



Product Features

- Excellent Insertion Loss and Isolation performance
- High Linearity
- RFFE 2.1 Control Interface
- Broadband frequency range: 0.1 to 5 GHz
- Small package: QFN-16 2.0mm x 2.0mm x 0.55mm
- No DC blocking capacitors required
- 1kV HBM ESD Protection on all pins

Product Applications

- 5G multimode cellular tablets and Multi-Mode GSM, EDGE, WCDMA, LTE
- Diversity antenna switching

Product Description

The LX1033H is a Silicon On Insulator (SOI) Single Pole, Three-Throw (3P3T) antenna switch with a Mobile Industry Processor Interface (MIPI) which require very low insertion loss, high isolation and high linearity performance.

The high linearity performance and low insertion loss for 5G and LTE applications.

The LX1033H is manufactured in a compact 2.0mm x 2.0mm x 0.55mm, 16-pin surface mount Quad Flat No-Lead (QFN) package.

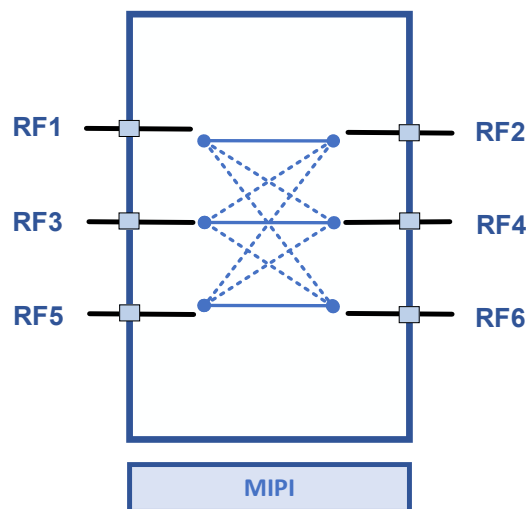


Figure 1 Functional Block Diagram

Absolute Maximum Conditions

| Parameters | Symbol | Minimum | Maximum | Units |
|----------------------------|------------------|---------|---------|-------|
| Digital control signal | V _{IO} | | 2.5 | V |
| RF input power | P _{in} | | +38 | dBm |
| Storage temperature | T _{STG} | -55 | +150 | °C |
| Operating temperature | T _{OP} | -40 | +90 | °C |
| Human Body Model, Class 1C | ESD | 1000 | | V |

1: Test condition 50% duty cycle, VSWR=1:1, +25 °C

Note: 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. Exceeding any of the limits listed here may result in permanent damage to the device.

General Electrical Specifications

| Parameters | Symbol | Test Condition | Min. | Typ. | Max. | Units |
|-----------------------------------|-------------------|--|---------------------|-----------------|---------------------|-------|
| Interface supply | V _{IO} | | 1.65 | 1.8 | 1.95 | V |
| SDATA, SCLK High | V _{IH} | | 0.8*V _{IO} | V _{IO} | V _{IO} | V |
| SDATA, SCLK Low | V _{IL} | | 0 | 0 | 0.2*V _{IO} | V |
| USID Control Voltage | V _{usid} | | 0 | | V _{IO} | V |
| Control current: High Low | I _{CTL} | | | 150 | 180 | μA |
| Turn-on time (PIN = +27 dBm) | T _{ON} | Measured from 50% of final supply voltage to 90% of RF power | | | 10 | μs |
| Switching time (PIN = +27 dBm) | T _{SW} | Measured from 50% of final supply voltage to 90% of RF power | 2 | | 3 | μs |

(V_{IO} = 1.8 V, V_{IH}=1.8V, V_{IL}=0V, T_{OP} = +25 °C, Characteristic Impedance [Z₀] = 50 Ω, Unless Otherwise Noted)

