

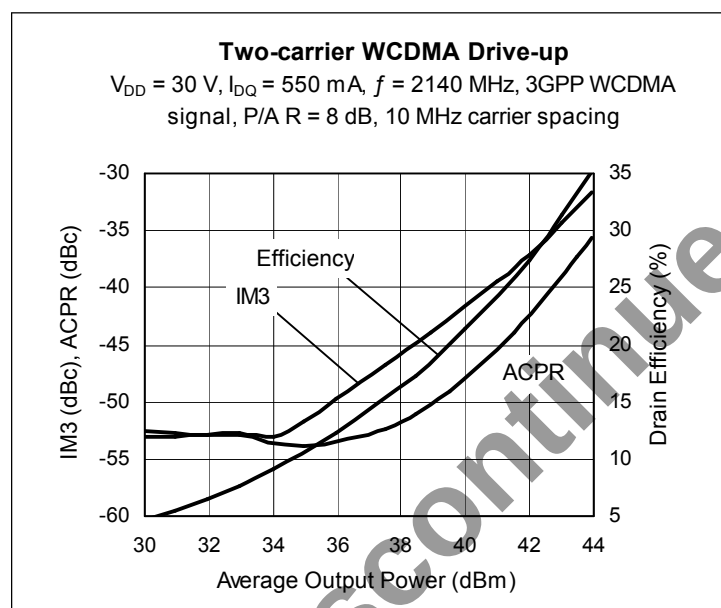
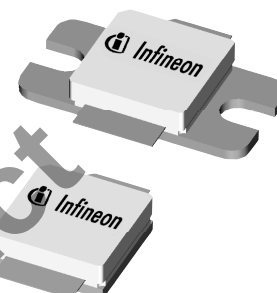
## Thermally-Enhanced High Power RF LDMOS FET 70 W, 2110 – 2170 MHz

### Description

The PTFA210701E and PTFA210701F are 70-watt LDMOS FETs designed for single- and dual-carrier WCDMA power amplifier applications in the 2110 MHz to 2170 MHz band. Features include input and output matching, and thermally-enhanced packages with slotted or earless flanges. Manufactured with Infineon's advanced LDMOS process, these devices provide excellent thermal performance and superior reliability.

PTFA210701E  
Package H-36265-2

PTFA210701F  
Package H-37265-2



### Features

- Thermally-enhanced packages, Pb-free and RoHS-compliant
- Broadband internal matching
- Typical two-carrier WCDMA performance at 2140 MHz, 30 V
  - Average output power = 42 dBm
  - Linear Gain = 16.5 dB
  - Efficiency = 27.0%
  - Intermodulation distortion = -37 dBc
  - Adjacent channel power = -42.5 dBc
- Typical CW performance, 2170 MHz, 30 V
  - Output power at P-1dB = 80 W
  - Efficiency = 58%
- Integrated ESD protection: Human Body Model, Class 2 (minimum)
- Excellent thermal stability, low HCI drift
- Capable of handling 10:1 VSWR @ 30 V, 70 W (CW) output power

### RF Characteristics

#### WCDMA Measurements (tested in Infineon test fixture)

$V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 550\text{ mA}$ ,  $P_{OUT} = 18\text{ W}$  average

$f_1 = 2135\text{ MHz}$ ,  $f_2 = 2145\text{ MHz}$ , 3GPP signal, channel bandwidth = 3.84 MHz, peak/average = 8 dB @ 0.01% CCDF

| Characteristic             | Symbol   | Min  | Typ   | Max   | Unit |
|----------------------------|----------|------|-------|-------|------|
| Gain                       | $G_{ps}$ | 15.5 | 16.5  | —     | dB   |
| Drain Efficiency           | $\eta_D$ | 28   | 29    | —     | %    |
| Intermodulation Distortion | IMD      | —    | -36.5 | -35.5 | dBc  |

All published data at  $T_{CASE} = 25^\circ\text{C}$  unless otherwise indicated

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

## RF Characteristics (cont.)

**Two-tone Measurements** (not subject to production test—verified by design/characterization in Infineon test fixture)

$V_{DD} = 30\text{ V}$ ,  $I_{DQ} = 550\text{ mA}$ ,  $P_{OUT} = 70\text{ W PEP}$ ,  $f = 2140\text{ MHz}$ , tone spacing = 1 MHz

| Characteristic             | Symbol   | Min | Typ   | Max | Unit |
|----------------------------|----------|-----|-------|-----|------|
| Gain                       | $G_{ps}$ | —   | 16.5  | —   | dB   |
| Drain Efficiency           | $\eta_D$ | —   | 41    | —   | %    |
| Intermodulation Distortion | IMD      | —   | -29.5 | —   | dBc  |

## DC Characteristics

| Characteristic                 | Conditions                                        | Symbol        | Min | Typ   | Max  | Unit          |
|--------------------------------|---------------------------------------------------|---------------|-----|-------|------|---------------|
| Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}$ , $I_{DS} = 10\text{ mA}$   | $V_{(BR)DSS}$ | 65  | —     | —    | V             |
| Drain Leakage Current          | $V_{DS} = 28\text{ V}$ , $V_{GS} = 0\text{ V}$    | $I_{DSS}$     | —   | —     | 1.0  | $\mu\text{A}$ |
|                                | $V_{DS} = 63\text{ V}$ , $V_{GS} = 0\text{ V}$    | $I_{DSS}$     | —   | —     | 10.0 | $\mu\text{A}$ |
| On-State Resistance            | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0.1\text{ V}$  | $R_{DS(on)}$  | —   | 0.125 | —    | $\Omega$      |
| Operating Gate Voltage         | $V_{DS} = 30\text{ V}$ , $I_{DQ} = 550\text{ mA}$ | $V_{GS}$      | 2.0 | 2.5   | 3.0  | V             |
| Gate Leakage Current           | $V_{GS} = 10\text{ V}$ , $V_{DS} = 0\text{ V}$    | $I_{GSS}$     | —   | —     | 1.0  | $\mu\text{A}$ |

