

Pericom's PS391 Family Achieves Performance Improvement

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Highlights:

- Pin and Functionally Compatible
- Lower On Resistance (RON)
- Less Glitching
- Faster Switching Times (TON, TOFF)
- Improved Second Source for MAX391

This competitive evaluation shows that Pericom's PS391/PS392/PS393 analog switches are improved replacements for the MAX391/392/393.

Both device families have identical pinouts and functionality. The main improvements can be summarized as follows: 29% lower On-Resistance (R_{ON}), significant switching glitch reduction, and slightly faster switching times, i.e., Turn On (T_{ON}), and Turn Off (T_{OFF}).

On-Resistance

As illustrated by the On-resistance plots shown below, using $\pm 5V$ supplies, Pericom's PS391 offers a 29% R_{ON} reduction: from 17Ω to 12Ω . The improvement is even more dramatic for single 5V operation: from 41Ω to 22Ω (46% reduction).

Because of its low On-resistance, Pericom's PS391 produces

distortion free, crystal clear outputs when **switching and routing audio signals**.

In high-accuracy instrumentation and test equipment applications, the PS391 lowers errors because Error Voltage is directly proportional to On-resistance:

$$V_{Error} = R_{ON} \times I_{Leakage(ON)}$$

As shown in the Graph, for both Dual and Single supply operation, R_{ON} is lower for the PS391. For Pericom's PS391, with $\pm 5V$ supplies, for $V_{NC} = \pm 3.5V$, R_{ON} is **13.5Ω minimum and 16.7Ω maximum**, whereas for the MAX391 it is at 15.5Ω minimum and 21.6Ω maximum.

Also, for Pericom's PS391, with a single +5V supply, and $V_{NC} = +3.5V$, R_{ON} is **20.3Ω min. and 27.5Ω max**, whereas for MAX391 it is at 26.8Ω min. and 41.4Ω max.

