PRELIMINARY DATA SHEET

# SKY77638-11 SkyLiTE™ Multimode Multiband Power Amplifier Module

## Applications

- Multiband 3G / LTE handsets
- CDMA Bands
  BC0, BC1, BC4, BC6, BC10, BC15
- WCDMA Bands
  1, 2, 3, 4, 5, 8
- TD-SCDMA Bands
  34, 39
- FDD LTE Bands
  1, 2, 3, 4, 5, 7, 8, 9, 12, 13, 17, 20, 25, 26, 28, 30
- TDD LTE Bands
  38, 39, 40, 41

## Features

- Two T/R (RX) port and 12 outputs
- Industry-leading PAE for 3G/4G
- Optimized for APT DCDC operation
- Fully programmable Mobile Industry Processor Interface (MIPI) control
- Dual Low Band RF inputs support separate transceiver outputs or interstage filtering
- MIPI programmable bias modes optimize best efficiency / linearity trade-off for 3G and 4G; minimizes DG09 for 3G.
- Small, low profile package:
  - 4.0 x 6.8 x 0.75 mm
  - 42-pad configuration

Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to Skyworks *Definition of Green*™, document number SQ04-0074.

## Description

Skyworks SKY77638-11 SkyLiTE™ is a multimode multiband (MMMB) Power Amplifier Module (PAM) that supports 3G / 4G handsets and operates efficiently in CDMA, WCDMA, TD-SCDMA, and LTE modes. The module is fully programmable through a Mobile Industry Processor Interface (MIPI®).

The PAM consists of a WCDMA / LTE block for low, high, and mid-bands, and a Multi-Function Control (MFC) block, RF input/output ports internally matched to 50 Ω to reduce the number of external components. A CMOS integrated circuit uses standard MIPI controls to provide the internal MFC interface and operation. Extremely low leakage current maximizes handset standby time.

The InGaP die and the silicon die and passive components are mounted on a multi-layer laminate substrate. The assembly is encapsulated in a 4.0 mm x 6.8 mm x 0.75 mm, 42-pad MCM, SMT package which is a more highly manufacturable, low cost solution.

**3G:** The SKY77638-11 supports CDMA, WCDMA, High-Speed Downlink Packet Access (HSDPA), High Speed Uplink Packet Access (HSUPA), High Speed Packet Access (HSPA+), and TD-SCDMA modulations. Varying the input power level provides output power control. $V_{CC}$ is adjusted using a DCDC converter to maximize efficiency for each power level and modulation type.

**4G:** The SKY77638-11 supports 1.4, 3, 5, 10, 15, 20, 30, 35, 40 MHz channel bandwidths. Similar to 3G operation, output power is controlled by varying the input power and $V_{CC}$ is adjusted using a DCDC converter to maximize efficiency for each power level.

3G / 4G Modulation scheme includes:

- WCDMA Voice Release 99
- HSDPA categories
- HSUPA
- HSPA+
- TD-SCDMA
- CDMA2000 1xRC1, 1xRC3
- CDMA2000 EVDO
- FDD LTE
- TDD LTE
- Uplink Carrier Aggregation (CA) support for
  Band 39 (up to 35 MHz) and Band 40/41 (up to 40 MHz)

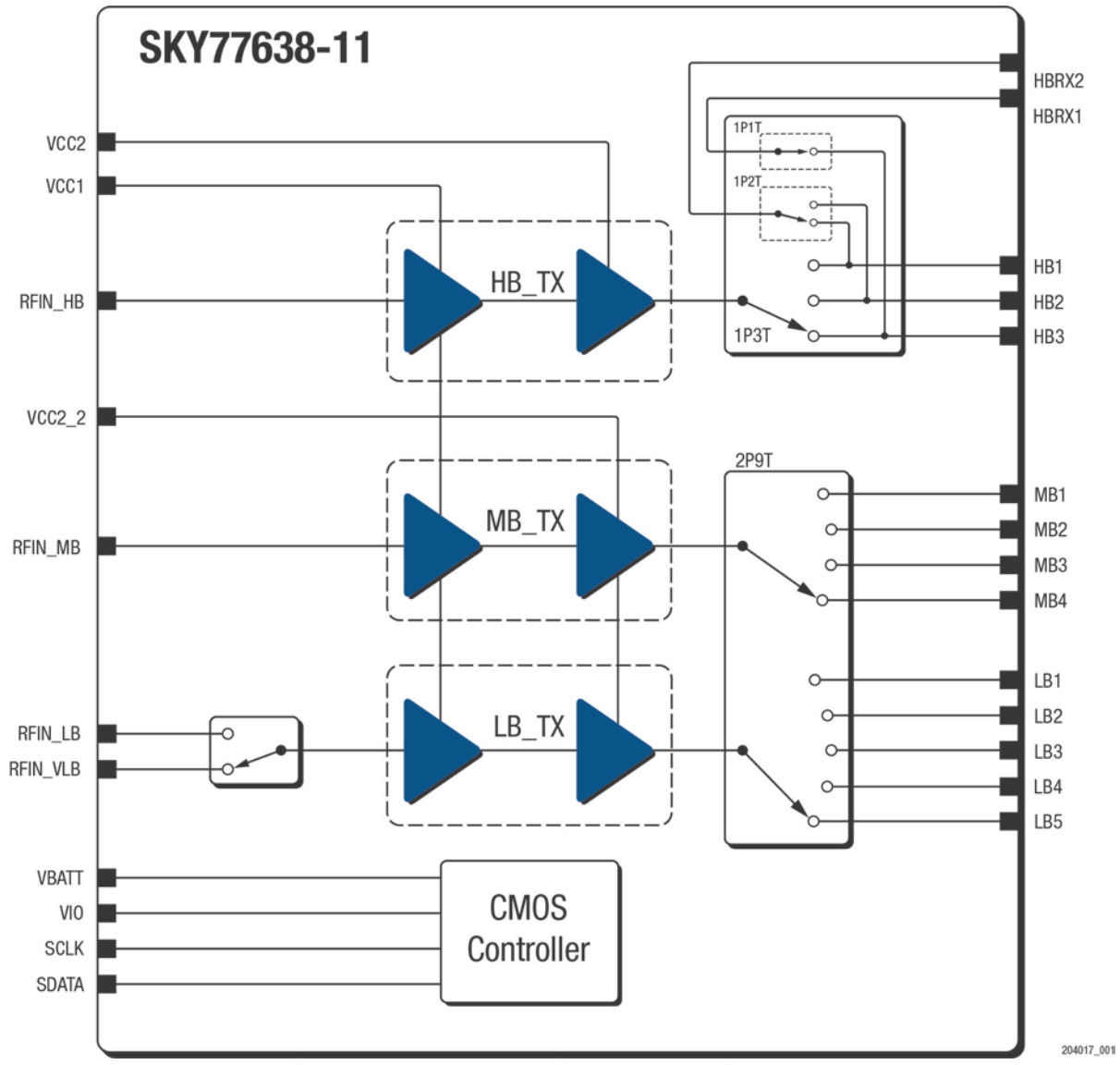



**Figure 1. SKY77638-11 Functional Block Diagram**

## Electrical Specifications

The following tables list the electrical characteristics of the SKY77638-11 Power Amplifier Module. The absolute maximum conditions are provided in Table1; recommended operating conditions are specified in Table 2. Tables 3 through 17 contain the performance characteristics of the SKY77638-11.

The SKY77638-11 is a static-sensitive electronic device and should not be stored nor operated near strong electrostatic fields. Detailed information on device dimensions, pad descriptions, packaging and handling can be found in later sections of this data sheet.

**Table 1. SKY77638-11 Absolute Maximum Conditions[1]**

| Parameter | | Symbol | Minimum | Nominal | Maximum | Unit |
|---|---|---|---|---|---|---|
| RF Input Power | | $P_{IN}$ | | 0 | 10 | dBm |
| Supply Voltage | No RF | $V_{BATT}$ | –1.2[2] | 3.4 | 6.0 | Volts |
| | | $V_{CC1}$, $V_{CC2}$, $V_{CC2\_2}$ | 0 | 3.4 | 6.0 | |
| | With RF | $V_{BATT}$ | 0 | 3.4 | 6.0 | |
| | | $V_{CC1}$, $V_{CC2}$, $V_{CC2\_2}$ | 0 | 3.4 | 5.5 | |
| Digital Control Lines | | VIO, SCLK, SDATA | 0.5 | | 2.2 | Volts |
| Case Temperature[3] | Operating | $T_{CASE}$ | –40 | 25 | +110 | °C |
| | Storage | $T_{STG}$ | –40 | | +150 | |
| ESD – Human Body Mode (HBM) | | $ESD_{HBM}$ | –1.5 | | 1.5 | kV |

1 *Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value.*

2 *Pulsed for up to 100 µs*

3 *Case Operating Temperature ($T_{CASE}$) refers to the temperature of the GROUND PAD at the underside of the package.*

**Table 2. SKY77638-11 Recommended Operating Conditions**

| Parameter | | Symbol | Minimum | Nominal | Maximum | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage | | $V_{CC1}$ | 0.55 | 3.4 | 4.6[1] | Volts |
| | | $V_{CC2}$, $V_{CC2\_2}$ | 0.55 | 3.4 | 4.6[1] | |
| | | $V_{BATT}$ | 3.0 | 3.4 | 4.8 | |
| MIPI RFFE Supply | | VIO | 1.65 | 1.8 | 1.95 | Volts |
| MIPI RFFE Signal Levels for SCLK, SDATA | Low | $V_{MIPI\_LOW}$ | 0.0 | 0.0 | 0.2 x VIO | Volts |
| | High | $V_{MIPI\_HIGH}$ | 0.8 x VIO | 1.8 | VIO | |
| Leakage Current | $V_{BATT}$ = 3.4 V | $I_{\_BATT\_LK}$ | | | 10 | µA |
| | $V_{CC1}$, $V_{CC2}$, $V_{CC2}$ = 3.4 V | $I_{\_CC\_LK}$ | | | 10 | |
| Case Operating Temperature Range | | $T_{RANGE}$ | –20 | +25 | +85 | °C |
| | | $T_{EXTENDED}$[2] | –40 | | +105 | |

1 *Derate Bands 7 and 30 FDD output power by 400 mW/V for VCC1, VCC2 above 3.8 V.*

2 *1.0 dB power backed-off*

**Table 3. SKY77638-11 Electrical Specifications – General**

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Turn On Time | $T_{ON}$ | Gain settled to within 0.5 dB of $G_P(P_{OUT} = P_{OUT\_MAX})$ | | | 5 | µs |
| Turn Off Time | $T_{OFF}$ | Gain ≤ $G_P(P_{OUT} = P_{OUT\_MAX})$ – 30 dB | | | 5 | µs |
| Mode Switching Time | $T_{MODE}$ | Time to transition from HPM to LPM, or LPM to HPM by changing state of Reg 0 [1] | | | 2.5 | µs |
| Switching Time | $T_{SW}$ | Time to transition from Iso to RX, Iso to TX, TX to RX, RX to TX, RX to Iso, and TX to Iso | | | 2.5 | µs |

**Table 4. SKY77638-11 Electrical Specifications for Nominal Operating Conditions – FDD LTE Band 7**

***Unless otherwise specified: $V_{BATT}$ = 3.8 V; $T_{CASE}$ = +25 °C; LTE Signal = QPSK/10 MHz/12RB for MPR = 0 and QPSK/20 MHz/100 RB for MPR = 1.***

| Characteristics | | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Operating Frequency | | $f_0$ | | 2500 | 2535 | 2570 | MHz |
| Maximum Output Power | | $P_{OUT\_MAX}$ | MPR = 0[1] | 28.5 | | | dBm |
| | | $P_{OUT\_MAX\_RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 27.5 | | | |
| Gain | | $G_{P\_NTC}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = +25 °C | 28.5 | 30.5 | 32.0 | dB |
| | | $G_{P\_RANGE}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = $T_{RANGE}$ | 26.5 | | 33.0 | |
| | | $G_{P\_LOW}$ | $P_{OUT}$ = 3 dBm, $V_{CC}$ = 0.55 V | 13.0 | | 22.0 | |
| Power Added Efficiency | | PAE | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 30 | | % |
| Total Supply Current[2] | | $I_{\_TOT\_MAX}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 650 | | mA |
| Adjacent Channel Leakage power Ratio | EUTRA | EUTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –38 | –35 | dBc |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –33 | |
| | UTRA1 | UTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –40 | –38 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –35 | |
| | UTRA2 | UTRA_ACLR2 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –43 | –41 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –39 | |
| Harmonic Suppression | Second | $2f_0$ | $P_{OUT}$ ≤ $P_{OUT\_MAX}$ | | | –21 | dBm |
| | Third | $3f_0$ | | | | –16 | |
| | Fourth | $4f_0$ | | | | –26 | |
| | Fifth | $5f_0$ | | | | –36 | |
| Tx Noise in Rx Bands[3] | Rx Band | $PNRX_{\_LTE}$ | 2620 MHz–2690 MHz | | | –126 | dBm/Hz |
| | GPS Rx | $PNRX_{\_GPS}$ | 1574 MHz–1577 MHz | | | –140 | |
| | BT, WLAN | $PNRX_{\_BT}$ | 2400 MHz–2452 MHz | | | –108 | |
| | WLAN | $PNRX_{\_5GHz}$ | 4900 MHz–5800 MHz | | | –140 | |
| EVM | | EVM | $V_{BATT}$ = 3.0 to 4.8 V, Load = 50 ohms, $T_{CASE}$ = $T_{RANGE}$ | | 3 | 5 | % |
| Input Voltage Standing Wave Ratio | | VSWR | | | 1.5:1 | | |
| Stability (Spurious output) | | S | Load VSWR = 6:1, all phase angles, $P_{OUT}$ ≤ $P_{OUT\_MAX}$, $V_{BATT}$ = 3.0 V to 4.8 V, $T_{CASE}$ = $T_{RANGE}$ | All spurious below –36 dBm | | | |
| Ruggedness | | Ru | Load VSWR = 10:1, all phase angles, $P_{OUT}$ ≤ $P_{OUT\_MAX}$, constant forward power, closed loop operation, $V_{BATT}$ = 4.8 V, $V_{CC}$ = 4.6 V, $T_{CASE}$ = +25 °C | No module damage or permanent degradation | | | |