RF Specifications

| Parameters | Symbol | Test Condition | Min. | Typ. | Max. | Units |
|--|--------|----------------------|------|------|------|-------|
| Operating frequency | f | | 0.1 | | 5 | GHz |
| Insertion loss | IL | Up to 0.9 GHz | | 0.40 | 0.50 | dB |
| | | Up to 2.2 GHz | | 0.45 | 0.55 | |
| | | Up to 2.7 GHz | | 0.55 | 0.60 | |
| | | Up to 4.2 GHz | | 0.65 | 0.80 | |
| | | Up to 5.0 GHz | | 0.90 | 1.10 | |
| Isolation (port to any receive port) | Iso | Up to 0.9 GHz | 40 | 50 | | dB |
| | | Up to 2.2 GHz | 35 | 40 | | |
| | | Up to 2.7 GHz | 30 | 35 | | |
| | | Up to 4.2 GHz | 28 | 30 | | |
| | | Up to 5.0 GHz | 25 | 28 | | |
| 2nd Order harmonics | 2fo | Pin = +26 dBm,900MHz | | -70 | -68 | dBm |
| | | Pin = +35 dBm,900MHz | | -60 | -55 | |
| 3rd Order harmonics | 3fo | Pin = +26 dBm,900MHz | | -79 | -74 | dBm |
| | | Pin = +35 dBm,900MHz | | -53 | -48 | |
| 0.1 dB Compression Point 50% duty cycle, VSWR=1:1 | P0.1dB | 900M, 50Ω | | 38 | | dBm |

Truth Table

| Reg_1C | Reg_00 | | | | | | | | RF Channel Operating Mode |
|--------|--------|----|----|----|----|----|----|----|---------------------------|
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| 38 | x | x | x | x | x | 0 | 0 | 0 | RF5 ISO |
| 38 | x | x | x | x | x | 0 | 0 | 1 | RF5 – RF6 |
| 38 | x | x | x | x | x | 0 | 1 | 0 | RF5 – RF4 |
| 38 | x | x | x | x | x | 0 | 1 | 1 | RF5 – RF2 |
| 38 | x | x | 0 | 0 | 0 | x | x | x | RF3 ISO |
| 38 | x | x | 0 | 0 | 1 | x | x | x | RF3 – RF6 |
| 38 | x | x | 0 | 1 | 0 | x | x | x | RF3 – RF4 |
| 38 | x | x | 0 | 1 | 1 | x | x | x | RF3 – RF2 |
| Reg_1C | Reg_01 | | | | | | | | RF Channel Operating Mode |
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| 38 | x | x | x | x | x | 0 | 0 | 0 | RF1 ISO |
| 38 | x | x | x | x | x | 0 | 0 | 1 | RF1 – RF6 |
| 38 | x | x | x | x | x | 0 | 1 | 0 | RF1 – RF4 |
| 38 | x | x | x | x | x | 0 | 1 | 1 | RF1 – RF2 |

Register definition

| Register 0, Address: 0x00 (MODE_CTRL) | | | | |
|---------------------------------------|--------------------|---------|--|------|
| Register 0 | Description | Default | Notes | Trig |
| [7:0] | MODE_CTRL | 0x0 | Switch control. See Truth Table | 0 |
| Register 1B, Address: 0x1B | | | | |
| Register 1B | Description | Default | Notes | Trig |
| [7:4] | Reserved | 0000 | Reserved | No |
| [3:0] | GSID | 0000 | Group slave ID | No |
| Register 1C Address: 0x1C (PM_TRIG) | | | | |
| Register 1C | Description | Default | Notes | Trig |
| [7:6] | PWR_MODE | 0 | 00 = Normal Operation (ACTIVE) 01 = Default Settings (STARTUP) 10 = Low Power (LOW POWER) 11 = Reserved | No |
| [5] | Trigger Mask 2 | 0 | Trigger Enable: 0 Trigger Disable: 1 | No |
| [4] | Trigger Mask 1 | 0 | Trigger Enable: 0 Trigger Disable: 1 | No |
| [3] | Trigger Mask 0 | 0 | Trigger Enable: 0 Trigger Disable: 1 | No |
| [2] | Trigger Register 2 | 0 | 1 = Latch Register 2 contents | No |
| [1] | Trigger Register 1 | 0 | 1 = Latch Register 1 contents | No |
| [0] | Trigger Register 0 | 0 | 1 = Latch Register 0 contents | No |
| Register 1D, Address: 0x01D (PM_ID) | | | | |
| Register 1D | Description | Default | Notes | Trig |
| [7:0] | Product ID | 0x0E | Product ID = 0X0E | No |
| Register 1E, Address: 0x01E (MAN_ID) | | | | |
| Register 1E | Description | Default | Notes | Trig |
| [7:0] | Manufacturer ID | 0x78 | Manufacturer ID[7:0] = 0x78 | No |
| Register 1F Address: 0x01F (USID) | | | | |
| Register 1F | Description | Default | Notes | Trig |
| [7:4] | Manufacturer ID | 0x4 | Manufacturer ID [11:8] | No |
| [3:0] | User ID | 0x8 | USID pin connected to GND | No |
| | | 0x9 | USID pin connected to VIO | No |

