PRELIMINARY SPECIFICATION

PE4256

75Ω SPDT CATV MOSFET Switch

Features

- 75Ω characteristic impedance
- Integrated 75Ω 0.25 watt terminations
- CTB performance of 90dBc
- High isolation 65 dB at 1 GHz
- Low insertion loss: typically 0.5 dB at 5 MHz, 0.8 dB at 1 GHz
- High input IP3: >50 dBm
- CMOS two-pin control
- Single +3 volt supply operation
- Low current consumption: 8 µA

Product Description

The PE4256 is a high-isolation MOSFET Switch designed for CATV applications, covering a broad frequency range from DC up to 1.3 GHz. This single-supply SPDT switch integrates a two-pin CMOS control interface. It also provides low insertion loss with extremely low bias requirements while operating on a single 3-volt supply. In a typical CATV application, the PE4256 provides for a cost effective and manufacturable solution when compared to mechanical relays.

The PE4256 is manufactured in Peregrine's patented Ultra Thin Silicon (UTSi®) CMOS process, offering the performance of GaAs with the economy and integration of conventional CMOS.

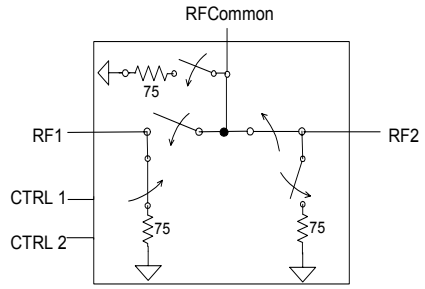
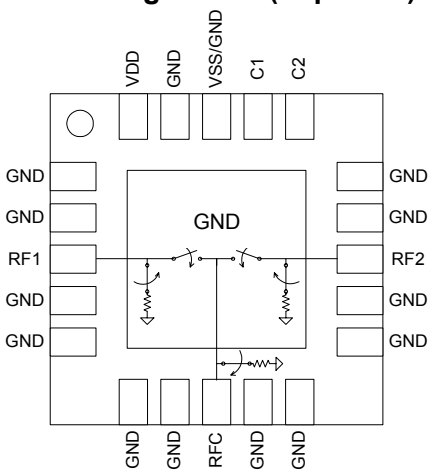


Table 1. Electrical Specifications @ +25 °C (Z_S = Z_L = 75 Ω)

Parameter	Condition	Minimum	Typical	Maximum	Units
Operating Frequency[1]		DC		3000	MHz
Insertion Loss	5 MHz – 250 MHz 250 MHz – 750 MHz 750 MHz – 1000 MHz 1000 MHz – 2000 MHz		0.5 0.7 0.8 1.1.		dB
Isolation	5 MHz – 250 MHz 250 MHz – 750 MHz 750 MHz – 1000 MHz 1000 MHz – 2000 MHz		90 75 70 55		dB dB dB
Input IP2[2]	5 MHz - 1000 MHz		80		dBm
Input IP3[2]	5 MHz - 1000 MHz		55		dBm
Input 1dB Compression[2]	1000 MHz		31		dBm
CTB / CSO	77 & 110 channels; Power Out = 44 dBmV		-90		dBc
Switching Time	50% CTRL to 10/90 RF		2		µs
Video Feedthrough[3]	5 MHz - 1000 MHz			15	mV_{pp}

Notes: 1. Device linearity will begin to degrade below 1 MHz.
2. Measured in a 50 Ω system.
3. Measured with a 1 ns risetime, 0/3 V pulse and 500 MHz bandwidth

Figure 2. Pin Configuration (Top View)



