

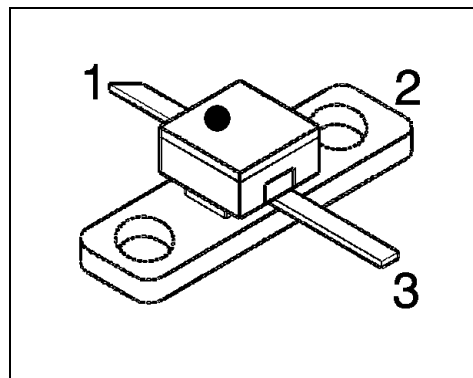
## HiRel X-Band GaAs Power-MESFET

- **HiRel Discrete and Microwave Semiconductor**

- For professional power amplifiers
- For frequencies from 500 MHz to 15 GHz
- Hermetically sealed microwave power package
- Low thermal resistance for high voltage application
- Power added efficiency > 55 %

-  **ESA Space Qualification Expected 1998**

ESA/SCC Detail Spec. No.: 5614/007,  
Type Variant No.s 04 to 06



**ESD:** Electrostatic discharge sensitive device, observe handling precautions!

| Type          | Marking | Ordering Code | Pin Configuration |   |   | Package |
|---------------|---------|---------------|-------------------|---|---|---------|
|               |         |               | 1                 | 2 | 3 |         |
| CLX27-00 (ql) | -       | see below     | G                 | S | D | MWP-25  |
| CLX27-05 (ql) |         |               |                   |   |   |         |
| CLX27-10 (ql) |         |               |                   |   |   |         |

CLX27-nn: specifies output power level (see electrical characteristics)

|                     |                          |                |            |
|---------------------|--------------------------|----------------|------------|
| (ql) Quality Level: | P: Professional Quality, | Ordering Code: | Q62702L119 |
|                     | H: High Rel Quality,     | Ordering Code: | on request |
|                     | S: Space Quality,        | Ordering Code: | on request |
|                     | ES: ESA Space Quality,   | Ordering Code: | Q62702L118 |

(see order instructions for ordering example)

**Maximum Ratings**

| Parameter                                            | Symbol    | Values                                                                                                   | Unit |
|------------------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------|------|
| Drain-source voltage                                 | $V_{DS}$  | 11                                                                                                       | V    |
| Drain-gate voltage                                   | $V_{DG}$  | 13                                                                                                       | V    |
| Gate-source voltage                                  | $V_{GS}$  | - 6                                                                                                      | V    |
| Drain current                                        | $I_D$     | 420                                                                                                      | mA   |
| Gate forward current                                 | $I_G$     | 5                                                                                                        | mA   |
| Compression Level<br>Operation Range 1 <sup>1)</sup> | $P_C$     | 1.5 at $V_{DS} \leq 8 \text{ V}$<br>2.5 at $V_{DS} \leq 7 \text{ V}$<br>3.5 at $V_{DS} \leq 6 \text{ V}$ | dB   |
| Compression Level<br>Operation Range 2 <sup>2)</sup> | $P_C$     | 3.5 at $V_{DS} \leq 6 \text{ V}$                                                                         | dB   |
| Compression Level<br>Operation Range 3 <sup>3)</sup> | $P_C$     | tbd.                                                                                                     | dB   |
| Junction temperature                                 | $T_J$     | 175                                                                                                      | °C   |
| Storage temperature range                            | $T_{stg}$ | - 65...+ 175                                                                                             | °C   |
| Total power dissipation <sup>4)</sup>                | $P_{tot}$ | 3.38                                                                                                     | W    |
| Soldering temperature <sup>5)</sup>                  | $T_{sol}$ | 230                                                                                                      | °C   |

**Thermal Resistance**

|                          |             |           |     |
|--------------------------|-------------|-----------|-----|
| Junction-soldering point | $R_{th,JS}$ | $\leq 40$ | K/W |
|--------------------------|-------------|-----------|-----|

**Notes.:**

- 1) Operation Range 1:  $80 \text{ mA} \leq I_D \leq 160 \text{ mA}$
- 2) Operation Range 2:  $I_D > 160 \text{ mA}$
- 3) Operation Range 3:  $I_D < 80 \text{ mA}$
- 4) At  $T_S = + 40 \text{ °C}$ . For  $T_S > + 40 \text{ °C}$  derating is required.
- 5) During 15 sec. maximum. The same terminal shall not be resoldered until 3 minutes have elapsed.

**Electrical Characteristics** (at  $T_A=25^\circ\text{C}$ ; unless otherwise specified)

| Parameter                                                                                                                | Symbol       | Values |      |      | Unit          |
|--------------------------------------------------------------------------------------------------------------------------|--------------|--------|------|------|---------------|
|                                                                                                                          |              | min.   | typ. | max. |               |
| DC Characteristics                                                                                                       |              |        |      |      |               |
| Drain-source saturation current<br>$V_{DS} = 2\text{ V}, V_{GS} = 0\text{ V}$                                            | $I_{DSS}$    | 180    | 300  | 420  | mA            |
| Gate threshold voltage<br>$V_{DS} = 3\text{ V}, I_D = 12\text{ mA}$                                                      | $-V_{Gth}$   | 1.2    | 2.2  | 3.2  | V             |
| Drain current at pinch-off, low $V_{DS}$<br>$V_{DS} = 3\text{ V}, V_{GS} = -3.5\text{ V}$                                | $I_{Dp3}$    | -      | -    | 60   | $\mu\text{A}$ |
| Gate current at pinch-off, low $V_{DS}$<br>$V_{DS} = 3\text{ V}, V_{GS} = -3.5\text{ V}$                                 | $-I_{Gp3}$   | -      | -    | 24   | $\mu\text{A}$ |
| Drain current at pinch-off, high $V_{DS}$<br>$V_{DS} = 9.5\text{ V}, V_{GS} = -3.5\text{ V}$                             | $I_{Dp9.5}$  | -      | -    | 600  | $\mu\text{A}$ |
| Gate current at pinch-off, high $V_{DS}$<br>$V_{DS} = 9.5\text{ V}, V_{GS} = -3.5\text{ V}$                              | $-I_{Gp9.5}$ | -      | -    | 240  | $\mu\text{A}$ |
| Transconductance<br>$V_{DS} = 3\text{ V}, I_D = 120\text{ mA}$                                                           | $g_m$        | 130    | 160  | -    | mS            |
| Thermal resistance<br>Junction to soldering point<br>$V_{DS} = 8\text{ V}, I_D = 120\text{ mA}, T_s = +25^\circ\text{C}$ | $R_{th JS}$  | -      | 35   | -    | K/W           |

