PE42727

Product Specification

UltraCMOS® SPDT RF Switch, 5–3100 MHz

Features

- Supports DOCSIS 4.0 requirements
- Exceptional harmonics:
  - 2fo: -121 dBc @ 17 MHz
  - 3fo: -140 dBc @ 17 MHz
- Best-in-class linearity across the frequency band
- Low insertion loss: 0.4 dB @ 1784 MHz
- High isolation: 40 dB @ 1794 MHz
- Packaging: 12-lead 3.0 × 3.0 × 0.75 mm QFN

Applications

- Broadband market (DOCSIS 3.0, 3.1, and 4.0):
  - Cable modems
  - Set-top boxes
  - Residential gateways
- Filter bank switching
- Relay replacement between DOCSIS 3.0, 3.1, and 4.0 configurations

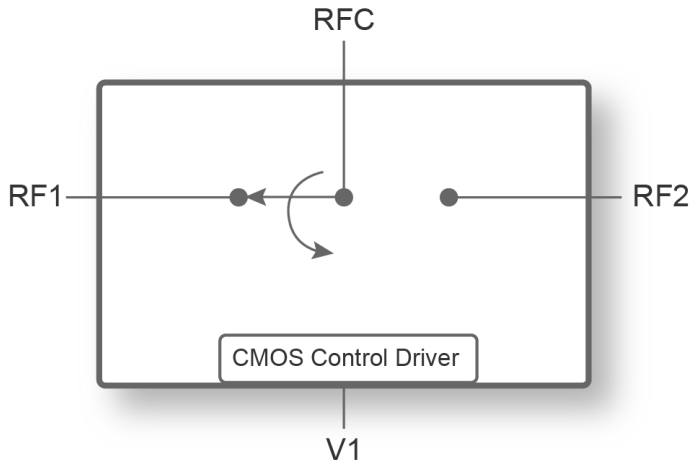


Figure 1. PE42727 functional diagram

Product description

The PE42727 is a HaRP™ technology-enhanced reflective SPDT RF switch designed for use in cable applications, including DOCSIS 3.0/3.1/4.0 cable modems, set-top boxes, and residential gateways. It delivers high linearity and excellent harmonics performance in the 5–3100 MHz band. It also features low insertion loss and high isolation performance, making the PE42727 ideal for DOCSIS 3.0/3.1/4.0 applications.

The PE42727 is manufactured on pSemi's UltraCMOS® process, a patented variation of silicon-on-insulator (SOI) technology on a sapphire substrate, offering the performance of GaAs with the economy and integration of conventional CMOS.

©2026, pSemi Corporation. All rights reserved.
Headquarters: 9369 Carroll Park Dr, San Diego, CA 92121

Absolute maximum ratings

Exceeding the absolute maximum ratings listed in Table 1 could cause permanent damage. Restrict operation to the limits in Table 2. Operation between the operating range maximum and the absolute maximum for extended periods could reduce reliability.

ESD precautions

When handling this UltraCMOS device, observe the same precautions as with any other ESD-sensitive devices. Although this device contains circuitry to protect it from damage due to ESD, do not exceed the rating listed in Table 1.

Latch-up immunity

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

Table 1. PE42727 absolute maximum ratings

Parameter or condition	Symbol	Min	Max	Unit
Supply voltage	V_{DD}	-0.3	5.5	V
Digital input voltage	V1	-0.3	3.6	V
RF input power, 75Ω	P_{IN}	–	86	dBmV
Maximum junction temperature	T_J	–	+150	°C
Storage temperature range	T_{ST}	-65	+150	°C
ESD voltage HBM, all pins(1)	V_{ESD_HBM}	–	2000	V
ESD voltage CDM, all pins(2)	V_{ESD_CDM}	–	500	V

Notes:
1. Human body model (MIL-STD 883 Method 3015).
2. Charged device model (JEDEC JESD22-C101).

Recommended operating conditions

Table 2 lists the PE42727 recommended operating conditions. Do not operate devices outside the operating conditions listed below.