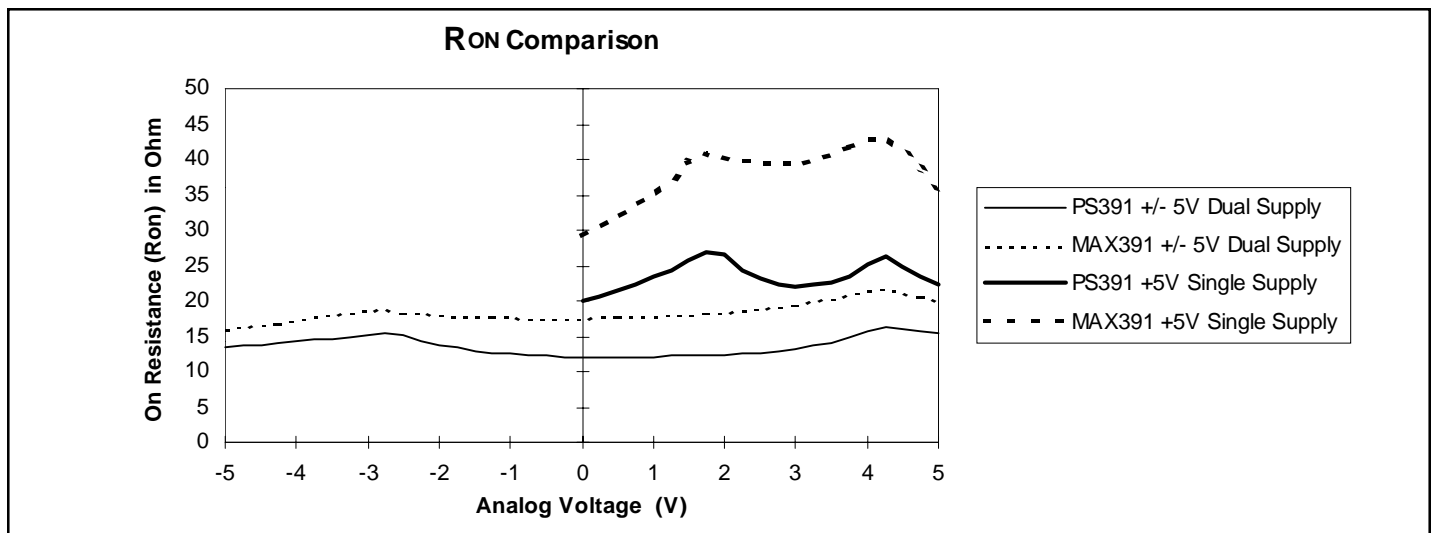


Table 1. R_{ON} measurements for Single and Dual Supply at Room Temperature

Parameter	Conditions	V+	V-	PS391	MAX391	Unit
R_{ON} Min	ICOM = -10mA, $V_{NC} = \pm 3.5V$	5V	-5V	13.5	15.5	Ω
R_{ON} Max.	ICOM = -10mA, $V_{NC} = \pm 3.5V$	5V	-5V	16.7	21.6	Ω
R_{ON} Flatness	ICOM = -10mA, $V_{NC} = \pm 3.5V$	5V	-5V	3.7	3.1	Ω
ΔR_{ON} Between Channels	ICOM = -10mA, $V_{NC} = \pm 3.5V$	5V	-5V	0.2	0.3	Ω
R_{ON} Min	ICOM = -10mA, $V_{NC} = \pm 3.5V$	5V	0V	20.3	26.8	Ω
R_{ON} Min	ICOM = -10mA, $V_{NC} = \pm 3.5V$	5V	0V	27.5	41.4	Ω
R_{ON} Flatness	ICOM = -10mA, $V_{NC} = 1V, 3V$	5V	0V	4.9	6	Ω
ΔR_{ON} Between Channels	ICOM = -10mA, $V_{NC} = 1V, 3V$	5V	0V	0.2	0.3	Ω

