

A Business Partner of Renesas Electronics Corporation.

# Application Based Optocoupler Design Guide



## Solutions as Easy as 1-2-3

Quickly select the right optocoupler for your application. We made it as simple as **1-2-3** regardless if you are a seasoned engineer or novice.

Simply follow the steps below to find your optocoupler solution:

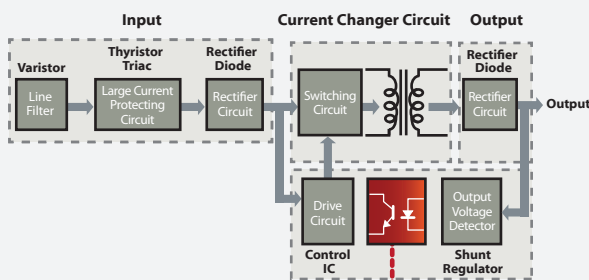
- 1.** Select your application.
- 2.** Look at the block diagram. Follow the corresponding color coded tables. (See Reference Tables on back page for series specs.)
- 3.** Answer the Questions in the block diagram to determine an orderable part. Visit [www.cel.com/Optocouplers](http://www.cel.com/Optocouplers) for a detailed datasheet.

## What is your Application?

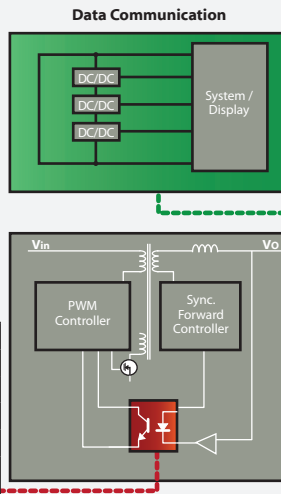
- ▶ **Switch Mode Power Supply**
- ▶ **Factory Automation Network**
- ▶ **Motor Drive and Control**
- ▶ **Power Over Ethernet (PoE)**
- ▶ **Power Line Communication (PLC)**
- ▶ **Smart Meters**
- ▶ **Solar Power**

## Choose your Application:

### Switch Mode Power Supply AC to DC Converter



Feedback Control Circuit & DC / DC Converter			
Isolation Voltage	Package	Family	Table
5KVr.m.s.	DIP 4	<a href="#">PS25xx</a>	<a href="#">1</a>
5KVr.m.s.	LSOP 4	<a href="#">PS2381</a>	<a href="#">2</a>
3.75KVr.m.s.	SOP 4	<a href="#">PS27xx</a>	<a href="#">3</a>
2.5KVr.m.s. isolation, 3.75KVr.m.s. for PS2861B	SSOP 4	<a href="#">PS28xx</a>	<a href="#">4</a>
2.5KVr.m.s.	Mini Flat 4	<a href="#">PS2911</a>	<a href="#">6</a>



#### Power Supplies



Communication Line			
Speed	Package	Family	Table
1 Mb/s Analog	DIP 8	<a href="#">PS8501</a>	<a href="#">5</a>

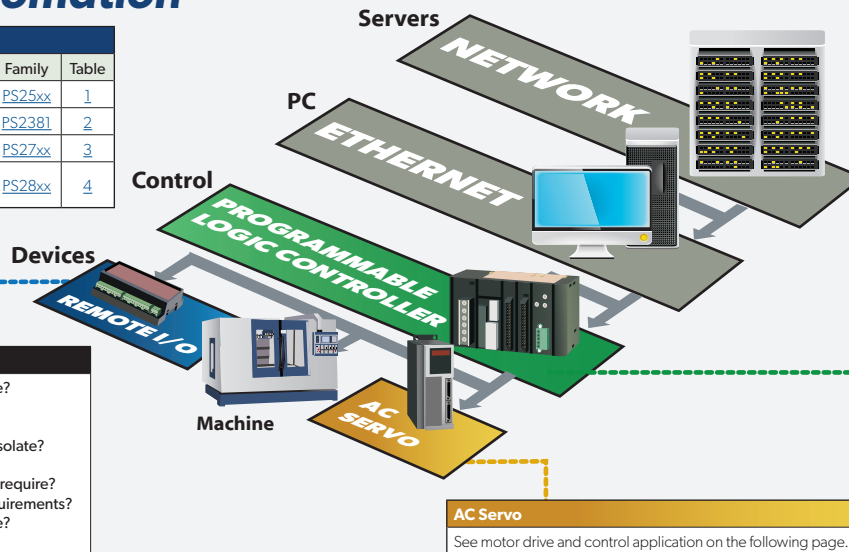
#### DC to DC Converter

##### Questions ?

- What Isolation Voltage do you require?
- SMT or Through Hole Package?
- What Operating Temperature do you require?
- What Current Transfer Ratio (CTR) do you require?
- What are your creepage distance requirements?
- What Safety Standards do you require? (UL, VDE, etc.)