Table 2. PE42727 operating conditions

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	V_{DD}	2.3	3.3	5.5	V
Supply current	I_{DD}	–	80	150	µA
Digital input high	V1	1.17	–	3.6(1)	V
Digital input low	V1	-0.3	–	0.6	V
RF input power, CW(2)	P_{IN_CW}	–	–	80	dBmV
RF input power, peak(3)	P_{IN_PEAK}	–	–	85	dBmV
Operating temperature range	T_{OP}	-40	+25	+85	°C

Notes:
1. The maximum digital input voltage is limited to V_{DD} and cannot exceed 3.6V.
2. 100% duty cycle, 75Ω.
3. OFDMA DOCSIS 3.1, single channel, 75Ω.

Electrical specifications

Table 3 lists the PE42727 key electrical specifications at +25 °C, V_{DD} = 3.3V, and Z_S = Z_L = 50Ω, unless otherwise specified.

Table 3. PE42727 electrical specifications

Parameter	Path	Condition	Min	Typ	Max	Unit
Operating frequency	–	–	5	–	3100	MHz
Insertion loss[1]	RFC–RFx	5–85 MHz 85–204 MHz 204–684 MHz 684–1218 MHz 1218–1794 MHz 3100 MHz	–	0.16 0.17 0.20 0.26 0.29 0.55	0.21 0.23 0.30 0.48 0.63 –	dB
Isolation	All paths	5–85 MHz 85–204 MHz 204–684 MHz 684–1218 MHz 1218–1794 MHz 3100 MHz	60 54 40 35 32 –	64 56 46 41 37 30	–	dB
Return loss[1]	RFC–RFx	5–85 MHz 85–204 MHz 204–684 MHz 684–1218 MHz 1218–1794 MHz 3100 MHz	32 28 17 13 12 –	36 32 20 14 15 22	–	dB
Second harmonic, 2fo	RFx	fo = 17 MHz, average PCW = 65 dBmV fo = 170 MHz, average PCW = 65 dBmV fo = 900 MHz, average PCW = 65 dBmV	–	-121 -121 -121	–	dBc
Third harmonic, 3fo	RFx	fo = 17 MHz, average PCW = 65 dBmV fo = 170 MHz, average PCW = 65 dBmV fo = 900 MHz, average PCW = 65 dBmV	–	-140 -135 -135	–	dBc
Input 0.1-dB compression point[2]	RFC–RFx	5–1218 MHz	–	87	–	dBmV
Switching time[3]	–	50% CTRL to 90% or 10% RF	–	38	–	µs

Notes:
1. To improve high-frequency performance, use external matching.
2. The input 0.1-dB compression point is a linearity figure of merit. For the operating RF input power (75Ω), see Table 2.
3. The PE42727 has a maximum 10 kHz switching frequency. The switching frequency describes the time duration between switching events. The switching time is the time duration between the point that the control signal reaches 50% of the final value and the point that the output signal reaches within 10% or 90% of its target value.

Spurious performance

The PE42727 fundamental occurs at 2.5 to 3 MHz.

- With V1 = H, the typical spur level due to the harmonics is -172 dBm/Hz, giving a spur level of -119 dBm(*) in the certification bandwidth of 160 kHz.
- With V1 = 0, the spur performance is -172 dBm/Hz.

Note: * The -172 dBm/Hz level is not constant across the whole 160 kHz bandwidth, so the total power in the specified bandwidth is < -172 + 10 × log(BW) dBm.

Thermal data

The junction top-of-package, Psi-JT (Ψ_{JT}), is a thermal metric to estimate the junction temperature of the device on an application PCB per JEDEC JESD51-2.

$$\Psi_{JT} = (T_J - T_T)/P$$

where:

- Ψ_{JT} = Junction-to-top of package characterization parameter in °C/W
- T_J = Die junction temperature in °C
- T_T = Package temperature (top surface, in the center) in °C
- P = Power dissipated by the device in Watts

Table 4. PE42427 thermal data

Parameter	Typ	Unit
Junction top-of package, Ψ_{JT}	21	°C/W

SPDT control logic

Table 5. PE42727 truth table

State	V1
RFC–RF1	High
RFC–RF2	Low

Typical performance data

Figure 2 through Figure 10 show the typical performance at +25 °C, V_{DD} = 3.3V, and Z_S = Z_L = 50Ω, unless otherwise specified.