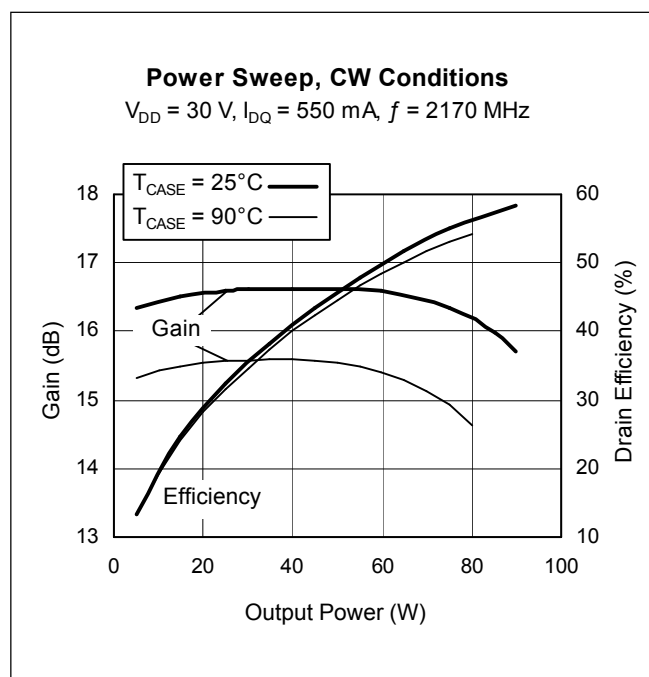
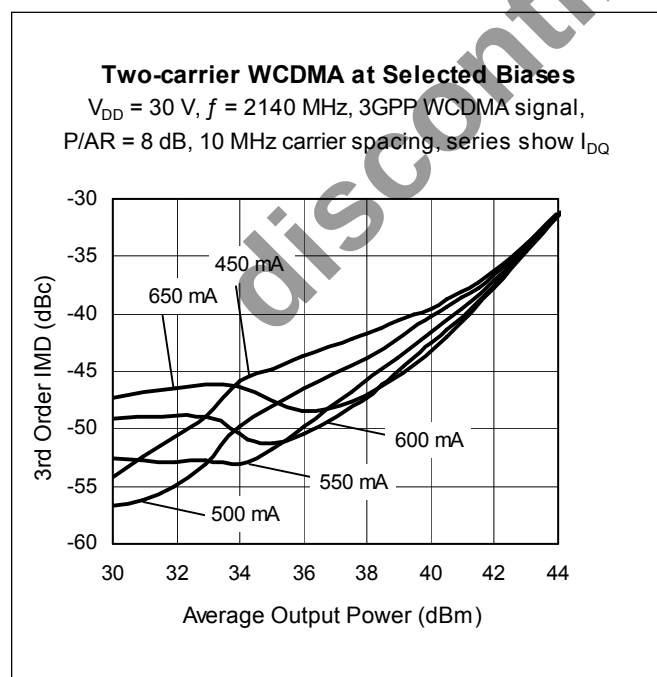
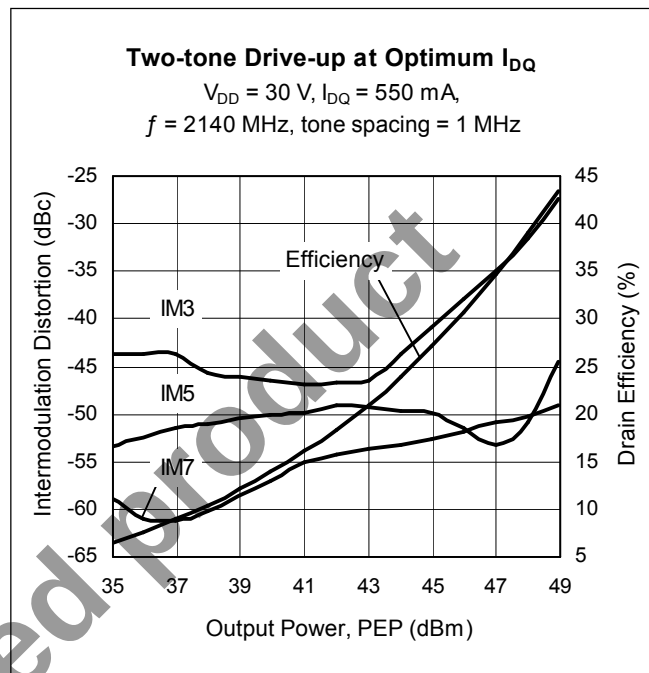
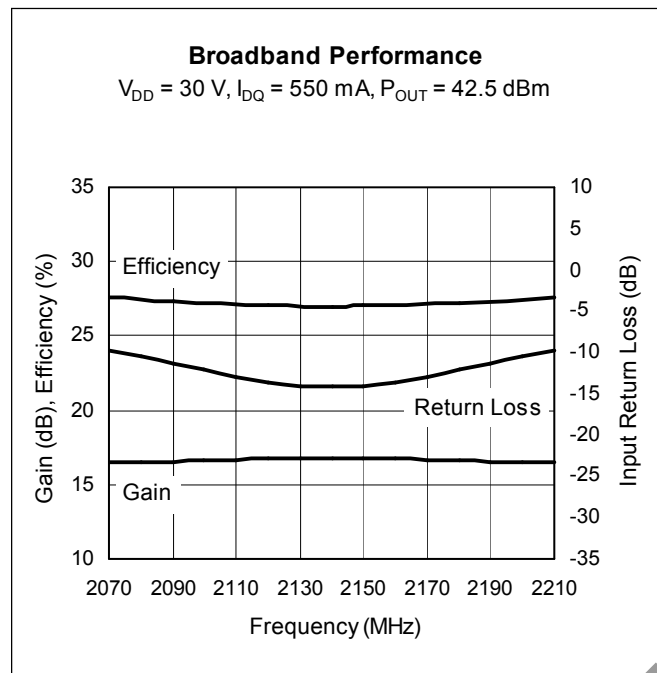
## Maximum Ratings

