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Test Procedure for the NCV7471A5V1GEVB Evaluation Board

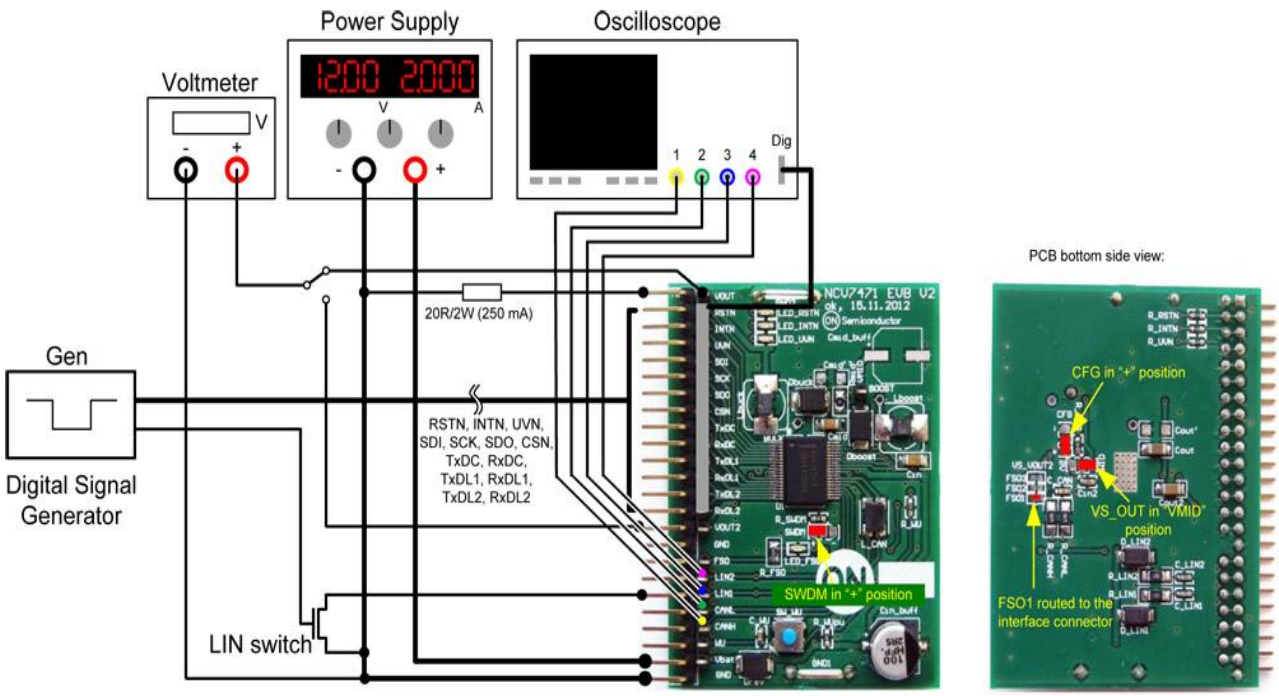

Figure 1: Test Setup Configuration

Required Equipment

- Oscilloscope with digital inputs
- Bench Power Supply
- Voltmeter
- Signal Generator (SPI capable)
- NCV7471 Evaluation Board, 250 mA version

Test procedure Step 1 (Power-up sequence, Normal mode, Boost-buck operation):

1. Connect the setup as shown above, but without VOUT load; SWDM and CFG soldering straps have to be in "+" position
2. Set VS_VOUT2 to "VMID" position
3. Apply an input voltage, V_{BAT} = 12 V, current capability min. 1.5 A
4. Check VOUT, LIN1, LIN2, CANH, CANL, RxDL1, RxDL2, RxDC, RSTN, INTN and UVN_ VOUT State
5. Check I_{BAT}.

Table 1: Desired Results

I_{BAT} < 20 mA
VOUT = ON
LIN1/2 = RECESSIVE
CANH, CANL = RECESSIVE
RxDL1/2 = HIGH
RxDC = HIGH
RSTN = HIGH (LED_RSTN = off)
INTN = HIGH (LED_INTN = off)
UVN_VOUT = HIGH (LED_UVN = off)

Test procedure Step 2 (Boost-buck converter function):

1. Connect load to VOUT (500 mA, depending on assembly option)
2. Alternate , V_{BAT} voltage in full operating range (3.3 – 28 V or 2.5 – 28 V)
3. Check VOUT, RSTN, INTN and UVN_VOUT State
4. Check I_{BAT}.
5. Set input voltage to initial value, V_{BAT} = 12 V

Table 2: Desired Results

I_{BAT} should decrease with increasing V_{BAT}
VOUT ON
RSTN = HIGH (LED_RSTN = off)
INTN = HIGH (LED_INTN = off)
UVN_VOUT = HIGH (LED_UVN = off) for VOUT = 5 V UVN_VOUT = LOW (LED_UVN = on) for VOUT < 4.65 V (Typ.)
VMID > 6.5 V (optional check on test point)

Test procedure Step 3 (LIN1/2 Transmit in Normal mode):

1. Set TxDL1/2 to LOW, wait < 6 ms, set TxDL1/2 HIGH (Generate LIN Dominant state); can be repeated with 50% duty cycle
2. Observe LIN1/2 and RxDL1/2. Start observation with TxDL1/2 falling edge.