Pin-out Information

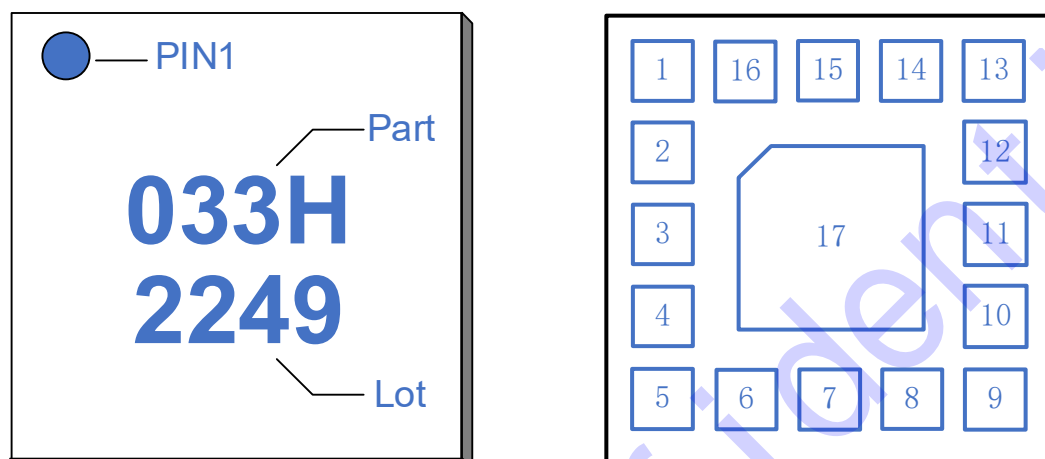


Figure 2 Pin-out Information

Table 1. Pin Description

| Pin # | Name | Description | Pin # | Name | Description |
|-------|-------|--------------------------|-------|------|-------------|
| 1 | GND | Ground | 10 | RF2 | RF Port 2 |
| 2 | RF3 | RF Port 3 | 11 | GND | Ground |
| 3 | GND | Ground | 12 | RF4 | RF Port 4 |
| 4 | RF1 | RF Port 1 | 13 | GND | Ground |
| 5 | NC | Not Connected | 14 | RF6 | RF Port 6 |
| 6 | VIO | Supply Voltage | 15 | GND | Ground |
| 7 | SDATA | RFFE Data Bus | 16 | RF5 | RF Port 5 |
| 8 | SCLK | RFFE Clock Bus | 17 | GND | Ground |
| 9 | USID | RFFE Slave ID Select Pin | | | |

