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# HL5877 Broadband Limiting Amplifier (24 GHz)

## PRODUCT SUMMARY

The HL5877 is an ultra-broadband, thermally-compensated limiting amplifier. The HL5877 demonstrates exceptional input sensitivity, allowing amplification of very small input signals while responding with a limited range of output amplitude. The HL5877 allows user control of both output amplitude and eye pattern crossing point.

## DEPLOYMENT NOTES

All specifications contained herein are typical unless otherwise noted.

## S-PARAMETERS

S-parameters files are available on our website.

## AVAILABLE OPTIONS

The following options and configurations are available for this product:

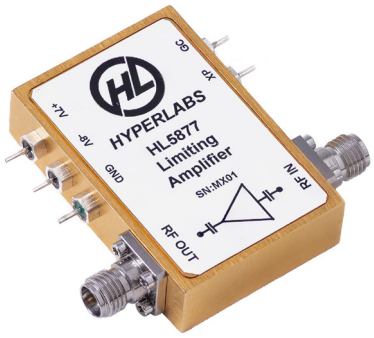
- ***-24***, 2.4 mm connectors
- ***-29***, 2.92 mm connectors

- ***-PP***, plug in & out
- ***-PJ***, plug in, jack out
- ***-JJ***, jack in & out
- ***-JP***, jack in, plug out

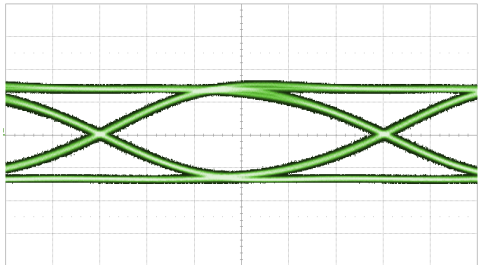
## Key Features and Technical Specifications[1]

| | |
|---|---|
| Bandwidth (3 dB) | 35 kHz to 24 GHz |
| Small Signal Gain | 27 dB<br>See *Fig. 1* |
| Amplitude Deviation | ± 3%, 0-60° C<br>See *Fig. 3* |
| XP Deviation | ± 2%, 0-60° C<br>See *Fig. 4* |
| Return Loss | 10 dB, input<br>10 dB, output<br>See *Fig. 2* |
| Dimensions | 47.24 x 42.16 x 10.2 mm (opt. -29-JJ)<br>1.86” x 1.66” x 0.400” |
| Weight | 27 g (0.95 oz) |
| Temperature Limits | 0° to +60° C, operating |
| RoHS Compliant | Yes, assembled with lead-free solder |
| REACH Compliant | Yes |
| Warranty | 1 year, see website |

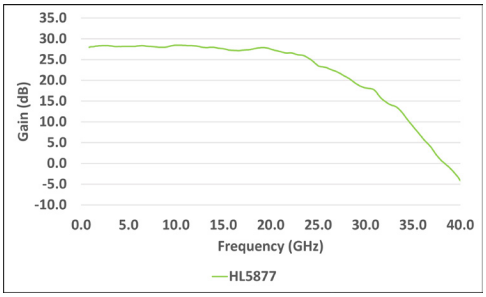
NOTE 1 - The specifications in this table are typical. Full specifications, are available on Pages 2-3 of this datasheet.




*HL5877, option -29-JJ shown*



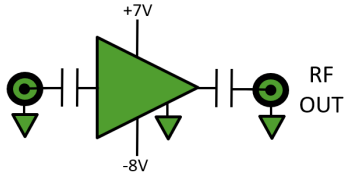
*24 Gbps PRBS7pattern on the RF Out port of HL5877-29-JJ; see also Figs. 5-10*




*Typical Small Signal Gain of HL5877-29-JJ; see also Fig. 1*

## DEVICE PORT ASSIGNMENTS

For the purposes of this datasheet, the below port assignments are used.