### Factory Automation

Remote I/O			
Isolation Voltage	Package	Family	Table
5KVr.m.s.	DIP 4	<a href="#">PS25xx</a>	<a href="#">1</a>
5KVr.m.s.	LSOP 4	<a href="#">PS2381</a>	<a href="#">2</a>
3.75KVr.m.s.	SOP 4	<a href="#">PS27xx</a>	<a href="#">3</a>
2.5KVr.m.s. isolation, 3.75KVr.m.s. for PS2861B	SSOP 4	<a href="#">PS28xx</a>	<a href="#">4</a>



Programmable Logic Controller Input/Output Isolation			
Isolation Voltage	Package	Family	Table
2.5KVr.m.s.	SSOP 4	<a href="#">PS2801C</a>	<a href="#">4</a>
2.5KVr.m.s.	SSOP 4	<a href="#">PS2805C</a>	<a href="#">4</a>
1.5KVr.m.s.	SSOP 12	<a href="#">PS2841-4x</a>	<a href="#">4</a>
3.75KVr.m.s.	SOP 4	<a href="#">PS2701A</a>	<a href="#">3</a>
5KVr.m.s.	SOP 4	<a href="#">PS2501A</a>	<a href="#">1</a>

Programmable Logic Controller Communication Isolation			
Speed	Package	Family	Table
1 Mb/s Analog	SOP 5	<a href="#">PS8101</a>	<a href="#">5</a>
1 Mb/s Digital	SOP 5 SOP 8	<a href="#">PS9122</a> <a href="#">PS9822</a>	<a href="#">5</a>
10 Mb/s Digital	SOP 5	<a href="#">PS9117A</a>	<a href="#">5</a>
10 Mb/s Digital	SOP 8	<a href="#">PS9817A</a>	<a href="#">5</a>
15 Mb/s Digital	SOP 5 SOP 5 SOP 8	<a href="#">PS9121</a> <a href="#">PS9123</a> <a href="#">PS9821</a>	<a href="#">5</a>
10 Mb/s Digital	DIP 8	<a href="#">PS9587</a>	<a href="#">5</a>

##### Questions ?

- What Isolation Voltage do you require?
- What Transfer Speed do you require?
- SMT or Through Hole Package?
- How many channels do you need to isolate? (1, 2 or 4 per package)
- What Operating Temperature do you require?
- What are your creepage distance requirements?
- What Safety Standards do you require? (UL, VDE, etc.)

See motor drive and control application on the following page.

# Motor Drive and Control

## Inverter Control Isolated Gate Driving of MOSFETs and IGBTs

I <sub>o</sub> peak (A)	Package	Family	Table
2.5	DIP 8	PS9905	7
0.6	SDIP 6	PS9307	7
2.5	SDIP 8	PS9305	7
2.5	DIP 8	PS9505	7
0.6	DIP 8	PS9506	7
2.5	SO16	PS9402	7

## Power Supply Isolation

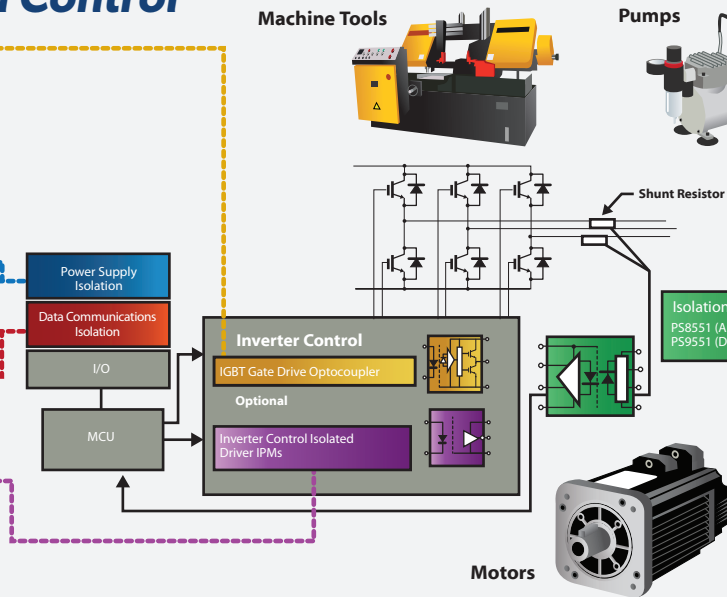
Isolation Voltage	Package	Family	Table
3.75KVr.m.s.	SOP 4	PS27xx	3
2.5KVr.m.s. isolation, 3.75KVr.m.s. for PS2861B	SSOP 4	PS28xx	4

## Data Communication Isolation

Speed	Package	Family	Table
10 Mb/s Digital	SOP 5	PS9117A	5
10 Mb/s Digital	SDIP 6	PS9817A	5

## Inverter Control Isolated Driving of IPMs

Speed	Package	Family	Table
5 Mb/s Digital	SDIP 6	PS9309	8
1 Mb/s Digital	SDIP 6	PS9303	8
1 Mb/s Digital	SOP 5	PS9113	8
1 Mb/s Digital	SDIP 6	PS9313	8
1 Mb/s Digital	DIP 8	PS9513	8