Application circuit

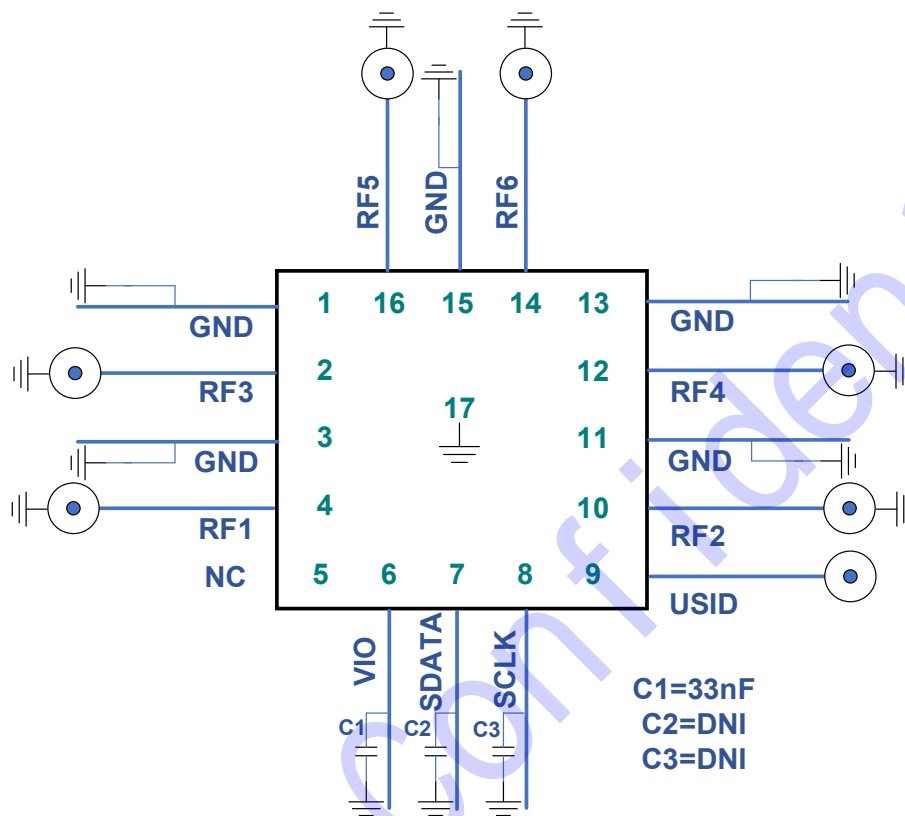


Figure 3 Application circuit

Evaluation Board

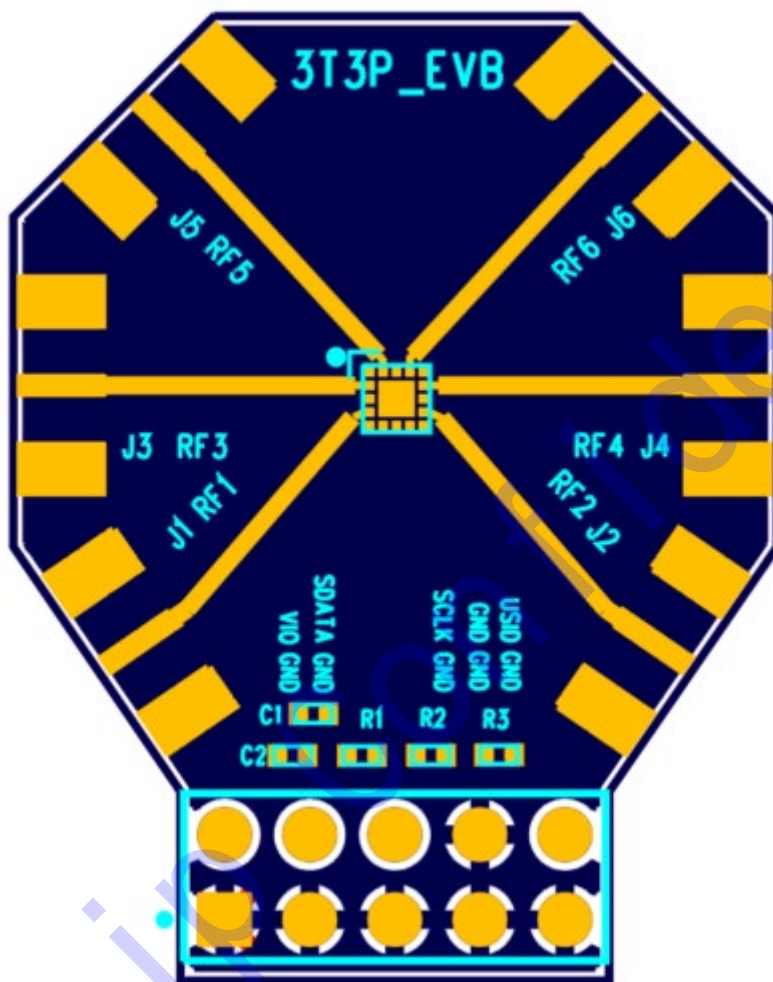
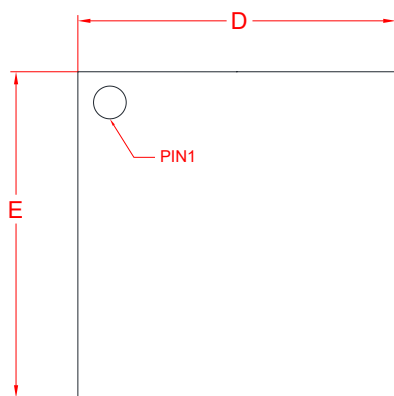
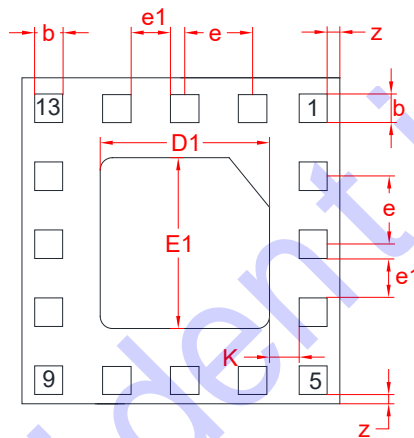