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## HL5877 Full Specifications

| Parameter | Conditions | Minimum | Typical | Maximum | Comments |
|---|---|---|---|---|---|
| Upper 3 dB Frequency | -30 dBm ≤ $P_{in}$ ≤ -5 dBm | | 24 GHz | | 3 dB roll-off point, relative to avg. gain from 35 MHz to 2 GHz |
| Lower 3 dB Frequency | | | 35 kHz | | 3 dB roll-off point |
| Small Signal Gain | Input signal = -30 dBm | 24 dB | 27 dB | | Avg. from 35 MHz to 2 GHz |
| Calibrated Output Amplitude | $V_{in}$ = 100 $mV_{P-P}$ | 0.95 $V_{P-P}$ | 1.0 $V_{P-P}$ | 1.05 $V_{P-P}$ | |
| Output Amplitude at Maximum Input | $V_{in}$ = 850 $mV_{P-P}$ | 1.0 $V_{P-P}$ | | | |
| Return Loss, Input | | | 10 dB | | 35 MHz < f < 24 GHz |
| Return Loss, Output | | | 10 dB | | 35 MHz < f < 24 GHz |
| Group Delay | | | 320 ps | | |
| Input Referred Noise Voltage | | | 290 µV rms | | 20 GHz broadband measurement |
| Impedance | | | 50 Ω | | |
| Polarity | | Non-inverting | | | |
| Coupling | | AC, input and output | | | |
| Supply Voltage (+) | | +6.5 $V_{DC}$ | +7 $V_{DC}$ | +10 $V_{DC}$ | |
| Supply Voltage (-) | | -8.5 $V_{DC}$ | -8 $V_{DC}$ | -7.5 $V_{DC}$ | |
| Supply Current (+) | | | 220 mA | | |
| Supply Current (-) | | | 30 mA | | |
| Power Dissipation | | | 1.8 W | 2.75 W | |

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## HL5877 Full Specifications (continued)

| Parameter | Conditions | Minimum | Typical | Maximum | Comments |
|---|---|---|---|---|---|
| Recommended Input Range | | 25 $mV_{P-P}$ | | 850 $mV_{P-P}$ | |
| Damage Threshold Input | | | | 900 $mV_{P-P}$ | Input damage threshold |
| Input DC Bias Range | | -20 $V_{DC}$ | | +20 $V_{DC}$ | Input is AC coupled |
| Output DC Bias Range | | -20 $V_{DC}$ | | +20 $V_{DC}$ | Output is AC coupled |
| Amplitude Control | 0V on GC pin<br>$V_{in}$ = 100 $mV_{P-P}$ | | 1 $V_{P-P}$ | | $V_{out}$ |
| Amplitude Control | 5V on GC pin<br>$V_{in}$ = 100 $mV_{P-P}$ | | | 0.5 $V_{P-P}$ | $V_{out}$ |
| Crossing % Point Control | -5 to +5 V on XP pin | 35% | | 65% | $V_{XP}$ sensitivity is a function of $V_{in}$ amplitude |
| Operating Temperature | | 0° C | | 60° C | Ambient temperature |
| Storage Temperature | | -40° C | | 125° C | |
| RF Connectors | 2.92 mm jack/female (opt. -29)<br>2.4 mm jack/female (opt. -24) | | | | |
| DC Connector | Solder pins | | | | |
| Dimensions (W x D x H) | 47.24 x 42.16 x 10.2 mm (opt. -29-JJ)<br>1.86” x 1.66” x 0.400” | | | | |
| Weight | 27 g. (0.95 oz.) | | | | |
| RoHS Compliant | Yes, assembled with lead-free solder | | | | |
| REACH Compliant | Yes | | | | |
| Warranty | 1 year, repair or replacement; see website for details | | | | |

*Specifications subject to change without notice.

## HL5877 Gain

*Figure 1* shows the small signal gain of the HL5877 to 40 GHz.