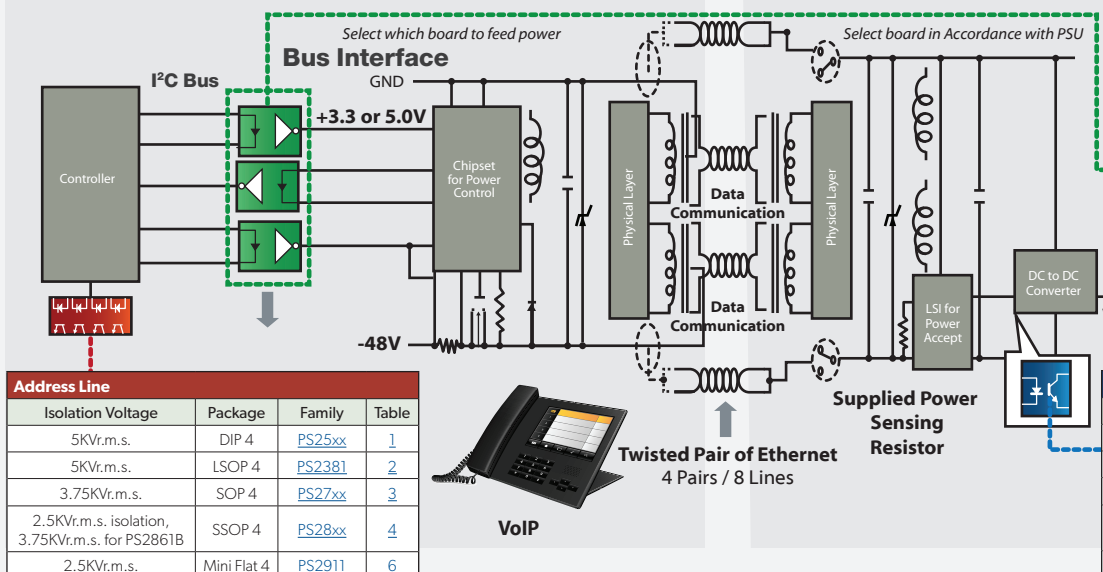
### Isolation Amplifier for feedback control

Isolation Voltage	Package	Family	Table
5KVr.m.s.	SDIP 8	PS8551	9
5KVr.m.s.	SDIP 8	PS9551	10

Isolation Amplifier  
PS8551 (Analog Type)  
PS9551 (Digital Type)

- ### Questions ?
- What Isolation Voltage do you require?
  - What Transfer Speed do you require?
  - SMT or Through Hole Package?
  - How many channels do you need to isolate? (1, 2 or 4 per package)
  - What Operating Temperature do you require?
  - What are your creepage distance requirements?
  - What Safety Standards do you require? (UL, VDE, etc.)

# POE (Power Over Ethernet)



- ### Questions ?
- What Isolation Voltage do you require?
  - What Transfer Speed do you require?
  - SMT or Through Hole Package?
  - How many channels do you need to isolate? (1, 2 or 4 per package)
  - What Operating Temperature do you require?
  - What are your creepage distance requirements?
  - What Safety Standards do you require? (UL, VDE, etc.)

### I2C Bus

Speed	Package	Family	Table
1 Mb/s Analog	SOP 8	PS8821	5
1 Mb/s Digital	SOP 5 SOP 8	PS9122 PS9822	5
15 Mb/s Digital	SOP 5 SOP 5 SOP 8	PS9121 PS9123 PS9821	5

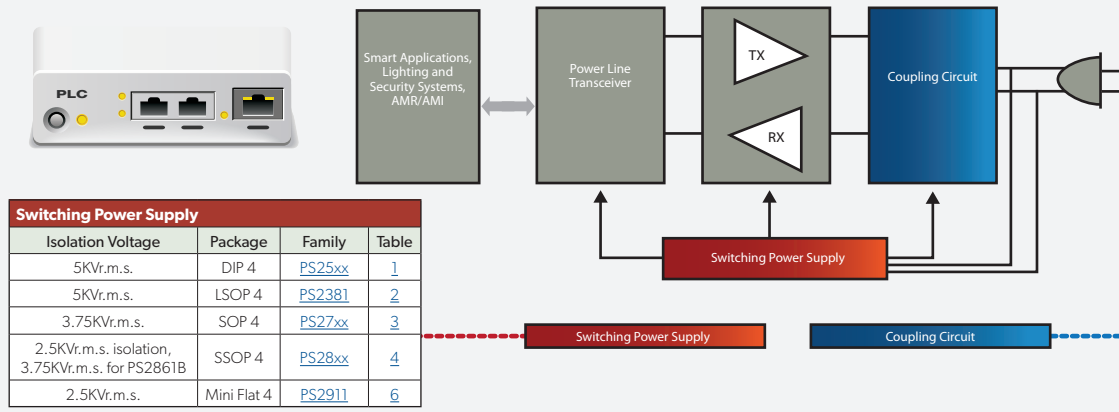
### Address Line

Isolation Voltage	Package	Family	Table
5KVr.m.s.	DIP 4	PS25xx	1
5KVr.m.s.	LSOP 4	PS2381	2
3.75KVr.m.s.	SOP 4	PS27xx	3
2.5KVr.m.s. isolation, 3.75KVr.m.s. for PS2861B	SSOP 4	PS28xx	4
2.5KVr.m.s.	Mini Flat 4	PS2911	6