| Parameter                                                         | Symbol          | Value       | Unit                  |
|-------------------------------------------------------------------|-----------------|-------------|-----------------------|
| Drain-Source Voltage                                              | $V_{DSS}$       | 65          | V                     |
| Gate-Source Voltage                                               | $V_{GS}$        | -0.5 to +12 | V                     |
| Junction Temperature                                              | $T_J$           | 200         | $^{\circ}\text{C}$    |
| Total Device Dissipation<br>Above 25 $^{\circ}\text{C}$ derate by | $P_D$           | 190         | W                     |
|                                                                   |                 | 1.09        | W/ $^{\circ}\text{C}$ |
| Storage Temperature Range                                         | $T_{STG}$       | -40 to +150 | $^{\circ}\text{C}$    |
| Thermal Resistance ( $T_{CASE} = 70^{\circ}\text{C}$ , 70 W CW)   | $R_{\theta JC}$ | 0.92        | $^{\circ}\text{C/W}$  |

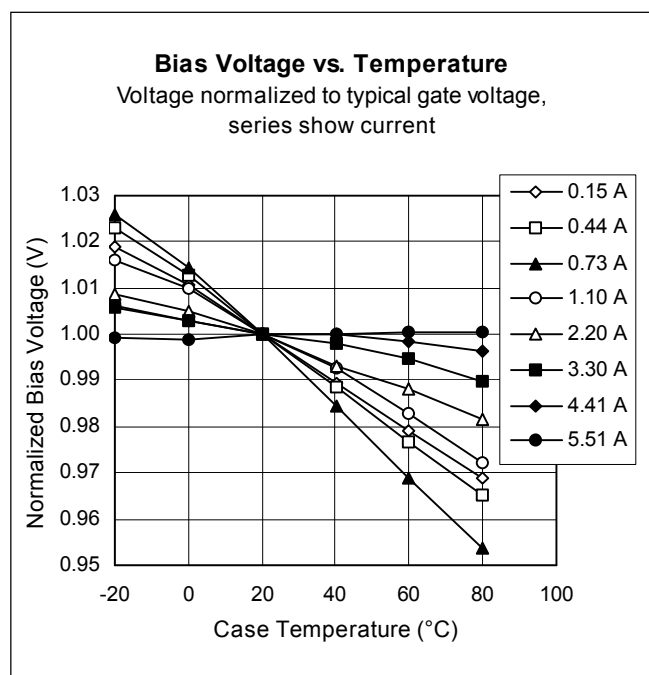
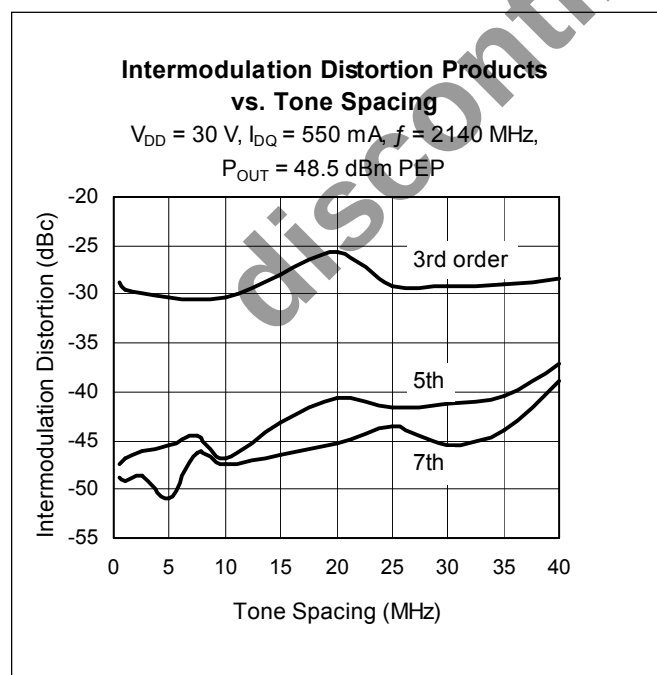
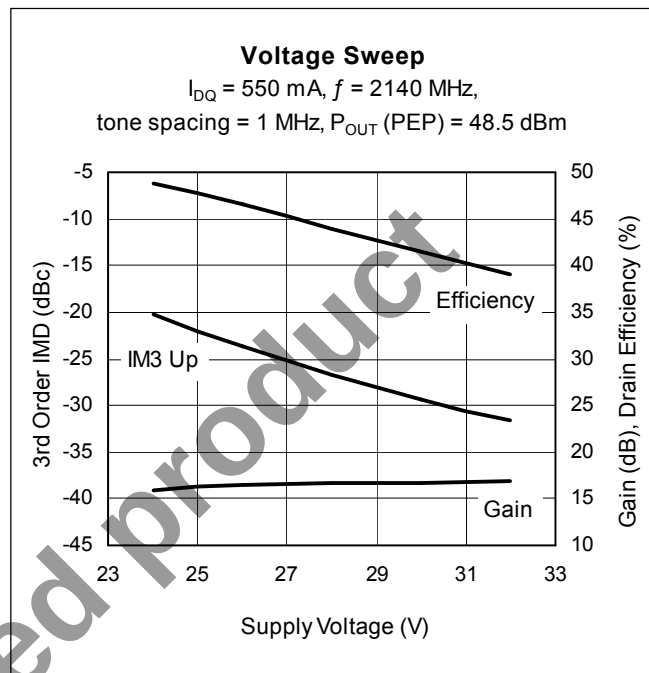
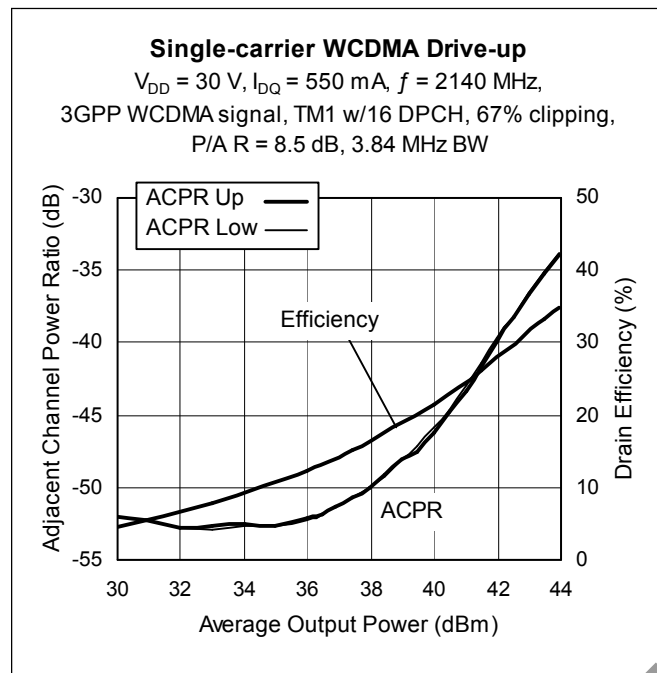
## Ordering Information

