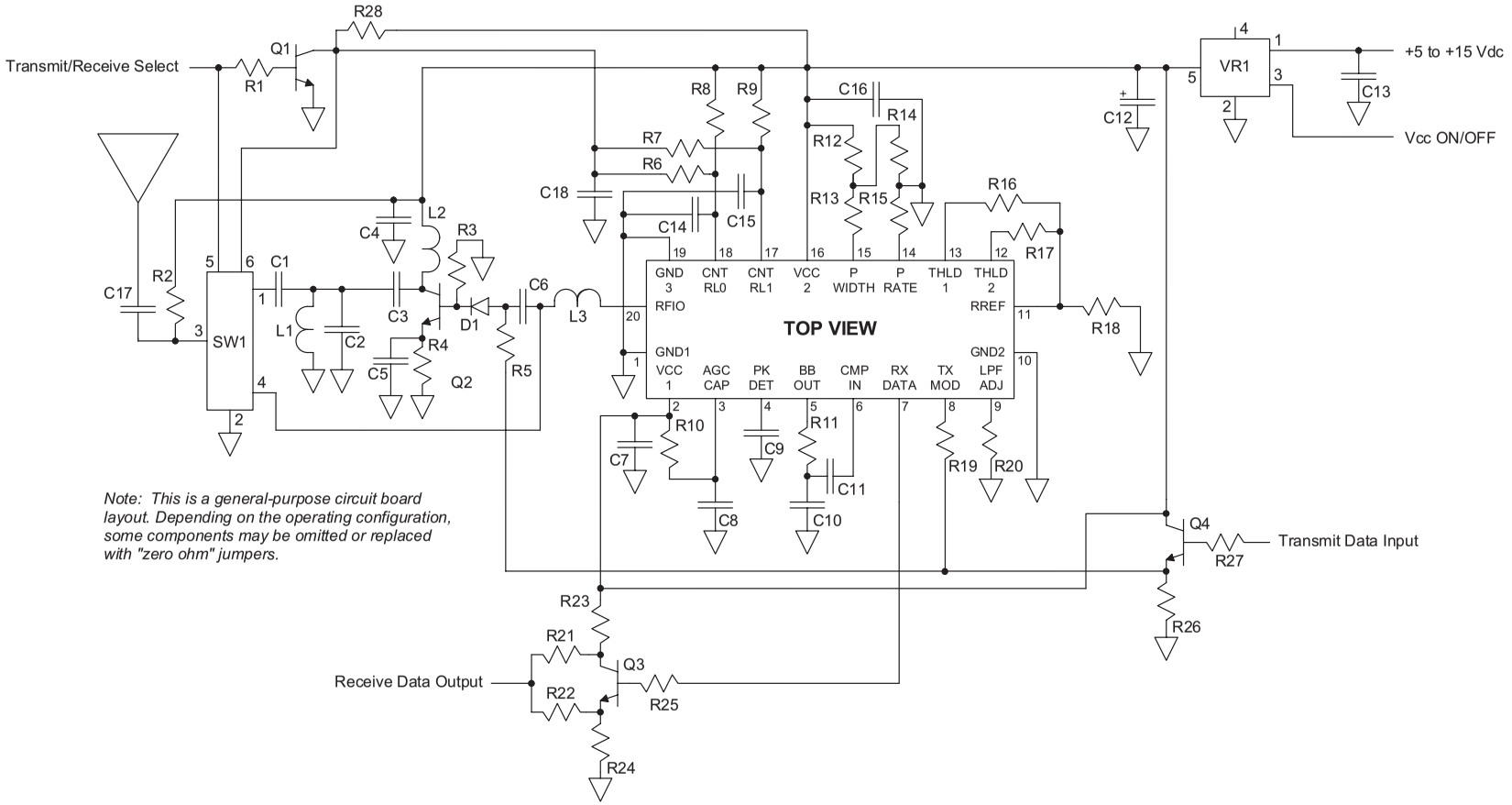

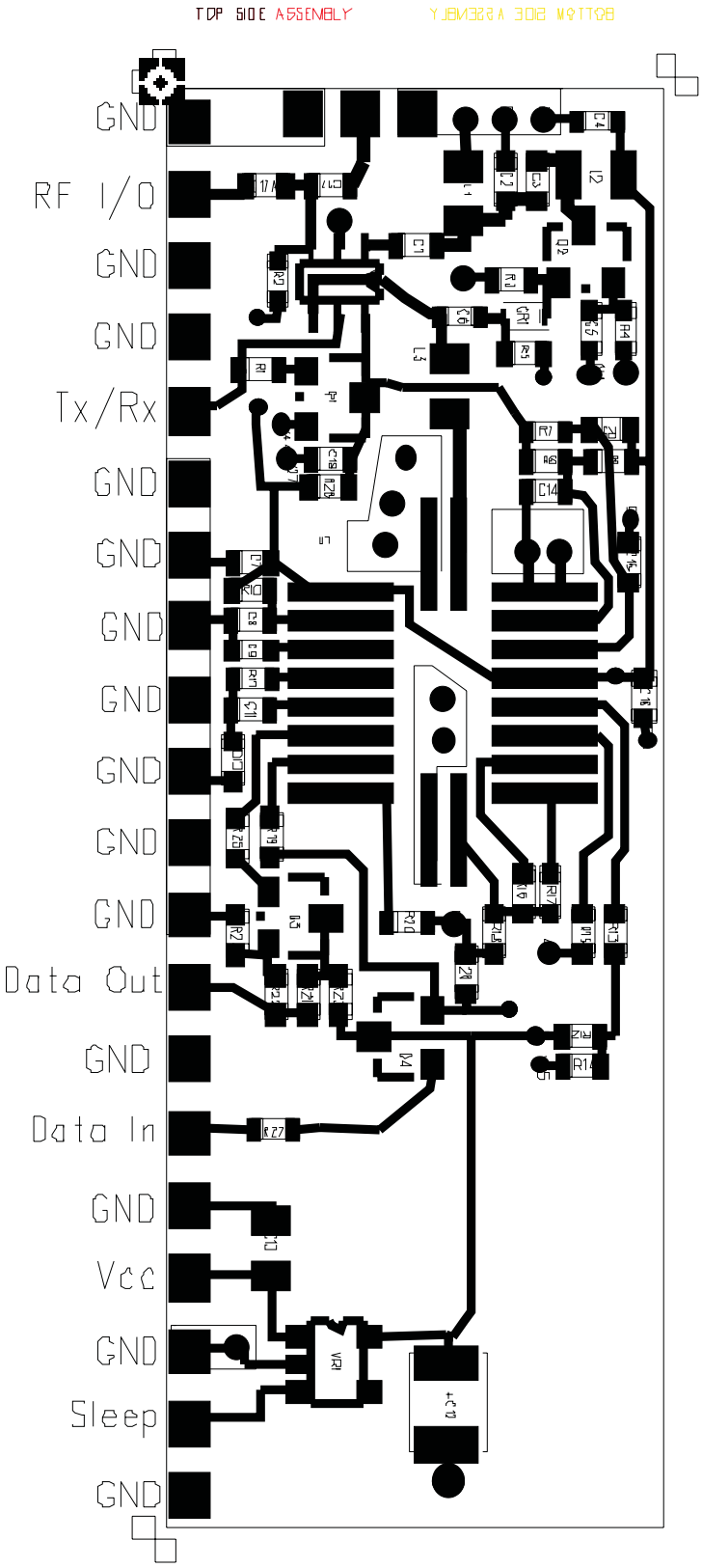
TOP SIDE ASSEMBLY
GND
RF I/O
GND
GND
Tx/Rx
GND
GND
GND
GND
GND
GND
GND
Data Out
GND
Data In
GND
Vcc
GND
Sleep
GND

ASH Transceiver 10 mW Power Amplifier Circuit Board			
868.35 MHz, 1200 bps OOK, zero threshold, non-inverting RX data buffer			
Designator	**Description**	**Vendor**	**Vendor Part #**
U1	ASH Transceiver	RFM	TR1001
SW1	RF Switch	Alpha	AS125-73
VR1	Voltage Regulator	National	LP2980AIM5-3.0
Q1	SOT-23 Transistor	Motorola	MMBT2222L
Q2	SOT-23 Transistor	NEC	NE85633
Q3	SOT-23 Transistor	Motorola	MMBT2222L
Q4	SOT-23 Transistor	Motorola	MMBT2222L
D1	SMT PIN Diode	Alpha	SMP1302-079
L1	Inductor, 3.3 nH, ±5%, 0603	Toko	LL2012-F3N3K
L2	Inductor, 10 nH, ±5%, 0603	Toko	LL2012-F10NK
L3	Inductor, 10 nH, ±5%, 0603	Toko	LL2012-F10NK
C1	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C2	Capacitor, 6 pF, ±5%, NPO, 0603	as required	as required
C3	Capacitor, 2.7 pF, ±5%, NPO, 0603	as required	as required
C4	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C5	Capacitor, 10 pF, ±5%, NPO, 0603	as required	as required
C6	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C7	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C8	not used	not used	not used
C9	not used	not used	not used
C10	Capacitor, 0.015 uF, ±10%, 0603	as required	as required
C11	Capacitor, 0.2 uF, ±10%, 0603	as required	as required
C12	Capacitor, 4.7 uF, ±10%, tantalum, 0603	as required	as required
C13	Capacitor, 0.1 uF, ±10%, 0603	as required	as required