Figure 2. Insertion loss RFC to RFx vs. frequency

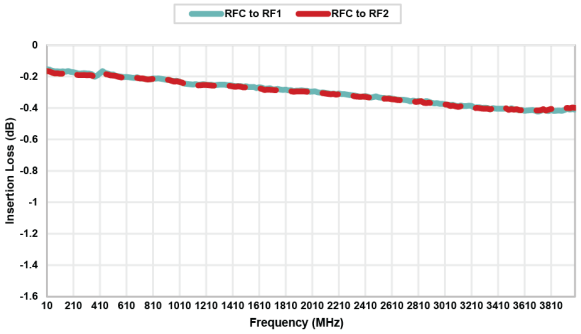


Figure 2. Insertion loss RFC to RFx vs. frequency

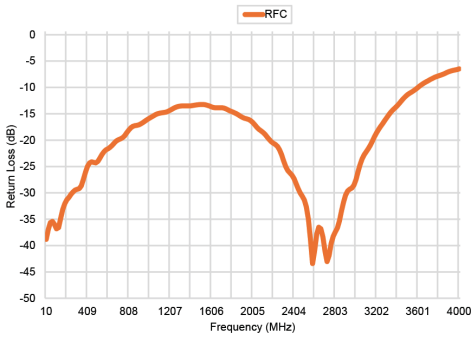


Figure 3. RFC port return loss

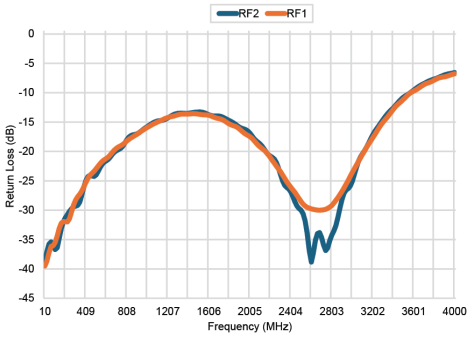


Figure 4. RFx port return loss

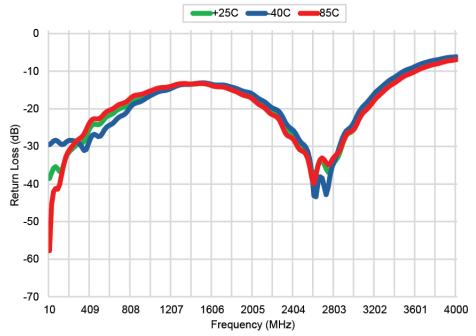


Figure 5. RFx port return loss over temperature

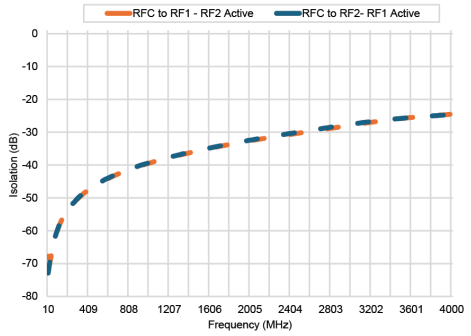


Figure 6. Isolation RFC to RFx

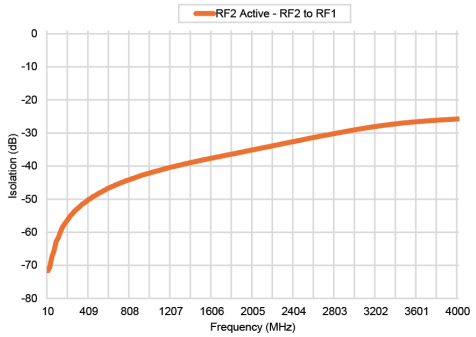


Figure 7. Isolation RFx to RFx

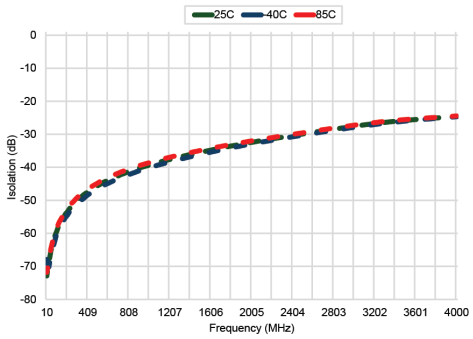


Figure 8. Isolation vs. temperature (RFC to RFx)