*[1] MPR is the maximum power reduction as defined in 3GPP TS36.101*

*[2] $I_{\_TOT} = I_{BATT} + (I_{CC1} + I_{CC2})(V_{CC}/V_{BATT})(1/DC\_DC\_EFF)$. $V_{CC}$ ~ 3.4 V, DC_DC_EFF ~ 96%.*

*[3] Measured with 20 MHz/100RB LTE Waveform.*

**Table 5. SKY77638-11 Electrical Specifications for Nominal Operating Conditions – FDD LTE Band 30 (WCS)**

***Unless otherwise specified: $V_{BATT}$ = 3.8 V; $T_{CASE}$ = +25 °C; LTE Signal = QPSK/10 MHz/12RB for MPR = 0 and QPSK/10 MHz/50 RB for MPR = 1.***

| Characteristics | | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Operating Frequency | | $f_0$ | | 2305 | 2310 | 2315 | MHz |
| Maximum Output Power | | $P_{OUT\_MAX}$ | MPR = 0[1] | 28.5 | | | dBm |
| | | $P_{OUT\_MAX\_RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 27.5 | | | |
| Gain | | $G_{P\_NTC}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = +25 °C | 28.0 | 29.5 | 31.5 | dB |
| | | $G_{P\_RANGE}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = $T_{RANGE}$ | 26.5 | | 32.5 | |
| | | $G_{P\_LOW}$ | $P_{OUT}$ = 3 dBm, $V_{CC}$ = 0.55 V | 13.0 | | 22.0 | |
| Power Added Efficiency | | PAE | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 30 | | % |
| Total Supply Current[2] | | $I_{TOT\_MAX}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 650 | | mA |
| Adjacent Channel Leakage power Ratio | EUTRA | EUTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –38 | –35 | dBc |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –33 | |
| | UTRA1 | UTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –40 | –38 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –35 | |
| | UTRA2 | UTRA_ACLR2 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –43 | –41 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –39 | |
| Harmonic Suppression | Second | $2f_0$ | $P_{OUT} \leq P_{OUT\_MAX}$ | | | –15 | dBm |
| | Third | $3f_0$ | | | | –15 | |
| | Fourth | $4f_0$ | | | | –21 | |
| | Fifth | $5f_0$ | | | | –36 | |
| Tx Noise in Rx Bands[3] | GPS Rx | $P_{NRX\_GPS}$ | 1574 MHz–1577 MHz | | | –140 | dBm/Hz |
| | BT, WLAN | $P_{NRX\_BT}$ | 2400 MHz–2483.5 MHz | | | –113 | |
| | WLAN | $P_{NRX\_5GHz}$ | 4900 MHz–5800 MHz | | | –140 | |
| EVM | | EVM | $V_{BATT}$ = 3.0 to 4.8 V, Load = 50 ohms, $T_{CASE}$ = $T_{RANGE}$ | | 3 | 5 | % |
| Input Voltage Standing Wave Ratio | | VSWR | | | 1.8:1 | | |
| Stability (Spurious output) | | S | Load VSWR = 6:1, all phase angles, $P_{OUT} \leq P_{OUT\_MAX}$, $V_{BATT}$ = 3.0 V to 4.8 V, $T_{CASE}$ = $T_{RANGE}$ | All spurious below –36 dBm | | | |
| Ruggedness | | Ru | Load VSWR = 10:1, all phase angles, $P_{OUT} \leq P_{OUT\_MAX}$, constant forward power, closed loop operation, $V_{BATT}$ = 4.8 V, $V_{CC}$ = 4.6 V, $T_{CASE}$ = +25 °C | No module damage or permanent degradation | | | |

[1] *MPR is the maximum power reduction as defined in 3GPP TS36.101*

[2] *$I_{TOT}$ = $I_{BATT}$ + ($I_{CC1}$ + $I_{CC2}$)($V_{CC}$/$V_{BATT}$)(1/DC_DC_EFF). $V_{CC}$ ~ 3.4 V, DC_DC_EFF ~ 96%.*

[3] *Measured with 10 MHz/50RB LTE Waveform.*

**Table 6. SKY77638-11 Electrical Specifications for Nominal Operating Conditions – TDD LTE Band 38**

***Unless otherwise specified: $V_{BATT}$ = 3.8 V; $T_{CASE}$ = +25 °C; LTE Signal = QPSK/10 MHz/12RB for MPR = 0 and QPSK/20 MHz/100 RB for MPR = 1.***

| Characteristics | | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Operating Frequency | | $f_0$ | | 2570 | 2595 | 2620 | MHz |
| Maximum Output Power | | $P_{OUT\_MAX}$ | MPR = 0[1] | 28.5 | | | dBm |
| | | $P_{OUT\_MAX\_RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 27.5 | | | |
| Gain | | $G_{P\_NTC}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = +25 °C | 28.0 | 29.5 | 31.5 | dB |
| | | $G_{P\_RANGE}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = $T_{RANGE}$ | 26.5 | | 33.0 | |
| | | $G_{P\_LOW}$ | $P_{OUT}$ = 3 dBm, $V_{CC}$ = 0.55 V | 13.0 | | 22.0 | |
| Power Added Efficiency | | PAE | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 31 | | % |
| Total Supply Current[2] | | $I_{TOT\_MAX}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 630 | | mA |
| Adjacent Channel Leakage power Ratio | EUTRA | EUTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –38 | –35 | dBc |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –33 | |
| | | EUTRA_ACLR1_CA | $P_{OUT}$ = $P_{OUT\_MAX}$, Modulation = QPSK/40 MHz/200 RB | | –37 | | |
| | UTRA1 | UTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –40 | –38 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –35 | |
| | UTRA2 | UTRA_ACLR2 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –43 | –41 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –39 | |
| Harmonic Suppression | Second | $2f_0$ | $P_{OUT} \le P_{OUT\_MAX}$ | | | –21 | dBm |
| | Third | $3f_0$ | | | | –16 | |
| | Fourth | $4f_0$ | | | | –26 | |
| | Fifth | $5f_0$ | | | | –36 | |
| Tx Noise in Rx Bands[3] | GPS Rx | $P_{NRX\_GPS}$ | 1574 MHz–1577 MHz | | | –140 | dBm/Hz |
| | BT, WLAN | $P_{NRX\_BT}$ | 2400 MHz–2483.5 MHz | | | –113 | |
| | WLAN | $P_{NRX\_5GHz}$ | 4900 MHz–5800 MHz | | | –140 | |
| EVM | | EVM | $V_{BATT}$ = 3.0 to 4.8 V, Load = 50 ohms, $T_{CASE}$ = $T_{RANGE}$ | | 3 | 5 | % |
| Input Voltage Standing Wave Ratio | | VSWR | | | 1.5:1 | | |
| Stability (Spurious output) | | S | Load VSWR = 6:1, all phase angles, $P_{OUT} \le P_{OUT\_MAX}$, $V_{BATT}$ = 3.0 V to 4.8 V, $T_{CASE}$ = $T_{RANGE}$ | All spurious below –36 dBm | | | |
| Ruggedness | | Ru | Load VSWR = 10:1, all phase angles, $P_{OUT} \le P_{OUT\_MAX}$, constant forward power, closed loop operation, $V_{BATT}$ = 4.8 V, $V_{CC}$ = 4.6 V, $T_{CASE}$ = +25 °C | No module damage or permanent degradation | | | |

[1] *MPR is the maximum power reduction as defined in 3GPP TS36.101*

[2] *$I_{TOT}$ = $I_{BATT}$ + ($I_{CC1}$ + $I_{CC2}$)($V_{CC}$/$V_{BATT}$)(1/DC_DC_EFF). $V_{CC}$ ~ 3.4 V, DC_DC_EFF ~ 96%.*

[3] *Measured with 20 MHz/100RB LTE Waveform.*

**Table 7. SKY77638-11 Electrical Specifications for Nominal Operating Conditions – TDD LTE Band 40**

***Unless otherwise specified: $V_{BATT}$ = 3.8 V; $T_{CASE}$ = +25 °C; LTE Signal = QPSK/10 MHz/12RB for MPR = 0 and QPSK/20 MHz/100 RB for MPR = 1.***

| Characteristics | | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Operating Frequency | | $f_0$ | | 2300 | 2350 | 2400 | MHz |
| Maximum Output Power | | $P_{OUT\_MAX}$ | MPR = 0[1] | 28.5 | | | dBm |
| | | $P_{OUT\_MAX\_RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 27.5 | | | |
| Gain | | $G_{P\_NTC}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = +25 °C | 28.0 | 29.5 | 31.5 | dB |
| | | $G_{P\_RANGE}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = $T_{RANGE}$ | 26.5 | | 33.0 | |
| | | $G_{P\_LOW}$ | $P_{OUT}$ = 3 dBm, $V_{CC}$ = 0.55 V | 13.0 | | 22.0 | |
| Power Added Efficiency | | PAE | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 30 | | % |
| Total Supply Current[2] | | $I_{TOT\_MAX}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 650 | | mA |
| Adjacent Channel Leakage power Ratio | EUTRA | EUTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –38 | –35 | dBc |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –33 | |
| | | EUTRA_ACLR1_CA | $P_{OUT}$ = $P_{OUT\_MAX}$, Modulation = QPSK/40 MHz/200 RB | | –37 | | |
| | UTRA1 | UTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –40 | –38 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –35 | |
| | UTRA2 | UTRA_ACLR2 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –43 | –41 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –39 | |
| Harmonic Suppression | Second | $2f_0$ | $P_{OUT} \le P_{OUT\_MAX}$ | | | –15 | dBm |
| | Third | $3f_0$ | | | | –15 | |
| | Fourth | $4f_0$ | | | | –21 | |
| | Fifth | $5f_0$ | | | | –36 | |
| Tx Noise in Rx Bands[3] | GPS Rx | $P_{NRX\_GPS}$ | 1574 MHz–1577 MHz | | | –140 | dBm/Hz |
| | BT, WLAN | $P_{NRX\_BT}$ | 2447 MHz–2483.5 MHz | | | –104 | |
| | WLAN | $P_{NRX\_5GHz}$ | 4900 MHz–5800 MHz | | | –140 | |
| EVM | | EVM | $V_{BATT}$ = 3.0 to 4.8 V, Load = 50 ohms, $T_{CASE}$ = $T_{RANGE}$ | | 3 | 5 | % |
| Input Voltage Standing Wave Ratio | | VSWR | | | 1.8:1 | | |
| Stability (Spurious output) | | S | Load VSWR = 6:1, all phase angles, $P_{OUT} \le P_{OUT\_MAX}$, $V_{BATT}$ = 3.0 V to 4.8 V, $T_{CASE}$ = $T_{RANGE}$ | All spurious below –36 dBm | | | |
| Ruggedness | | Ru | Load VSWR = 10:1, all phase angles, $P_{OUT} \le P_{OUT\_MAX}$, constant forward power, closed loop operation, $V_{BATT}$ = 4.8 V, $V_{CC}$ = 4.6 V, $T_{CASE}$ = +25 °C | No module damage or permanent degradation | | | |