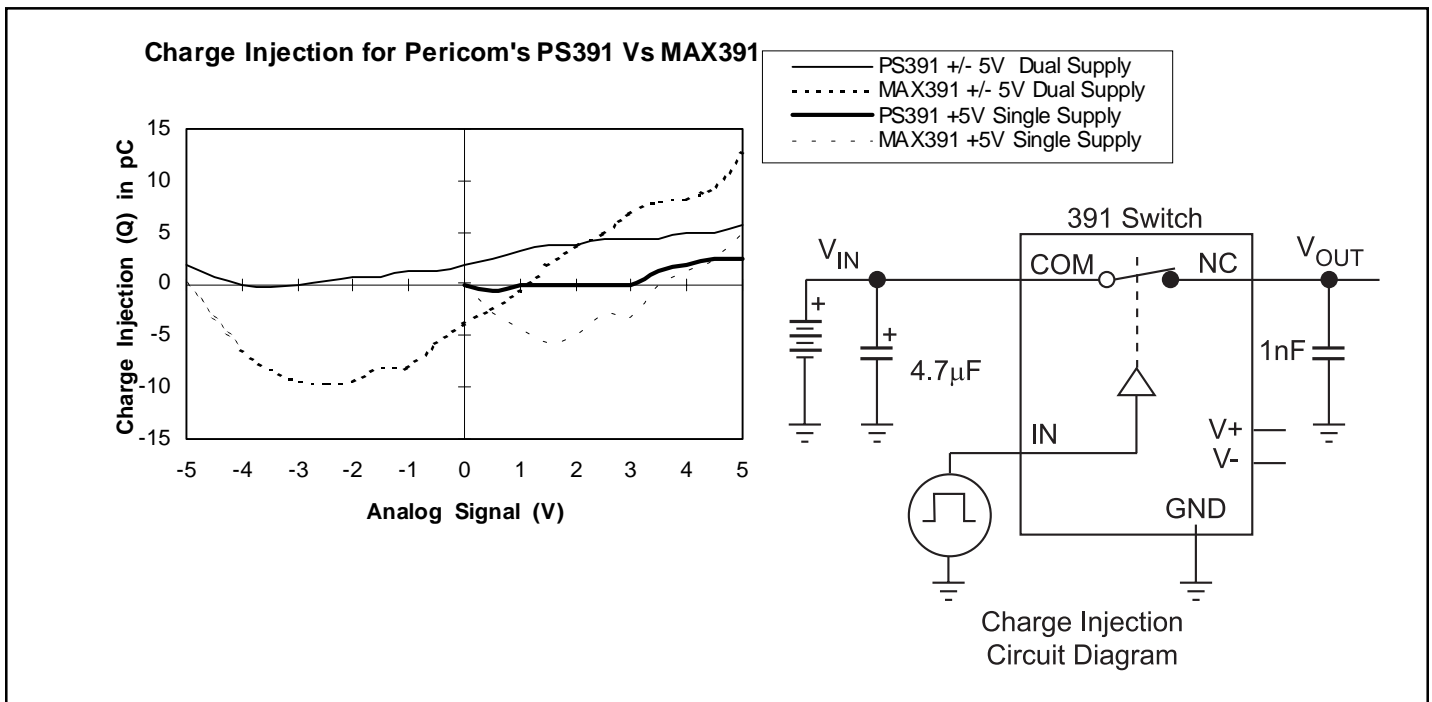
Charge Injection

Lower charge injection means less clicking and less popping noise when switching audio. Less glitching results in faster settling times and less step errors in Sample-and-Hold circuits.

As you can see in the graph, over the Analog Signal range from +5V to -5V, charge injection for Pericom's PS391 is lower than for the MAX391.

Pericom's PS391 has only positive low charge injection over the +5V to -5V Analog Signal range. When you have a low charge injection, it is easy to design offsetting circuits to compensate for charge injection. For instance, as shown in the graph, a -3.0V charge injection is 0pC for Pericom's PS391, whereas the MAX391 is at -9.3pC. For dual supply operation, a 5.0V charge injection for Pericom's PS391 is 5.6pC, whereas the MAX391 is at 12.5pC.

For single supply operation, a 1.5V charge injection is 0pC for Pericom's PS391, whereas the MAX391 is at -5.6pC. A 5.0V charge injection for Pericom's PS391 is 2.5pC, whereas the MAX391 is at 5.0pC. Pericom's PS391 has a swing of 5.62pC maximum for dual supply operation and 3.13pC maximum for Single Supply operation, whereas the MAX391 is at 21.88pC and 10.62pC respectively. The graph shows direct comparisons.



t_{ON} /t_{OFF} Measurements

Except for a considerably faster t_{ON} with a single +5V, Pericom’s PS391 showed slight improvements in some switching times. Table 2 shows a direct comparison between Pericom’s PS391 and the MAX391.

**Table 2. t_{ON} /t_{OFF} Measurements with Single and Dual Supplies at Room Temperature
Load: 300Ω / 35pF to Ground**

Parameter	Conditions	V+	V-	PS391	MAX391	Unit
t _{ON}	V _{IN} @= 1Mhz @ 3V, V _{COM} =+3V	5V	-5V	64.8	63.6	ns
t _{OFF}	V _{IN} @= 1Mhz @ 3V, V _{COM} =+3V	5V	-5V	33.0	36.6	ns
t _{ON}	V _{IN} @= 1Mhz @ 3V, V _{COM} =+3V	5V	0V	77.8	124.4	ns
t _{OFF}	V _{IN} @= 1Mhz @ 3V, V _{COM} =+3V	5V	0V	32.8	32.3	ns
t _{ON}	V _{IN} @= 1Mhz @ 3V, V _{COM} =+3V	3.3V	0V	142.4	148.8	ns
t _{OFF}	V _{IN} @= 1Mhz @ 3V, V _{COM} =+3V	3.3V	0V	48.4	38.4	ns

Conclusion

This competitive evaluation shows that Pericom’s PS39X family is an improved second-source for the MAX39X analog switches. They satisfy all the requirements of fit, form, and function equivalence for a true second source device.

Pericom’s improvements in lower on resistance, less glitching, and slightly faster settling times will produce performance advantages in some applications.