**Electrical Characteristics** (continued)

| Parameter                                                                                                                                                                                          | Symbol           | Values |      |      | Unit |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------|------|------|------|
|                                                                                                                                                                                                    |                  | min.   | typ. | max. |      |
| AC Characteristics                                                                                                                                                                                 |                  |        |      |      |      |
| Linear power gain <sup>1)</sup><br><br>V <sub>DS</sub> = 8 V, I <sub>D</sub> = 120 mA, f = 2.3 GHz,<br>P <sub>in</sub> = 0 dBm<br><br>CLX27-00<br><br>CLX27-05<br><br>CLX27-10                     | G <sub>lp</sub>  |        |      |      | dB   |
|                                                                                                                                                                                                    |                  | 17.5   | 18.5 | -    |      |
|                                                                                                                                                                                                    |                  | 18.0   | 19.0 | -    |      |
|                                                                                                                                                                                                    |                  | 18.0   | 19.0 | -    |      |
| Power output at 1dB gain compr. <sup>1)</sup><br><br>V <sub>DS</sub> = 8 V, I <sub>D(RF off)</sub> = 120 mA, f = 2.3 GHz<br><br>CLX27-00<br><br>CLX27-05<br><br>CLX27-10                           | P <sub>1dB</sub> |        |      |      | dBm  |
|                                                                                                                                                                                                    |                  | -      | 26.5 | -    |      |
|                                                                                                                                                                                                    |                  | -      | 27.3 | -    |      |
|                                                                                                                                                                                                    |                  | -      | 27.8 | -    |      |
| Output Power <sup>1)</sup><br><br>V <sub>DS</sub> = 8 V, I <sub>D(RF off)</sub> = 120 mA, f = 2.3 GHz,<br>P <sub>in</sub> = 10.5 dBm<br><br>CLX27-00<br><br>CLX27-05<br><br>CLX27-10               | P <sub>out</sub> |        |      |      | dBm  |
|                                                                                                                                                                                                    |                  | 26.0   | 26.5 | -    |      |
|                                                                                                                                                                                                    |                  | 27.0   | 27.3 | -    |      |
|                                                                                                                                                                                                    |                  | 27.5   | 27.8 | -    |      |
| Power added efficiency <sup>1), 2)</sup><br><br>V <sub>DS</sub> = 8 V, I <sub>D(RF off)</sub> = 120 mA, f = 2.3 GHz,<br>P <sub>in</sub> = 10.5 dBm<br><br>CLX27-00<br><br>CLX27-05<br><br>CLX27-10 | PAE              |        |      |      | %    |
|                                                                                                                                                                                                    |                  | 45     | 50   | -    |      |
|                                                                                                                                                                                                    |                  | 48     | 53   | -    |      |
|                                                                                                                                                                                                    |                  | 50     | 55   | -    |      |