[1] *MPR is the maximum power reduction as defined in 3GPP TS36.101*

[2] *$I_{\_TOT}$ = IBATT + (ICC1 + ICC2)(VCC/VBATT)(1/DC_DC_EFF). $V_{CC}$ ~ 3.4 V, DC_DC_EFF ~ 96%.*

[3] *Measured with 20 MHz/100RB LTE Wave form.*

**Table 8. SKY77638-11 Electrical Specifications for Nominal Operating Conditions – TDD LTE Band 41, TDD AXGP Band**

***Unless otherwise specified: $V_{BATT}$ = 3.8 V; $T_{CASE}$ = +25 °C; LTE Signal = QPSK/10 MHz/12RB for MPR = 0 and QPSK/20 MHz/100 RB for MPR = 1.***

| Characteristics | | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Operating Frequency | | $f_0$ | | 2496 | 2595 | 2690 | MHz |
| Maximum Output Power | | $P_{OUT\_MAX}$ | MPR = 0[1] | 28.5 | | | dBm |
| | | $P_{OUT\_MAX\_RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 27.5 | | | |
| Gain | | $G_{P\_NTC}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = +25 °C | 28.0 | 29.5 | 32.0 | dB |
| | | $G_{P\_RANGE}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = $T_{RANGE}$ | 26.5 | | 33.5 | |
| | | $G_{P\_LOW}$ | $P_{OUT}$ = 3 dBm, $V_{CC}$ = 0.55 V | 13.0 | | 22.0 | |
| Power Added Efficiency | | PAE | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 30.5 | | % |
| Total Supply Current[2] | | $I_{TOT\_MAX}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 630 | | mA |
| Adjacent Channel Leakage power Ratio | EUTRA | EUTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –38 | –35 | dBc |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –33 | |
| | | EUTRA_ACLR1_CA | $P_{OUT}$ = $P_{OUT\_MAX}$, Modulation = QPSK/40 MHz/200 RB | | –37 | | |
| | UTRA1 | UTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –40 | –38 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –35 | |
| | UTRA2 | UTRA_ACLR2 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –43 | –41 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –39 | |
| Harmonic Suppression | Second | $2f_0$ | $P_{OUT} \le P_{OUT\_MAX}$ | | | –21 | dBm |
| | Third | $3f_0$ | | | | –16 | |
| | Fourth | $4f_0$ | | | | –26 | |
| | Fifth | $5f_0$ | | | | –36 | |
| Tx Noise in Rx Bands | GPS Rx | $P_{NRX\_GPS}$ | 1574 MHz–1577 MHz[3] | | | –140 | dBm/Hz |
| | BT, WLAN | $P_{NRX\_BT}$ | 2400 MHz–2452 MHz[3] | | | –104 | |
| | WLAN | $P_{NRX\_5GHz}$ | 4900 MHz–5800 MHz[3] | | | –140 | |
| EVM | | EVM | $V_{BATT}$ = 3.0 to 4.8 V, Load = 50 ohms, $T_{CASE}$ = $T_{RANGE}$ | | 3 | 5 | % |
| Input Voltage Standing Wave Ratio | | VSWR | | | 1.5:1 | | |
| Stability (Spurious output) | | S | Load VSWR = 6:1, all phase angles, $P_{OUT} \le P_{OUT\_MAX}$, $V_{BATT}$ = 3.0 V to 4.8 V, $T_{CASE}$ = $T_{RANGE}$ | All spurious below –36 dBm | | | |
| Ruggedness | | Ru | Load VSWR = 10:1, all phase angles, $P_{OUT} \le P_{OUT\_MAX}$, constant forward power, closed loop operation, $V_{BATT}$ = 4.8 V, $V_{CC}$ = 4.6 V, $T_{CASE}$ = +25 °C | No module damage or permanent degradation | | | |

*[1] MPR is the maximum power reduction as defined in 3GPP TS36.101*

*[2] $I_{\_TOT}$ = $I_{BATT}$ + ($I_{CC1}$ + $I_{CC2}$)($V_{CC}$/$V_{BATT}$)(1/DC_DC_EFF). $V_{CC}$ ~ 3.4 V, DC_DC_EFF ~ 96%.*

*[3] Measured with 20 MHz/100RB LTE Wave form.*

**Table 9. SKY77638-11 Electrical Specifications – Transmit WCDMA Mid-Band**

***Unless otherwise specified: $V_{BATT}$ = 3.8 V; $T_{CASE}$ = +25 °C; Voice RMC 12.2 kbps***

| Parameter | | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Frequency | Band 1 | $f$ | | 1920 | | 1980 | MHz |
| | Band 2 | | | 1850 | | 1910 | |
| | Band 3 | | | 1710 | | 1785 | |
| | Band 4 | | | 1710 | | 1755 | |
| Maximum Output Power | Band 4 | $P_{OUT\_MAX}$ | | 28.5 | | | dBm |
| | | $P_{OUT\_MAX\_RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 27.0 | | | |
| | Bands 1, 2, 3 | $P_{OUT\_MAX}$ | | 29.0 | | | |
| | | $P_{OUT\_MAX\_RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 27.5 | | | |
| Power Gain | Bands 1, 2 | $G_{P\_NTC}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | 27.0 | | 31.0 | dB |
| | | $G_{P\_RANGE}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = $T_{RANGE}$ | 26.0 | | 32.0 | |
| | Bands 3, 4 | $G_{P\_NTC}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | 27.5 | | 31.0 | |
| | | $G_{P\_RANGE}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = $T_{RANGE}$ | 26.5 | | 32.5 | |
| | | $G_{P\_LOW}$ | $P_{OUT}$ = 3 dBm, $V_{CC}$ = 0.55 V | | | 20.0 | |
| Power Added Efficiency | | PAE | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 38 | | % |
| Total Supply Current[1] | | $I_{TOT\_MAX\_B4}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 495 | | mA |
| | | $I_{TOT\_MAX\_B2,3}$ | | | 560 | | |
| | | $I_{TOT\_MAX\_B1}$ | | | 585 | | |
| Adjacent Channel Leakage power Ratio | 5 MHz offset | ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –40 | –38 | dBc |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –36 | |
| | 10 MHz offset | ACLR2 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –52 | –48 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –46 | |
| Modulation Accuracy | | EVM | $V_{BATT}$ = 3.0 V to 4.8 V, Load = 50 ohms, $T_{CASE}$ = $T_{RANGE}$ | | 2.5 | 5.0 | % |
| Harmonics | Second | $2f_{0\_B1,2}$ | $P_{OUT} \le P_{OUT\_MAX}$ | | | –15 | dBm |
| | | $2f_{0\_B3,4}$ | | | | –12 | |
| | Third | $3f_0$ | | | | –15 | |
| | Fourth and higher | $4f_0$ | | | | –20 | |
| Noise Power in Rx Band with WCDMA Modulated Tx[2] | | | | | | | dBm/Hz |
| B1 $f_{TX}$ = 1920–1980 MHz | | $P_{NOISE\_DPX}$ | $f_{RX}$ = $f_{TX}$ +190 MHz | | –133.5 | | |
| B2 $f_{TX}$ = 1850–1910 MHz | | | $f_{RX}$ = $f_{TX}$ +80 MHz | | –133.0 | | |
| B3 $f_{TX}$ = 1710–1785 MHz | | | $f_{RX}$ = $f_{TX}$ +95 MHz | | –132.5 | | |
| B4 $f_{TX}$ = 1710–1755 MHz | | | $f_{RX}$ = $f_{TX}$ +400 MHz | | –137.0 | | |
| GPS Rx | | $P_{NOISE\_GPS}$ | $f_{RX}$ = 1574 MHz–1577 MHz | | –134.0 | | |
| BT, WLAN | | $P_{NOISE\_BT}$ | $f_{RX}$ = 2400 MHz–2483.5 MHz | | –141.0 | | |
| WLAN | | $P_{NOISE\_5GHz}$ | $f_{RX}$ = 4900 MHz–5800 MHz | | –155.0 | | |
| Input VSWR | | $VSWR_{IN}$ | $P_{OUT} \le P_{OUT\_MAX}$ | | 1.3:1 | | |
| Stability | | S | Load VSWR = 6:1, all phase angles, $P_{OUT} \le P_{OUT\_MAX}$, $V_{BATT}$ = 3.0 V to 4.8 V, $T_{CASE}$ = $T_{RANGE}$ | All spurious below –36 dBm | | | |
| Ruggedness | | Ru | Load VSWR = 10:1, all phase angles, $P_{OUT} \le P_{OUT\_MAX}$, constant forward power, closed loop operation, $V_{BATT}$ = 4.8 V, $V_{CC}$ = 4.6 V, $T_{CASE}$ = +25 °C | No module damage or permanent degradation | | | |

[1] *$I_{TOT}$ = $I_{BATT}$ + ($I_{CC1}$ + $I_{CC2}$)($V_{CC}$/$V_{BATT}$)(1/DC_DC_EFF). VCC ~ 3.3 V. DC_DC_EFF ~ 96%.*

[2] *Harmonically-related spurious excluded.*

**Table 10. SKY77638-11 Electrical Specifications – Transmit WCDMA Low Band**

***Unless otherwise specified: $V_{BATT}$ = 3.8 V; $T_{CASE}$ = +25 °C; Voice RMC 12.2 kbps***

| Parameter | | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Frequency | Band 5 | $f$ | | 824 | | 849 | MHz |
| | Band 8 | | | 880 | | 915 | |
| Maximum Output Power | Bands 5, 8 | $P_{OUT\_MAX}$ | | 28.5 | | | dBm |
| | | $P_{OUT\_MAX\_RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 27.0 | | | |
| Power Gain | | $G_{P\_NTC}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | 28.0 | | 31.5 | dB |
| | | $G_{P\_RANGE}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = $T_{RANGE}$ | 27.0 | | 33.0 | |
| | | $G_{P\_LOW}$ | $P_{OUT}$ = 3 dBm, $V_{CC}$ = 0.6 V | | | 20.0 | |
| Power Added Efficiency | | $PAE_{B5}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 42 | | % |
| | | $PAE_{B8}$ | | | 41 | | |
| Total Supply Current[1] | | $I_{TOT\_MAX\_B5}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 465 | | mA |
| | | $I_{TOT\_MAX\_B8}$ | | | 480 | | |
| Adjacent Channel Leakage power Ratio | 5 MHz offset | ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –40 | –38 | dBc |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –36 | |
| | 10 MHz offset | ACLR2 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –52 | –48 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –46 | |
| Modulation Accuracy | | EVM | $V_{BATT}$ = 3.0 V to 4.8 V, Load = 50 ohms, $T_{CASE}$ = $T_{RANGE}$ | | 2.5 | 5.0 | % |
| Harmonics | Second | $2f_0$ | $P_{OUT} \le P_{OUT\_MAX}$ | | | –15 | dBm |
| | Third | $3f_0$ | | | | –15 | |
| | Fourth and higher | $4f_0$ | | | | –20 | |
| Noise Power in Rx Band with WCDMA Modulated Tx[2] | | | | | | | dBm/Hz |
| B5 $f_{TX}$ = 824–849 MHz | | $P_{NOISE\_DPX}$ | $f_{RX}$ = $f_{TX}$ +45 MHz | | –131.5 | | |
| B8 $f_{TX}$ = 880–915 MHz | | | $f_{RX}$ = $f_{TX}$ +45 MHz | | –131.5 | | |
| | GPS Rx | $P_{NOISE\_GPS}$ | $f_{RX}$ = 1574 MHz–1577 MHz | | –155.0 | | |
| | BT, WLAN | $P_{NOISE\_BT}$ | $f_{RX}$ = 2400 MHz–2483.5 MHz | | –155.0 | | |
| | WLAN | $P_{NOISE\_5GHz}$ | $f_{RX}$ = 4900 MHz–5800 MHz | | –155.0 | | |
| Input VSWR | | $VSWR_{IN}$ | $P_{OUT} \le P_{OUT\_MAX}$ | | 1.6:1 | | |
| Stability | | S | Load VSWR = 5:1, all phase angles, $P_{OUT} \le P_{OUT\_MAX}$, $V_{BATT}$ = 3.0 V to 4.8 V, $T_{CASE}$ = $T_{RANGE}$ | All spurious below –36 dBm | | | |
| Ruggedness | | Ru | Load VSWR = 10:1, all phase angles, $P_{OUT} \le P_{OUT\_MAX}$, constant forward power, closed loop operation, $V_{BATT}$ = 4.8 V, $V_{CC}$ = 4.6 V, $T_{CASE}$ = +25 °C | No module damage or permanent degradation | | | |

[1] *$I_{TOT}$ = $I_{BATT}$ + ($I_{CC1}$ + $I_{CC2}$)($V_{CC}$/$V_{BATT}$)(1/DC_DC_EFF). VCC ~ 3.0 V. DC_DC_EFF ~ 96%.*

[2] *Harmonically-related spurious excluded.*

**Table 11. SKY77638-11 Electrical Specifications – Transmit LTE Mid-Band**

***Unless otherwise specified: $V_{BATT}$ = 3.8 V; $T_{CASE}$ = +25 °C; LTE Signal = QPSK/10 MHz/12RB for MPR = 0 and QPSK/20 MHz/100 RB for MPR = 1.***