| Type and Version | Package Type | Package Description                             | Marking     |
|------------------|--------------|-------------------------------------------------|-------------|
| PTFA210701E V4   | H-36265-2    | Thermally-enhanced slotted flange, single-ended | PTFA210701E |
| PTFA210701F V4   | H-37265-2    | Thermally-enhanced earless flange, single-ended | PTFA210701F |

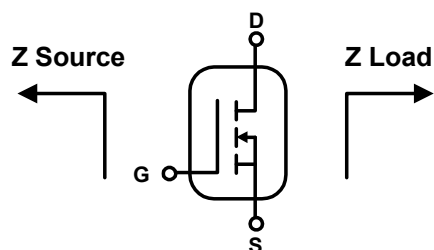
## Typical Performance (data taken in a production test fixture)



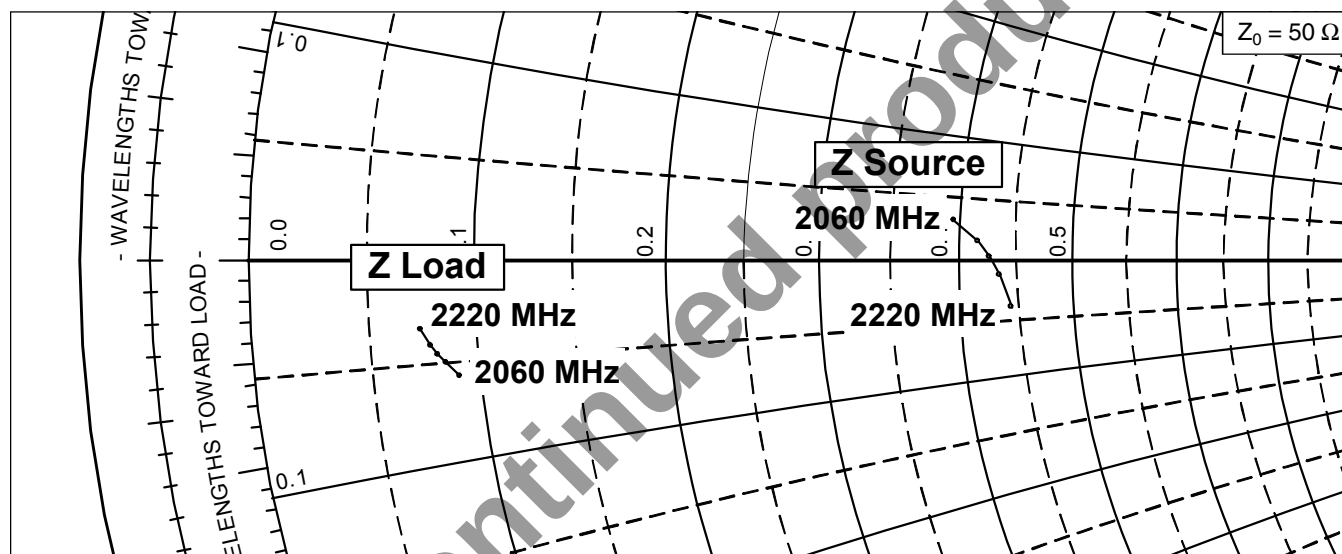
## Typical Performance (cont.)