Figure 4 Evaluation Board Assembly Diagram

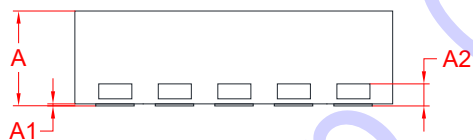
Package Outline Dimension



TOP-VIEW:



BOTTOM-VIEW:

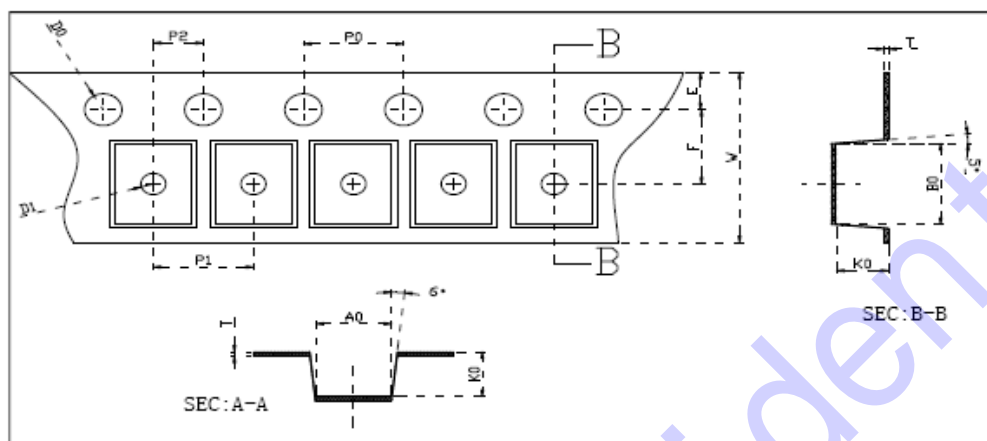


FRONT-VIEW:

| SYMBOL | MILLIMETER | | |
|--------|------------|-------|-------|
| | MIN | NOM | MAX |
| A | 0.50 | 0.55 | 0.60 |
| A1 | 0.00 | 0.02 | 0.05 |
| A2 | 0.119 | 0.127 | 0.135 |
| b | 0.15 | 0.20 | 0.25 |
| D | 1.95 | 2.00 | 2.05 |
| E | 1.95 | 2.00 | 2.05 |
| D1 | 0.95 | 1.00 | 1.05 |
| E1 | 0.95 | 1.00 | 1.05 |
| z | 0.10REF | | |
| e | 0.35 | 0.40 | 0.45 |
| e1 | 0.15 | 0.20 | 0.25 |
| K | 0.15 | 0.20 | 0.25 |