### Feedback for DC to DC Converter

Isolation Voltage	Package	Family	Table
5KVr.m.s.	DIP 4	PS25xx	1
5KVr.m.s.	LSOP 4	PS2381	2
3.75KVr.m.s.	SOP 4	PS27xx	3
2.5KVr.m.s. isolation, 3.75KVr.m.s. for PS2861B	SSOP 4	PS28xx	4
2.5KVr.m.s.	Mini Flat 4	PS2911	6

# PLC (Power Line Communication)



- ### Questions ?
- What Isolation Voltage do you require?
  - What Transfer Speed do you require?
  - SMT or Through Hole Package?
  - What is your Operating Voltage?
  - What Operating Temperature do you require?
  - What are your creepage distance requirements?
  - What Safety Standards do you require? (UL, VDE, etc.)

### Switching Power Supply

Isolation Voltage	Package	Family	Table
5KVr.m.s.	DIP 4	PS25xx	1
5KVr.m.s.	LSOP 4	PS2381	2
3.75KVr.m.s.	SOP 4	PS27xx	3
2.5KVr.m.s. isolation, 3.75KVr.m.s. for PS2861B	SSOP 4	PS28xx	4
2.5KVr.m.s.	Mini Flat 4	PS2911	6

### Coupling Circuit

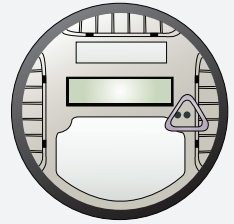
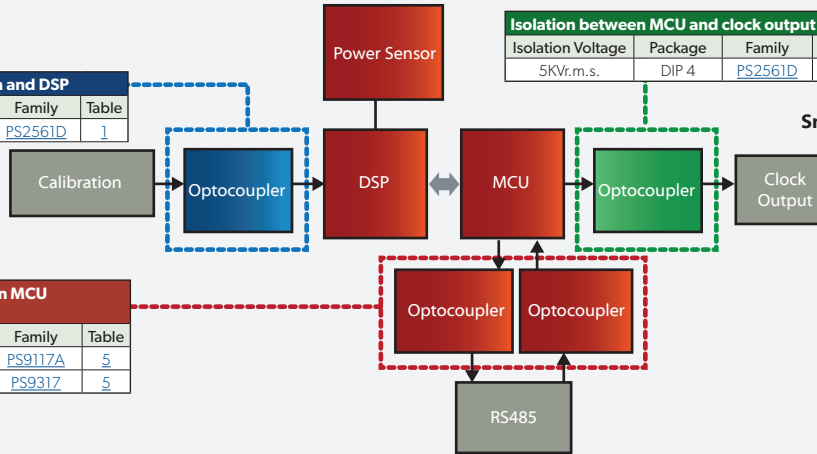
Vcc	Package	Family	Table
5V	SOP 5	PS9117A	5
5V	SOP 5	PS9123	5
5V	SOP 8	PS9851	5
3.3V	SOP 8	PS9821	5



# Smart Meters

Isolation between Calibration and DSP			
Isolation Voltage	Package	Family	Table
5Kv.r.m.s.	DIP 4	PS2561D	1

Isolation between MCU and clock output			
Isolation Voltage	Package	Family	Table
5Kv.r.m.s.	DIP 4	PS2561D	1



Smart Meters

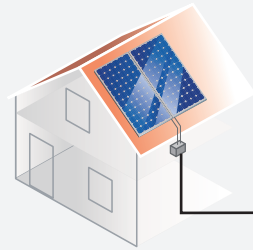
High Speed Isolation between MCU and RS485			
Speed	Package	Family	Table
10 Mb/s Digital	SOP 5	PS9117A	5
10 Mb/s Digital	SDIP 6	PS9317	5

### Questions ?

- What Isolation Voltage do you require?
- What Transfer Speed do you require?
- SMT or Through Hole Package?
- How many channels do you need to isolate? (1, 2 or 4 per package)
- What Operating Temperature do you require?
- What are your creepage distance requirements?
- What Safety Standards do you require? (UL, VDE, etc.)