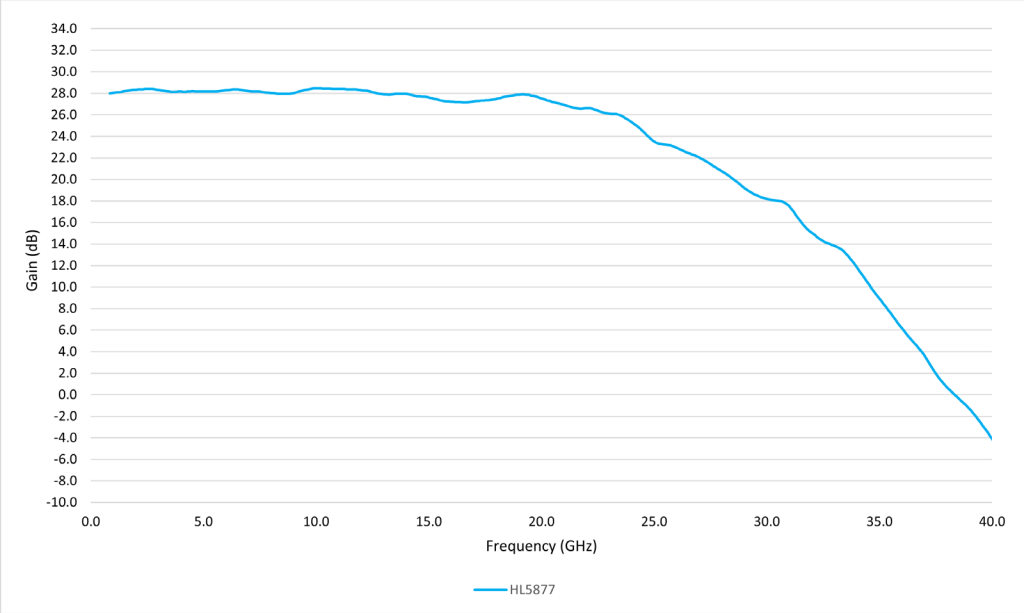


*Figure 1: HL5877 Gain (opt. -29-JJ), $P_{in}$ = -30 dBm*

## HL5877 Return Loss

*Figure 2* shows the return loss of the HL5877 to 40 GHz.

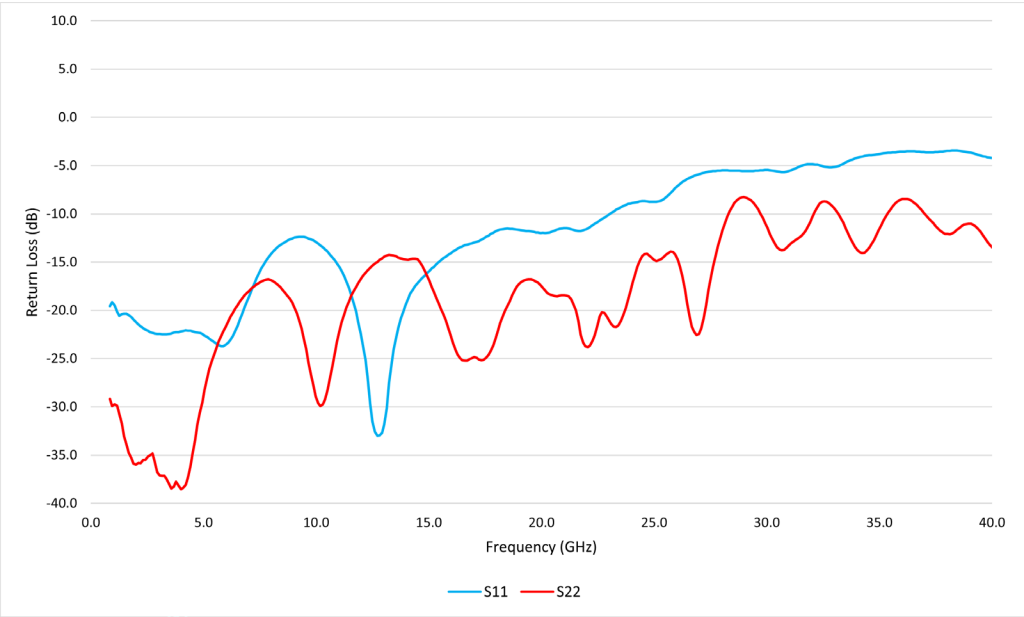


*Figure 2: HL5877 Return Loss (opt. -29-JJ)*

## HL5877 Performance Over Temperature

*Figures 3-4* show the typical amplitude deviation and the typical crossing point (XP) deviation, respectively, over the operating temperature range of 0 to +60 °C, when the input signal amplitude = 100 mV.