**Notes.:**

1) RF Power characteristics given for power matching conditions

2) Power added efficiency:  $PAE = (P_{RFout} - P_{RFin}) / P_{DC}$

## Typical Common Source S-Parameters

| $V_{DS} = 3\text{ V}, I_D = 120\text{ mA}, Z_0 = 50\ \Omega$ |               |                 |               |                 |               |                 |               |                 |                  |                         |             |
|--------------------------------------------------------------|---------------|-----------------|---------------|-----------------|---------------|-----------------|---------------|-----------------|------------------|-------------------------|-------------|
| f<br>[GHz]                                                   | S11 <br>[mag] | <S11<br>[angle] | S21 <br>[mag] | <S21<br>[angle] | S12 <br>[mag] | <S12<br>[angle] | S22 <br>[mag] | <S22<br>[angle] | k-Fact.<br>[mag] | $S_{21}/S_{12}$<br>[dB] | MAG<br>[dB] |
| 0,5                                                          | 0,945         | -45             | 8,649         | 151             | 0,0266        | 67              | 0,136         | -85             | 0,22             | 25,1                    |             |
| 0,6                                                          | 0,928         | -52             | 8,466         | 145             | 0,0283        | 60              | 0,141         | -91             | 0,27             | 24,8                    |             |
| 0,7                                                          | 0,911         | -60             | 8,254         | 140             | 0,0303        | 55              | 0,148         | -97             | 0,32             | 24,4                    |             |
| 0,8                                                          | 0,898         | -66             | 8,022         | 135             | 0,0327        | 50              | 0,156         | -104            | 0,35             | 23,9                    |             |
| 0,9                                                          | 0,886         | -73             | 7,777         | 131             | 0,0352        | 47              | 0,165         | -111            | 0,37             | 23,4                    |             |
| 1,0                                                          | 0,875         | -80             | 7,531         | 126             | 0,0381        | 43              | 0,177         | -118            | 0,39             | 23,0                    |             |
| 1,1                                                          | 0,867         | -87             | 7,281         | 122             | 0,0407        | 40              | 0,185         | -125            | 0,40             | 22,5                    |             |
| 1,2                                                          | 0,861         | -93             | 7,028         | 117             | 0,0428        | 37              | 0,195         | -130            | 0,41             | 22,2                    |             |
| 1,3                                                          | 0,855         | -100            | 6,776         | 113             | 0,0448        | 34              | 0,204         | -135            | 0,42             | 21,8                    |             |
| 1,4                                                          | 0,849         | -106            | 6,533         | 109             | 0,0463        | 31              | 0,213         | -140            | 0,43             | 21,5                    |             |
| 1,5                                                          | 0,844         | -111            | 6,298         | 105             | 0,0478        | 29              | 0,224         | -144            | 0,44             | 21,2                    |             |
| 1,6                                                          | 0,839         | -117            | 6,067         | 101             | 0,0493        | 26              | 0,232         | -148            | 0,45             | 20,9                    |             |
| 1,7                                                          | 0,834         | -122            | 5,842         | 98              | 0,0504        | 23              | 0,240         | -152            | 0,47             | 20,6                    |             |
| 1,8                                                          | 0,830         | -126            | 5,628         | 94              | 0,0512        | 20              | 0,248         | -155            | 0,48             | 20,4                    |             |
| 1,9                                                          | 0,826         | -131            | 5,421         | 91              | 0,0518        | 18              | 0,256         | -158            | 0,50             | 20,2                    |             |
| 2,0                                                          | 0,822         | -135            | 5,221         | 88              | 0,0530        | 16              | 0,264         | -161            | 0,52             | 19,9                    |             |
| 2,1                                                          | 0,819         | -140            | 5,027         | 84              | 0,0531        | 14              | 0,271         | -164            | 0,54             | 19,8                    |             |
| 2,2                                                          | 0,815         | -144            | 4,843         | 81              | 0,0537        | 12              | 0,278         | -167            | 0,56             | 19,6                    |             |
| 2,3                                                          | 0,812         | -147            | 4,669         | 78              | 0,0543        | 10              | 0,283         | -169            | 0,58             | 19,3                    |             |
| 2,4                                                          | 0,810         | -151            | 4,506         | 76              | 0,0546        | 8               | 0,289         | -172            | 0,60             | 19,2                    |             |
| 2,5                                                          | 0,807         | -154            | 4,354         | 73              | 0,0548        | 6               | 0,293         | -174            | 0,63             | 19,0                    |             |
| 2,6                                                          | 0,806         | -158            | 4,212         | 70              | 0,0553        | 5               | 0,296         | -177            | 0,64             | 18,8                    |             |
| 2,7                                                          | 0,804         | -161            | 4,076         | 67              | 0,0555        | 3               | 0,300         | -178            | 0,67             | 18,7                    |             |
| 2,8                                                          | 0,803         | -164            | 3,948         | 65              | 0,0557        | 2               | 0,301         | 180             | 0,69             | 18,5                    |             |
| 2,9                                                          | 0,802         | -167            | 3,830         | 62              | 0,0558        | 1               | 0,306         | 178             | 0,71             | 18,4                    |             |
| 3,0                                                          | 0,800         | -169            | 3,717         | 60              | 0,0559        | -1              | 0,310         | 177             | 0,73             | 18,2                    |             |
| 3,1                                                          | 0,799         | -172            | 3,611         | 58              | 0,0559        | -2              | 0,314         | 175             | 0,75             | 18,1                    |             |
| 3,2                                                          | 0,799         | -175            | 3,509         | 55              | 0,0560        | -3              | 0,319         | 174             | 0,77             | 18,0                    |             |
