## ORDERING INFORMATION

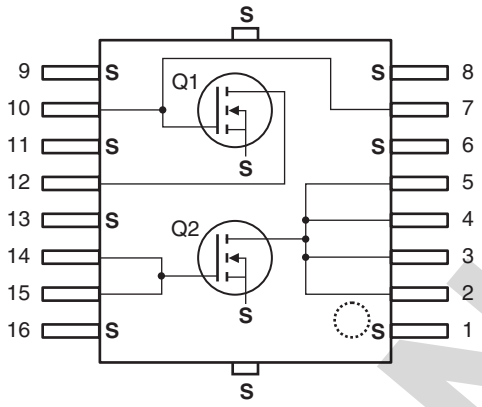
| Part Number | Order Number | Package | Marking | Supplying Form |
|---|---|---|---|---|
| NE55410GR | NE55410GR-T3-AZ | 16-pin plastic HTSSOP (Pb-Free) Note | 55410 | • Embossed tape 12 mm wide<br>• Pin 1 and 8 indicates pull-out direction of tape<br>• Qty 1 kpcs/reel |

**Note** With regards to terminal solder (the solder contains lead) plated products (conventionally plated), contact your nearby sales office.

**Remark** To order evaluation samples, contact your nearby sales office.
Part number for sample order: NE55410GR

## PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM

(Top View)




| Pin No. | Pin Name | Pin No. | Pin Name |
|---|---|---|---|
| 1 | Source | 9 | Source |
| 2 | Drain (Q2) | 10 | Gate (Q1) |
| 3 | Drain (Q2) | 11 | Source |
| 4 | Drain (Q2) | 12 | Drain (Q1) |
| 5 | Drain (Q2) | 13 | Source |
| 6 | Source | 14 | Gate (Q2) |
| 7 | Gate (Q1) | 15 | Gate (Q2) |
| 8 | Source | 16 | Source |

**Remark** All the terminals of a Q2 connected to a circuit. Backside : Source (**S**)

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = +25°C, unless otherwise specified)

| Parameter | Symbol | Test Conditions | Ratings | Unit |
|---|---|---|---|---|
| Drain to Source Voltage | $V_{DS}$ | | 65 | V |
| Gate to Source Voltage | $V_{GS}$ | | ±7 | V |
| Drain Current (Q1) | $I_{D(Q1)}$ | | 0.25 | A |
| Drain Current (Q2) | $I_{D(Q2)}$ | | 1.0 | A |
| Total Device Dissipation ($T_{case}$ = 25°C) | $P_{tot}$ | | 40 | W |
| Input Power (Q1) | $P_{in(Q1)}$ | f = 2.14 GHz, $V_{DS}$ = 28 V | 0.3 | W |
| Input Power (Q2) | $P_{in(Q2)}$ | f = 2.14 GHz, $V_{DS}$ = 28 V | 1.5 | W |
| Channel Temperature | $T_{ch}$ | | 150 | °C |
| Storage Temperature | $T_{stg}$ | | –65 to +150 | °C |

## THERMAL RESISTANCE ($T_A$ = +25°C)

| Parameter | Symbol | Test Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Channel to Case Resistance | $R_{th\ (ch\text{-}c)}$ | | – | 2.5 | 3.0 | °C/W |

## RECOMMENDED OPERATING CONDITIONS ($T_A$ = +25°C)

| | Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| <R> | Drain to Source Voltage | $V_{DS}$ | – | 28 | 32 | V |
| | Gate to Source Voltage | $V_{GS}$ | 2.7 | 3.3 | 3.7 | V |
| | Input Power (Q1), CW | $P_{in\ (Q1)}$ | – | 15 | 23 | dBm |
| | Input Power (Q2), CW | $P_{in\ (Q2)}$ | – | 20 | 30 | dBm |
| <R> | Average Output Power (Q1), CW Note | $P_{O\ (ave.)\ (Q1)}$ | – | – | 24 | dBm |
| <R> | Average Output Power (Q2), CW Note | $P_{O\ (ave.)\ (Q2)}$ | – | – | 30 | dBm |

<R> **Note** When mounting on the PWB that our company recommends.