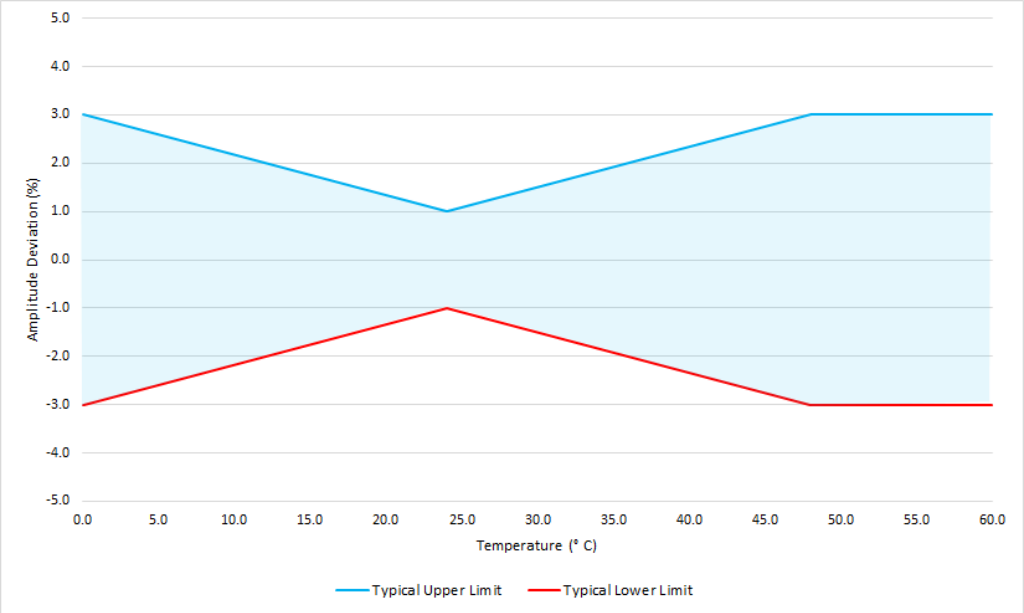


*Figure 3: HL5877 Amplitude Deviation (all options)*

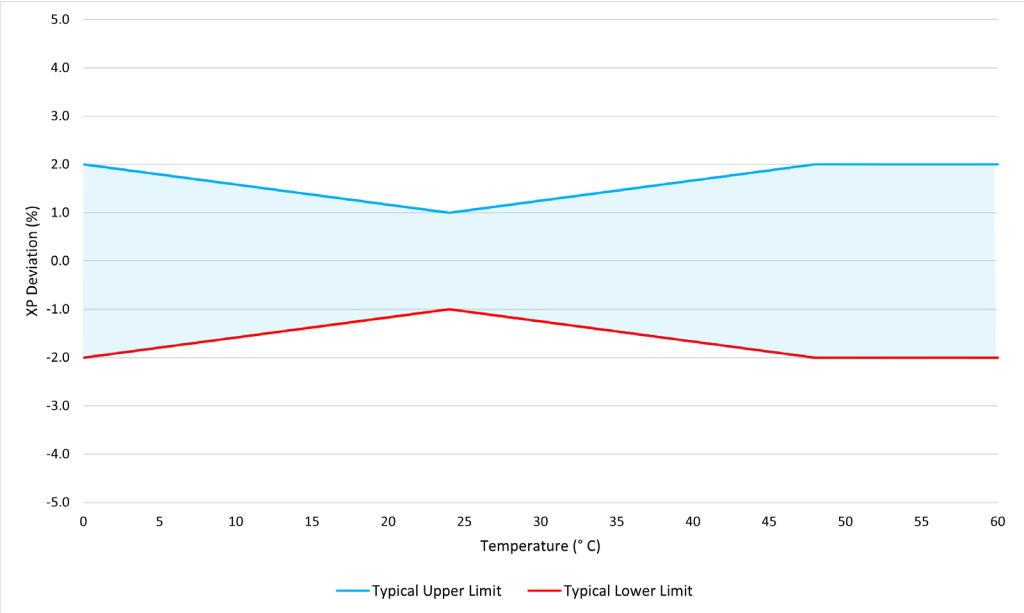


*Figure 4: HL5877 Crossing Point Deviation (all options)*

## HL5877 Eye Diagrams

*Figures 5, 7, and 9* show input signals at 3 different amplitude levels.