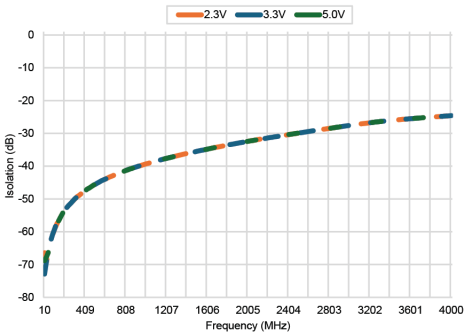


Figure 9. Isolation vs. V_{DD} voltage (RFC to RFx)

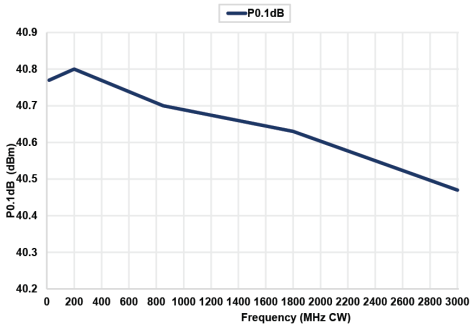


Figure 10. P01.dB vs. frequency (CW)

Evaluation kit

pSemi designed the PE42727 evaluation board to ease your evaluation of the PE42727 SPDT RF switch. The RF common port connects through a 75Ω transmission line via F-type connector, J3. The RF1 and RF2 ports connect through 75Ω transmission lines via F-Type connectors J1 and J2, respectively. A 75Ω through transmission line is available via F-type connectors J4 (THRU left) and J5 (THRU right), which you can use to de-embed the loss of the PCB. J6 provides DC and digital inputs to the device.

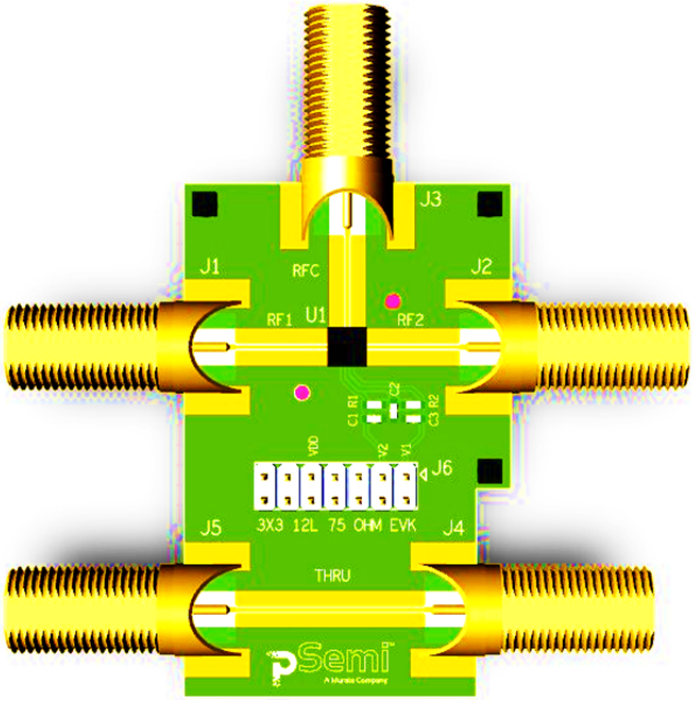


Figure 11. Evaluation board layout (PRT-60916-02)

Pin configuration

Figure 12 shows the PE42727 pin configuration for the 12-lead 3.0 × 3.0 × 0.75 mm QFN package, and Table 6 lists the description for each pin.