4x4mm -20 Lead MLPQ

Table 2. Pin Descriptions

No.	Name	Description
1	GND	RF Ground
2	GND	RF Ground
3[1]	RF1	RF I/O
4	GND	RF Ground
5	GND	RF Ground
6	GND	RF Ground
7	GND	RF Ground
8[1]	RFC	RF Common
9	GND	RF Ground
10	GND	RF Ground
11	GND	RF Ground
12	GND	RF Ground
13[1]	RF2	RF I/O
14	GND	RF Ground
15	GND	RF Ground
16[2]	C2	Control 2
17[2]	C1	Control 1
18[3]	VSS / GND	Negative Supply Option
19	GND	Digital Ground
20	VDD	Supply
Pad	GND	RF Ground Pad

Notes:

1. RF pins 3, 8, and 13 must be at 0 VDC. The RF pins do not require DC blocking capacitors for proper operation if the 0 VDC requirement is met.

2. Pins 16 and 17 are the CMOS controls that set the four operating states.

3. Connect pin 18 to GND to enable the negative voltage generator. Connect pin 18 to V_{SS} (-3V) to bypass and disable internal -3V supply generator. See paragraph "Switching Frequency."

Table 3. Absolute Maximum Ratings

Symbol	Parameter/Condition	Min	Max	Unit
V_{DD}	Power supply voltage	-0.3	4.0	V
V_I	Voltage on CTRL input	-0.3	V_{DD} + 0.3	V
P_{RF}	RF power on RFC, RF1, RF2		24	dBm
T_{ST}	Storage temperature	-65	150	°C
T_{OP}	Operating temperature	-40	85	°C
V_{ESD}	ESD voltage (Human Body Model)	1000		V

Table 4. DC Electrical Specifications @ 25 °C

Parameter	Min	Typ	Max	Unit
V_{DD} Power Supply	2.7	3.0	3.3	V
I_{DD} Power Supply Current (V_{DD} = 3V, V_{CNTL} = 3V)			10	µA
Control Voltage High	70% V_{DD}			V
Control Voltage Low	0		30% V_{DD}	V

Electrostatic Discharge (ESD) Precautions

When handling this UTSi device, observe the same precautions that you would use with other ESD-sensitive devices. Although this device contains circuitry to protect it from damage due to ESD, precautions should be taken to avoid exceeding the rating specified.

Latch-Up Avoidance

Unlike conventional CMOS devices, UTSi CMOS devices are immune to latch-up.

Switching Frequency

The PE4256 has a maximum 25KHz switching rate when the internal negative voltage generator is used (pin 18=GND). The rate at which the PE4256 can be switched is only limited to the switching time if an external -3V supply is provided at (pin18=V_{SS}).

Table 5. Truth Table

C1	C2	RFC – RF1	RFC – RF2
Low	Low	OFF	OFF
Low	High	OFF	ON
High	Low	ON	OFF
High	High	N/A[1]	N/A[1]

Notes:
1. The operation of the PE4256 is not supported or characterized in the C1=VDD and C2=VDD state.

Typical Performance Data @ 25°C (Unless Otherwise Noted)

(75-ohm impedance except as indicated)