## Broadband Circuit Impedance

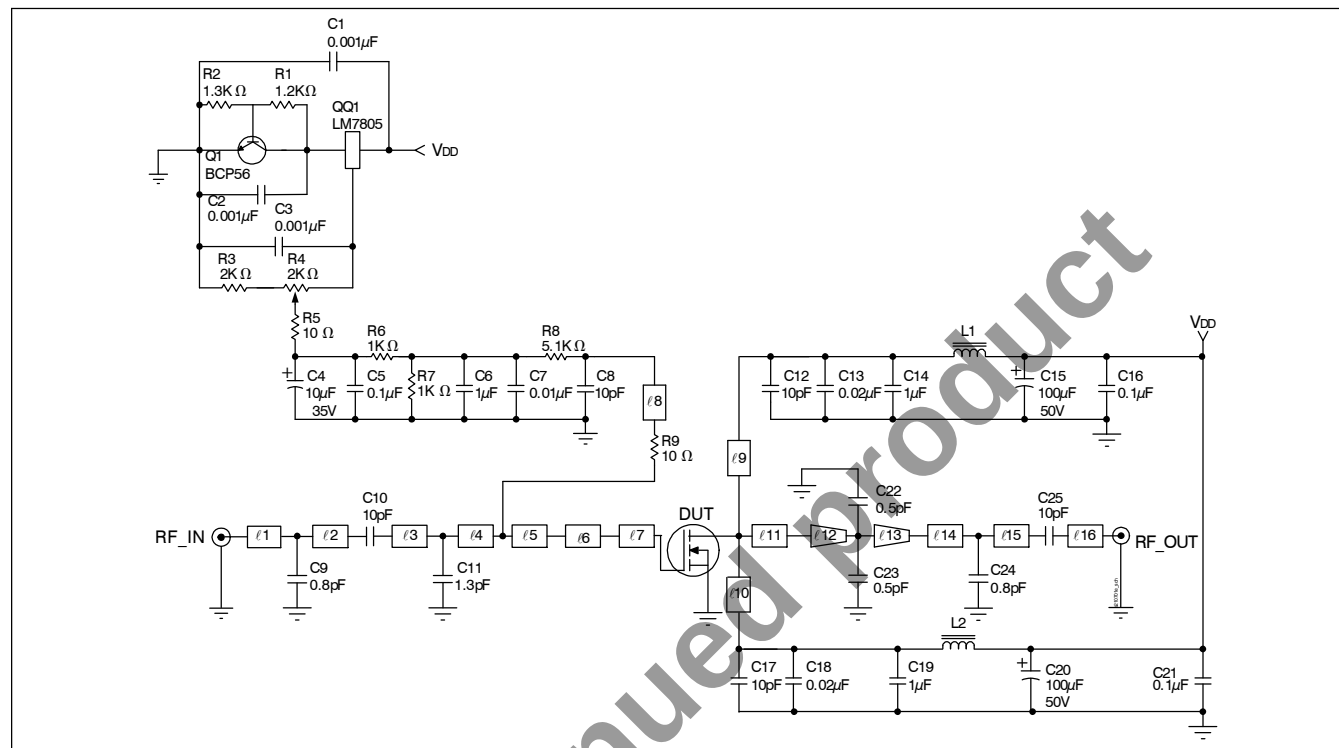


| Frequency<br>MHz | Z Source $\Omega$ |       | Z Load $\Omega$ |       |
|------------------|-------------------|-------|-----------------|-------|
|                  | R                 | jX    | R               | jX    |
| 2060             | 19.94             | 1.61  | 4.50            | -2.87 |
| 2110             | 20.94             | 0.77  | 4.20            | -2.50 |
| 2140             | 21.41             | 0.11  | 4.02            | -2.29 |
| 2170             | 21.83             | -0.69 | 3.88            | -2.07 |
| 2220             | 22.26             | -2.09 | 3.66            | -1.66 |