## ELECTRICAL CHARACTERISTICS ($T_A$ = +25°C)

| Parameter | Symbol | Test Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Q1 | | | | | | |
| Gate to Source Leak Current | $I_{GSS\ (Q1)}$ | $V_{GSS}$ = 5V | – | – | 1 | μA |
| Drain to Source Leakage Current | $I_{DSS\ (Q1)}$ | $V_{DSS}$ = 65 V | – | – | 1 | mA |
| Gate Threshold Voltage | $V_{th\ (Q1)}$ | $V_{DS}$ = 10 V, $I_{DS}$ = 1 mA | 2.2 | 2.8 | 3.4 | V |
| Transconductance | $g_{m\ (Q1)}$ | $V_{DS}$ = 28 V, $I_{DS}$ = 20 mA | – | 0.09 | – | S |
| Drain to Source Breakdown Voltage | $BV_{DSS\ (Q1)}$ | $I_{DSS}$ = 10 μA | 65 | 75 | – | V |
| Q2 | | | | | | |
| Gate to Source Leak Current | $I_{GSS\ (Q2)}$ | $V_{GSS}$ = 5V | – | – | 1 | μA |
| Drain to Source Leakage Current | $I_{DSS\ (Q2)}$ | $V_{DSS}$ = 65 V | – | – | 1 | mA |
| Gate Threshold Voltage | $V_{th\ (Q2)}$ | $V_{DS}$ = 10 V, $I_{DS}$ = 1 mA | 2.0 | 2.6 | 3.2 | V |
| Transconductance | $g_{m\ (Q2)}$ | $V_{DS}$ = 28 V, $I_{DS}$ = 100 mA | – | 0.45 | – | S |
| Drain to Source Breakdown Voltage | $BV_{DSS\ (Q2)}$ | $I_{DSS}$ = 10 μA | 65 | 75 | – | V |

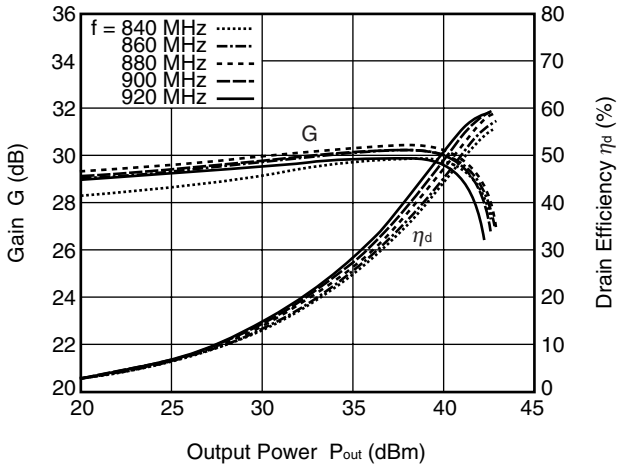
## <R> RF CHARACTERISTICS ($T_A$ = +25°C)

| Parameter | Symbol | Test Conditions | MIN. | TYP. | MAX. | Unit |
|---|---|---|---|---|---|---|
| Q1 | | | | | | |
| Gain 1 dB Compression Output Power | $P_{O\ (1\ dB)}$ | f = 2 140 MHz, $V_{DS}$ = 28 V, | – | 35.4 | – | dBm |
| Drain Efficiency | $\eta_d$ | $I_{Dset}$ = 20 mA | – | 52 | – | % |
| Linear Gain | $G_L$ Note1 | | 12 | 13.5 | – | dB |
| Q2 | | | | | | |
| Gain 1 dB Compression Output Power | $P_{O\ (1\ dB)}$ | f = 2 140 MHz, $V_{DS}$ = 28 V, | – | 40.4 | – | dBm |
| Drain Efficiency | $\eta_d$ | $I_{Dset}$ = 100 mA | – | 46 | – | % |
| Linear Gain | $G_L$ Note2 | | 9.5 | 11 | – | dB |
| Gain 1 dB Compression Output Power | $P_{O\ (1\ dB)}$ | f = 1 840 MHz, $V_{DS}$ = 28 V, | – | 40.5 | – | dBm |
| Drain Efficiency | $\eta_d$ | $I_{Dset}$ = 100 mA | – | 49 | – | % |
| Linear Gain | $G_L$ Note2 | | – | 14 | – | dB |
| Q1 + Q2 | | | | | | |
| Gain 1 dB Compression Output Power | $P_{O\ (1\ dB)}$ | f = 880 MHz, $V_{DS}$ = 28 V, | – | 41.5 | – | dBm |
| Drain Efficiency | $\eta_d$ | $I_{Dset}$ = 120 mA (Q1 + Q2) | – | 55 | – | % |
| Linear Gain | $G_L$ Note3 | | – | 30 | – | dB |
| Gain 1 dB Compression Output Power | $P_{O\ (1\ dB)}$ | f = 2 140 MHz, $V_{DS}$ = 28 V, | – | 40.0 | – | dBm |
| Drain Efficiency | $\eta_d$ | $I_{Dset}$ = 120 mA (Q1 + Q2) | 34 | 42 | – | % |
| Output Power | $P_{out}$ | | 39 | 40 | – | dB |
| Linear Gain | $G_L$ Note4 | | 24 | 25 | – | dB |
| 3rd Order Intermodulation Distortion | $IM_3$ | f = 2 132.5/2 147.5 MHz, $V_{DS}$ = 28 V, | – | –40 | – | dBc |
| Drain Efficiency | $\eta_d$ | 2 carrier W-CDMA 3GPP, Test Model1, 64DPCH, 67% Clipping, $I_{Dset}$ = 120 mA (Q1 + Q2), Ave $P_{out}$ = 33 dBm | – | 21 | – | % |