Figure 3. Insertion Loss

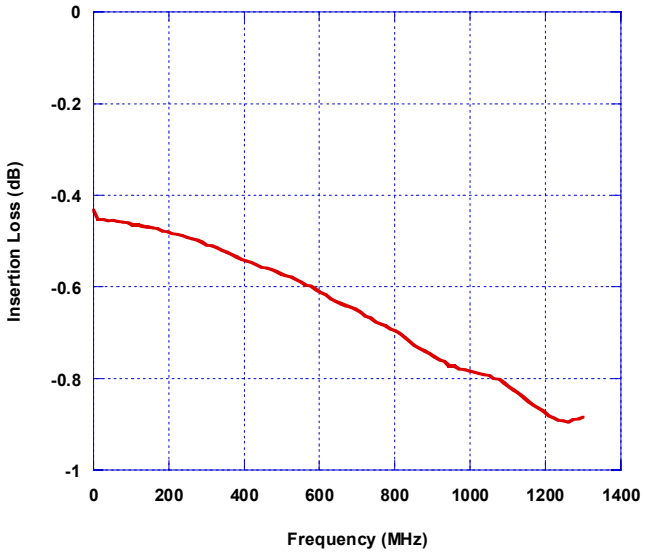


Figure 4. Input to Output Isolation

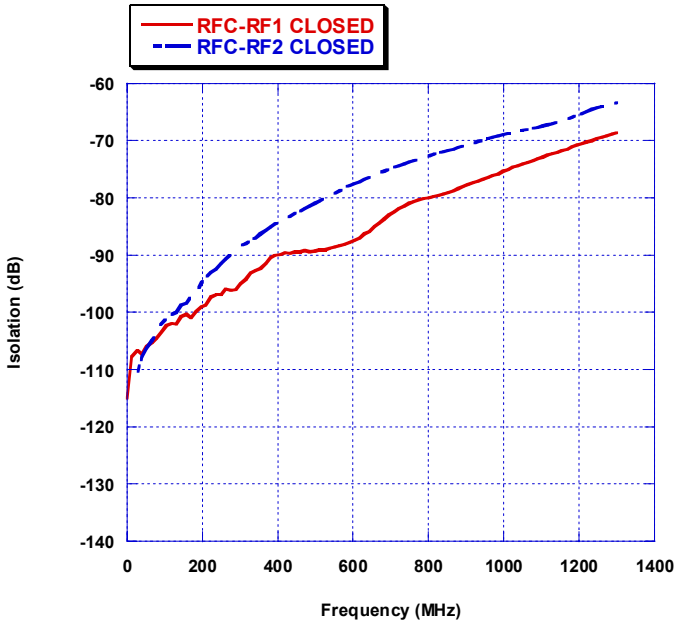
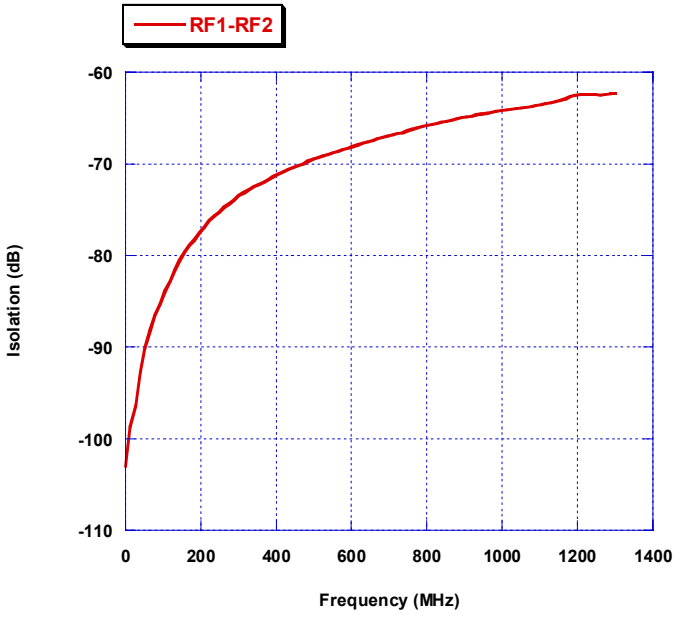


Figure 5. Isolation – RF1 To RF2



Typical Performance Data @ 25°C (Unless Otherwise Noted)

(75-ohm impedance except as indicated)