See next page for circuit information

## Reference Circuit



Reference circuit schematic for  $f = 2140 \text{ MHz}$

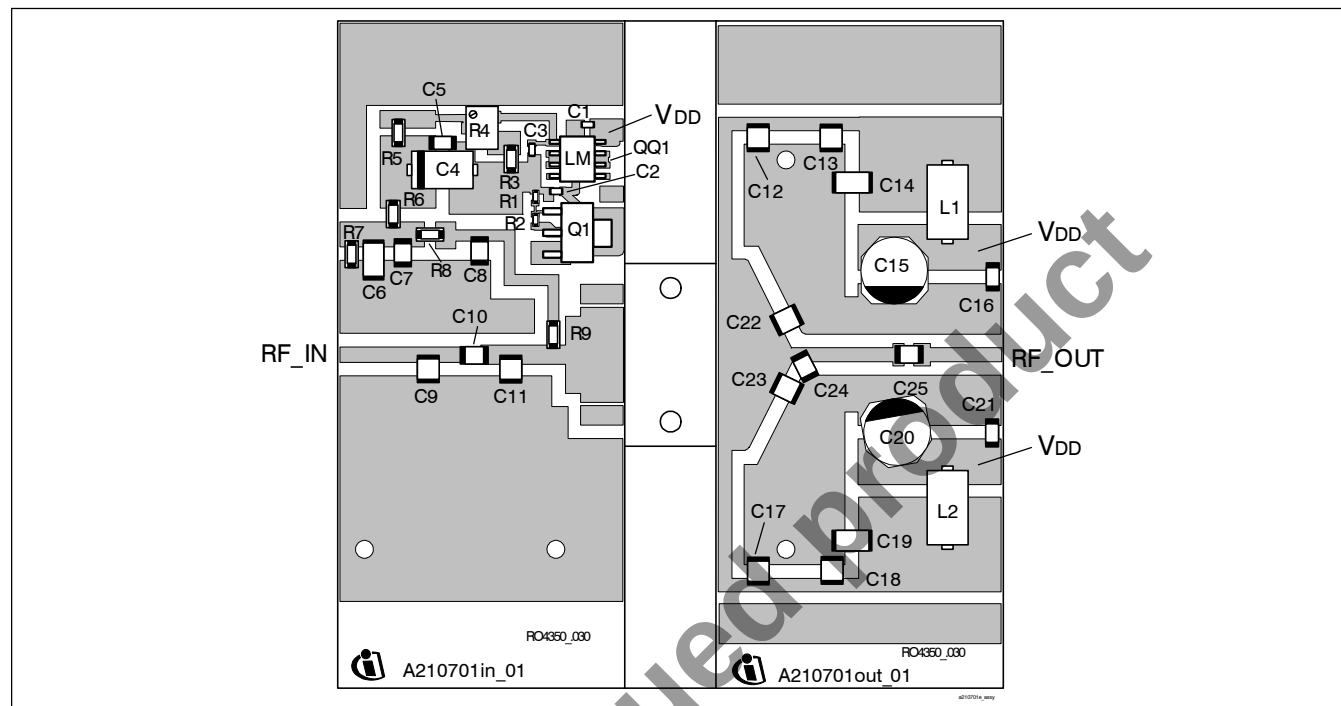
### Circuit Assembly Information

|     |                                            |                  |              |
|-----|--------------------------------------------|------------------|--------------|
| DUT | PTFA210701E or PTFA210701F                 | LDMOS Transistor |              |
| PCB | 0.76 mm [.030"] thick, $\epsilon_r = 3.48$ | Rogers 4350      | 1 oz. copper |

| Microstrip          | Electrical Characteristics at 2140 MHz <sup>1</sup> | Dimensions: L x W (mm) | Dimensions: L x W (in.) |
|---------------------|-----------------------------------------------------|------------------------|-------------------------|
| $\ell_1$            | 0.112 $\lambda$ , 50.0 $\Omega$                     | 9.53 x 1.78            | 0.375 x 0.070           |
| $\ell_2$            | 0.053 $\lambda$ , 50.0 $\Omega$                     | 4.52 x 1.78            | 0.178 x 0.070           |
| $\ell_3$            | 0.044 $\lambda$ , 43.0 $\Omega$                     | 3.73 x 2.18            | 0.147 x 0.086           |
| $\ell_4$            | 0.054 $\lambda$ , 43.0 $\Omega$                     | 4.57 x 2.18            | 0.180 x 0.086           |
| $\ell_5$            | 0.016 $\lambda$ , 43.0 $\Omega$                     | 1.37 x 2.18            | 0.054 x 0.086           |
| $\ell_6$            | 0.022 $\lambda$ , 14.6 $\Omega$                     | 1.73 x 8.76            | 0.068 x 0.345           |
| $\ell_7$            | 0.062 $\lambda$ , 12.2 $\Omega$                     | 4.88 x 10.82           | 0.192 x 0.426           |
| $\ell_8$            | 0.214 $\lambda$ , 61.0 $\Omega$                     | 18.36 x 1.22           | 0.723 x 0.048           |
| $\ell_9, \ell_{10}$ | 0.211 $\lambda$ , 53.0 $\Omega$                     | 17.91 x 1.57           | 0.705 x 0.062           |
| $\ell_{11}$         | 0.042 $\lambda$ , 6.5 $\Omega$                      | 3.25 x 21.84           | 0.128 x 0.860           |
| $\ell_{12}$ (taper) | 0.043 $\lambda$ , 6.5 $\Omega$ / 16.2 $\Omega$      | 3.30 x 21.84 / 7.80    | 0.130 x 0.860 / 0.307   |
| $\ell_{13}$ (taper) | 0.023 $\lambda$ , 16.2 $\Omega$ / 50.0 $\Omega$     | 1.88 x 7.80 / 1.57     | 0.074 x 0.307 / 0.062   |
| $\ell_{14}$         | 0.010 $\lambda$ , 53.0 $\Omega$                     | 0.89 x 1.57            | 0.035 x 0.062           |
| $\ell_{15}$         | 0.130 $\lambda$ , 53.0 $\Omega$                     | 11.07 x 1.57           | 0.436 x 0.062           |
| $\ell_{16}$         | 0.116 $\lambda$ , 53.0 $\Omega$                     | 9.88 x 1.57            | 0.389 x 0.062           |

<sup>1</sup>Electrical characteristics are rounded.