| 3,3                                                          | 0,797         | -177            | 3,410         | 53              | 0,0562        | -4              | 0,323         | 172             | 0,79             | 17,8                    |             |
| 3,4                                                          | 0,796         | -180            | 3,315         | 51              | 0,0550        | -5              | 0,326         | 170             | 0,84             | 17,8                    |             |
| 3,5                                                          | 0,795         | 178             | 3,227         | 48              | 0,0562        | -7              | 0,329         | 168             | 0,85             | 17,6                    |             |
| 4,0                                                          | 0,794         | 165             | 2,883         | 37              | 0,0564        | -13             | 0,344         | 163             | 0,93             | 17,1                    |             |
| 4,5                                                          | 0,793         | 157             | 2,574         | 27              | 0,0567        | -18             | 0,360         | 157             | 1,01             | 16,6                    | 15,8        |
| 5,0                                                          | 0,793         | 147             | 2,320         | 18              | 0,0567        | -23             | 0,374         | 151             | 1,11             | 16,1                    | 14,1        |
| 5,5                                                          | 0,792         | 139             | 2,123         | 9               | 0,0571        | -26             | 0,387         | 146             | 1,21             | 15,7                    | 12,9        |
| 6,0                                                          | 0,791         | 131             | 1,950         | 2               | 0,0574        | -29             | 0,402         | 141             | 1,30             | 15,3                    | 12,0        |
| 6,5                                                          | 0,791         | 123             | 1,805         | -8              | 0,0585        | -32             | 0,415         | 136             | 1,36             | 14,9                    | 11,3        |
| 7,0                                                          | 0,790         | 116             | 1,686         | -17             | 0,0601        | -35             | 0,428         | 130             | 1,41             | 14,5                    | 10,7        |
| 7,5                                                          | 0,789         | 108             | 1,584         | -26             | 0,0623        | -38             | 0,440         | 125             | 1,44             | 14,1                    | 10,1        |
| 8,0                                                          | 0,788         | 100             | 1,493         | -35             | 0,0646        | -40             | 0,452         | 118             | 1,47             | 13,6                    | 9,6         |
| 8,5                                                          | 0,788         | 92              | 1,394         | -44             | 0,0675        | -43             | 0,464         | 111             | 1,50             | 13,1                    | 9,0         |
| 9,0                                                          | 0,787         | 84              | 1,340         | -53             | 0,0700        | -47             | 0,473         | 103             | 1,51             | 12,8                    | 8,6         |
| 9,5                                                          | 0,786         | 76              | 1,275         | -62             | 0,0734        | -52             | 0,488         | 96              | 1,50             | 12,4                    | 8,2         |
| 10,0                                                         | 0,784         | 68              | 1,217         | -71             | 0,0772        | -56             | 0,501         | 89              | 1,48             | 12,0                    | 7,9         |
| 10,5                                                         | 0,780         | 61              | 1,166         | -80             | 0,0817        | -61             | 0,512         | 83              | 1,47             | 11,5                    | 7,5         |
| 11,0                                                         | 0,776         | 54              | 1,121         | -89             | 0,0867        | -66             | 0,524         | 77              | 1,43             | 11,1                    | 7,2         |
| 11,5                                                         | 0,770         | 47              | 1,083         | -97             | 0,0924        | -71             | 0,534         | 71              | 1,39             | 10,7                    | 7,0         |
| 12,0                                                         | 0,757         | 39              | 1,052         | -106            | 0,0995        | -76             | 0,539         | 66              | 1,38             | 10,2                    | 6,6         |
| 12,5                                                         | 0,739         | 32              | 1,030         | -115            | 0,1082        | -82             | 0,541         | 60              | 1,37             | 9,8                     | 6,2         |
| 13,0                                                         | 0,715         | 24              | 1,012         | -125            | 0,1156        | -89             | 0,541         | 55              | 1,39             | 9,4                     | 5,7         |
| 13,5                                                         | 0,690         | 15              | 0,995         | -135            | 0,1245        | -97             | 0,538         | 49              | 1,40             | 9,0                     | 5,3         |
| 14,0                                                         | 0,666         | 5               | 0,982         | -144            | 0,1384        | -104            | 0,526         | 42              | 1,40             | 8,5                     | 4,7         |
| 14,5                                                         | 0,641         | -6              | 0,971         | -154            | 0,1540        | -113            | 0,510         | 34              | 1,40             | 8,0                     | 4,2         |
| 15,0                                                         | 0,619         | -19             | 0,970         | -165            | 0,1713        | -122            | 0,489         | 25              | 1,37             | 7,5                     | 3,9         |
| 15,5                                                         | 0,599         | -33             | 0,960         | -177            | 0,1915        | -133            | 0,466         | 16              | 1,35             | 7,0                     | 3,5         |
| 16,0                                                         | 0,585         | -48             | 0,955         | 172             | 0,2144        | -145            | 0,442         | 5               | 1,31             | 6,5                     | 3,2         |
| 16,5                                                         | 0,583         | -63             | 0,952         | 160             | 0,2376        | -157            | 0,415         | -9              | 1,25             | 6,0                     | 3,0         |
| 17,0                                                         | 0,592         | -76             | 0,945         | 151             | 0,2660        | -166            | 0,402         | -24             | 1,19             | 5,5                     | 2,9         |
| 17,5                                                         | 0,613         | -88             | 0,950         | 142             | 0,2967        | -175            | 0,400         | -36             | 1,07             | 5,1                     | 3,4         |
| 18,0                                                         | 0,636         | -98             | 0,966         | 134             | 0,3244        | 179             | 0,408         | -46             | 0,98             | 4,7                     |             |