# Solar Power

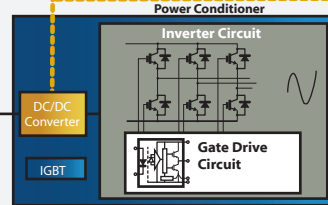
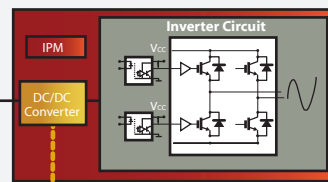
## Home System Solar Cell



## Plant / Building System



IPM Driver			
Isolation Voltage	Package	Family	Table
3.75Kv.r.m.s.	SOP 5	PS9113	8
5Kv.r.m.s.	DIP 8	PS9513	8



Feedback Control Circuit in DC/DC Converter			
Isolation Voltage	Package	Family	Table
5Kv.r.m.s.	DIP 4	PS2561D	1

IGBT Gate Driver			
I <sub>o</sub> peak (A)	Package	Family	Table
2.5	DIP 8	PS9905	Z
0.6	SDIP 6	PS9307	Z
2.5	SDIP 8	PS9305	Z
2.5	DIP 8	PS9505	Z
0.6	DIP 8	PS9506	Z

### Questions ?

- What Isolation Voltage do you require?
- What Transfer Speed do you require?
- SMT or Through Hole Package?
- How many channels do you need to isolate? (1, 2 or 4 per package)
- What Operating Temperature do you require?
- What are your creepage distance requirements?
- What Safety Standards do you require? (UL, VDE, etc.)

# Part Numbering System

Note: This diagram is intended to explain existing part numbers and is not to be used to create part numbers since NOT all combinations are available.



Package Style	
No.	Description
23	4 Pin LSOP (Pin pitch 2.54 mm)
25	4 Pin to16 DIP Multi Type
27	4 Pin to16 SOP (Pin pitch 2.54 mm)
28	4 Pin or 16 SSOP (Pin pitch 1.27 mm)
29	4 Pin Mini Flat (Pin pitch 1.27 mm)
81	SOP5 (Analog Output)
83	6 Pin SDIP (Analog Output)
85	8 Pin DIP (Hi-Speed Analog Output)
88	SO8 (Analog Output)
91	SOP5 (Digital Output)
92	SOP5 (Digital Output / 5.5 mm long creepage)
93	6 Pin SDIP (Digital Output)
94	SO16 (Hi-Speed / Hi-Function)
95	8 Pin DIP (Hi-Speed / Hi-Function)
98	SO8 (Digital Output)
99	8 Pin DIP (Long Creepage Distance 14 mm)

Package Terminology	
Style	Description
DIP	Dual In Line Package with through hole and/or surface mount leads
Mini Flat	Small package with flat surface mount leads
LSOP	Long Small Outline Package with surface mount leads
SDIP	Small Dual in Line Package with surface mount leads
SOP	Small Outline Package with surface mount leads
SSOP	Shrink Small Outline Package with surface mount leads

- Options
- 23  
25  
27  
28  
29  
81  
83  
85  
88  
91  
92  
93  
94  
95  
98  
99

ID Number

- Options
- A  
B  
C  
D  
F

Options

Lead Bend

- Options
- 1  
2  
4

Options

V = VDE

Options

Tape/Reel

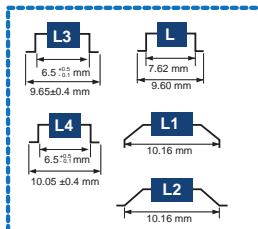
Options

CTR Rank (See Datasheet)

Options

Lead Finish

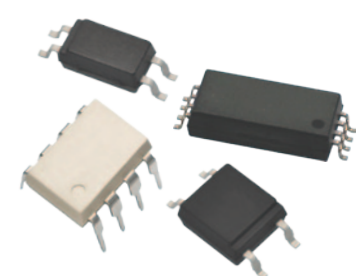
Variations	
Letter	Description
A	Die shrunk
B	High Temperature
C	Die Shrunk High V <sub>CEO</sub>
D	New Process
F	New Process



Tape and Reel	
Options	Description
E3	Reel
F3	Larger Reel

Lead Finish	
Options	Description
None	Standard Finish
A	Pb-Free Finish
AX	NiPdAu Finish

Channel Type	
No.	Description
1	1-Channel Type
2	2-Channel Type
4	4-Channel Type



# Reference Tables

Bold\* = Focus Products

Table 1	Root Part	Input	Output	Operating Temperature Range (°C)	V <sub>CEO</sub> Max (V)	I <sub>F</sub> Max (mA)	CTR (%)	CTR Rank Available	Comments
	<b>PS2561D*</b>	<b>DC</b>	<b>Standard</b>	<b>-55 to +110</b>	<b>80</b>	<b>40</b>	<b>50-400</b>	<b>Yes</b>	<b>Low cost version of PS2561B, PS2501 and PS2501A, High temp</b>
	PS2501	DC	Standard	-55 to +100	80	80	80-600	Yes	Standard
	PS2501A	DC	Standard	-55 to +100	70	30	50-400	Yes	Low cost version of PS2501
	PS2561B	DC	Standard	-55 to +110	80	40	50-400	Yes	High temp, 0.4mm Internal isolation distance
PS2561E	DC	Standard	-55 to +110	80	30	300-600	No	Low cost version of PS2501-1-K, High temp	