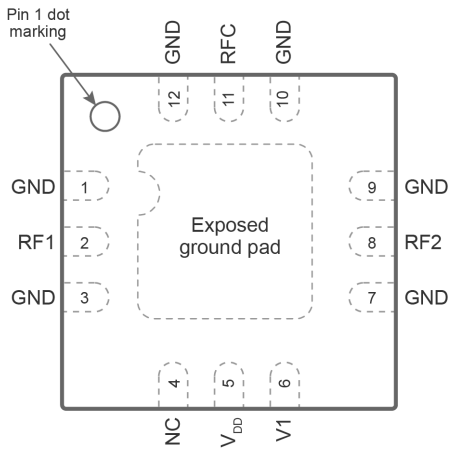


Figure 12. Pin configuration, top view

Table 6. PE42727 pin descriptions

Pin no.	Pin name	Description
1, 3, 7, 9, 10, 12	GND	Ground
2(*)	RF1	RF port 1
4	NC	Do not connect
5	V_{DD}	Nominal 3.3V supply voltage
6	V1	Digital control logic input 1
8(*)	RF2	RF port 2
11(*)	RFC	RF common port
Pad	GND	Exposed pad. Ground for proper operation.
Note: * RF pins 2, 8, and 11 must be at 0 VDC. These RF pins do not require DC blocking capacitors for proper operation if the 0 VDC requirement is met.		

Packaging information

This section provides the following packaging data:

- Moisture sensitivity level
- Package drawing
- Package marking
- Tape-and-reel information

Moisture sensitivity level

The PE42727 moisture sensitivity level rating for the 12-lead 3.0 × 3.0 × 0.75 mm QFN package is MSL1.

Package drawing

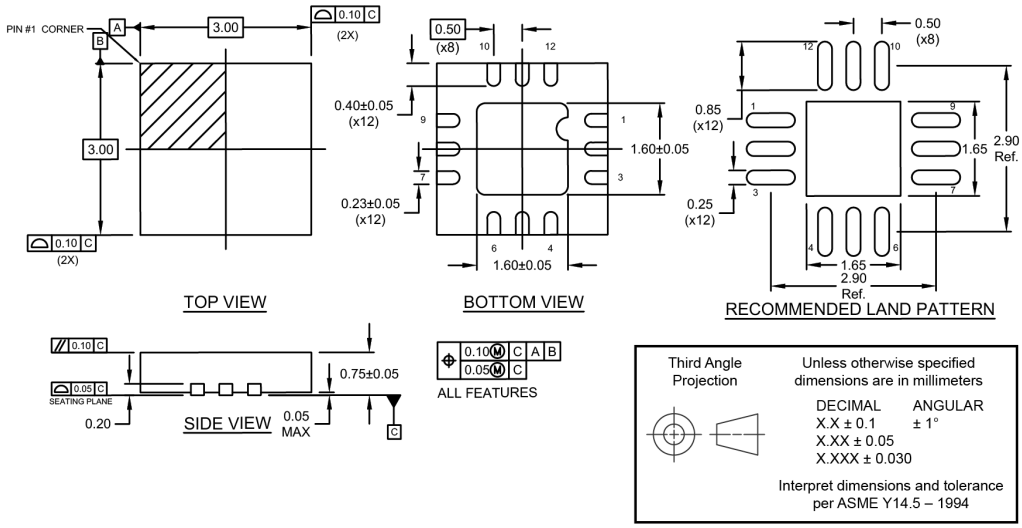


Figure 13. Package mechanical drawing for the 12-lead 3.0 × 3.0 × 0.75 mm QFN package