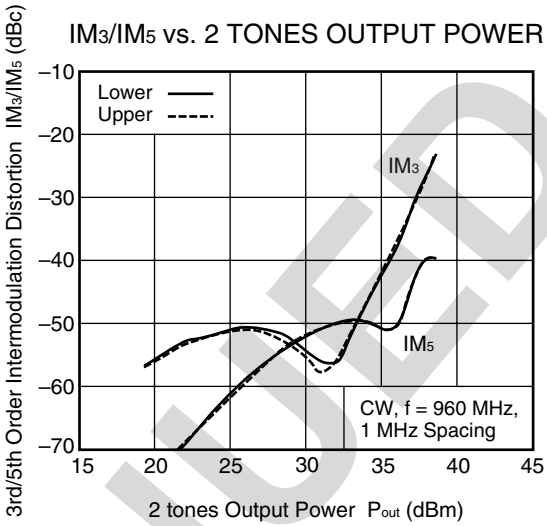
**Notes 1.** $P_{in}$ = 15 dBm
**2.** $P_{in}$ = 20 dBm
**3.** $P_{in}$ = 5 dBm
**4.** $P_{in}$ = 10 dBm

**TYPICAL CHARACTERISTICS ($T_A$ = +25°C, $V_{DS}$ = 28 V, $I_{Dset}$ = 120 mA, unless otherwise specified)**

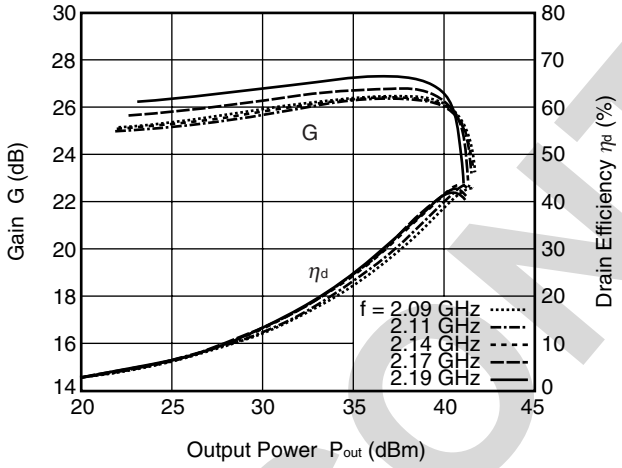
GAIN, DRAIN EFFICIENCY, vs. OUTPUT POWER



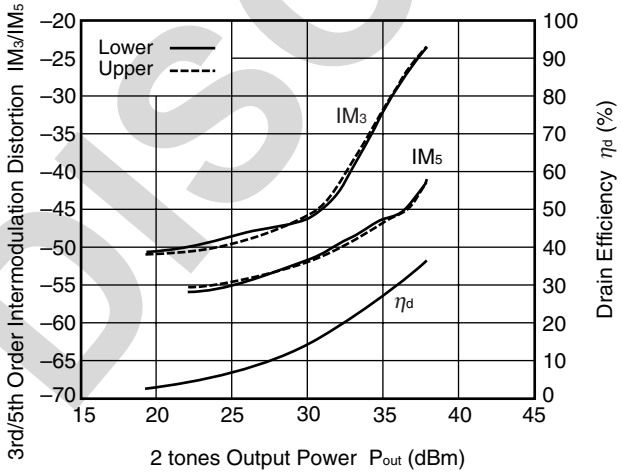

IM3/IM5 vs. 2 TONES OUTPUT POWER




GAIN, DRAIN EFFICIENCY, vs. OUTPUT POWER




IM3/IM5, DRAIN EFFICIENCY, vs. 2 TONES OUTPUT POWER




W-CDMA 3GPP, Test Model 1,
64 DPCH, 67% Clipping,
Center Frequency 2.14GHz,
15 MHz spacing