Figure 5 Package Outline Dimension

Package Dimensions (5000pcs)



| | | | | | | | |
|----|-----------|----|-----------|----|-----------|----|-------|
| W | 8.00±0.10 | T | 0.20±0.05 | D1 | 1.00±0.10 | 单位 | MM |
| E | 1.75±0.10 | F | 3.50±0.10 | D0 | 1.50±0.10 | 材质 | PC+PS |
| P0 | 4.00±0.10 | P1 | 4.00±0.10 | P2 | 2.00±0.10 | | |
| A0 | 2.18±0.10 | B0 | 2.20±0.10 | K0 | 0.75±0.10 | | |

Figure 6 Tape and Reel Dimensions

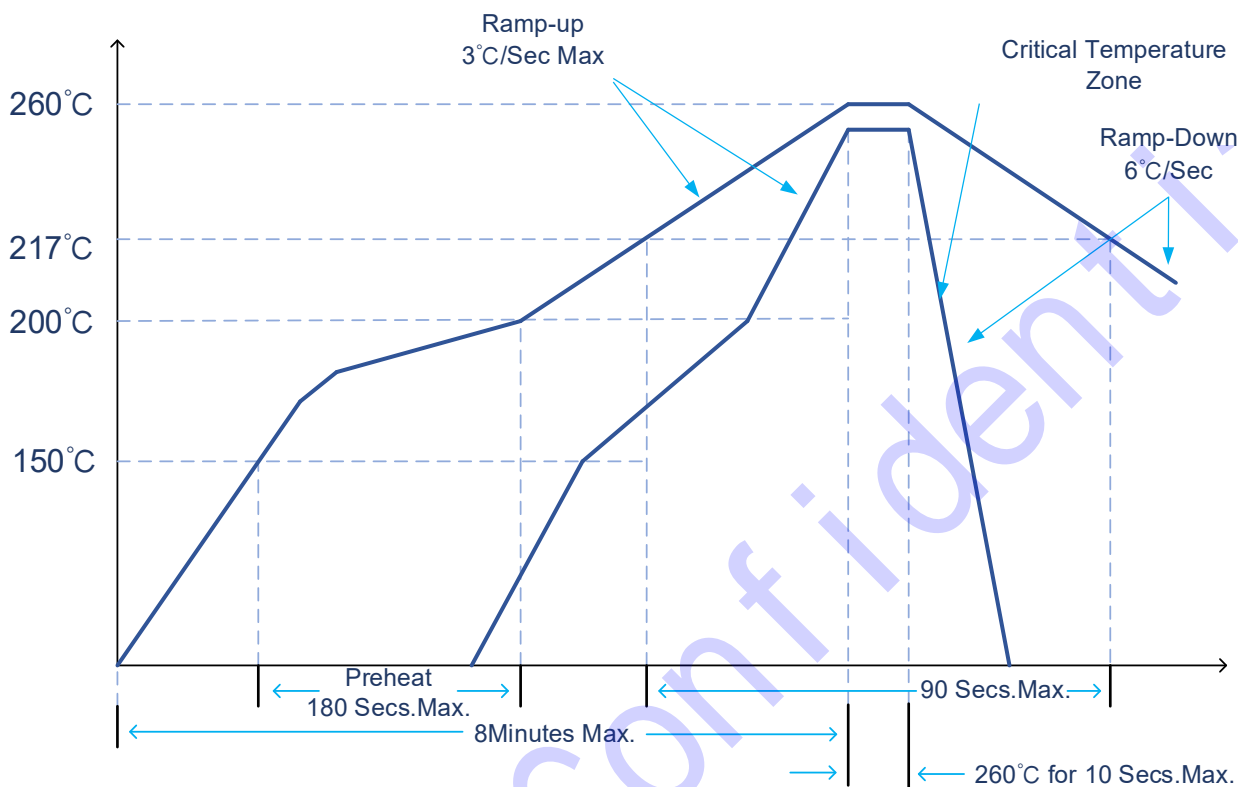
Declaration of No Harmful Substances

This part is compliant with 2005/20/EC packaging directive, 1907/2006/EC REACH directive and the 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment), as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead free
- Halogen Free (Chlorine, Bromine)
- SVHC Free

Reflow Chart



NOTE: Reflow Profile with 240°C peak also acceptable.