Figure 6. Return Loss

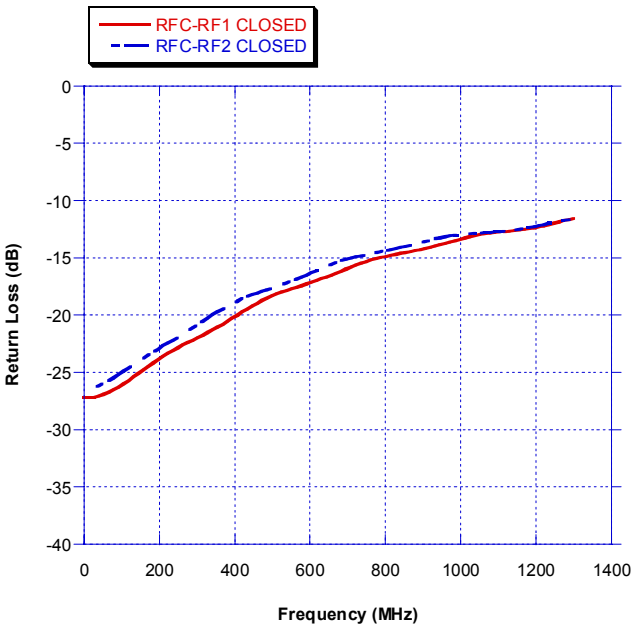
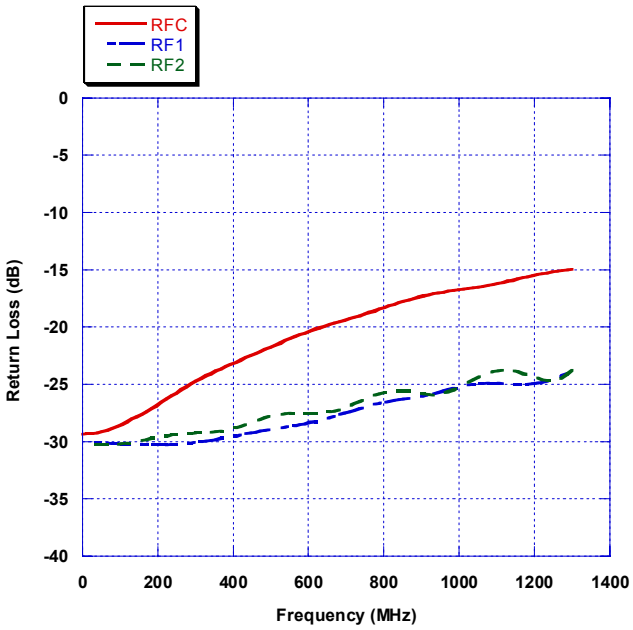


Figure 7. Return Loss (All Ports OPEN & Internally Terminated)



Evaluation Kit

The SPDT Switch Evaluation Kit board was designed to ease customer evaluation of the PE4256 SPDT switch. The RF common port is connected through a 75Ω transmission line to J2. Port 1 and Port 2 are connected through 75Ω transmission lines to J1 and J3. A through transmission line connects F connectors J4 and J5. This transmission line can be used to estimate the loss of the PCB over the environmental conditions being evaluated.

The board is constructed of a four metal layer FR4 material with a total thickness of 0.062". The transmission lines were designed using a coplanar waveguide with ground plane (28 mil core, 21mil width, 30mil gap).

J6 provides a means for controlling DC and digital inputs to the device.

The provided jumpers short the package pin to ground for logic low. When the jumper is removed, the pin is pulled up to Vdd for logic high.

When the jumper is in place, 3µA of current will flow through the 1MΩ pull up resistor. This extra current should not be attributed to the requirements of the device.