**Typical Common Source S-Parameters (continued)**

| $V_{DS} = 5\text{ V}, I_D = 120\text{ mA}, Z_0 = 50\ \Omega$ |               |               |               |               |               |               |               |               |                  |                         |             |
|--------------------------------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|------------------|-------------------------|-------------|
| f<br>[GHz]                                                   | S11 <br>[mag] | <S11<br>[ang] | S21 <br>[mag] | <S21<br>[ang] | S12 <br>[mag] | <S12<br>[ang] | S22 <br>[mag] | <S22<br>[ang] | k-Fact.<br>[mag] | $S_{21}/S_{12}$<br>[dB] | MAG<br>[dB] |
| 0,5                                                          | 0,946         | -45           | 9,316         | 152           | 0,0205        | 62            | 0,257         | -29           | 0,28             | 26,6                    |             |
| 0,6                                                          | 0,931         | -51           | 9,124         | 146           | 0,0219        | 58            | 0,254         | -36           | 0,33             | 26,2                    |             |
| 0,7                                                          | 0,914         | -58           | 8,903         | 141           | 0,0234        | 55            | 0,249         | -43           | 0,38             | 25,8                    |             |
| 0,8                                                          | 0,898         | -65           | 8,660         | 136           | 0,0252        | 51            | 0,243         | -49           | 0,42             | 25,4                    |             |
| 0,9                                                          | 0,887         | -71           | 8,404         | 131           | 0,0273        | 47            | 0,238         | -55           | 0,43             | 24,9                    |             |
| 1,0                                                          | 0,879         | -78           | 8,150         | 126           | 0,0293        | 44            | 0,233         | -61           | 0,44             | 24,4                    |             |
| 1,1                                                          | 0,872         | -85           | 7,888         | 122           | 0,0314        | 41            | 0,228         | -66           | 0,45             | 24,0                    |             |
| 1,2                                                          | 0,865         | -91           | 7,628         | 117           | 0,0332        | 38            | 0,224         | -72           | 0,45             | 23,6                    |             |
| 1,3                                                          | 0,859         | -98           | 7,367         | 113           | 0,0350        | 35            | 0,220         | -77           | 0,46             | 23,2                    |             |
| 1,4                                                          | 0,854         | -104          | 7,110         | 109           | 0,0361        | 33            | 0,218         | -82           | 0,48             | 22,9                    |             |
| 1,5                                                          | 0,849         | -109          | 6,862         | 105           | 0,0370        | 30            | 0,216         | -87           | 0,49             | 22,7                    |             |
| 1,6                                                          | 0,844         | -115          | 6,615         | 101           | 0,0382        | 27            | 0,215         | -92           | 0,51             | 22,4                    |             |
| 1,7                                                          | 0,839         | -120          | 6,374         | 97            | 0,0391        | 25            | 0,215         | -96           | 0,52             | 22,1                    |             |
| 1,8                                                          | 0,835         | -125          | 6,144         | 94            | 0,0395        | 23            | 0,215         | -101          | 0,55             | 21,9                    |             |
| 1,9                                                          | 0,831         | -129          | 5,922         | 90            | 0,0401        | 20            | 0,216         | -105          | 0,57             | 21,7                    |             |
| 2,0                                                          | 0,826         | -133          | 5,708         | 87            | 0,0402        | 18            | 0,217         | -110          | 0,60             | 21,5                    |             |
| 2,1                                                          | 0,823         | -138          | 5,501         | 84            | 0,0404        | 16            | 0,217         | -114          | 0,63             | 21,3                    |             |
| 2,2                                                          | 0,820         | -142          | 5,304         | 80            | 0,0405        | 14            | 0,219         | -117          | 0,66             | 21,2                    |             |
| 2,3                                                          | 0,817         | -145          | 5,120         | 77            | 0,0410        | 12            | 0,221         | -120          | 0,68             | 21,0                    |             |
| 2,4                                                          | 0,814         | -149          | 4,944         | 74            | 0,0411        | 11            | 0,223         | -123          | 0,71             | 20,8                    |             |
| 2,5                                                          | 0,812         | -152          | 4,783         | 71            | 0,0420        | 9             | 0,226         | -125          | 0,72             | 20,6                    |             |
| 2,6                                                          | 0,811         | -156          | 4,628         | 69            | 0,0413        | 8             | 0,228         | -128          | 0,76             | 20,5                    |             |
| 2,7                                                          | 0,809         | -159          | 4,480         | 66            | 0,0415        | 6             | 0,231         | -130          | 0,79             | 20,3                    |             |
| 2,8                                                          | 0,808         | -162          | 4,336         | 63            | 0,0418        | 5             | 0,234         | -133          | 0,81             | 20,2                    |             |
| 2,9                                                          | 0,807         | -165          | 4,206         | 61            | 0,0422        | 4             | 0,239         | -135          | 0,82             | 20,0                    |             |
| 3,0                                                          | 0,805         | -168          | 4,079         | 58            | 0,0422        | 3             | 0,242         | -137          | 0,85             | 19,9                    |             |
| 3,1                                                          | 0,804         | -170          | 3,958         | 56            | 0,0422        | 2             | 0,245         | -140          | 0,88             | 19,7                    |             |
| 3,2                                                          | 0,804         | -173          | 3,845         | 53            | 0,0430        | 1             | 0,249         | -142          | 0,89             | 19,5                    |             |
| 3,3                                                          | 0,803         | -176          | 3,737         | 51            | 0,0425        | 0             | 0,253         | -144          | 0,92             | 19,4                    |             |