Table 2	Root Part	Input	Output	Operating Temperature Range (°C)	V <sub>CEO</sub> Max (V)	I <sub>F</sub> Max (mA)	CTR (%)	CTR Rank Available	Comments
	<b>PS2381*</b>	<b>DC</b>	<b>Standard</b>	<b>-40 to +115</b>	<b>80</b>	<b>60</b>	<b>50-450</b>	<b>Yes</b>	<b>Stretched package, high temp operation</b>

Table 3	Root Part	Input	Output	Operating Temperature Range (°C)	V <sub>CEO</sub> Max (V)	I <sub>F</sub> Max (mA)	CTR (%)	CTR Rank Available	Comments
	<b>PS2761B*</b>	<b>DC</b>	<b>Standard</b>	<b>-55 to +110</b>	<b>70</b>	<b>25</b>	<b>50-400</b>	<b>Yes</b>	<b>High temp, low cost version of PS2701 and PS2701A</b>
	PS2701	DC	Standard	-55 to +100	40	50	50-300	Yes	Standard
PS2701A	DC	Standard	-55 to +100	70	30	50-300	Yes	Low cost version of PS2701	

Table 4	Root Part	Input	Output	Operating Temperature Range (°C)	V <sub>CEO</sub> Max (V)	I <sub>F</sub> Max (mA)	CTR (%)	CTR Rank Available	Comments
	<b>PS2861B*</b>	<b>DC</b>	<b>Standard</b>	<b>-55 to +110</b>	<b>70</b>	<b>50</b>	<b>50-400</b>	<b>No</b>	<b>High temp version of PS2801 and PS2801C</b>
	PS2801C	DC	Standard	-55 to +100	80	30	50-400	Yes	Low cost version of PS2801
	PS2801	DC	Standard	-55 to +100	80	50	80-600	Yes	Standard
	PS2805C	AC	Standard	-55 to +100	80	±30	50-400	Yes	AC input
PS2841-4x	x=A common cathode x=B common anode	Common Collector	-40 to +100	70	20	100-400	No	Ultra SSOP, quad channel with 12 leads	

Table 5	Root Part	Type	Speed	Operating Temperature Range (°C)	Package	Isolation Voltage (Vr.m.s.)	CMR (KV/μS)	V <sub>CC</sub> Max (V)	V <sub>CC</sub> TYP (V)	Comments
	<b>PS9122*</b>	<b>High Speed / High Function</b>	<b>1 Mbps</b>	<b>-40 to +100</b>	<b>5 pin SOP</b>	<b>3.75K</b>	<b>±15</b>	<b>7</b>	<b>3.3 or 5</b>	<b>3.3V &amp; 5V versions, Open Collector</b>
	<b>PS9117A*</b>	<b>High Speed / High Function</b>	<b>10 Mbps</b>	<b>-40 to +85</b>	<b>5 pin SOP</b>	<b>3.75K</b>	<b>±15</b>	<b>7</b>	<b>5</b>	<b>5V, Low Distortion</b>
	<b>PS9821*</b>	<b>High Speed / High Function</b>	<b>15 Mbps</b>	<b>-40 to +85</b>	<b>SO8</b>	<b>2.5K</b>	<b>±15</b>	<b>7</b>	<b>3.3</b>	<b>3.3V, Low Distortion</b>
	<b>PS9324L/L2*</b>	<b>High Speed / High Function</b>	<b>15 Mbps</b>	<b>-40 to +100</b>	<b>6 pin SDIP</b>	<b>5k</b>	<b>±15</b>	<b>7</b>	<b>3.3 or 5</b>	<b>3.3V &amp; 5V versions, Open Collector, Low Distortion</b>
	<b>PS9123*</b>	<b>High Speed / High Function</b>	<b>15 Mbps</b>	<b>-40 to +100</b>	<b>5 pin SOP</b>	<b>3.75K</b>	<b>±15</b>	<b>7</b>	<b>5</b>	<b>Totem Pole Output, Low Distortion</b>
	PS8101	High Speed / High Function	1 Mbps	-55 to +100	5 pin SOP	3.75K	±15	35	-	High CMR analog output
	PS8821	High Speed / High Function	1 Mbps	-55 to +100	SO8	2.5K	±1	7	3.3 typ.	3.3V, Power Over Ethernet
	PS9822	High Speed / High Function	1 Mbps	-40 to +100	SO8	2.5K	±20	7	3.3 or 5	3.3V & 5V versions, Open Collector
	PS9121	High Speed / High Function	15 Mbps	-40 to +85	5 pin SOP	3.75K	±15	7	3.3	3.3V, Low Distortion
	PS9817A	High Speed / High Function	10 Mbps	-40 to +85	SO8	2.5K	±15	7	5	5V, Low Distortion
	PS9317	High Speed / High Function	10 Mbps	-40 to +85	6 pin SDIP	5K	±15	7	5	8mm creepage, 6 pin SDIP
	PS9587	High Speed / High Function	10 Mbps	-40 to +85	8 pin DIP	5K	±15	7	5	8mm creepage, 8 pin DIP
PS8501	High Speed / High Function	1 Mbps	-55 to +100	8 pin DIP	5K	-	35	-	8mm creepage, 8 pin DIP	
PS9851	High Speed / High Function	15 Mbps	-40 to +100	SO8	2.5K	±10	5.5	5	5V, 100°C max operating temp	