Figure 12. Evaluation Board Layouts

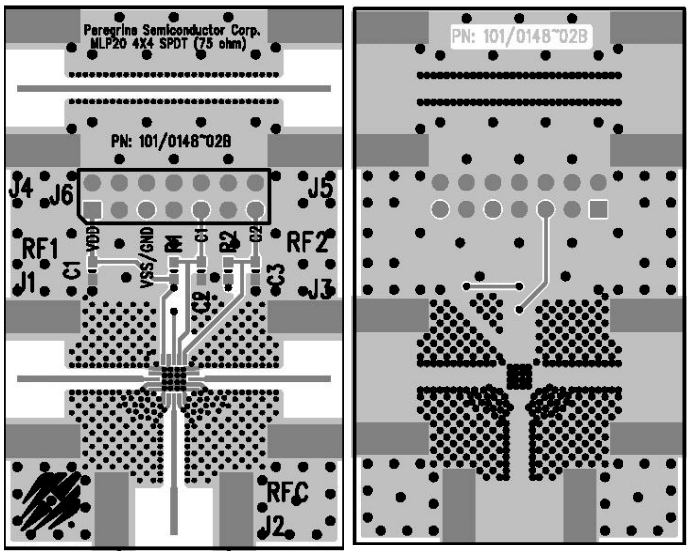


Figure 13. Evaluation Board Schematic

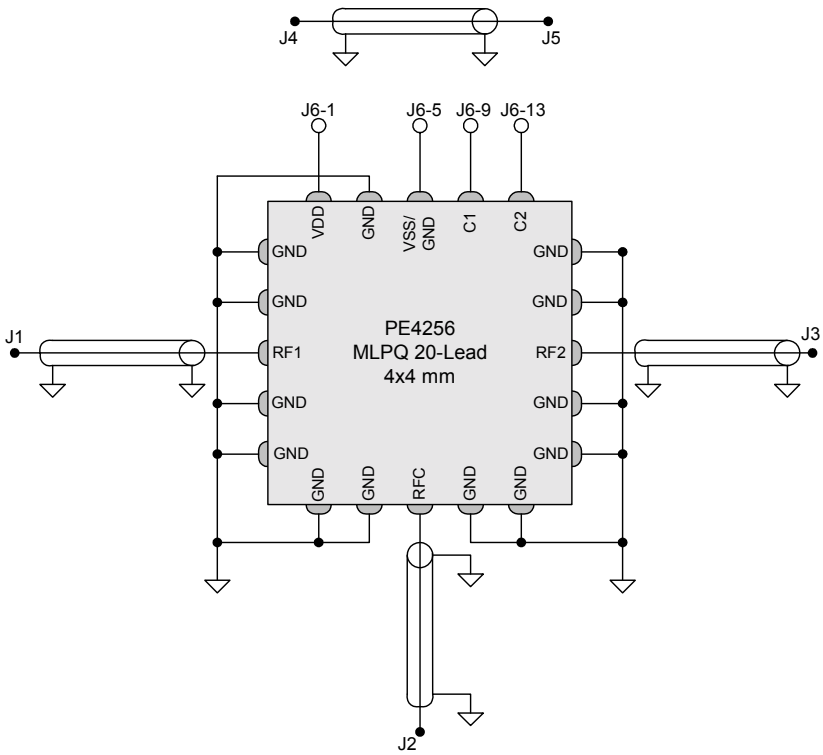


Figure 13. Package Drawing

20-lead 4x4 MLPQ

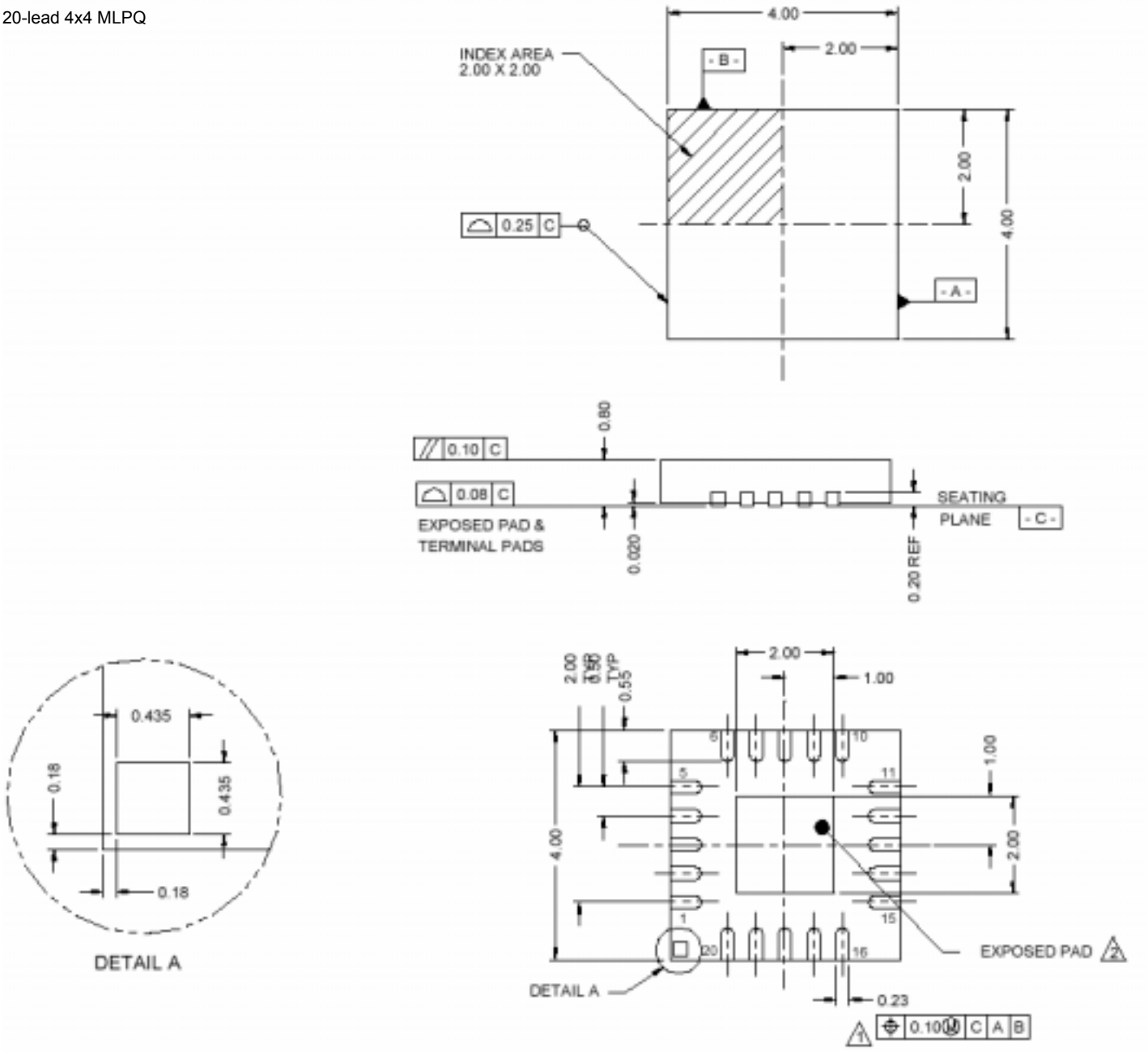


Table 6. Ordering Information

Order Code	Part Marking	Package	Shipping Method
4256-01	4256	20-lead 4X4mm MLPM	91 Unit Tube
4256-02	4256	20-lead 4X4mm MLPM	3000 units / T&R
4256-00	PE4256EK	Evaluation Kit	BOX

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Data Sheet Identification

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The product is in a formative or design stage. The data sheet contains design target specifications for product development. Specifications and features may change in any manner without notice.

Preliminary Specification

The data sheet contains preliminary data. Additional data may be added at a later date. Peregrine reserves the right to change specifications at any time without notice in order to supply the best possible product.

Product Specification

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Peregrine products are protected under one or more of the following U.S. patents: 6,090,648; 6,057,555; 5,973,382; 5,973,363; 5,930,638; 5,920,233; 5,895,957; 5,883,396; 5,864,162; 5,863,823; 5,861,336; 5,663,570; 5,610,790; 5,600,169; 5,596,205; 5,572,040; 5,492,857; 5,416,043. Other patents are pending.