| 3,4                                                          | 0,803         | -178          | 3,632         | 48            | 0,0424        | -1            | 0,258         | -146          | 0,95             | 19,3                    |             |
| 3,5                                                          | 0,802         | 180           | 3,537         | 46            | 0,0423        | -2            | 0,263         | -147          | 0,98             | 19,2                    |             |
| 4,0                                                          | 0,801         | 167           | 3,120         | 35            | 0,0423        | -6            | 0,286         | -156          | 1,09             | 18,7                    | 16,8        |
| 4,5                                                          | 0,800         | 157           | 2,776         | 24            | 0,0423        | -10           | 0,309         | -165          | 1,22             | 18,2                    | 15,4        |
| 5,0                                                          | 0,799         | 149           | 2,494         | 12            | 0,0423        | -12           | 0,333         | -173          | 1,33             | 17,7                    | 14,2        |
| 5,5                                                          | 0,798         | 140           | 2,258         | 4             | 0,0429        | -14           | 0,357         | -181          | 1,44             | 17,2                    | 13,3        |
| 6,0                                                          | 0,798         | 132           | 2,068         | -6            | 0,0440        | -15           | 0,381         | 169           | 1,51             | 16,7                    | 12,5        |
| 6,5                                                          | 0,797         | 124           | 1,907         | -16           | 0,0461        | -16           | 0,404         | 162           | 1,54             | 16,2                    | 11,8        |
| 7,0                                                          | 0,796         | 117           | 1,772         | -25           | 0,0484        | -18           | 0,424         | 155           | 1,56             | 15,6                    | 11,2        |
| 7,5                                                          | 0,796         | 109           | 1,656         | -34           | 0,0518        | -20           | 0,444         | 148           | 1,53             | 15,0                    | 10,7        |
| 8,0                                                          | 0,795         | 101           | 1,554         | -42           | 0,0553        | -22           | 0,463         | 141           | 1,51             | 14,5                    | 10,3        |
| 8,5                                                          | 0,794         | 93            | 1,463         | -51           | 0,0591        | -25           | 0,481         | 132           | 1,49             | 13,9                    | 9,8         |
| 9,0                                                          | 0,793         | 85            | 1,381         | -60           | 0,0633        | -29           | 0,500         | 124           | 1,45             | 13,4                    | 9,4         |
| 9,5                                                          | 0,793         | 77            | 1,308         | -69           | 0,0679        | -33           | 0,517         | 116           | 1,41             | 12,8                    | 9,0         |
| 10,0                                                         | 0,793         | 69            | 1,241         | -78           | 0,0727        | -38           | 0,536         | 108           | 1,35             | 12,3                    | 8,8         |
| 10,5                                                         | 0,792         | 61            | 1,182         | -87           | 0,0783        | -43           | 0,557         | 100           | 1,27             | 11,8                    | 8,6         |
| 11,0                                                         | 0,792         | 54            | 1,127         | -96           | 0,0842        | -49           | 0,577         | 93            | 1,19             | 11,3                    | 8,6         |
| 11,5                                                         | 0,790         | 47            | 1,080         | -105          | 0,0907        | -54           | 0,594         | 86            | 1,11             | 10,8                    | 8,7         |
| 12,0                                                         | 0,778         | 40            | 1,041         | -114          | 0,0987        | -60           | 0,607         | 80            | 1,07             | 10,2                    | 8,6         |
| 12,5                                                         | 0,761         | 32            | 1,005         | -123          | 0,1085        | -67           | 0,618         | 74            | 1,04             | 9,7                     | 8,4         |
| 13,0                                                         | 0,738         | 23            | 0,981         | -132          | 0,1195        | -75           | 0,623         | 68            | 1,03             | 9,1                     | 8,1         |
| 13,5                                                         | 0,714         | 15            | 0,957         | -142          | 0,1310        | -82           | 0,625         | 61            | 1,03             | 8,6                     | 7,6         |
| 14,0                                                         | 0,695         | 5             | 0,941         | -151          | 0,1445        | -91           | 0,621         | 54            | 1,02             | 8,1                     | 7,3         |
| 14,5                                                         | 0,666         | -7            | 0,929         | -161          | 0,1623        | -100          | 0,612         | 46            | 1,02             | 7,6                     | 6,7         |
| 15,0                                                         | 0,641         | -20           | 0,917         | -172          | 0,1824        | -110          | 0,598         | 38            | 1,02             | 7,0                     | 6,1         |
| 15,5                                                         | 0,620         | -34           | 0,908         | 176           | 0,2049        | -121          | 0,581         | 29            | 1,01             | 6,5                     | 5,9         |
| 16,0                                                         | 0,604         | -48           | 0,900         | 165           | 0,2300        | -134          | 0,561         | 18            | 0,99             | 5,9                     |             |
| 16,5                                                         | 0,604         | -63           | 0,898         | 153           | 0,2620        | -147          | 0,539         | 5             | 0,93             | 5,3                     |             |
| 17,0                                                         | 0,620         | -77           | 0,900         | 145           | 0,2891        | -157          | 0,526         | -8            | 0,89             | 4,9                     |             |
| 17,5                                                         | 0,643         | -89           | 0,908         | 135           | 0,3231        | -165          | 0,526         | -19           | 0,80             | 4,5                     |             |
| 18,0                                                         | 0,667         | -98           | 0,923         | 127           | 0,3541        | -172          | 0,537         | -28           | 0,72             | 4,2                     |             |