Top-marking specification

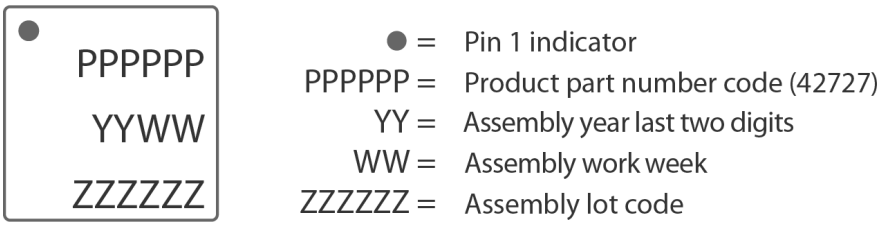
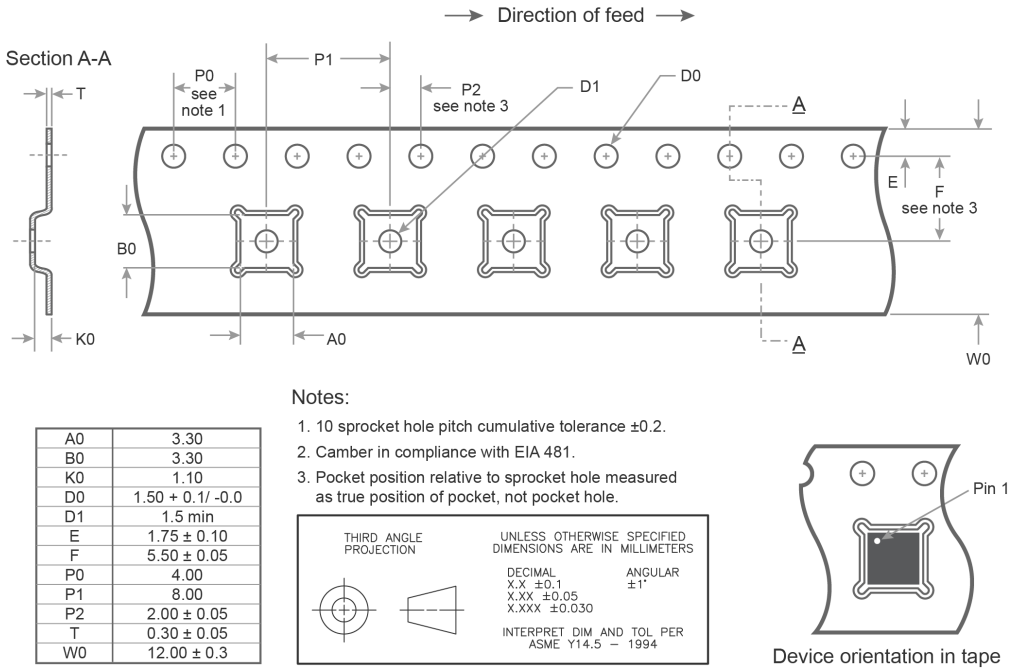


Figure 14. PE42727 package marking specification

Tape and reel specification



A0	3.30
B0	3.30
K0	1.10
D0	1.50 + 0.1/ -0.0
D1	1.5 min
E	1.75 ± 0.10
F	5.50 ± 0.05
P0	4.00
P1	8.00
P2	2.00 ± 0.05
T	0.30 ± 0.05
W0	12.00 ± 0.3

Notes:

1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. Camber in compliance with EIA 481.
3. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS

DECIMAL
X.X ±0.1
X.XX ±0.05
X.XXX ±0.030

ANGULAR
±1°

INTERPRET DIM AND TOL PER ASME Y14.5 – 1994

Figure 15. Tape and reel specification for the 12-lead 3.0 × 3.0 × 0.75 mm QFN package

Ordering information

Order code	Description	Packaging	Shipping method
PE42727A-Z	PE42727 SPDT RF switch	Green 12-lead 3.0 × 3.0 × 0.75 mm QFN	3000 units/tape and reel
EK42727-01	PE42727 evaluation kit	Evaluation kit	1/box

Copyright, Patents, and Trademark

© 2026, pSemi Corporation. All rights reserved. “pSemi”, “”, “pSemi”, and “pSemi Corporation” are registered trademarks and service marks of pSemi Corporation for the products and services for which they have been registered in the United States and foreign countries. “UltraCMOS”, “Peregrine”, and “” are registered trademarks of pSemi Corporation for the semiconductor products for which they have been registered in the United States and foreign countries. “HaRP”, “DuNE”, and “ULTRACMOS” are trademarks of pSemi Corporation for the products on or with which they are used. All other trademarks and service marks are the property of their respective owners. U.S. Patents applicable to products of pSemi Corporation include the U.S. Patents identified at http://patents.psemi.com. The websites https://www.psemi.com and https://patents.psemi.com, as well as documents and materials published by pSemi Corporation, are protected by copyright, with reservation of all applicable rights.

Disclaimers

The information in this data sheet is believed to be reliable. However, pSemi assumes no liability for the use of this information. Use shall be entirely at the user’s own risk. No patent rights or licenses to any circuits described in this data sheet are implied or granted to any third party. pSemi’s products are not designed or intended for use in devices or systems intended for surgical implant, or in other applications intended to support or sustain life, or in any application in which the failure of the pSemi product could create a situation in which personal injury or death might occur. pSemi assumes no liability for damages, including consequential or incidental damages, arising out of the use of its products in such applications.

Sales contact

For more information, contact Sales at sales@psemi.com.