**Remark** The graphs indicate nominal characteristics.

<R> **S-PARAMETERS**

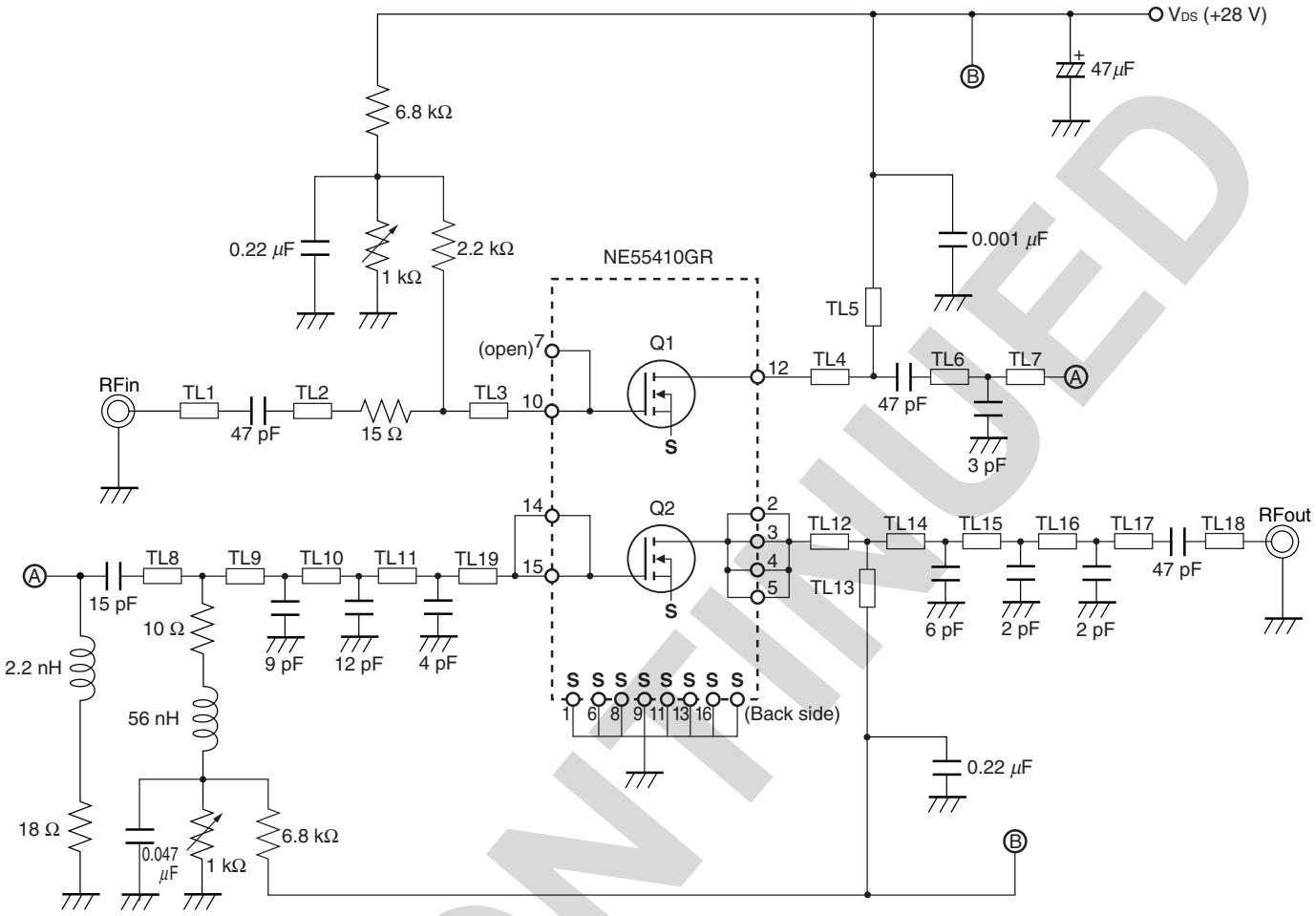
S-parameters/Noise parameters are provided on our web site in a form (S2P) that enables direct import to a microwave circuit simulator without keyboard input.

Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

URL http://www.ncsd.necel.com/microwave/index.html

## EVALUATION CIRCUIT (f = 840 to 960 MHz, $V_{DS}$ = 28 V, $I_{Dset}$ = 120 mA)



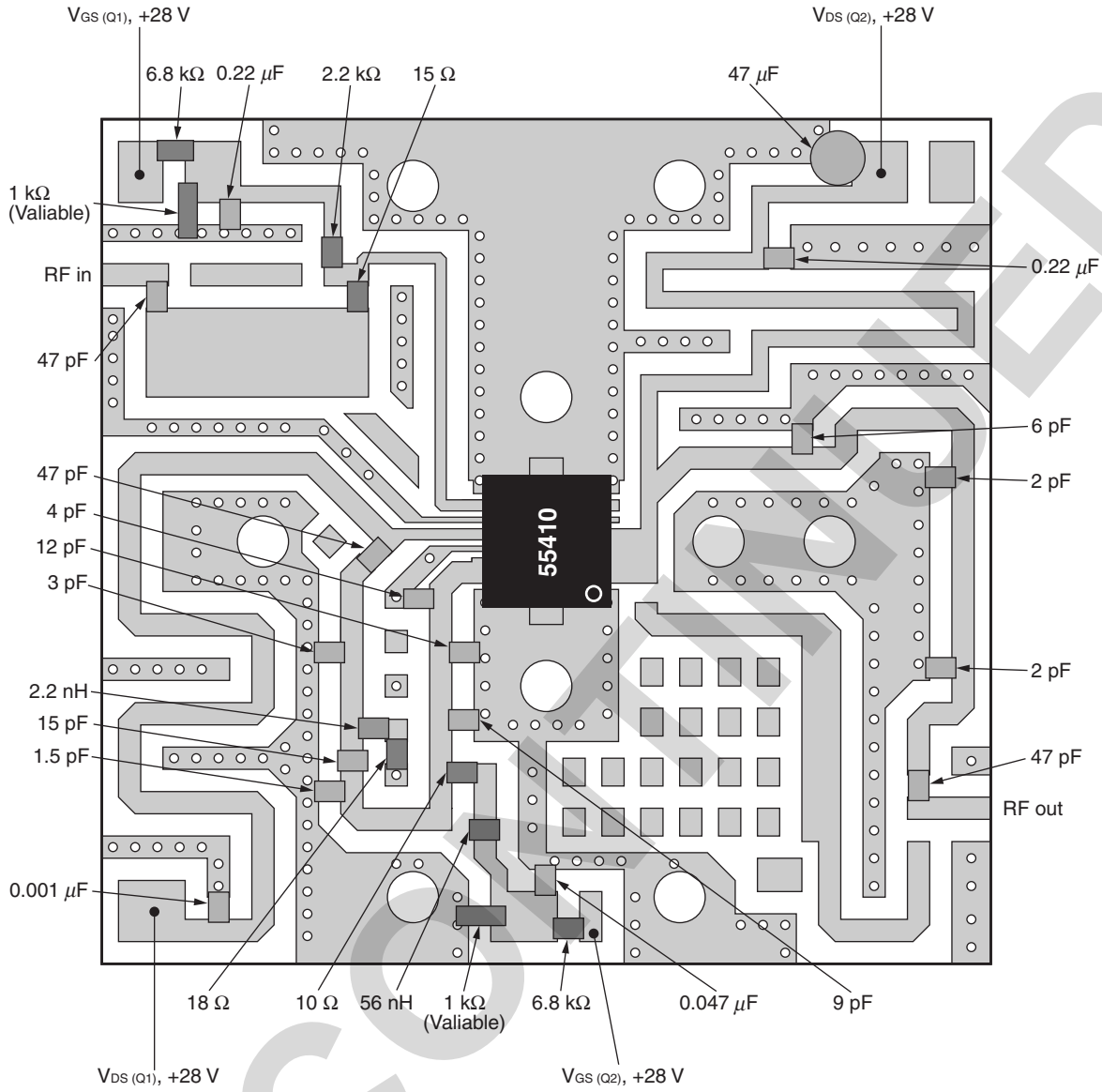

| Symbol | Width (mm) | Length (mm) |
|---|---|---|
| TL1 | 1.0 | 3.0 |
| TL2 | 4.5 | 10.0 |
| TL3 | 0.5 | 16.0 |
| TL4 | 0.5 | 5.0 |
| TL5 | 1.0 | 48.0 |
| TL6 | 1.0 | 4.0 |
| TL7 | 1.0 | 3.0 |
| TL8 | 1.0 | 6.0 |
| TL9 | 1.0 | 3.0 |
| TL10 | 1.0 | 4.0 |

| Symbol | Width (mm) | Length (mm) |
|---|---|---|
| TL11 | 1.0 | 3.0 |
| TL12 | 1.0 | 5.0 |
| TL13 | 0.8 | 48.0 |
| TL14 | 1.0 | 6.5 |
| TL15 | 1.0 | 10.5 |
| TL16 | 1.0 | 9.5 |
| TL17 | 1.0 | 10.0 |
| TL18 | 1.0 | 6.0 |
| TL19 | 1.0 | 3.0 |