**Typical Common Source S-Parameters (continued)**

| $V_{DS} = 8\text{ V}, I_D = 120\text{ mA}, Z_0 = 50\ \Omega$ |               |               |               |               |               |               |               |               |                  |                         |             |
|--------------------------------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|------------------|-------------------------|-------------|
| f<br>[GHz]                                                   | S11 <br>[mag] | <S11<br>[ang] | S21 <br>[mag] | <S21<br>[ang] | S12 <br>[mag] | <S12<br>[ang] | S22 <br>[mag] | <S22<br>[ang] | k-Fact.<br>[mag] | $S_{21}/S_{12}$<br>[dB] | MAG<br>[dB] |
| 0,5                                                          | 0,950         | -44           | 9,344         | 149           | 0,0135        | 65            | 0,404         | -21           | 0,33             | 28,4                    |             |
| 0,6                                                          | 0,932         | -52           | 9,149         | 143           | 0,0156        | 61            | 0,398         | -26           | 0,39             | 27,7                    |             |
| 0,7                                                          | 0,915         | -58           | 8,924         | 139           | 0,0176        | 57            | 0,390         | -29           | 0,44             | 27,1                    |             |
| 0,8                                                          | 0,902         | -65           | 8,677         | 135           | 0,0197        | 53            | 0,381         | -33           | 0,46             | 26,4                    |             |
| 0,9                                                          | 0,891         | -72           | 8,420         | 130           | 0,0210        | 49            | 0,373         | -37           | 0,49             | 26,0                    |             |
| 1,0                                                          | 0,881         | -79           | 8,166         | 125           | 0,0225        | 46            | 0,365         | -41           | 0,51             | 25,6                    |             |
| 1,1                                                          | 0,874         | -85           | 7,908         | 121           | 0,0240        | 42            | 0,357         | -45           | 0,52             | 25,2                    |             |
| 1,2                                                          | 0,868         | -92           | 7,648         | 116           | 0,0253        | 39            | 0,350         | -48           | 0,53             | 24,8                    |             |
| 1,3                                                          | 0,862         | -98           | 7,387         | 112           | 0,0265        | 36            | 0,343         | -52           | 0,54             | 24,5                    |             |
| 1,4                                                          | 0,857         | -104          | 7,132         | 108           | 0,0274        | 33            | 0,338         | -55           | 0,56             | 24,2                    |             |
| 1,5                                                          | 0,852         | -110          | 6,882         | 104           | 0,0281        | 30            | 0,333         | -59           | 0,58             | 23,9                    |             |
| 1,6                                                          | 0,848         | -115          | 6,632         | 100           | 0,0286        | 28            | 0,328         | -62           | 0,60             | 23,7                    |             |
| 1,7                                                          | 0,843         | -120          | 6,389         | 96            | 0,0293        | 25            | 0,324         | -66           | 0,62             | 23,4                    |             |
| 1,8                                                          | 0,839         | -125          | 6,155         | 92            | 0,0297        | 23            | 0,320         | -69           | 0,65             | 23,2                    |             |
| 1,9                                                          | 0,836         | -130          | 5,928         | 89            | 0,0302        | 21            | 0,318         | -72           | 0,67             | 22,9                    |             |
| 2,0                                                          | 0,832         | -134          | 5,711         | 85            | 0,0304        | 19            | 0,317         | -75           | 0,70             | 22,7                    |             |
| 2,1                                                          | 0,829         | -138          | 5,505         | 82            | 0,0306        | 17            | 0,315         | -79           | 0,73             | 22,6                    |             |
| 2,2                                                          | 0,827         | -142          | 5,309         | 79            | 0,0307        | 16            | 0,314         | -82           | 0,76             | 22,4                    |             |
| 2,3                                                          | 0,825         | -146          | 5,125         | 75            | 0,0310        | 15            | 0,312         | -85           | 0,79             | 22,2                    |             |
| 2,4                                                          | 0,823         | -149          | 4,953         | 72            | 0,0313        | 14            | 0,311         | -88           | 0,81             | 22,0                    |             |
| 2,5                                                          | 0,821         | -153          | 4,792         | 69            | 0,0313        | 12            | 0,311         | -91           | 0,85             | 21,8                    |             |
| 2,6                                                          | 0,820         | -156          | 4,634         | 66            | 0,0313        | 11            | 0,311         | -94           | 0,88             | 21,7                    |             |
| 2,7                                                          | 0,819         | -159          | 4,486         | 64            | 0,0316        | 10            | 0,313         | -96           | 0,90             | 21,5                    |             |
| 2,8                                                          | 0,818         | -162          | 4,342         | 61            | 0,0314        | 9             | 0,315         | -99           | 0,94             | 21,4                    |             |
| 2,9                                                          | 0,817         | -165          | 4,206         | 58            | 0,0314        | 8             | 0,317         | -101          | 0,97             | 21,3                    |             |
| 3,0                                                          | 0,815         | -168          | 4,076         | 56            | 0,0315        | 7             | 0,319         | -104          | 1,00             | 21,1                    | 20,9        |
| 3,1                                                          | 0,815         | -171          | 3,956         | 53            | 0,0315        | 6             | 0,321         | -107          | 1,03             | 21,0                    | 19,9        |
| 3,2                                                          | 0,814         | -173          | 3,841         | 50            | 0,0315        | 5             | 0,325         | -110          | 1,06             | 20,9                    | 19,3        |
| 3,3                                                          | 0,813         | -176          | 3,731         | 48            | 0,0315        | 4             | 0,327         | -113          | 1,10             | 20,7                    | 18,8        |
| 3,4                                                          | 0,813         | -178          | 3,629         | 45            | 0,0315        | 4             | 0,330         | -115          | 1,12             | 20,6                    | 18,5        |
| 3,5                                                          | 0,812         | 179           | 3,534         | 43            | 0,0315        | 3             | 0,334         | -118          | 1,15             | 20,5                    | 18,1        |
| 4,0                                                          | 0,812         | 168           | 3,110         | 32            | 0,0314        | 1             | 0,353         | -131          | 1,29             | 20,0                    | 16,7        |
| 4,5                                                          | 0,812         | 158           | 2,748         | 20            | 0,0315        | 1             | 0,378         | -143          | 1,42             | 19,4                    | 15,5        |
| 5,0                                                          | 0,812         | 148           | 2,463         | 10            | 0,0322        | 1             | 0,403         | -154          | 1,53             | 18,8                    | 14,5        |
| 5,5                                                          | 0,812         | 140           | 2,223         | 2             | 0,0339        | 1             | 0,428         | -164          | 1,58             | 18,2                    | 13,7        |
| 6,0                                                          | 0,811         | 132           | 2,025         | -8            | 0,0364        | 1             | 0,450         | -173          | 1,58             | 17,5                    | 13,0        |
| 6,5                                                          | 0,811         | 122           | 1,860         | -20           | 0,0398        | 1             | 0,474         | 179           | 1,53             | 16,7                    | 12,4        |
| 7,0                                                          | 0,811         | 116           | 1,721         | -28           | 0,0430        | 0             | 0,498         | 171           | 1,49             | 16,0                    | 11,9        |
| 7,5                                                          | 0,811         | 108           | 1,601         | -37           | 0,0478        | -2            | 0,519         | 163           | 1,40             | 15,3                    | 11,5        |
| 8,0                                                          | 0,811         | 100           | 1,496         | -47           | 0,0528        | -6            | 0,538         | 154           | 1,32             | 14,5                    | 11,1        |
| 8,5                                                          | 0,810         | 92            | 1,402         | -57           | 0,0581        | -11           | 0,556         | 145           | 1,25             | 13,8                    | 10,8        |
| 9,0                                                          | 0,810         | 84            | 1,317         | -66           | 0,0637        | -16           | 0,574         | 136           | 1,17             | 13,2                    | 10,6        |
| 9,5                                                          | 0,809         | 76            | 1,240         | -76           | 0,0692        | -21           | 0,595         | 127           | 1,10             | 12,5                    | 10,6        |
| 10,0                                                         | 0,809         | 68            | 1,171         | -85           | 0,0759        | -27           | 0,614         | 118           | 1,02             | 11,9                    | 10,9        |
| 10,5                                                         | 0,808         | 60            | 1,109         | -94           | 0,0828        | -33           | 0,635         | 110           | 0,94             | 11,3                    |             |
| 11,0                                                         | 0,806         | 53            | 1,052         | -104          | 0,0902        | -39           | 0,656         | 102           | 0,86             | 10,7                    |             |
| 11,5                                                         | 0,802         | 46            | 1,002         | -112          | 0,0978        | -45           | 0,674         | 94            | 0,79             | 10,1                    |             |
| 12,0                                                         | 0,793         | 38            | 0,959         | -121          | 0,1066        | -51           | 0,688         | 88            | 0,75             | 9,5                     |             |
| 12,5                                                         | 0,778         | 30            | 0,926         | -130          | 0,1169        | -58           | 0,698         | 81            | 0,72             | 9,0                     |             |
| 13,0                                                         | 0,756         | 22            | 0,891         | -140          | 0,1290        | -66           | 0,706         | 75            | 0,71             | 8,4                     |             |
| 13,5                                                         | 0,735         | 13            | 0,863         | -149          | 0,1400        | -74           | 0,709         | 67            | 0,72             | 7,9                     |             |
| 14,0                                                         | 0,713         | 3             | 0,842         | -158          | 0,1568        | -82           | 0,711         | 60            | 0,71             | 7,3                     |             |
| 14,5                                                         | 0,691         | -9            | 0,825         | -168          | 0,1759        | -92           | 0,708         | 52            | 0,70             | 6,7                     |             |
| 15,0                                                         | 0,665         | -22           | 0,810         | -179          | 0,1975        | -103          | 0,699         | 44            | 0,71             | 6,1                     |             |
| 15,5                                                         | 0,639         | -36           | 0,800         | 169           | 0,2214        | -115          | 0,688         | 34            | 0,73             | 5,6                     |             |
| 16,0                                                         | 0,622         | -51           | 0,793         | 158           | 0,2474        | -128          | 0,673         | 23            | 0,73             | 5,1                     |             |
| 16,5                                                         | 0,622         | -66           | 0,787         | 146           | 0,2765        | -142          | 0,657         | 11            | 0,71             | 4,5                     |             |
| 17,0                                                         | 0,642         | -80           | 0,787         | 137           | 0,3148        | -152          | 0,648         | -2            | 0,65             | 4,0                     |             |
| 17,5                                                         | 0,668         | -92           | 0,794         | 128           | 0,3530        | -161          | 0,652         | -13           | 0,58             | 3,5                     |             |
| 18,0                                                         | 0,694         | -101          | 0,808         | 121           | 0,3881        | -167          | 0,667         | -22           | 0,51             | 3,2                     |             |