## Reference Circuit (cont.)

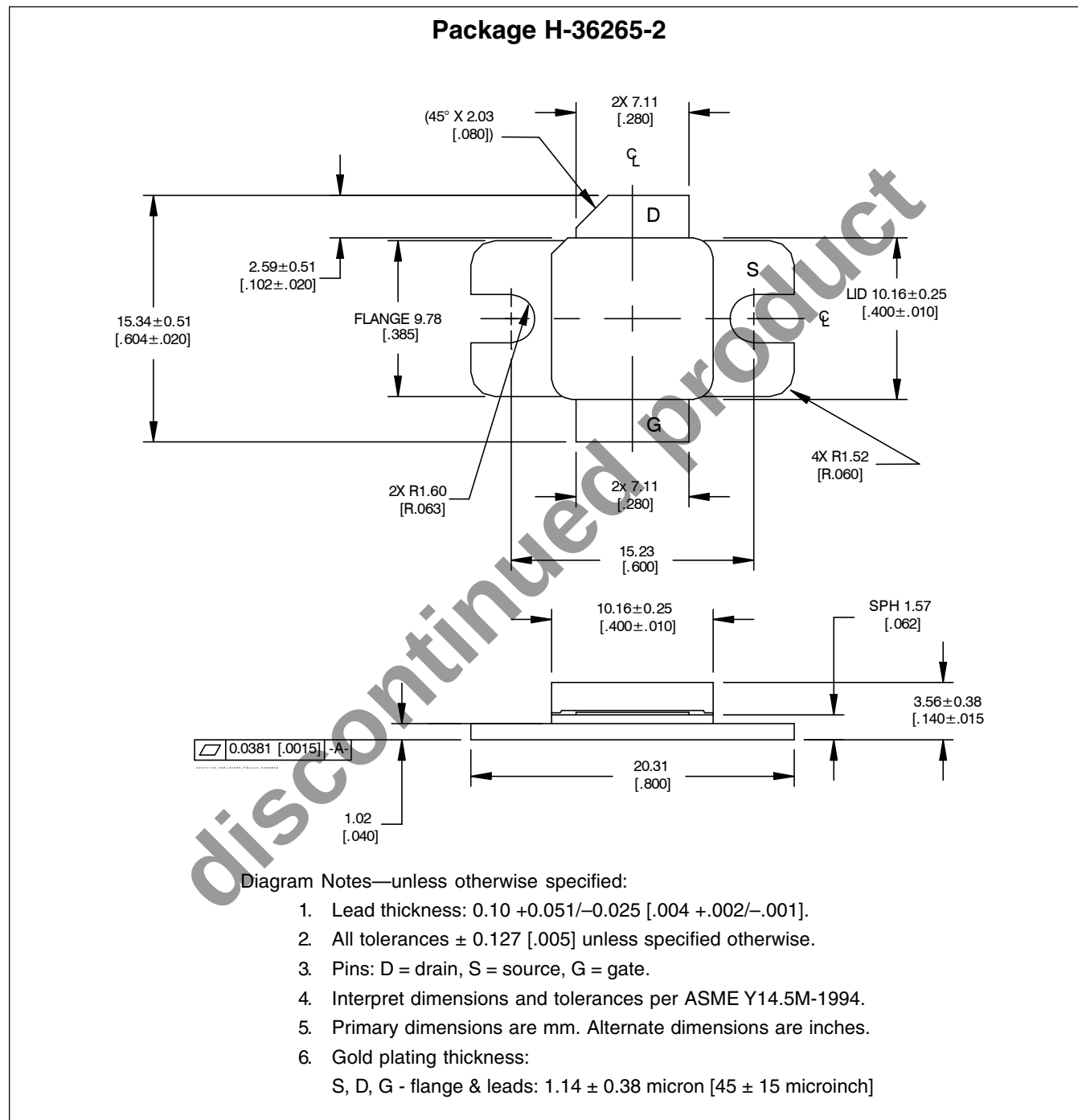


Reference circuit assembly diagram (not to scale)\*

| Component              | Description                               | Suggested Manufacturer | P/N or Comment    |
|------------------------|-------------------------------------------|------------------------|-------------------|
| C1, C2, C3             | Capacitor, 0.001 $\mu$ F                  | Digi-Key               | PCC1772CT-ND      |
| C4                     | Tantalum capacitor, 10 $\mu$ F, 35 V      | Digi-Key               | 399-1655-2-ND     |
| C5, C16, C21           | Capacitor, 0.1 $\mu$ F                    | Digi-Key               | PCC104BCT-ND      |
| C6, C14, C19           | Ceramic capacitor, 1 $\mu$ F              | Digi-Key               | 445-1411-2-ND     |
| C7                     | Capacitor, 0.01 $\mu$ F                   | ATC                    | 200B 103          |
| C8, C10, C12, C17, C25 | Ceramic capacitor, 10 pF                  | ATC                    | 100B 100          |
| C9, C24                | Ceramic capacitor, 0.8 pF                 | ATC                    | 100B 0R8          |
| C11                    | Ceramic capacitor, 1.3 pF                 | ATC                    | 100B 1R3          |
| C13, C18               | Capacitor, 0.02 $\mu$ F                   | ATC                    | 200B 203          |
| C15, C20               | Electrolytic capacitor, 100 $\mu$ F, 50 V | Digi-Key               | PCE3718CT-ND      |
| C22, C23               | Ceramic capacitor, 0.5pF                  | ATC                    | 100B 0R5          |
| L1, L2                 | Ferrite, 8.9 mm                           | Elna Magnetics         | BDS 4.6/3/8.9-4S2 |
| Q1                     | Transistor                                | Infineon Technologies  | BCP56             |
| QQ1                    | Voltage regulator                         | National Semiconductor | LM7805            |
| R1                     | Chip resistor 1.2K ohms                   | Digi-Key               | P1.2KGCT-ND       |
| R2                     | Chip resistor 1.3K ohms                   | Digi-Key               | P1.3KGCT-ND       |
| R3                     | Chip resistor 2K ohms                     | Digi-Key               | P2KECT-ND         |
| R4                     | Potentiometer 2K ohms                     | Digi-Key               | 3224W-202ETR-ND   |
| R5, R9                 | Chip resistor 10 ohms                     | Digi-Key               | P10ECT-ND         |
| R6, R7                 | Chip resistor 1K ohms                     | Digi-Key               | P1KECT-ND         |
| R8                     | Chip resistor 5.1K ohms                   | Digi-Key               | P5.1KECT-ND       |