| Parameter | | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Frequency | Band 1 | $f$ | | 1920 | | 1980 | MHz |
| | Band 2 | | | 1850 | | 1910 | |
| | Band 3 | | | 1710 | | 1785 | |
| | Band 4 | | | 1710 | | 1755 | |
| | Band 25 | | | 1850 | | 1915 | |
| Maximum Output Power | Band 4 | $P_{OUT\_MAX}$ | | 27.5 | | | dBm |
| | | $P_{OUT\_MAX\_RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 26.0 | | | |
| | Bands 1, 2, 3, 25 | $P_{OUT\_MAX}$ | | 28.0 | | | |
| | | $P_{OUT\_MAX\_RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 26.5 | | | |
| Power Gain | | $G_{P\_NTC}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | 28.0 | | 32.0 | dB |
| | | $G_{P\_RANGE}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = $T_{RANGE}$ | 27.0 | | 33.0 | |
| | | $G_{P\_LOW}$ | $P_{OUT}$ = 3 dBm, $V_{CC}$ = 0.55 V | | | 22.0 | dB |
| Power Added Efficiency | | $PAE_{\_B1}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 33.5 | | % |
| | | $PAE_{\_B2,3,4}$ | | | 34.5 | | |
| Total Supply Current[1] | | $I_{\_TOT\_MAX\_B4}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 450 | | mA |
| | | $I_{\_TOT\_MAX\_B2,3,25}$ | | | 495 | | |
| | | $I_{\_TOT\_MAX\_B1}$ | | | 525 | | |
| Adjacent Channel Leakage power Ratio | EUTRA | EUTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –38 | –36 | dBc |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –33 | |
| | | EUTRA_ACLR1_CA | $P_{OUT}$ = $P_{OUT\_MAX}$, Modulation = QPSK/40 MHz/200 RB | | –37 | | |
| | UTRA1 | UTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –40 | –37 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –36 | |
| | UTRA2 | UTRA_ACLR2 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –43 | –41 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –39 | |
| Modulation Accuracy | | EVM | $V_{BATT}$ = 3.0 V to 4.8 V, Load = 50 ohms, $T_{CASE}$ = $T_{RANGE}$ | | 2.5 | 5.0 | % |
| Harmonics | Second | $2f_{0\_B1,2}$ | $P_{OUT}$ ≤ $P_{OUT\_MAX}$ | | | –20 | dBm |
| | | $2f_{0\_B3,4}$ | | | | –12 | |
| | Third | $3f_{0\_B1,2}$ | | | | –15 | |
| | | $3f_{0\_B3,4}$ | | | | –12 | |
| | Fourth and higher | $4f_0$ | | | | –20 | |
| Noise Power in Rx Band with LTE[2] | | | | | | | dBm/Hz |
| B1 $f_{TX}$ = 1920–1980 MHz | | $P_{NOISE\_DPX}$ | $f_{RX}$ = $f_{TX}$ +190 MHz | | –133.0 | | |
| B2 $f_{TX}$ = 1850–1910 MHz | | | $f_{RX}$ = $f_{TX}$ +80 MHz | | –131.5 | | |
| B25 $f_{TX}$ = 1850–1915 MHz | | | $f_{RX}$ = $f_{TX}$ +80 MHz | | –131.5 | | |
| B3 $f_{TX}$ = 1710–1785 MHz | | | $f_{RX}$ = $f_{TX}$ +95 MHz | | –132.6 | | |
| B4 $f_{TX}$ = 1710–1755 MHz | | | $f_{RX}$ = $f_{TX}$ +400 MHz | | –136.0 | | |
| GPS Rx | | $P_{NOISE\_GPS}$ | $f_{RX}$ = 1574 MHz–1577 MHz | | –133.0 | | |
| BT, WLAN | | $P_{NOISE\_BT}$ | $f_{RX}$ = 2400 MHz–2483.5 MHz | | –141.0 | | |
| WLAN | | $P_{NOISE\_5GHz}$ | $f_{RX}$ = 4900 MHz–5800 MHz | | –155.0 | | |
| Input VSWR | | $VSWR_{IN}$ | $P_{OUT}$ ≤ $P_{OUT\_MAX}$ | | 1.3:1 | | |
| Stability | | S | Load VSWR = 6:1, all phase angles, $P_{OUT}$ ≤ $P_{OUT\_MAX}$, $V_{BATT}$ = 3.0 V to 4.8 V, $T_{CASE}$ = $T_{RANGE}$ | All spurious below –36 dBm | | | |
| Ruggedness | | Ru | Load VSWR = 10:1, all phase angles, $P_{OUT}$ ≤ $P_{OUT\_MAX}$, constant forward power, closed loop operation, $V_{BATT}$ = 4.8 V, $V_{CC}$ = 4.6 V, $T_{CASE}$ = +25 °C | No module damage or permanent degradation | | | |

[1] *$I_{\_TOT}$ = $I_{BATT}$ + ($I_{CC1}$ + $I_{CC2}$)($V_{CC}$/$V_{BATT}$)(1/DC_DC_EFF). $V_{CC}$ ~3.3 V. DC_DC_EFF ~ 96%.*

[2] *QPSK/10 MHz/1RB; Harmonically-related spurious excluded.*

**Table 12-1. SKY77638-11 Electrical Specifications – Transmit LTE Low Band**

***Unless otherwise specified: $V_{BATT}$ = 3.8 V; $T_{CASE}$ = +25 °C; LTE Signal = QPSK/10 MHz/12RB for MPR = 0 and QPSK/20 MHz/100 RB for MPR = 1.***

| Parameter | | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Frequency | Band 5 | $f$ | | 824 | | 849 | MHz |
| | Band 8 | | | 880 | | 915 | |
| | Band 12 | | | 699 | | 716 | |
| | Band 13 | | | 777 | | 787 | |
| | Band 17 | | | 704 | | 716 | |
| | Band 20 | | | 832 | | 862 | |
| | Band 26 | | | 814 | | 849 | |
| | Band 28 | | | 703 | | 748 | |
| Maximum Output Power | Bands 5,8,20,26 | $P_{OUT\_MAX}$ | | 27.5 | | | dBm |
| | | $P_{OUT\_MAX\_RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 26.0 | | | |
| | Bands 12,13,17, 28 | $P_{OUT\_MAX}$ | | 28.0 | | | |
| | | $P_{OUT\_MAX\_ RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 26.5 | | | |
| Power Gain | Bands 12,13,17,28 | $G_{P\_NTC}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | 28.5 | | 32.0 | dB |
| | | $G_{P\_ RANGE}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = $T_{RANGE}$ | 27.5 | | 33.5 | |
| | Bands 5,8,20,26 | $G_{P\_NTC}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | 28.0 | | 32.0 | |
| | | $G_{P\_ RANGE}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = $T_{RANGE}$ | 27.0 | | 33.0 | |
| | | $G_{P\_LOW}$ | $P_{OUT}$ = 3 dBm, $V_{CC}$ = 0.6 V | | | 22.0 | |
| Power Added Efficiency | Bands 12,17,28 | PAE | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 35 | | % |
| | Bands 5,8,13, 20,26 | | | | 36 | | |
| Total Supply Current[1] | | $I_{\_TOT\_MAX\_B12,17,28}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 490 | | mA |
| | | $I_{\_TOT\_MAX\_B13}$ | | | 460 | | |
| | | $I_{\_TOT\_MAX\_B5,8,20,26}$ | | | 430 | | |
| Adjacent Channel Leakage power Ratio | EUTRA | $EUTRA_{\_ACLR1}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –39 | –36 | dBc |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_ RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –33 | |
| | UTRA1 | $UTRA_{\_ACLR1}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –40 | –37 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_ RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –36 | |
| | UTRA2 | $UTRA_{\_ACLR2}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –43 | –41 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_ RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –39 | |

**Table 12-2. SKY77638-11 Electrical Specifications – Transmit LTE Low Band**

***Unless otherwise specified: $V_{BATT}$ = 3.8 V; $T_{CASE}$ = +25 °C; LTE Signal = QPSK/10 MHz/12RB for MPR = 0 and QPSK/20 MHz/100 RB for MPR = 1.***

| Parameter | | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Modulation Accuracy | | EVM | $V_{BATT}$ = 3.0 V to 4.8 V, Load = 50 ohms, $T_{CASE}$ = $T_{RANGE}$ | | 2.5 | 5.0 | % |
| Harmonics | Second Bands 12,17,28 | $2f_0$ | $P_{OUT} \le P_{OUT\_MAX}$ | | | –4 | dBm |
| | Second Bands 5,8,13,20,26 | | | | | –15 | |
| | Third | $3f_0$ | | | | –12 | |
| | Fourth and higher | $4f_0$ | | | | –20 | |
| Noise Power in Rx Band with LTE[2] | | | | | | | dBm/Hz |
| | B26 $f_{TX}$ = 814–849 MHz | $P_{NOISE\_DPX}$ | $f_{RX} = f_{TX}$ + 45 MHz | | –133.5 | | |
| | B5 $f_{TX}$ = 824–849 MHz | | $f_{RX} = f_{TX}$ + 45 MHz | | –133.5 | | |
| | B8 $f_{TX}$ = 880–915 MHz | | $f_{RX} = f_{TX}$ + 45 MHz | | –133.3 | | |
| | B13 $f_{TX}$ = 777–787 MHz | | $f_{RX} = f_{TX}$ – 31 MHz | | –132.7 | | |
| | B17 $f_{TX}$ = 704–716 MHz | | $f_{RX} = f_{TX}$ + 30 MHz | | –131.0 | | |
| | B20 $f_{TX}$ = 832–862 MHz | | $f_{RX} = f_{TX}$ – 41 MHz | | –133.0 | | |
| | B28 $f_{TX}$ = 703–748 MHz | | $f_{RX}$ = 758–803 MHz | | –134.0 | | |
| | GPS Rx | $P_{NOISE\_GPS}$ | $f_{RX}$ = 1574 MHz–1577 MHz | | –155.0 | | |
| | BT, WLAN | $P_{NOISE\_BT}$ | $f_{RX}$ = 2400 MHz–2483.5 MHz | | –155.0 | | |
| | WLAN | $P_{NOISE\_5GHz}$ | $f_{RX}$ = 4900 MHz–5800 MHz | | –155.0 | | |
| Input VSWR | | $VSWR_{IN}$ | $P_{OUT} \le P_{OUT\_MAX}$ | | 1.6:1 | | |
| Stability | | S | Load VSWR = 6:1, all phase angles, $P_{OUT} \le P_{OUT\_MAX}$, $V_{BATT}$ = 3.0 V to 4.8 V, $T_{CASE}$ = $T_{RANGE}$ | All spurious below –36 dBm | | | |
| Ruggedness | | Ru | Load VSWR = 10:1, all phase angles, $P_{OUT} \le P_{OUT\_MAX}$, constant forward power, closed loop operation, $V_{BATT}$ = 4.8 V, $V_{CC}$ = 4.6 V, $T_{CASE}$ = +25 °C | No module damage or permanent degradation | | | |

*1 $I\_TOT = I_{BATT} + (I_{CC1} + I_{CC2})(V_{CC}/V_{BATT})(1/DC\_DC\_EFF)$. VCC ~ 3.2 V. DC_DC_EFF ~ 96%.*

*2 QPSK/10 MHz/1RB; Harmonically-related spurious excluded.*

**Table 13. SKY77638-11 Electrical Specifications – TD-SCDMA Bands 34, 39**

***Unless otherwise specified: $V_{BATT}$ = 3.8 V; $T_{CASE}$= +25 °C; Voice Modulation***

| Parameter | | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Frequency | Band 34 | $f$ | | 2010 | | 2025 | MHz |
| | Band 39 | | | 1880 | | 1920 | |
| Maximum Output Power | | $P_{OUT\_MAX}$ | | 28.5 | | | dBm |
| | | $P_{OUT\_MAX\_RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 27.0 | | | |
| Power Gain | | $G_{P\_NTC}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | 27.5 | 30.0 | 31.0 | dB |
| | | $G_{P\_RANGE}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = $T_{RANGE}$ | 26.5 | | 32.5 | |
| | | $G_{P\_LOW}$ | $P_{OUT}$ = 3 dBm, $V_{CC}$ = 0.55 V | | | 20.0 | dB |
| Power Added Efficiency | | $PAE_{B39}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 39.0 | | % |
| | | $PAE_{B34}$ | | | 37.5 | | |
| Total Supply Current[1] | | $I_{TOT\_MAX\_B39}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 490 | | mA |
| | | $I_{TOT\_MAX\_B34}$ | | | 515 | | |
| Adjacent Channel Leakage Power Ratio | 1.6 MHz offset | ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –40 | –38 | dBc |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –36 | |
| | 3.2 MHz offset | ACLR2 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –52 | –48 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –46 | |
| Modulation Accuracy | | EVM | $V_{BATT}$ = 3.0 V to 4.8 V, Load = 50 ohms, $T_{CASE}$ = $T_{RANGE}$ | | 2.5 | 5.0 | % |
| Harmonics | Second | $f2$ | $P_{OUT}$ ≤ $P_{OUT\_MAX}$ | | | –20 | dBm |
| | Third | $f3$ | | | | –13 | |
| | Fourth and higher | $4f$ | | | | –20 | |
| Noise Power in Coexistence Bands[2] | | | | | | | dBm/Hz |
| | GPS Rx | $P_{NOISE\_GPS}$ | $f_{RX}$ = 1574 MHz–1577 MHz | | –133 | | |
| | BT, WLAN | $P_{NOISE\_BT}$ | $f_{RX}$ = 2400 MHz–2483.5 MHz | | –141 | | |
| | WLAN | $P_{NOISE\_5GHz}$ | $f_{RX}$ = 4900 MHz–5800 MHz | | –155 | | |
| Input VSWR | | $VSWR_{IN}$ | $P_{OUT}$ ≤ $P_{OUT\_MAX}$ | | 1.3:1 | | |
| Stability | | S | Load VSWR = 6:1, all phase angles, $P_{OUT}$ ≤ $P_{OUT\_MAX}$, $V_{BATT}$ = 3.0 V to 4.8 V, $T_{CASE}$ = $T_{RANGE}$ | All spurious below –36 dBm | | | |
| Ruggedness | | Ru | Load VSWR = 10:1, all phase angles, $P_{OUT}$ ≤ $P_{OUT\_MAX}$, constant forward power, closed loop operation, $V_{BATT}$ = 4.8 V, $V_{CC}$ = 4.6 V, $T_{CASE}$ = +25 °C | No module damage or permanent degradation | | | |

[1] *$I_{TOT}$ = $I_{BATT}$ + ($I_{CC1}$ + $I_{CC2}$)($V_{CC}$/$V_{BATT}$)(1/DC_DC_EFF). $V_{CC}$ ~ 3.0 V. DC_DC_EFF ~ 96%.*