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(nn):                      Output Power Level  
(ql):      Quality Level

**Ordering Example:**

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CLX27-10 ES  
For CLX27; Output Power Level 10 ( $P_{out} > 27.5$  dBm)  
in ESA Space Quality Level

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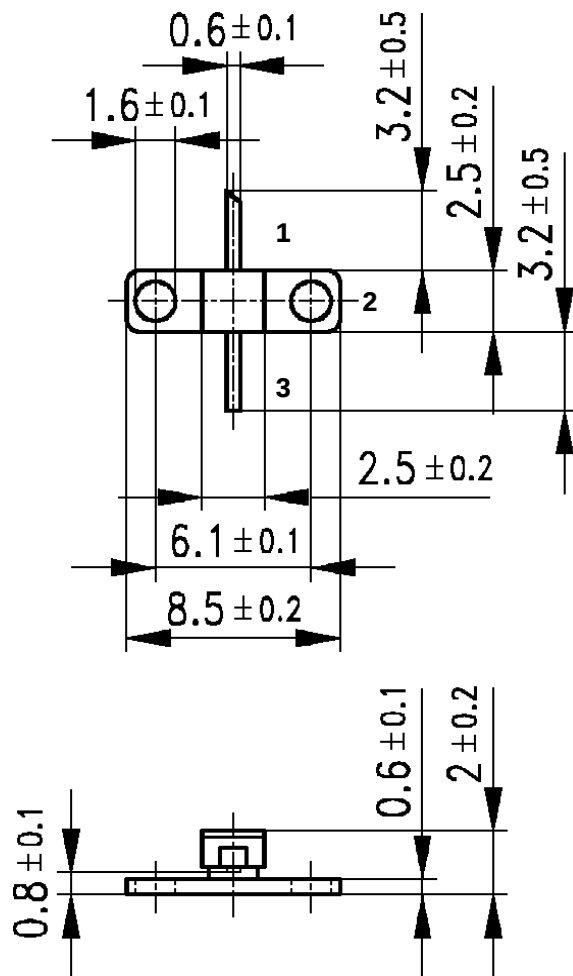
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