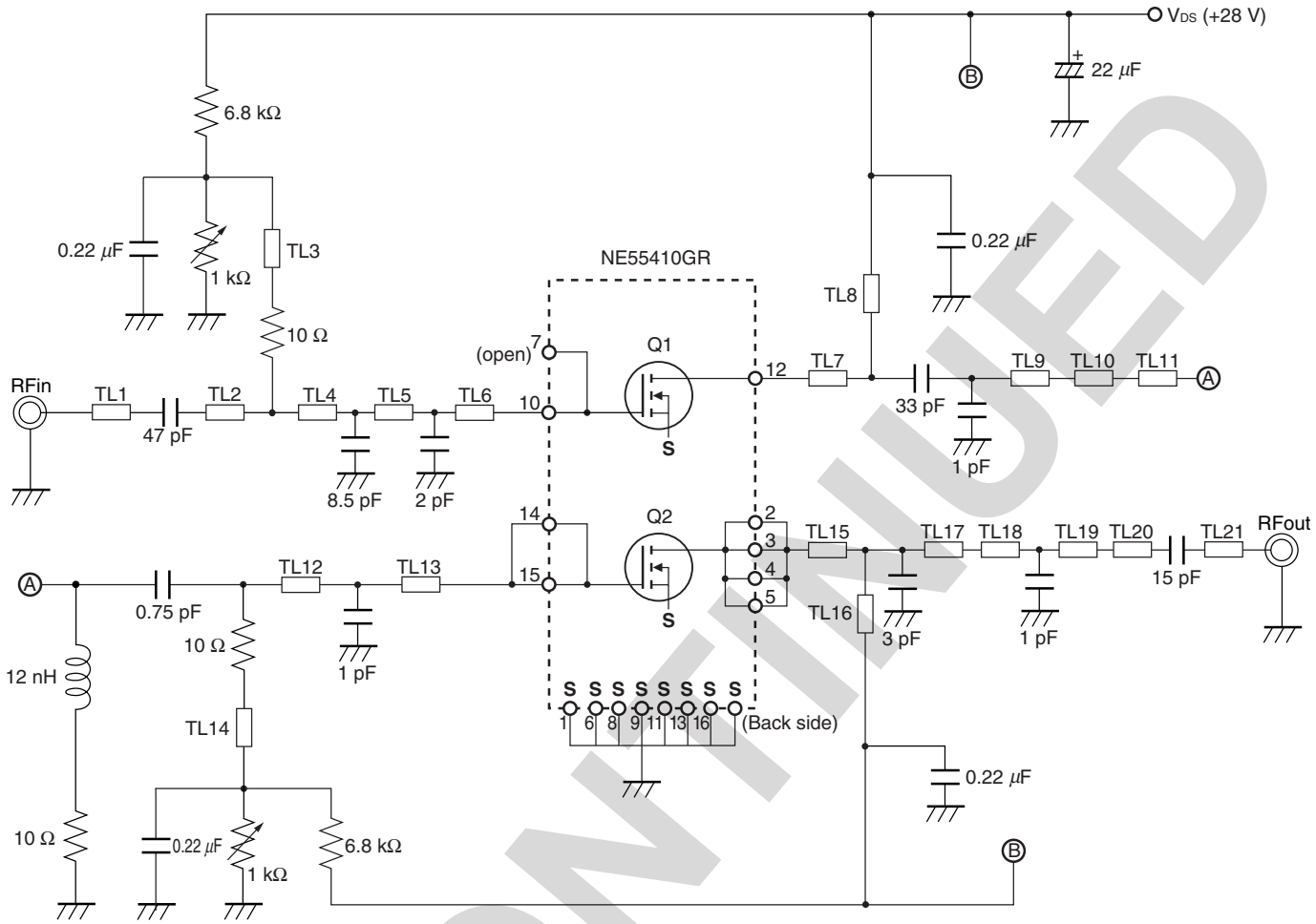


The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

## EVALUATION CIRCUIT (f = 840 to 960 MHz, $V_{DS}$ = 28 V, $I_{Dset}$ = 120 mA)



## EVALUATION CIRCUIT (f = 2 090 to 2 190 MHz, $V_{DS}$ = 28 V, $I_{Dset}$ = 120 mA)



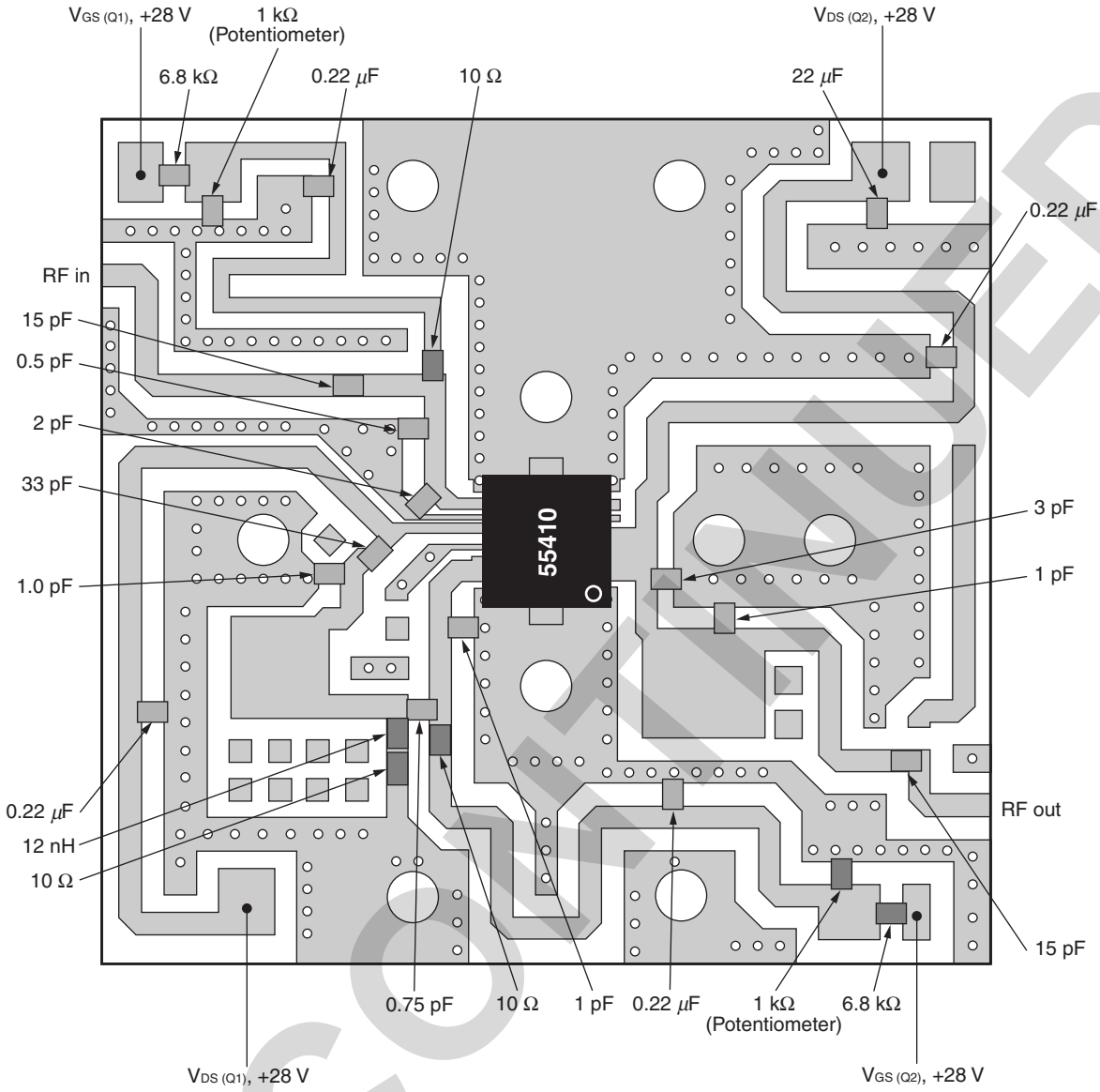

| Symbol | Width (mm) | Length (mm) |
|---|---|---|
| TL1 | 1.0 | 17.0 |
| TL2 | 1.0 | 4.0 |
| TL3 | 1.0 | 24.5 |
| TL4 | 1.0 | 2.5 |
| TL5 | 1.0 | 3.0 |
| TL6 | 0.5 | 2.5 |
| TL7 | 0.5 | 4.5 |
| TL8 | 1.0 | 25.5 |
| TL9 | 1.0 | 2.5 |
| TL10 | 4.5 | 4.5 |
| TL11 | 1.0 | 3.5 |

| Symbol | Width (mm) | Length (mm) |
|---|---|---|
| TL12 | 1.0 | 4.0 |
| TL13 | 1.0 | 4.5 |
| TL14 | 1.0 | 25.0 |
| TL15 | 2.5 | 2.5 |
| TL16 | 1.0 | 27.0 |
| TL17 | 1.0 | 2.0 |
| TL18 | 5.0 | 4.0 |
| TL19 | 5.0 | 2.0 |
| TL20 | 1.0 | 12.5 |
| TL21 | 1.0 | 5.5 |