[2] *Harmonically-related spurious excluded.*

**Table 14. SKY77638-11 Electrical Specifications – Transmit TDD LTE Band 39**

***Unless otherwise specified: $V_{BATT}$ = 3.8 V; $T_{CASE}$ = +25 °C; LTE Signal = QPSK/10 MHz/12RB for MPR = 0 and QPSK/20 MHz/100RB for MPR = 1.***

| Parameter | | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Frequency | Band 39 | $f$ | | 1880 | | 1920 | MHz |
| Maximum Output Power | | $P_{OUT\_MAX}$ | | 27.5 | | | dBm |
| | | $P_{OUT\_MAX\_RANGE}$ | $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | 26.0 | | | |
| Power Gain | | $G_{P\_NTC}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | 28.0 | | 31.5 | dB |
| | | $G_{P\_RANGE}$ | $P_{OUT}$ = $P_{OUT\_MAX}$, $T_{CASE}$ = $T_{RANGE}$ | 27.0 | | 33.0 | |
| | | $G_{P\_LOW}$ | $P_{OUT}$ = 3 dBm, $V_{CC}$ = 0.55 V | | | 20.0 | |
| Power Added Efficiency | | PAE | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 33 | | % |
| Total Supply Current[1] | | $I_{TOT\_MAX}$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | 460 | | mA |
| Adjacent Channel Leakage power Ratio | EUTRA | EUTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –39 | –36 | dBc |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –33 | |
| | | EUTRA_ACLR1_CA | $P_{OUT}$ = $P_{OUT\_MAX}$, Modulation = QPSK/35 MHz/175 RB | | –37 | | |
| | UTRA1 | UTRA_ACLR1 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –40 | –37 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –36 | |
| | UTRA2 | UTRA_ACLR2 | $P_{OUT}$ = $P_{OUT\_MAX}$ | | –43 | –41 | |
| | | | $P_{OUT}$ = $P_{OUT\_MAX\_RANGE}$, $V_{BATT}$ = $V_{CC}$ = 3.0 V, $T_{CASE}$ = $T_{RANGE}$ | | | –39 | |
| Modulation Accuracy | | EVM | $V_{BATT}$ = 3.0 to 4.8 V, Load = 50 ohms, $T_{CASE}$ = $T_{RANGE}$ | | 2.5 | 5.0 | % |
| Harmonics | Second | $f2$ | $P_{OUT}$ = $P_{OUT\_MAX}$ | | | –20 | dBm |
| | Third | $f3$ | | | | –15 | |
| | Fourth and higher | $4f$ | | | | –20 | |
| Noise Power in Coexistence Bands[2] | | | | | | | dBm/Hz |
| | GPS Rx | $P_{NOISE\_GPS}$ | $f_{RX}$ = 1574 MHz–1577 MHz | | –133 | | |
| | BT, WLAN | $P_{NOISE\_BT}$ | $f_{RX}$ = 2400 MHz–2483.5 MHz | | –141 | | |
| | WLAN | $P_{NOISE\_5GHz}$ | $f_{RX}$ = 4900 MHz–5800 MHz | | –155 | | |
| Input VSWR | | $VSWR_{IN}$ | $P_{OUT} \leq P_{OUT\_MAX}$ | | 1.3:1 | | |
| Stability | | S | Load VSWR = 6:1, all phase angles, $P_{OUT} \leq P_{OUT\_MAX}$, $V_{BATT}$ = 3.0 V to 4.8 V, $T_{CASE}$ = $T_{RANGE}$ | All spurious below –36 dBm | | | |
| Ruggedness | | Ru | Load VSWR = 10:1, all phase angles, $P_{OUT} \leq P_{OUT\_MAX}$, constant forward power, closed loop operation, $V_{BATT}$ = 4.8 V, $V_{CC}$ = 4.6 V, $T_{CASE}$ = +25 °C | No module damage or permanent degradation | | | |

[1] *$I_{TOT}$ = $I_{BATT}$ + ($I_{CC1}$ + $I_{CC2}$)($V_{CC}$/$V_{BATT}$)(1/DC_DC_EFF). VCC ~ 3.4 V. DC_DC_EFF ~ 96%.*

[2] *QPSK/10 MHz/1RB; Harmonically-related spurious excluded.*

**Table 15. SKY77638-11 Electrical Specifications – Transmit CDMA2000 Low Band**

***Unless otherwise specified: VBATT = 3.8 V; TCASE = +25 °C; 1x RC1***

| Parameter | | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Frequency | Band BC0 | $f$ | | 815 | | 849 | MHz |
| | Band BC10 | | | 806 | | 901 | |
| Maximum Output Power | | POUT_MAX | | 28.5 | | | dBm |
| | | POUT_MAX_ RANGE | VBATT = VCC = 3.0 V, TCASE = TRANGE | 27.0 | | | |
| Power Gain | | GP_NTC | POUT = POUT_MAX | 28.0 | | 31.5 | dB |
| | | GP_ RANGE | POUT = POUT_MAX, TCASE = TRANGE, | 27.0 | | 33.0 | |
| | | GP_LOW | POUT = 3 dBm, VCC = 0.6 V | | | 20.0 | dB |
| Power Added Efficiency | | PAE | POUT = POUT_MAX | | 39 | | % |
| Total Supply Current[1] | | I_TOT_MAX | POUT = POUT_MAX | | 505 | | mA |
| Adjacent Channel Leakage power Ratio | 885 kHz offset | ACLR1 | POUT = POUT_MAX | | –50 | –47 | dBc |
| | | | POUT = POUT_MAX_ RANGE, VBATT = VCC = 3.0 V, TCASE = TRANGE | | | –45 | |
| | 1.98 MHz offset | ACLR2 | POUT = POUT_MAX | | –60 | –58 | |
| | | | POUT = POUT_MAX_ RANGE, VBATT = VCC = 3.0 V, TCASE = TRANGE | | | –57 | |
| Modulation Accuracy | | EVM | VBATT = 3.0 V to 4.8 V, Load = 50 ohms, TCASE = TRANGE | | 2.5 | 5.0 | % |
| Harmonics | Second | $2f_O$ | POUT ≤ POUT_MAX, MBW = 1 MHz | | | –13 | dBm |
| | Third | $3f_O$ | | | | –9 | |
| | Fourth and higher | $4f_O$ | | | | –20 | |
| Noise Power in Rx Band[2] | | | | | | | dBm/Hz |
| BC0 $f_{TX}$ = 815 MHz –849 MHz | | PNOISE_DPX | $f_{RX} = f_{TX}$ +45 MHz | | –133 | | |
| BC10 $f_{TX}$ = 806 MHz –901 MHz | | | $f_{RX} = f_{TX}$ +45 MHz | | –133 | | |
| GPS Rx | | PNOISE_GPS | $f_{RX}$ = 1574 MHz–1577 MHz | | –155 | | |
| BT, WLAN | | PNOISE_BT | $f_{RX}$ = 2400 MHz–2483.5 MHz | | –155 | | |
| WLAN | | PNOISE_5GHz | $f_{RX}$ = 4900 MHz–5800 MHz | | –155 | | |
| Input VSWR | | VSWR_IN | POUT ≤ POUT_MAX | | 1.6:1 | | |
| Stability | | S | Load VSWR = 6:1, all phase angles, POUT ≤ POUT_MAX, VBATT = 3.0 V to 4.8 V, TCASE = TRANGE | All spurious below –36 dBm | | | |
| Ruggedness | | Ru | Load VSWR = 10:1, all phase angles, POUT ≤ POUT_MAX, constant forward power, closed loop operation, VBATT = 4.8 V, VCC = 4.6 V, TCASE = +25 °C | No module damage or permanent degradation | | | |

*[1] I_TOT = IBATT + (ICC1 + ICC2)(VCC/VBATT)(1/DC_DC_EFF). VCC = 3.4 V. DC_DC_EFF ~ 96%.*

*[3] Harmonically-related spurious excluded.*

**Table 16. SKY77638-11 Electrical Specifications – Transmit CDMA2000 Mid-Band**

***Unless otherwise specified: VBATT = 3.8 V; TCASE = +25 °C; 1x RC1***

| Parameter | | Symbol | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Frequency | Band BC15 | $f$ | | 1710 | | 1755 | MHz |
| | Band BC4 | | | 1750 | | 1780 | |
| | Band BC1 | | | 1850 | | 1910 | |
| | Band BC6 | | | 1920 | | 1980 | |
| Maximum Output Power | Bands BC6, BC15 | POUT_MAX | | 28.5 | | | dBm |
| | | POUT_MAX_ RANGE | VBATT = VCC = 3.0 V, TCASE = TRANGE | 27.0 | | | |
| | Bands BC1, BC4 | POUT_MAX | | 28.75 | | | |
| | | POUT_MAX_ RANGE | VBATT = VCC = 3.0 V, TCASE = TRANGE | 27.25 | | | |
| Power Gain | BC1, BC6 | GP_NTC | POUT = POUT_MAX | 27.0 | | 30.5 | dB |
| | | GP_ RANGE | POUT = POUT_MAX_ETC, TCASE = TRANGE | 26.0 | | 32.0 | |
| | BC4, BC15 | GP_NTC | POUT = POUT_MAX | 27.5 | | 31.0 | |
| | | GP_RANGE | POUT = POUT_MAX_ETC, TCASE = TRANGE | 26.5 | | 32.5 | |
| | | GP_LOW | POUT = 3 dBm, VCC = 0.55 V | | | 20.0 | |
| Power Added Efficiency | | PAE | POUT = POUT_MAX | | 37 | | % |
| Total Supply Current[1] | | I_TOT_MAX_BC15 | POUT = POUT_MAX | | 540 | | mA |
| | | I_TOT_MAX_BC6 | | | 565 | | |
| | | I_TOT_MAX_BC1_BC4 | | | 550 | | |
| Adjacent Channel Leakage power Ratio | 885 kHz offset | ACLR1 | POUT = POUT_MAX | | –50 | –47 | dBc |
| | | | POUT = POUT_MAX_ RANGE, VBATT = VCC = 3.0 V, TCASE = TRANGE | | | –45 | |
| | 1.98 MHz offset | ACLR2 | POUT = POUT_MAX | | –60 | –56 | |
| | | | POUT = POUT_MAX_ RANGE, VBATT = VCC = 3.0 V, TCASE = TRANGE | | | –55 | |
| Modulation Accuracy | | EVM | VBATT = 3.0 V to 4.8 V, Load = 50 ohms, TCASE = TRANGE | | 2.5 | 5.0 | % |
| Harmonics | Second | $2fo_{BC1,6}$ | POUT ≤ POUT_MAX, MBW = 1 MHz | | | –15 | dBm |
| | | $2fo_{BC4,15}$ | | | | –12 | |
| | Third | $3fo_{BC1,6}$ | | | | –12 | |
| | | $3fo_{BC4,15}$ | | | | –10 | |
| | Fourth and higher | $4fo$ | | | | –20 | |
| Noise Power in Rx Band[2] | | | | | | | dBm/Hz |
| BC15 $f$Tx = 1710 MHz–1755 MHz | | PNOISE_DPX | $f_{RX} = f_{TX}$ +400 MHz | | –137.0 | | |
| BC4 $f$Tx = 1750 MHz–1780 MHz | | | $f_{RX} = f_{TX}$ +90 MHz | | –133.0 | | |
| BC1 $f$Tx = 1850 MHz–1910 MHz | | | $f_{RX} = f_{TX}$ +80 MHz | | –133.0 | | |
| BC6 $f$Tx = 1920 MHz–1980 MHz | | | $f_{RX} = f_{TX}$ +190 MHz | | –133.5 | | |
| GPS Rx | | PNOISE_GPS | $f_{RX}$ = 1574 MHz–1577 MHz | | –133.0 | | |
| BT, WLAN | | PNOISE_BT | $f_{RX}$ = 2400 MHz–2483.5 MHz | | –141.0 | | |
| WLAN | | PNOISE_5GHz | $f_{RX}$ = 4900 MHz–5800 MHz | | –155.0 | | |
| Input VSWR | | VSWR_IN | POUT ≤ POUT_MAX | | 1.3:1 | | |
| Stability | | S | Load VSWR = 6:1, all phase angles, POUT ≤ POUT_MAX, VBATT = 3.0 V to 4.8 V, TCASE = TRANGE | All spurious below –36 dBm | | | |
| Ruggedness | | Ru | Load VSWR = 10:1, all phase angles, POUT ≤ POUT_MAX, constant forward power, closed loop operation, VBATT = 4.8 V, VCC = 4.6 V, TCASE = +25 °C | No module damage or permanent degradation | | | |

*[1] I_TOT = IBATT + (ICC1 + ICC2)(VCC/VBATT)(1/DC_DC_EFF). VCC = 3.4 V DC_DC_EFF ~ 96%.*

*[2] Harmonically-related spurious excluded.*

**Table 17. SKY77638-11 Electrical Specification – Band Select Switch**

| Parameter | | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| Frequency Range | | ƒ_LB | | 699 | | 915 | MHz |
| | | ƒ_MB | | 1710 | | 1980 | |
| | | ƒ_HB | | 2300 | | 2690 | |
| Insertion Loss | | IL | HB1 to HBRx2 | | 0.5 | | dB |
| | | | HB2 to HBRx2 | | 0.5 | | |
| | | | HB3 to HBRx1 | | 0.5 | | |
| VSWR | | SWR | Any RF port tested in Rx mode | | | 1.8:1 | |
| Isolation | Tx Mode | ISO_Tx | Tx output at HB1, Isolation to HB3, HBRx1, HBRx2 | | 35 | | dB |
| | | | Tx output at HB1, Isolation to HB2 | | 29 | | |
| | | | Tx output at HB2, Isolation to HB3, HBRx1, HBRx2 | | 35 | | |
| | | | Tx output at HB2, Isolation to HB1 | | 30 | | |
| | | | Tx output at HB3, Isolation to HB1, HB2, HBRx1, HBRx2 | | 33 | | |
| | | | Tx output at any LB output, Isolation to any other LB output | | 30 | | |
| | | | Tx output at any MB output, Isolation to any other MB output | | 30 | | |
| | Rx Mode | ISO_Rx | Rx Path: HB1 to HBRx2, Isolation to HB2, HB3, HBRx1 | | 25 | | |
| | | | Rx Path: HB2 to HBRx2, Isolation to HB1, HB3, HBRx1 | | 25 | | |
| | | | Rx Path: HB3 to HBRx1, Isolation to HB1, HB2, HBRx2 | | 25 | | |