C14	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C15	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C16	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C17	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C18	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
R1	Resistor, 27 K, ±5%, 0.0625 W, 0603	as required	as required
R2	Resistor, 10 K, ±5%, 0.0625 W, 0603	as required	as required
R3	Resistor, 510, ±5%, 0.0625 W, 0603	as required	as required
R4	Resistor, 10, ±5%, 0.0625 W, 0603	as required	as required
R5	Resistor, 240, ±5%, 0.0625 W, 0603	as required	as required
R6	not used	not used	not used
R7	Resistor, "zero ohm", 0603	as required	as required
R8	Resistor, "zero ohm", 0603	as required	as required
R9	not used	not used	not used
R10	Resistor, "zero ohm", 0603	as required	as required
R11	Resistor, 12 K, ±5%, 0.0625 W, 0603	as required	as required
R12	not used	not used	not used
R13	Resistor, 270 K, ±5%, 0.0625 W, 0603	as required	as required
R14	Resistor, "zero ohm", 0603	as required	as required
R15	Resistor, 330 K, ±5%, 0.0625 W, 0603	as required	as required
R16	Resistor, "zero ohm", 0603	as required	as required
R17	not used	not used	not used
R18	Resistor, 100 K, ±1%, 0.0625 W, 0603	as required	as required
R19	Resistor, 3 K, ±5%, 0.0625 W, 0603	as required	as required
R20	Resistor, 330 K, ±5%, 0.0625 W, 0603	as required	as required
R21	not used	not used	not used
R22	Resistor, "zero ohm", 0603	as required	as required
R23	Resistor, "zero ohm", 0603	as required	as required
R24	Resistor, 47 K, ±5%, 0.0625 W, 0603	as required	as required
R25	Resistor, 22 K, ±5%, 0.0625 W, 0603	as required	as required
R26	Resistor, 2 K, ±5%, 0.0625 W, 0603	as required	as required