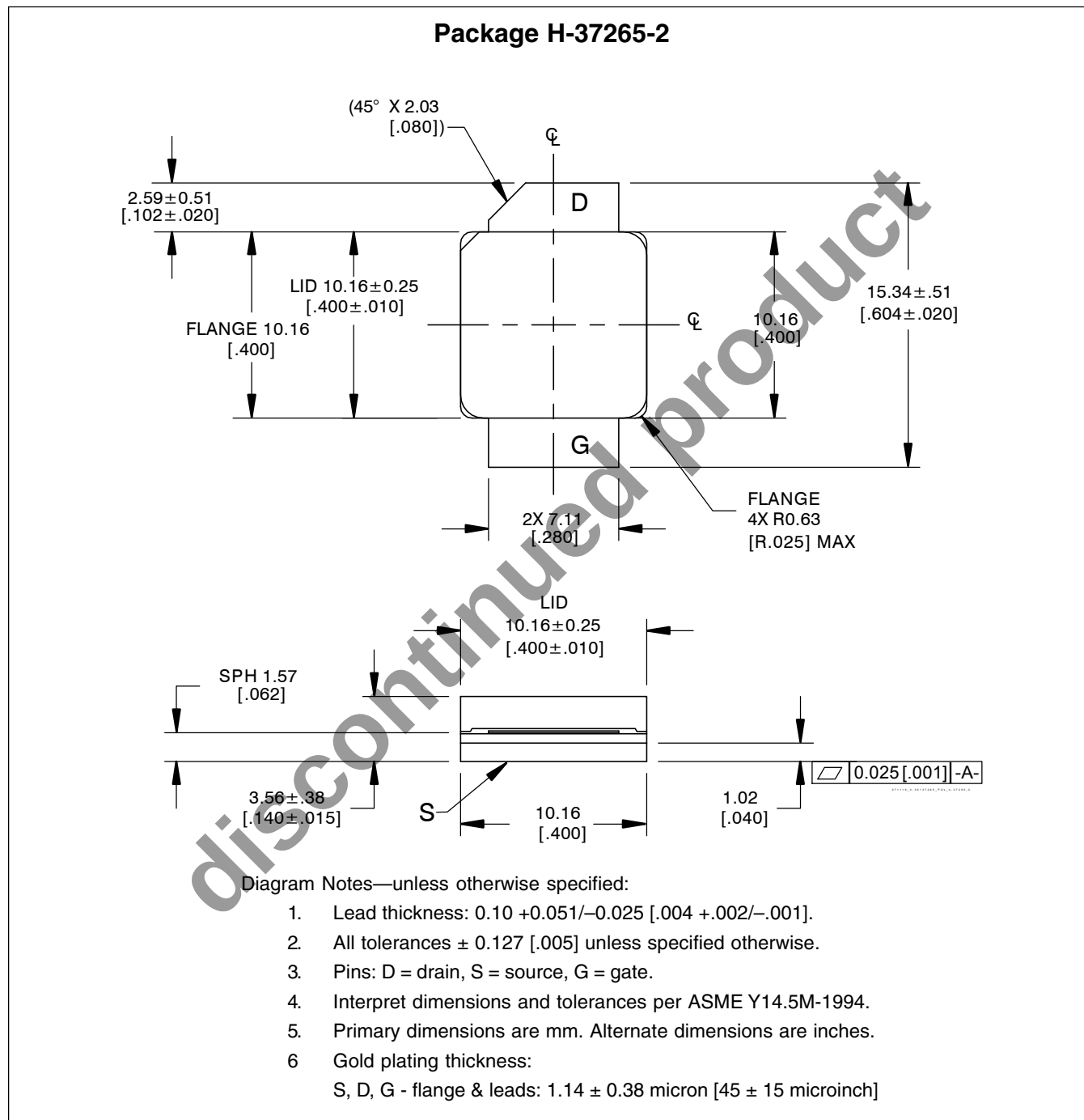
\*Gerber Files for this circuit available on request

## Package Outline Specifications



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Package Outline Specifications (cont.)



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**Revision History:** 2014-02-12

Data Sheet

Previous Version: 2009-02-18, Data Sheet

|      |                                                      |
|------|------------------------------------------------------|
| Page | Subjects (major changes since last revision)         |
| All  | Product Discontinued. Please see PD Notes: PD_012_14 |
|      |                                                      |
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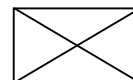
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