**Table 18. SKY77638-11 LTE Maximum Power Reduction (MPR)**

| Modulation | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | 5 MHz + 10 MHz | 10 MHz + 10 MHz | 5 MHz + 20 MHz | 10 MHz + 20 MHz | 15 MHz + 15 MHz | 15 MHz + 20 MHz | 20 MHz + 20 MHz | MPR (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| QPSK | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | N/A | N/A | N/A | N/A | N/A | N/A | N/A | 0 |
| QPSK | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | 8 < RB ≤ 25 | 12 < RB ≤ 50 | 8 < RB ≤ 25 | 12 < RB ≤ 50 | 16 < RB ≤ 75 | 16 < RB ≤ 75 | 18 < RB ≤ 100 | ≤ 1 |
| 16QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 8 | ≤ 12 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 16 | ≤ 18 | ≤ 1 |
| QPSK | N/A | N/A | N/A | N/A | N/A | N/A | > 25 | > 50 | > 25 | > 50 | > 75 | > 75 | > 100 | ≤ 2 |
| 16QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | 8 < RB ≤ 25 | 12 < RB ≤ 50 | 8 < RB ≤ 25 | 12 < RB ≤ 50 | 16 < RB ≤ 75 | 16 < RB ≤ 75 | 18 < RB ≤ 100 | ≤ 2 |
| 64QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 8 and one CC | ≤ 12 and one CC | ≤ 8 and one CC | ≤ 12 and one CC | ≤ 16 and one CC | ≤16 and one CC | ≤ 18 and one CC | ≤ 2 |
| 16QAM | N/A | N/A | N/A | N/A | N/A | N/A | >25 | > 50 | > 25 | > 50 | > 75 | > 75 | > 100 | ≤ 3 |
| 64QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | > 8 or two CC's | > 12 or two CC's | > 8 or two CC's | > 12 or two CC's | > 16 or two CC's | > 16 or two CC's | > 18 or two CC's | ≤ 3 |

**Table 19. SKY77638-11 Power vs. Modulation**

| Band | WCDMA | | | | |
|---|---|---|---|---|---|
| | | 3GGP HS Test Cases | | | |
| | R99 | HSDPA ST 1, 2<br>HSUPA ST 1, 5 | HSDPA ST 3, 4 | HSUPA ST 3 | HSUPA ST 2, 4 |
| 1 | 29.0 | 28.0 | 27.5 | 27.0 | 26.0 |
| 2, 25 | 29.0 | 28.0 | 27.5 | 27.0 | 26.0 |
| 3 | 29.0 | 28.0 | 27.5 | 27.0 | 26.0 |
| 4 | 28.5 | 27.5 | 27.0 | 26.5 | 25.5 |
| 5, 26 | 28.5 | 27.5 | 27.0 | 26.5 | 25.5 |
| 8 | 28.5 | 27.5 | 27.0 | 26.5 | 25.5 |

| Band | LTE | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 3GGP Test Cases: QPSK | | | 3GGP Test Cases: 16QAM | | | 3GGP Test Cases: 64QAM | |
| | 5 MHz 8RB<br>10 MHz 12RB<br>20 MHz 18RB | 5 MHz 25RB<br>10 MHz 50RB<br>20 MHz 100RB | 35 MHz 175RB<br>40 MHz 200RB | 5 MHz 8RB<br>10 MHz 12RB<br>20 MHz 18RB | 5 MHz 25RB<br>10 MHz 50RB<br>20 MHz 100RB | 35 MHz 175RB<br>40 MHz 200RB | 5 MHz 8RB<br>10 MHz 12RB<br>20 MHz 18RB | 5 MHz 25RB<br>10 MHz 50RB<br>15 MHz 75RB<br>20 MHz 100RB<br>35 MHz 175RB<br>40 MHz 200RB |
| 1 | 28.0 | 27.0 | 26.0 | 27.0 | 26.0 | 25.0 | 26.0 | 25.0 |
| 2, 25 | 28.0 | 27.0 | 26.0 | 27.0 | 26.0 | 25.0 | 26.0 | 25.0 |
| 3 | 28.0 | 27.0 | 26.0 | 27.0 | 26.0 | 25.0 | 26.0 | 25.0 |
| 4 | 27.5 | 26.5 | 25.5 | 26.5 | 25.5 | 24.5 | 25.5 | 24.5 |
| 5, 26 | 27.5 | 26.5 | N/A | 26.5 | 25.5 | N/A | 25.5 | 24.5 |
| 8 | 27.5 | 26.5 | N/A | 26.5 | 25.5 | N/A | 25.5 | 24.5 |
| 12 | 28.0 | 27.0 | N/A | 27.0 | 26.0 | N/A | 26.0 | 25.0 |
| 13 | 28.0 | 27.0 | N/A | 27.0 | 26.0 | N/A | 26.0 | 25.0 |
| 17 | 28.0 | 27.0 | N/A | 27.0 | 26.0 | N/A | 26.0 | 25.0 |
| 20 | 27.5 | 26.5 | N/A | 26.5 | 25.5 | N/A | 25.5 | 24.5 |
| 28 | 28.0 | 27.0 | N/A | 27.0 | 26.0 | N/A | 26.0 | 25.0 |
| 39 | 27.5 | 26.5 | 25.5 | 26.5 | 25.5 | 24.5 | 25.5 | 24.5 |
| 38 | 28.5 | 27.5 | 26.5 | 27.5 | 26.5 | 25.5 | 26.5 | 25.5 |
| 40 | 28.5 | 27.5 | 26.5 | 27.5 | 26.5 | 25.5 | 26.5 | 25.5 |
| 41 | 28.5 | 27.5 | 26.5 | 27.5 | 26.5 | 25.5 | 26.5 | 25.5 |
| 7 | 28.5 | 27.5 | 26.5 | 27.5 | 26.5 | 25.5 | 26.5 | 25.5 |
| 30 | 28.5 | 27.5 | N/A | 27.5 | 26.5 | N/A | 26.5 | 25.5 |
| AXGP | 28.5 | 27.5 | N/A | 27.5 | 26.5 | N/A | 26.5 | 25.5 |

## MIPI RFFE Information

**Table 20-1. MIPI RFFE Standard Register Map**

| Bit Fields | Description | Trigger Support | R/W | Default | Notes |
|---|---|---|---|---|---|
| ***Register 0, Address 0x00 (PA_CTRL0)*** | | | | | |
| [7] | Trigger Select | Trigger0 | R/W | 0 | 0 = Trigger 0,1,2 or' d together<br>1 = Trigger 0,1,2 fire independently |
| [6:3] | PA Band Select Control Mode | | R/W | 0000 | Control Mode<br>0000 = PA's Disabled<br>0001 = LB1_TX<br>0010 = LB2_TX<br>0011 = LB3_TX<br>0100 = LB4_TX<br>0101 = LB5_TX<br>0110 = MB1_TX<br>0111 = MB2_TX<br>1000 = MB3_TX<br>1001 = MB4_TX<br>1010 = Reserved<br>1011 = HB1_TX<br>1100 = HB2_TX<br>1101 = HB3_TX<br>1110 = Reserved<br>1111 = PA's Disabled (High switch isolation) |
| [2] | PA Enable | | R/W | 0 | PA Enable<br>0 = PA Off<br>1 = PA On |
| [1] | PA Mode | | R/W | 0 | PA Mode<br>0 = HPM<br>1 = LPM |
| [0] | LB Input Switch | | R/W | 0 | LB Input<br>0 = RFIN_L (default for MB/HB operation)<br>1 = RFIN_VL |
| ***Register 1, Address 0x01 (BIAS_CTRL1)*** | | | | | |
| [7:0] | Primary PA Bias | Trigger0 | R/W | 00000000 | See Lookup Table for appropriate bias words for each band and mode. |
| ***Register 2, Address 0x02 (HB_Switch_RX_CTRL)*** | | | | | |
| [7:4] | Spare | Trigger0 | R/W | 0000 | Spare |
| [3:0] | HB_Switch_RX_CTRL | | R/W | 0000 | Control Mode<br>0000 = Switch Off (Standby)<br>0001 = HB1 → HBRX2<br>0010 = HB2 → HBRX2<br>0011 = HB3 → HBRX1<br>Other States = High Isolation |
| ***Register 3, Address 0x03 (BIAS_CTRL3)*** | | | | | |
| [7] | Bias Mode | Trigger0 | R/W | 0 | 0 = limited bias 1 = standard bias |
| [6:4] | Temperature Compensation | | R/W | 000 | Bias Temperature Compensation |
| [3:0] | Secondary PA Bias | | R/W | 0000 | Secondary PA Bias Adjustment |
| ***Register 4, Address 0x04 (Spare)*** | | | | | |
| [7:0] | Spare | Trigger0 | R/W | 00000000 | Spare |

**Table 20-2. MIPI RFFE Standard Register Map**

| Bit Fields | Description | Trigger Support | R/W | Default | Notes |
|---|---|---|---|---|---|
| ***Register 28, Address 0x1C (PM_TRIG)*** | | | | | |
| [7:6] | PWR_MODE[1:0] | No | R/W | 10 | 00 = Normal Operation (ACTIVE)<br>01 = Default Settings (STARTUP)<br>10 = Low Power (LOW POWER)<br>11 = Reserved |
| [5] | TRIGGER_MASK_2 | | | 0 | 0 = Trigger Enable<br>1 = Trigger Disable |
| [4] | TRIGGER_MASK_1 | | | 0 | 0 = Trigger Enable<br>1 = Trigger Disable |
| [3] | TRIGGER_MASK_0 | | | 0 | 0 = Trigger Enable<br>1 = Trigger Disable |
| [2] | TRIGGER_2 | | | 0 | 1 = Load Trigger 2 registers |
| [1] | TRIGGER_1 | | | 0 | 1 = Load Trigger 1 registers |
| [0] | TRIGGER_0 | | | 0 | 1 = Load Trigger 0 registers |
| ***Register 29, Address 0x1D (PROD_ID)*** | | | | | |
| [7:0] | Product ID | No | R | 00011100 | Product ID = 0x1C |
| ***Register 30, Address 0x1E (MAN_ID)*** | | | | | |
| [7:0] | Manufacturer ID | No | R | 10100101 | Manufacturer ID = 0xA5 |
| ***Register 31, Address 0x01F (USID)*** | | | | | |
| [7:6] | Reserved | No | R | 0 | |
| [5:4] | MANUFACTURER_ID[9:8] | | R | 01 | |
| [3:0] | USID | | R/W | 1111 | USID = 0xF |
| ***Register 32, Address 0x20 (EXT_PRODUCT_ID)*** | | | | | |
| [7:0] | EXT_PRODUCT_ID | No | R | 00000100 | Extended Product ID = 0x04 |
| ***Register 33, Address 0x021 (REVISION_ID)*** | | | | | |
| [7:6] | MAJOR REV | No | R | 00 | |
| [5:4] | MINOR REV | | R | 00 | |
| [3:0] | MISC VARIANTS | | R | 0000 | |
| ***Register 34, Address 0x22 (GROUP_SID)*** | | | | | |
| [7:4] | GSID[3:0] | No | R/W | 0000 | Primary Group Slave ID |
| [3:0] | Reserved | | R/W | 0000 | Reserved for secondary Group Slave ID. Set all to zero. |
| ***Register 35, Address 0x23 (SW_RST)*** | | | | | |
| [7] | SOFTWARE RESET | No | R/W | 0 | |
| [6:0] | Reserved | | R | 0000000 | |
| ***Register 43, Address 0x2B (BUS_LOAD)*** | | | | | |
| [7:4] | Reserved | No | R/W | 0000 | Reserved for Future Use |
| [3:0] | BUS_LD | | | 0000 | |
| ***Register 44, Address 0x2C (TEST_PATTERN)*** | | | | | |
| [7:0] | TEST_PATT | No | R | 11010010 | A read to this register address will trigger the slave to transmit a fixed test pattern of 0xD2 |

## Evaluation Board Description

The evaluation board is a platform for testing and interfacing design circuitry. To accommodate the interface testing of the SKY77638-11, the evaluation board schematic and assembly diagrams are included for preliminary analysis and design. The basic EVB schematic is shown in Figure 2 and the assembly diagram in Figure 3. Table 21 is the Bill of Material.