*Figures 6, 8, and 10* show output eyes generated from the corresponding input signal levels.

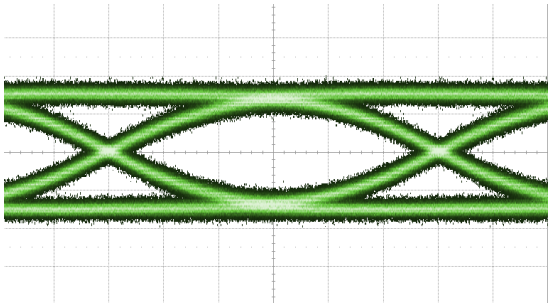

*Fig. 5: 24 Gbps PRBS7 pattern on RF In, 16mV/div.*

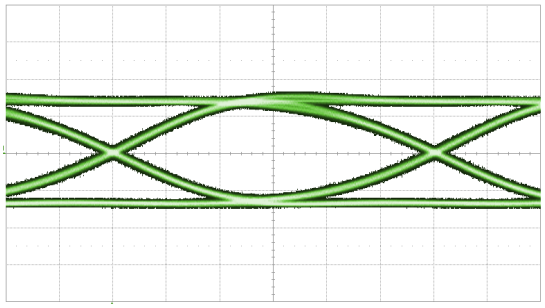

*Fig. 6: 24 Gbps PRBS7 pattern on RF Out, 325mV/div.*

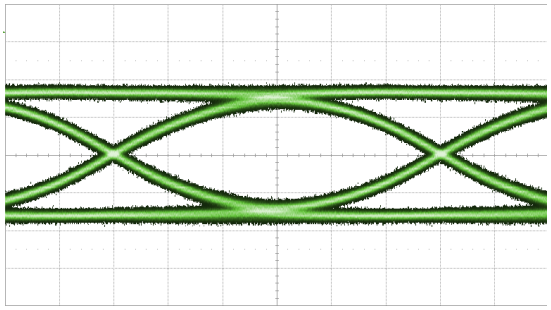

*Fig. 7: 24 Gbps PRBS7 pattern on RF In, 30mV/div.*

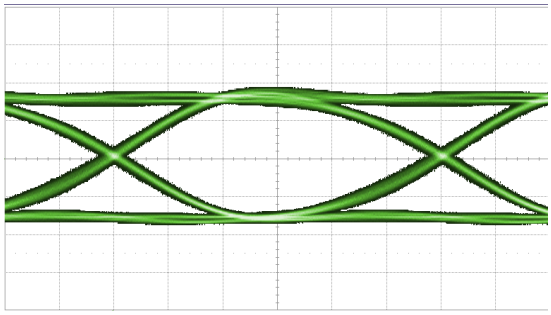

*Fig. 8: 24 Gbps PRBS7 pattern on RF Out, 325mV/div.*

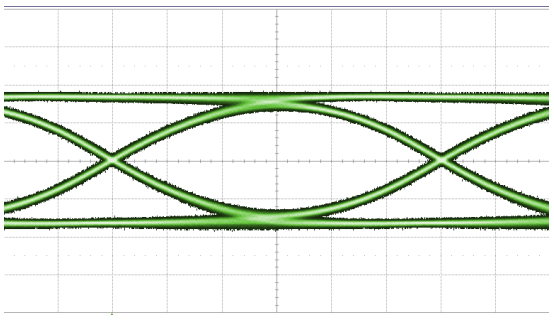

*Fig. 9: 24 Gbps PRBS7 pattern on RF In, 260mV/div*

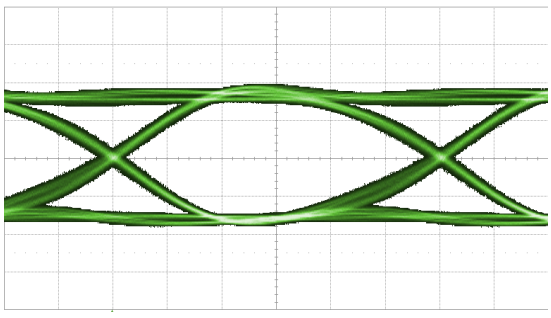

*Fig. 10: 24 Gbps PRBS7 pattern on RF Out, 325mV/div.*

## HL5877 Dimensional Drawing

Figure 11 shows a mechanical drawing of an HL5877, option -29-JJ. Unless otherwise noted, all units are in inches.