Table 6	Root Part	Input	Output	Operating Temperature Range (°C)	V <sub>CEO</sub> Max (V)	I <sub>F</sub> Max (mA)	CTR (%)	CTR Rank Available	Comments
	<b>PS2911*</b>	<b>DC</b>	<b>Standard</b>	<b>-55 to +100</b>	<b>40</b>	<b>50</b>	<b>100-400</b>	<b>Yes</b>	<b>Ultra small flat-lead package</b>
	PS2705A	AC	Standard	-55 to +100	80	±30	50-300	Yes	AC input

Table 7	Root Part	Input	t <sub>PLH</sub> / t <sub>PHL</sub> (μS)	Operating Temperature Range (°C)	Isolation Voltage (Vr.m.s.)	I <sub>F</sub> Max (mA)	CMR (KV/μS)	V <sub>CC</sub> Max (V)	Comments
	<b>PS9905*</b>	<b>DC</b>	<b>0.25</b>	<b>-40 to +110</b>	<b>7.5K</b>	<b>25</b>	<b>±25</b>	<b>30</b>	<b>14mm Long creepage, 8 pin DIP</b>
	<b>PS9307*</b>	<b>DC</b>	<b>0.175</b>	<b>-40 to +125</b>	<b>5K</b>	<b>25</b>	<b>±50</b>	<b>35</b>	<b>6 pin SDIP</b>
	<b>PS9505*</b>	<b>DC</b>	<b>0.25</b>	<b>-40 to +110</b>	<b>5K</b>	<b>25</b>	<b>±25</b>	<b>30</b>	<b>UVLO (Under Voltage Lock Out) protection with hysteresis</b>
	<b>PS9402*</b>	<b>DC</b>	<b>0.2</b>	<b>-40 to +110</b>	<b>5K</b>	<b>25</b>	<b>±25</b>	<b>33</b>	<b>Fault detection (desaturation detection, UVLO protection and active Miller clamping)</b>
	PS9305	DC	0.25	-40 to +110	5K	25	±25	30	UVLO (Under Voltage Lock Out) protection with hysteresis
PS9506	DC	0.4	-40 to +110	5K	25	±25	30	8mm creepage option available	

Table 8	Root Part	Input	t <sub>PLH</sub> / t <sub>PHL</sub> (nS)	Operating Temperature Range (°C)	Isolation Voltage (Vr.m.s.)	I <sub>F</sub> Max (mA)	CMR (KV/μS)	V <sub>CC</sub> Max (V)	Comments
	<b>PS9309*</b>	<b>DC</b>	<b>250/250</b>	<b>-40 to +110</b>	<b>5K</b>	<b>20</b>	<b>±15</b>	<b>20</b>	<b>5 Mbps Totem Pole output type, 6 pin SDIP, IPM driver</b>
	PS9303	DC	500/550	-40 to +110	5K	20	±15	25	1 Mbps Totem Pole output type, 6 pin SDIP, IPM driver
	PS9113	DC	750/500	-40 to +110	3.75K	25	±15	35	1 Mbps, open collector output, 5 pin SOP (SO5) IPM driver
	PS9313	DC	750/500	-40 to +110	5K	25	±15	30	1 Mbps, open collector output, 8mm creepage 6 pin SDIP IPM driver
PS9513	DC	750/500	-40 to +100	5K	30	±15	35	1 Mbps, open collector output, 8mm creepage 8 pin DIP IPM driver	

Table 9	Root Part	Operating Temperature Range (°C)	Bandwidth TYP (kHz)	Input Supply <sup>DD1</sup> Max (mA)	Output Supply <sup>DD2</sup> Max (mA)	Gain v/v TYP	Gain Error (%)	CMR (KV/μS)	Comments
	<b>PS8551*</b>	<b>-55 to +100</b>	<b>100</b>	<b>18</b>	<b>16</b>	<b>8</b>	<b>±3</b>	<b>±10</b>	<b>1 Mbps high CMR analog output isolation amplifier</b>

Table 10	Root Part	Operating Temperature Range (°C)	V <sub>CC</sub> Max (V)	V <sub>CC</sub> Range Recommended (V)	Input Supply <sup>DD1</sup> Max (mA)	Output Supply <sup>DD2</sup> Max (mA)	ENOB (Bits Min)	Output Clock Frequency (MHz Typ)	Comments
	PS9551	-40 to +85	5.5	4.5 to 5.5	18	15	10	10	High CMR digital output isolation amplifier, sigma-delta modulator

## CEL Headquarters

4590 Patrick Henry Drive  
Santa Clara, CA 95054  
Tel: (408) 919-2500  
Fax: (408) 988-0279

[www.cel.com](http://www.cel.com)