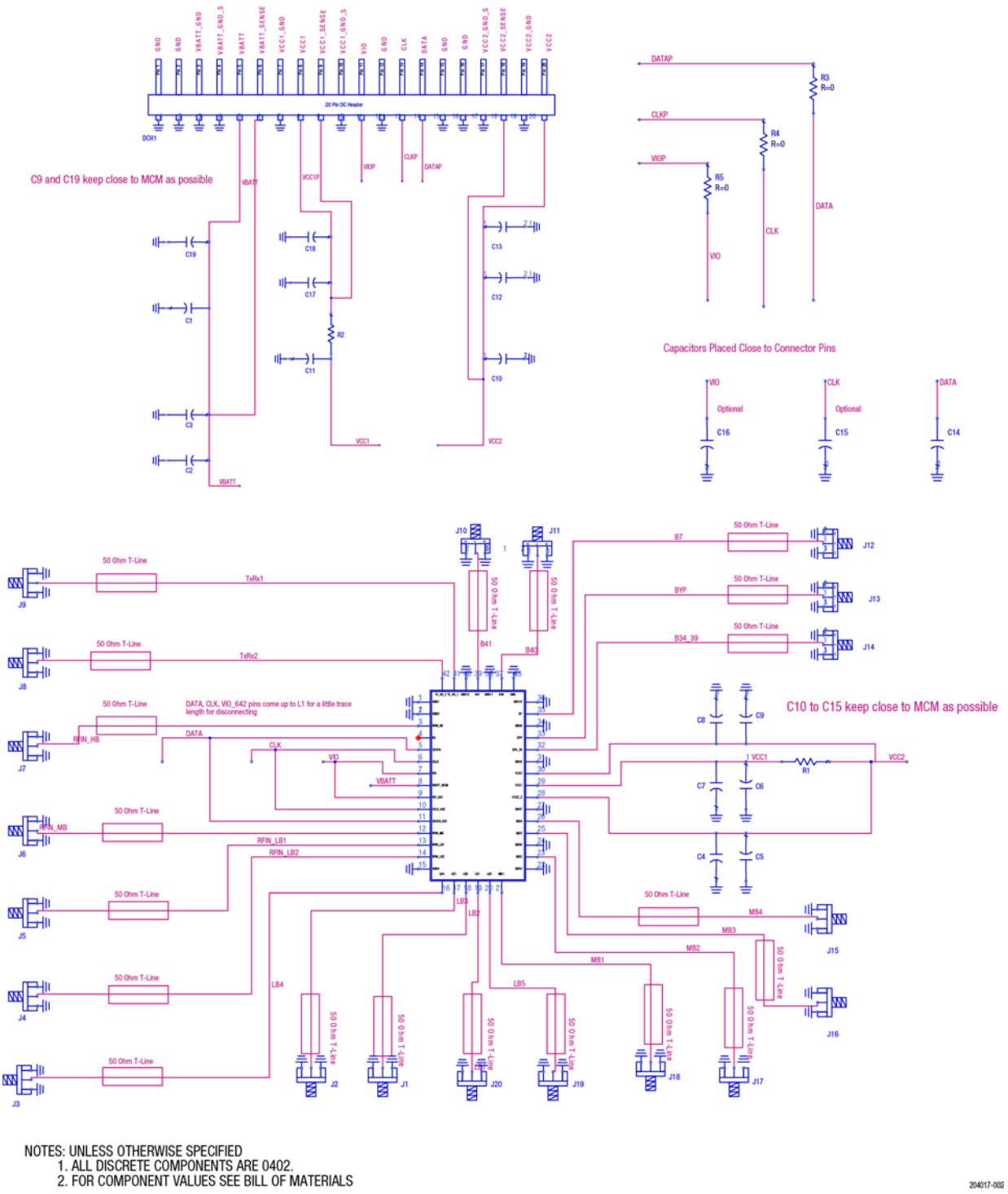



**Figure 2. SKY77638-11 Evaluation Board Schematic Diagram**

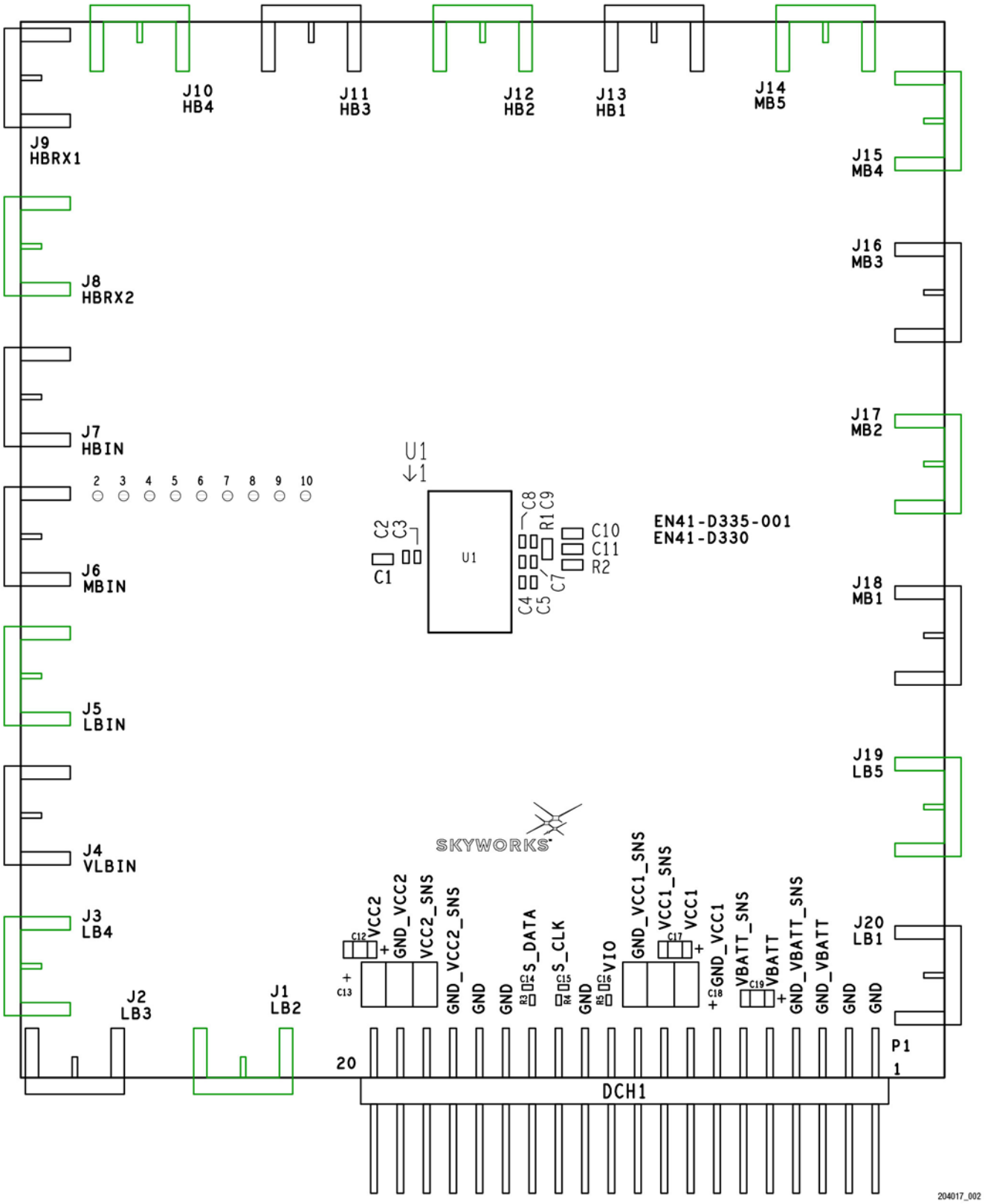



**Figure 3. SKY77638-11 Evaluation Board Assembly Diagram**

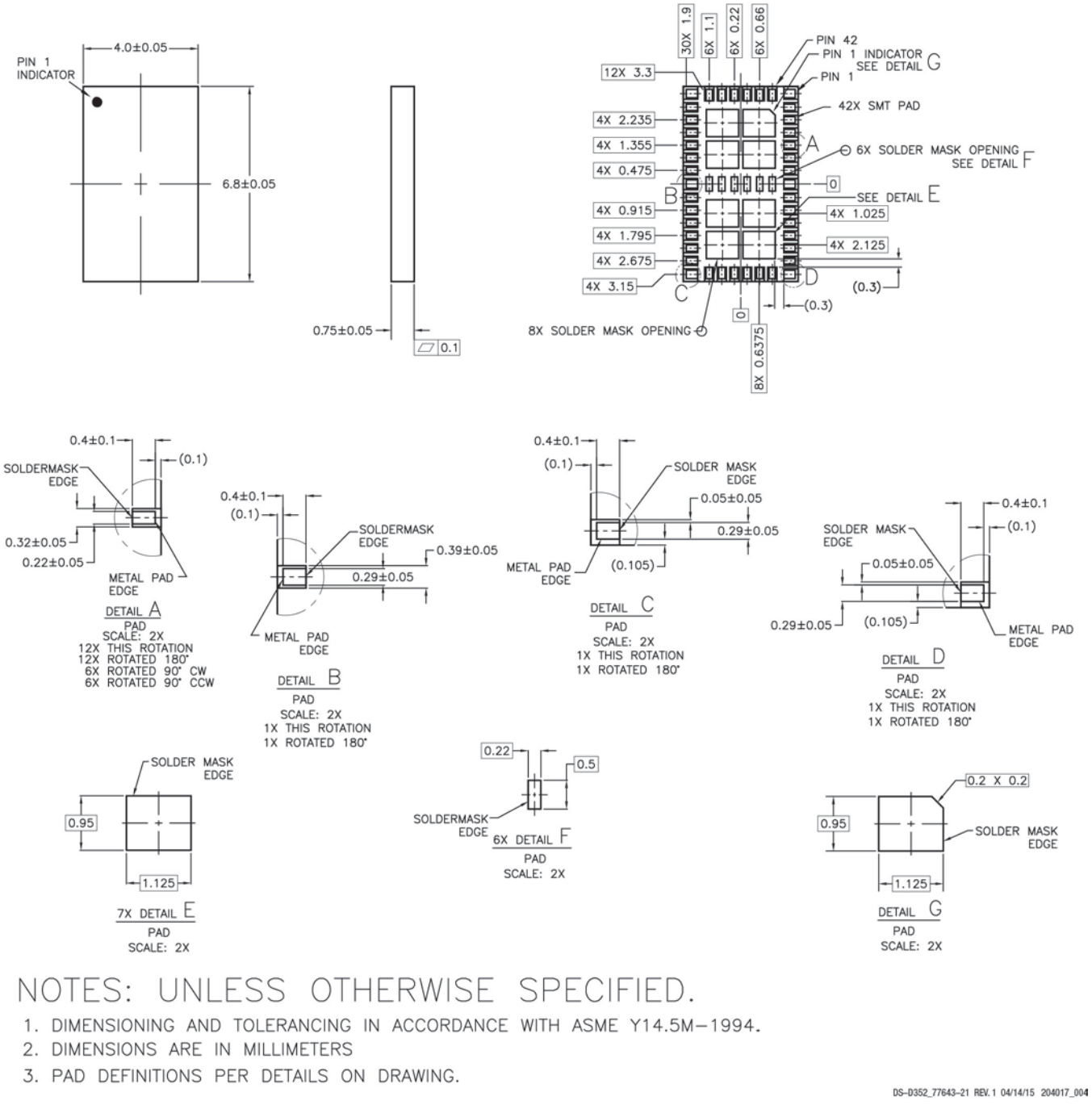
**Table 21. SKY77638-11 Evaluation Board Bill of Material**

| ITEM | QTY | REFERENCE DESIGNATORS | PART DESCRIPTION |
|---|---|---|---|
| 1 | 1 | P1 | CONNECTOR, 20 PINPOST LENGTH = 0.53" |
| 2 | 20 | J1 thru J20 | CONNECTOR, SMA END LAUNCH JACK TAB CONTACT GOLD, .062 |
| 3 | 4 | C2, C4, C6, C8 | CAPACITOR, CERAMIC, 100 pF, 10%, X7R, 16 V, 0201 (RSI) |
| 4 | 4 | C3, C5, C7, C9 | CAPACITOR, CERAMIC, 0.1 µF, 10%, X5R, 10 V, 0201 (RSI) |
| 5 | 4 | C12, C17, C19, C21 | CAPACITOR, TANTALUM MOLDED 10 µF, 16 V, ±10%, 1206 |
| 6 | 3 | C13, C18, C20 | CAPACITOR, 220 µF, TANT, LOW ESR, CASE D, AVX |
| 7 | 1 | C16 | CAPACITOR, CERAMIC, 270 pF, 10%, X7R, 50 V, 0402 |
| 8 | 4 | R2, R3, R4, R5 | RESISTOR, 0 OHM, JUMPER, 0.063 W, 0402 |
| 9 | 6 | C1, C10, C11, C14, C15, R1 | DO NOT PLACE (DNP) |

*NOTE: Highlighted items are not used in this EVB configuration.*

## Package Dimensions

Figure 4 is a mechanical drawing of the pad layout for the SKY77638-11, a 42-pad leadless quad-band power amplifier module. Figure 5 provides a recommended PC board layout footprint of the module to help the designer attain optimum thermal conductivity, good grounding, and minimum RF discontinuity for the 50-ohm terminals.




NOTES: UNLESS OTHERWISE SPECIFIED.

1. DIMENSIONING AND TOLERANCING IN ACCORDANCE WITH ASME Y14.5M–1994.
2. DIMENSIONS ARE IN MILLIMETERS
3. PAD DEFINITIONS PER DETAILS ON DRAWING.