R27	Resistor, 2 K, ±5%, 0.0625 W, 0603	as required	as required
R28	Resistor, 20 K, ±5%, 0.0625 W, 0603	as required	as required

ASH Transceiver 10 mW Power Amplifier Circuit Board			
433.92 MHz, 1200 bps OOK, zero threshold, non-inverting RX data buffer			
Designator	**Description**	**Vendor**	**Vendor Part #**
U1	ASH Transceiver	RFM	TR3000
SW1	RF Switch	Alpha	AS125-73
VR1	Voltage Regulator	National	LP2980AIM5-3.0
Q1	SOT-23 Transistor	Motorola	MMBT2222L
Q2	SOT-23 Transistor	NEC	NE85633
Q3	SOT-23 Transistor	Motorola	MMBT2222L
Q4	SOT-23 Transistor	Motorola	MMBT2222L
D1	SMT PIN Diode	Alpha	SMP1302-079
L1	Inductor, 6.8 nH, ±5%, 0603	Toko	LL2012-F6N8K
L2	Inductor, 33 nH, ±5%, 0603	Toko	LL2012-F33NK
L3	Inductor, 47 nH, ±5%, 0603	Toko	LL2012-F47NK
C1	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C2	Capacitor, 22 pF, ±5%, NPO, 0603	as required	as required
C3	Capacitor, 3 pF, ±5%, NPO, 0603	as required	as required
C4	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C5	Capacitor, 33 pF, ±5%, NPO, 0603	as required	as required
C6	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C7	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C8	not used	not used	not used
C9	not used	not used	not used
C10	Capacitor, 0.015 uF, ±10%, 0603	as required	as required
C11	Capacitor, 0.2 uF, ±10%, 0603	as required	as required
C12	Capacitor, 4.7 uF, ±10%, tantalum, 0603	as required	as required
C13	Capacitor, 0.1 uF, ±10%, 0603	as required	as required
C14	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C15	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C16	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C17	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