## CEL Regional Sales Offices

### CEL West

Tel: (408) 919-2639  
Fax: (408) 538-9000

### CEL Southwest

Tel: (760) 217-5190  
Fax: (408) 538-9000

### CEL Central

Tel: (408) 919-2619  
Fax: (913) 273-0741

### CEL Southcentral

Tel: (408) 919-2619  
Fax: (913) 273-0741

### CEL Southeast

Tel: (408) 919-2618  
Fax: (410) 558-6765

### CEL Northeast

Tel: (408) 919-2618  
Fax: (410) 558-6765

### CEL International

Tel: (408) 919-2615  
Fax: (908) 543-1013

### CEL Office for Distribution Partners

Tel: (408) 919-2500  
Fax: (408) 988-0279

## Distributors

### Arrow Electronics

[arrow.com](http://arrow.com)

### Avnet - Israel

[avnet-israel.com](http://avnet-israel.com)

### Digi-Key Corporation

[digkey.com](http://digkey.com)

### Future Electronics

[futureelectronics.com](http://futureelectronics.com)

### Mouser Electronics

[mouser.com](http://mouser.com)

### Nu Horizons

[nuhorizons.com](http://nuhorizons.com)

## U.S. Sales Representatives

WA / OR / ID / MT / WY  
**Disman Bakner**  
Tel: (800) 347-3010

Colorado / Utah  
**Straube Associates**  
Tel: (303) 426-0890

Southern CA - Irvine / LA  
**Centaur / Procyon**  
Tel: (949) 261-2123

Southern CA - San Diego  
**Centaur / Procyon**  
Tel: (858) 278-4950

Arizona / New Mexico  
**Centaur / Procyon**  
Tel: (602) 571-2454

Northern CA - Mountain View  
**TAARCOM**  
Tel: (650) 960-1550

Illinois  
**Stan Clothier Co.**  
Tel: (847) 781-4010

Iowa  
**Stan Clothier Co.**  
Tel: (319) 393-1576

Kansas  
**Stan Clothier Co.**  
Tel: (913) 894-1675

MN / ND / SD  
**Stan Clothier Co.**  
Tel: (952) 944-3456

Missouri  
**Stan Clothier Co.**  
Tel: (636) 916-3777

Wisconsin  
**Stan Clothier Co.**  
Tel: (608) 882-0686

Indiana / Kentucky  
**TMC**  
Tel: (317) 844-8462

Michigan  
**TMC**  
Tel: (248) 592-0814

Ohio / West PA  
**TMC**  
Tel: (513) 984-6720

TX / OK / AR / LA  
**TriStar Group**  
Tel: (972) 392-2848

CT / MA / ME / NH / RI / VT  
**Anchor Engineering**  
Tel: (508) 898-2724

North Carolina  
**Rep One**  
Tel: (919) 424-3814

South Carolina  
**Rep One**  
Tel: (704) 846-5744

GA / East TN  
**Rep One**  
Tel: (770) 209-9242

AL / West TN / MS  
**Rep One**  
Tel: (256) 539-7371

Southern Florida  
**Rep One**  
Tel: (561) 613-8342

Florida - Orlando  
**Rep One**  
Tel: (407) 952-9013

Florida - Tampa  
**Rep One**  
Tel: (813) 957-5293

Northern NJ / NYC / LI  
**Strategic Sales Inc.**  
Tel: (973) 808-5060

Southern NJ / East PA / DE  
**Strategic Sales Inc.**  
Tel: (856) 489-3883

MD / VA / WV  
**Strategic Sales Inc.**  
Tel: (410) 964-0097

New York - Syracuse  
**L.D. Allen**  
Tel: (315) 431-1001

New York - Rochester  
**L.D. Allen**  
Tel: (585) 218-5250

## Eastern Canada

Ontario, Quebec, Maritime  
Provinces  
**Astec Components Ltd.**  
Tel: (905) 607-1444

## Western Canada

BC, Alberta, Saskatchewan,  
Manitoba  
**Disman Bakner**  
Tel: (800) 347-3010

## Mexico

Zapopan, Jalisco  
**Everest Sales & Solutions**  
Tel: +(52) 33-3123-0848

Ecatepec, EDO de  
Mexico, DF  
**Everest Sales & Solutions**  
Tel: +(52) 55-5770-2179

## South America

Brazil  
**VLA Solutions**  
Tel: +(55) 115-505-8011

## Africa/Middle East

South Africa  
**RF Design**  
Tel: 27 (0) 21-555-8400  
Fax: 27 (0) 21-555-8401

Israel  
**Semix Marketing &  
Engineering Ltd.**  
Tel: +(972) 3-910-9910  
Fax: +(972) 3-903-2068

## Asia

India  
**International Marketing  
Services**  
Tel: +(91) 80-2286-4005  
Fax: +(91) 80-2286-1979

Singapore  
**CEL Administrative Office**  
Tel: +(65) 6-560-3255