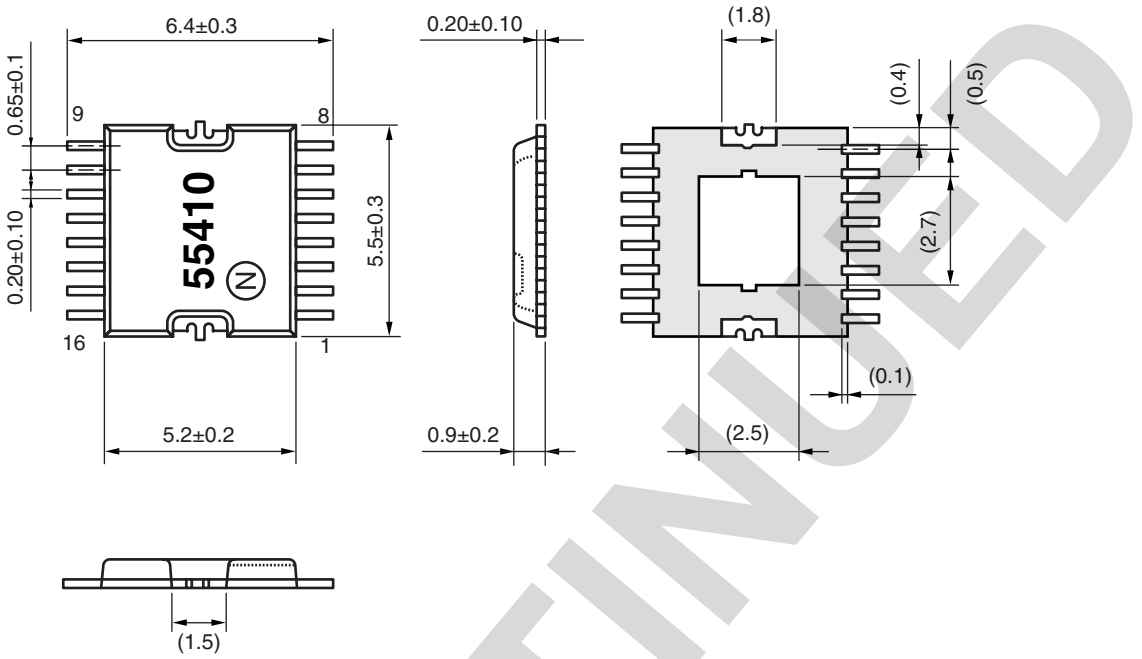
The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

<R> **EVALUATION CIRCUIT (f = 2 090 to 2 190 MHz, $V_{DS}$ = 28 V, $I_{Dset}$ = 120 mA)**



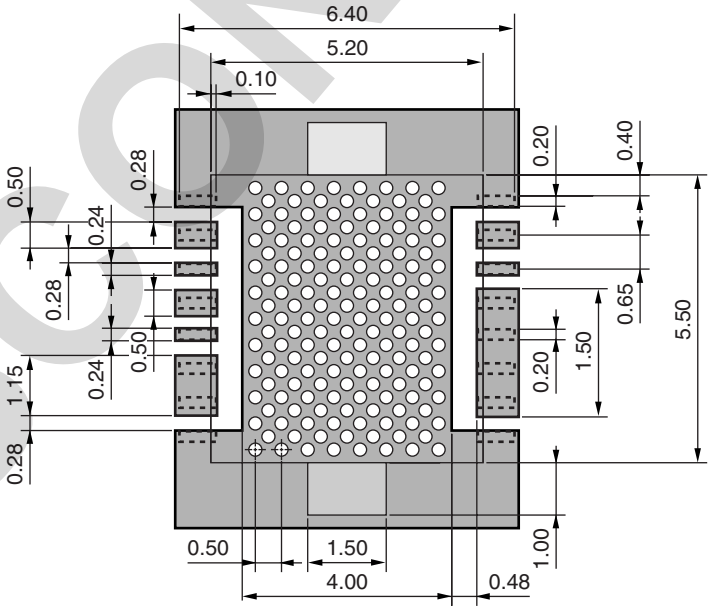
## PACKAGE DIMENSIONS

### 16-PIN PLASTIC HTSSOP (UNIT: mm)




**Remark** ( ): Reference value

### LAND PATTERN (UNIT: mm)




**Remarks1.** Via holes : 158 holes

<R> **2.** Hole size : $\phi$0.15 mm

**3.** Min. spacing : 0.354 mm

**4.** ▭ : Solder resist or etching

## RECOMMENDED SOLDERING CONDITIONS

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your nearby sales office.

| Soldering Method | Soldering Conditions | | Condition Symbol |
|---|---|---|---|
| Infrared Reflow | Peak temperature (package surface temperature)<br>Time at peak temperature<br>Time at temperature of 220°C or higher<br>Preheating time at 120 to 180°C<br>Maximum number of reflow processes<br>Maximum chlorine content of rosin flux (% mass) | : 260°C or below<br>: 10 seconds or less<br>: 60 seconds or less<br>: 120±30 seconds<br>: 3 times<br>: 0.2%(Wt.) or below | IR260 |
| Wave Soldering | Peak temperature (molten solder temperature)<br>Time at peak temperature<br>Preheating temperature (package surface temperature)<br>Maximum number of flow processes<br>Maximum chlorine content of rosin flux (% mass) | : 260°C or below<br>: 10 seconds or less<br>: 120°C or below<br>: 1 time<br>: 0.2%(Wt.) or below | WS260 |
| Partial Heating | Peak temperature (terminal temperature)<br>Soldering time (per side of device)<br>Maximum chlorine content of rosin flux (% mass) | : 350°C or below<br>: 3 seconds or less<br>: 0.2%(Wt.) or below | HS350 |

**Caution Do not use different soldering methods together (except for partial heating).**

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