C18	Capacitor, 100 pF, ±5%, NPO, 0603	as required	as required
R1	Resistor, 27 K, ±5%, 0.0625 W, 0603	as required	as required
R2	Resistor, 10 K, ±5%, 0.0625 W, 0603	as required	as required
R3	Resistor, 510, ±5%, 0.0625 W, 0603	as required	as required
R4	Resistor, 10, ±5%, 0.0625 W, 0603	as required	as required
R5	Resistor, 240, ±5%, 0.0625 W, 0603	as required	as required
R6	not used	not used	not used
R7	Resistor, "zero ohm", 0603	as required	as required
R8	Resistor, "zero ohm", 0603	as required	as required
R9	not used	not used	not used
R10	Resistor, "zero ohm", 0603	as required	as required
R11	Resistor, 12 K, ±5%, 0.0625 W, 0603	as required	as required
R12	not used	not used	not used
R13	Resistor, 270 K, ±5%, 0.0625 W, 0603	as required	as required
R14	Resistor, "zero ohm", 0603	as required	as required
R15	Resistor, 330 K, ±5%, 0.0625 W, 0603	as required	as required
R16	Resistor, "zero ohm", 0603	as required	as required
R17	not used	not used	not used
R18	Resistor, 100 K, ±1%, 0.0625 W, 0603	as required	as required
R19	Resistor, 10 K, ±5%, 0.0625 W, 0603	as required	as required
R20	Resistor, 330 K, ±5%, 0.0625 W, 0603	as required	as required
R21	not used	not used	not used
R22	Resistor, "zero ohm", 0603	as required	as required
R23	Resistor, "zero ohm", 0603	as required	as required
R24	Resistor, 47 K, ±5%, 0.0625 W, 0603	as required	as required
R25	Resistor, 22 K, ±5%, 0.0625 W, 0603	as required	as required
R26	Resistor, 2 K, ±5%, 0.0625 W, 0603	as required	as required
R27	Resistor, 2 K, ±5%, 0.0625 W, 0603	as required	as required
R28	Resistor, 20 K, ±5%, 0.0625 W, 0603	as required	as required