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**Figure 4. Dimensional Diagram for 4.0 mm x 6.8 mm x 0.75 mm, 42-Pad MCM Package – SKY77638-11**

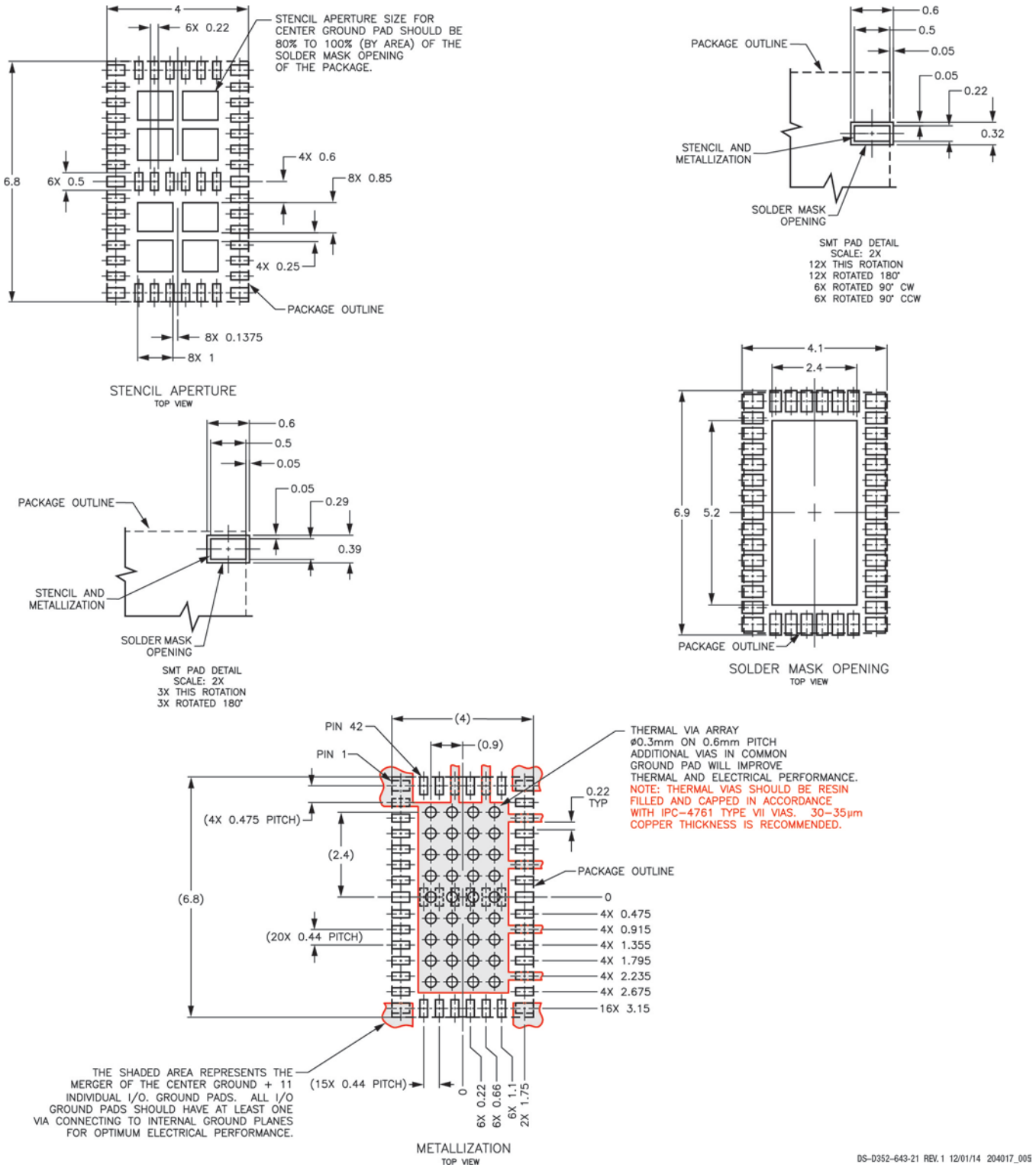
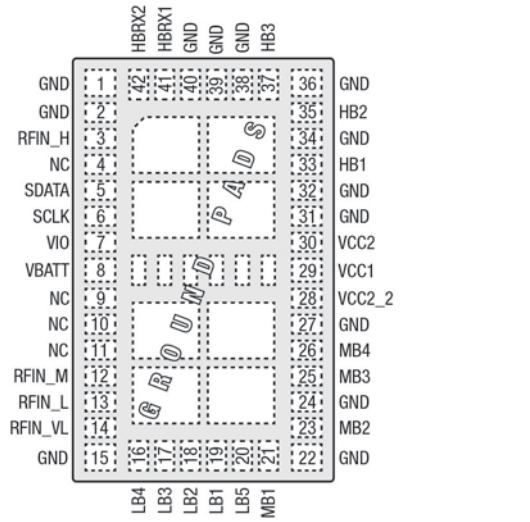



**Figure 5. PCB Layout Footprint for 4.0 mm x 6.8 mm, 42-Pad Package – SKY77638-11**

## Package Description

Figure 6 shows the device pad configuration and the pad numbering convention, which starts with pad 1 in the upper left corner and increments counter-clockwise around the package. Table 22 lists the pad names and signal descriptions. Figure 7 shows typical case markings for the SKY77638-11.




Pad layout as seen from Top View looking through package.
GROUND PAD is package underside

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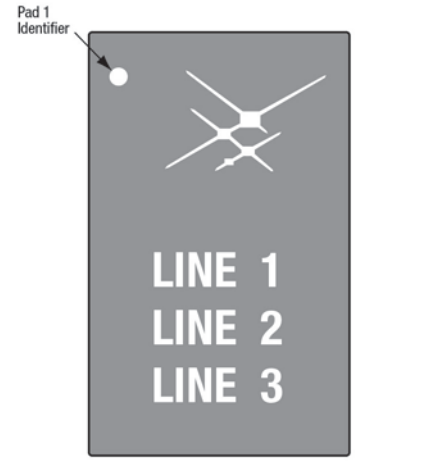
**Figure 6. SKY77638-11 Pad Configuration – 42-Pad MCM (Top View)**




NOTE: Lines 1, 2, 3 have a maximum of 12 characters
Line 1 = Part Number and Version
Line 2 = Lot Number
Line 3 = Year–Week–Country Code (MX)

204017_007

**Figure 7. Typical Case Markings (Top View)**

**Table 22. SKY77638-11 Pad Names and Signal Descriptions**

| Pad No. | Name | Description |
|---|---|---|
| 3 | RFIN_H | High Band (HB) Input |
| 4 | NC | Not Used (float or connect to GND) |
| 5 | SDATA | MIPI Data Bus |
| 6 | SCLK | MIPI Clock Bus |
| 7 | VIO | MIPI Supply |
| 8 | VBATT | Battery Supply |
| 9 | NC | Not Used (float or connect to GND) |
| 10 | NC | Not Used (float or connect to GND) |
| 11 | NC | Not Used (float or connect to GND) |
| 12 | RFIN_M | Mid Band (MB) Input |
| 13 | RFIN_L | Low Band (LB) Input |
| 14 | RFIN_VL | Alternate Low Band (LB) Input, Bands 12,17,13,28 |
| 16 | LB4 | Low Band (LB) 4 RF Output |
| 17 | LB3 | Low Band (LB) 3 RF Output |
| 18 | LB2 | Low Band (LB) 2 RF Output |
| 19 | LB1 | Low Band (LB) 1 RF Output |
| 20 | LB5 | Low Band (LB) 5 RF Output |
| 21 | MB1 | Mid Band (MB) 1 RF Output |
| 23 | MB2 | Mid Band (MB) 2 RF Output |
| 25 | MB3 | Mid Band (MB) 3 RF Output |
| 26 | MB4 | Mid Band (MB) 4 RF Output |
| 28 | VCC2_2 | Mid/Low Band 2nd Stage PA Collector Supply |
| 29 | VCC1 | High/Mid/Low Band 1st Stage PA Collector Supply |
| 30 | VCC2 | High Band 2nd Stage PA Collector Supply |
| 33 | HB1 | High Band (HB) 1 RF Output |
| 35 | HB2 | High Band (HB) 2 RF Output |
| 37 | HB3 | High Band (HB) 3 RF Output |
| 41 | HBRX1 | RX RF Output, Switches to HB3 |
| 42 | HBRX2 | RX RF Output, Switches to HB1 or HB2 |
| GROUND PADS | | Ground pads are device underside. |

[1] *Pads 1, 2, 15, 22, 24, 27, 31, 32, 34, 36, 38, 39 and 40 are GROUND pads.*

## Package Handling Information

Since the device package is sensitive to moisture absorption, it is baked and vacuum packed before shipping. Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The SKY77638-11 is rated to Moisture Sensitivity Level 3 (MSL3) at 260 °C. It can be used for lead or lead-free soldering. For additional information, refer to Skyworks Application Note, *PCB Design and SMT Assembly/Rework Guidelines for MCM-L Packages*, Document Number 101752.

Care must be taken when attaching this product, whether done manually or in a production solder reflow environment. Production quantities of this product are shipped in a standard tape and reel format (Figure 8).

## Electrostatic Discharge (ESD) Sensitivity

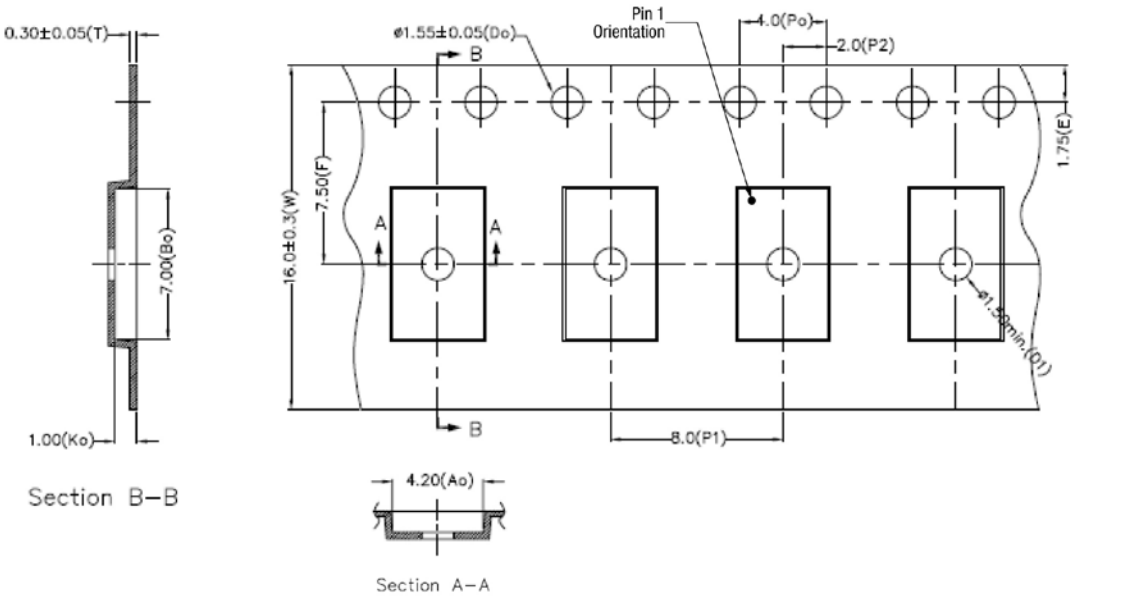
**Attention: Observe Precautions for Handling Electrostatic Sensitive Devices**

*Electrostatic Discharge (ESD) can damage this device, which must be protected from ESD at all times. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.*

The SKY77638-11 is a static-sensitive electronic device. Do not operate or store near strong electrostatic fields. Take proper ESD precautions.

To avoid ESD damage, both latent and visible, it is very important that the product assembly and test areas follow the ESD handling precautions listed below.

- Personnel Grounding
  - Wrist Straps
  - Conductive Smocks, Gloves and Finger Cots
  - Antistatic ID Badges
- Protective Workstation
  - Dissipative Table Top
  - Protective Test Equipment (Properly Grounded)
  - Grounded Tip Soldering Irons
  - Solder Conductive Suckers
  - Static Sensors
- Facility
  - Relative Humidity Control and Air Ionizers
  - Dissipative Floors (less than 1,000 MΩ to GND)
- Protective Packaging and Transportation
  - Bags and Pouches (Faraday Shield)
  - Protective Tote Boxes (Conductive Static Shielding)
  - Protective Trays
  - Grounded Carts
  - Protective Work Order Holders




NOTES:
1. MATERIAL: CONDUCTIVE POLYSTYRENE.
2. Po/P1 10 PITCHES CUMULATIVE TOLERANCE ON TAPE: ±0.20 mm.
3. Ao & Bo MEASUREMENT POINT TO BE 0.3 mm FROM BOTTOM POCKET.
4. ALLOWABLE CAMBER TO BE 1/100 mm, NON-CUMULATIVE OVER 250 mm.
5. SURFACE RESISTIVITY $10^4$ TO $10^{11}$ OHMS/SQ.

BODY SIZE 4.0 x 6.8 mm -164A

**Figure 8. Carrier Tape Dimensional Diagram for Body Size 4.0 mm x 6.8 mm x 0.85–1.05 mm – Overmold MCM**

## Ordering Information

| Product Name | Order Number | Evaluation Board Part Number |
|---|---|---|
| SKY77638-11 SkyLiTE™ Multimode Multiband Power Amplifier Module | SKY77638-11 | EN41-D335-001 |

## Revision History

| Revision | Date | Description |
|---|---|---|
| A | May 17, 2016 | Initial Release – Preliminary Information CO 277 |
| B | January 11, 2017 | Revise: Applications list (p1); Tables 1, 4–20, 22<br>Add: Table 21; Figures 2, 3 CN 10500 |

## References

Skyworks Application Note: *PCB Design and SMT Assembly/Rework*, Document Number 101752

Electrostatic Discharge Sensitivity (ESD) Testing: *JEDEC Standard, JESD22-A114 Human Body Model (HBM)*