Table 3: Desired Results

LIN1/2 = Contain one Dominant pattern
RxDL1/2 = Contain one Dominant pattern

Test procedure Step 4 (CAN Transmit in Normal mode):

1. Set TxDC to LOW, wait < 300 µs, set TxDC HIGH (Generate CAN Dominant state); can be repeated with 50% duty cycle
2. Observe CANH, CANL and RxDC. Start observation with TxDC falling edge.

Table 4: Desired Results

CANH, CANL = Contain one Dominant pattern
RxDC = Contains one Dominant pattern

Test procedure Step 5 (VOUT2 LDO function, SPI function):

1. Send SPI command to activate VOUT2 regulator (SPI bit enVOUT2=1 in CONTROL1 register; SPI frame = 0x2400)
2. Read SPI data from CONTROL1 register (send SPI frame = 0x3000)
3. Connect load to VOUT2 (50 mA)
4. Check VOUT2 State

Table 5: Desired Results

CONTROL1 = 0x3400
VOUT2 = ON

Test procedure Step 6 (Transition to Sleep mode):

1. Leave TxDL1, TxDL2 and TxDC floating (to simulate a microcontroller without power supply being connected to digital pins)
2. Send SPI Sleep command (SPI frame = 0x0600)
3. Disconnect SPI digital pins (to simulate a microcontroller without power supply being connected to digital pins)
4. Check I_{BAT}, VOUT, VOUT2, RSTN, INTN, UVN_VOUT State. Caution should be taken with oscilloscope digital probes resistance which could have influence on overall I_{BAT} current.

Table 6: Desired Results

I_{BAT} = Typ. 300 µA (incl. R_SWDM and R_CFG pull-up current)
VOUT = OFF
RSTN = LOW (LED_RSTN = off, due to VOUT off)
INTN = LOW (LED_INTN = off, due to VOUT off)
UVN_VOUT = LOW (LED_UVN = off, due to VOUT off)

Test procedure Step 7 (LIN1/2 Wakeup):

1. In Sleep, generate Remote LIN1 pattern: Set Gen HIGH, wait > 150 µs, set Gen LOW
2. Check VOUT, RxDL1/2, RSTN, INTN State

Table 7: Desired Results

VOUT = ON
RxDL1 = LOW – Signaling Wakeup source
RxDL2 = HIGH
RSTN = HIGH (LED_RSTN = off)
INTN = 1 ms HIGH / 5 ms LOW pulses – Signaling Wakeup (LED_INTN = on)
UVN_VOUT = HIGH (LED_UVN = off)

Test procedure Step 8 (Fail-safe mode, FSO1 functionality):

1. FSO1 soldering strap has to be connected
2. Short VOUT, wait > 1.65 s
3. Check VOUT, RSTN, FSO1 State
4. Remove VOUT short

VOUT = OFF
RSTN = LOW (LED_RSTN = on)
FSO1 = HIGH (LED_FSO = on)

Test procedure Step 9 (WU function, wakeup from Fail-safe mode):

1. Generate Local wakeup: Short WU pin to GND, wait > 50 µs (or press the SW_WU button)
2. Check VOUT, RSTN, FSO1 State

VOUT = ON
RSTN = HIGH (LED_RSTN = off)
FSO1 = HIGH (LED_FSO = on)

DC Characteristics

	MIN	TYP	MAX
VOUT ON	4.9 V	5.0 V	5.1 V
VOUT ON (Vbat < ~ 3 V)	3.3 V		
VOUT2 ON	4.83 V	5.0 V	5.17 V
RSTN, INTN, UVN_VOUT, RxDL1/2, RxDC LOW			0.4 V
RxDL1/2, RxDC HIGH	VOUT-0.4 V		
LIN DOMINANT			2 V
LIN RECESSIVE	V_{BAT} – 1.5 V		
CANH DOMINANT	3.0 V	3.6 V	4.25 V
CANL DOMINANT	0.5 V	1.4 V	1.75 V
CANH-CANL RECESSIVE	-0.12 V		0.05 V