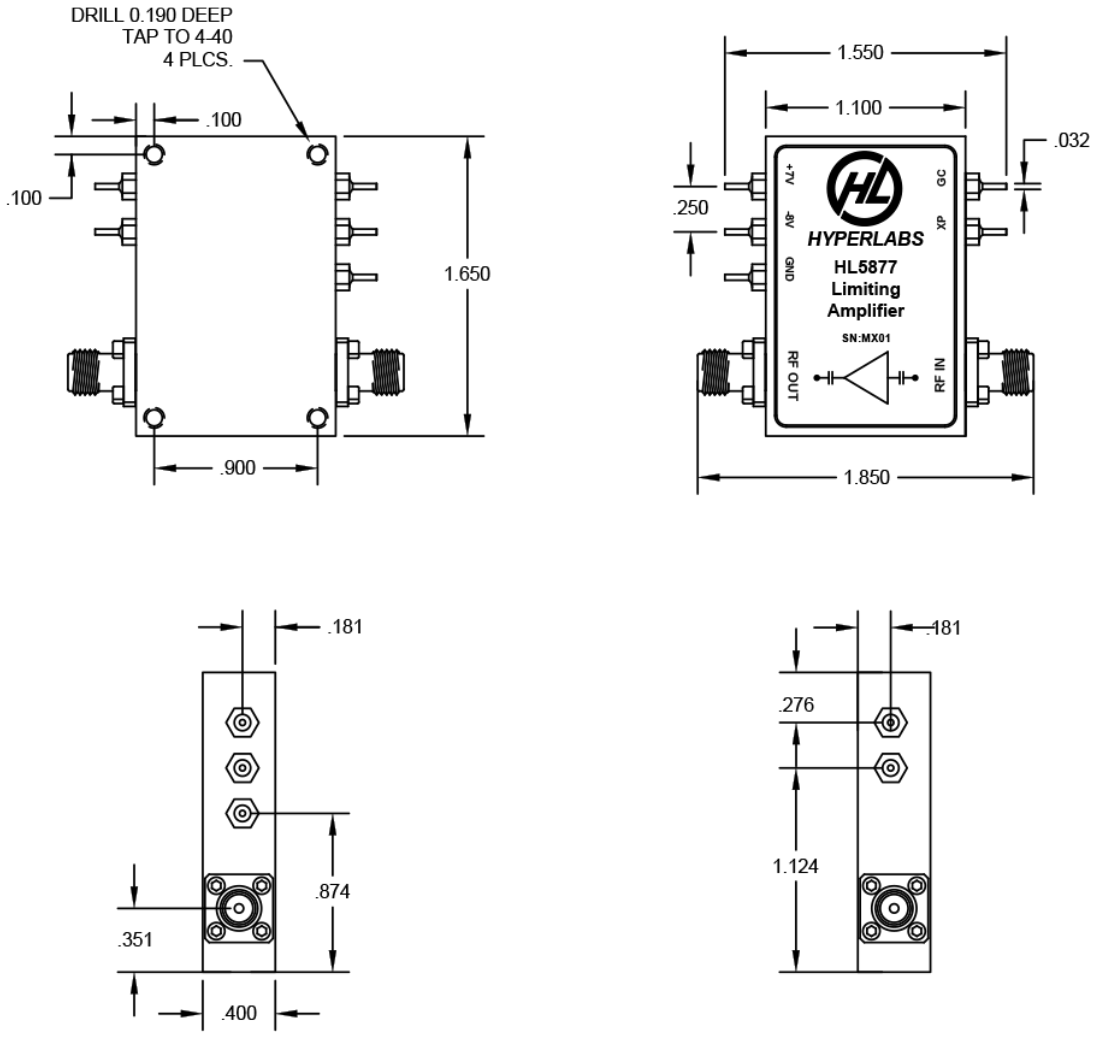


*Figure 11: HL5877 mechnical drawing (opt. -29-JJ), inches*