TELEDYNE COMPONENTS

**SD304**
**SD306**

# N-CHANNEL ENHANCEMENT-MODE DUAL GATE DMOS FET

## FEATURES

- **Normally Off-Enhancement-Mode Operation**
- **Dual Gate with Gate Protective Diodes**
- **Low Feedback Capacitance—$C_{rss}$ .03pF (typ)**
- **Wide Dynamic Range-Remote AGC Capability**
- **High Power Gain—17dB min. @ 500MHz (SD306)**
- **Low Noise—6.0dB max. @ 500MHz (SD306)**
- **Low Cross-Modulation Distortion**

## APPLICATIONS

- **Wide Band (Unneutralized) VHF/UHF Amplifiers**
- **VHF/UHF Linear Mixers**

## ORDERING INFORMATION

| Part No. | Package | Description |
|---|---|---|
| SD304DE | TO-206AF (TO-72) Package | 25V, 130Ω |
| SD306DE | TO-206AF (TO-72) Package | 20V, 100Ω |

## ABSOLUTE MAXIMUM RATINGS

$V_{DS}$ Drain-Source Voltage
- SD304 ..... +25V
- SD306 ..... +20V

$V_{G1B}$ Gate 1-Substrate Voltage
- SD304 ..... –0.3 to +10V
- SD306 ..... –0.3 to +20V

$V_{G2B}$ Gate 2-Substrate Voltage
- SD304 ..... –0.3 to +15V
- SD306 ..... –0.3 to +20V

$I_D$ Continuous Drain Current (Note 1) ..... 50mA

$P_D$ Continuous Power Dissipation (Note 1)
- $T_A$ = +25°C (Free Air) ..... 300mW
- $T_C$ = +25°C (Infinite Heat Sink) ..... 1.2W
- Power Derating Factors (Note 1)
- Free Air ..... 3.0mW/°C
- Infinite Heat Sink ..... 12mW/°C

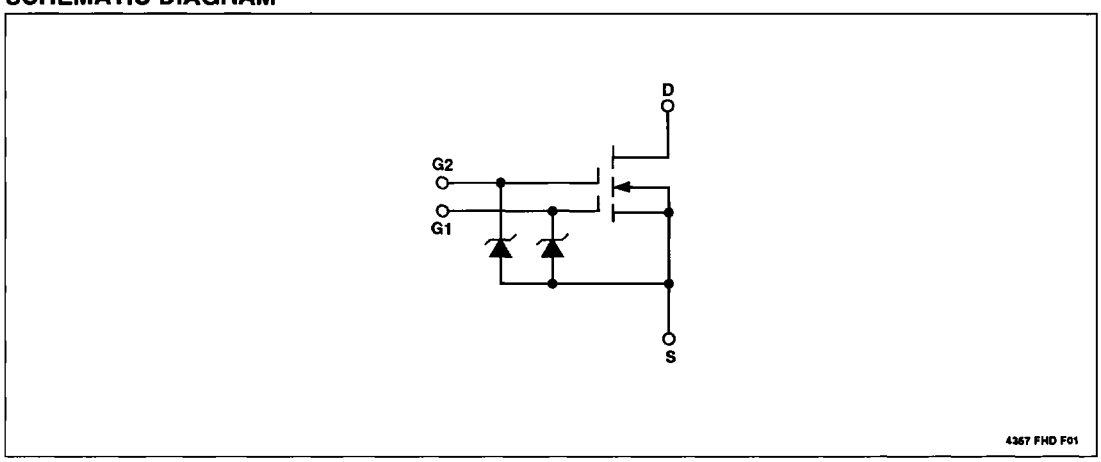
$T_{op}$ Operating Junction Temperature Range ..... –55 to +125°C

$T_{stg}$ Storage Temperature Range ..... –65 to +175°C

**NOTE:** 1. Not applicable to chips. Final value depends mounting substrate.

Static-sensitive device. Unused devices must be stored in conductive material. Protect devices from static discharge and static fields. Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operation sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

## SCHEMATIC DIAGRAM




14

# SD304
# SD306

## ELECTRICAL CHARACTERISTICS: ($T_A$ = +25°C unless otherwise noted)

| Symbol | Parameter | Test Conditions | SD304 Min | SD304 Typ | SD304 Max | SD306 Min | SD306 Typ | SD306 Max | Units |
|---|---|---|---|---|---|---|---|---|---|
| **Static** | | | | | | | | | |
| $BV_{DS}$ | Drain-Source Breakdown Voltage | $I_D$ = 5µA, $V_{G1S} = V_{G2S}$ = 0 | 25 | 30 | — | 20 | 25 | — | V |
| $I_{DSS}$ | Drain-Source OFF Leakage Current | $V_{DS}$ = 15V $V_{G1S} = V_{G2S}$ = 0 | — | .01 | 1.0 | — | .01 | 1.0 | µA |
| $I_{G1SS}$ | Gate 1 Leakage Current | $V_{G1S}$ = 5V $V_{G2S} = V_{DS}$ = 0 | — | 1.0 | 100 | — | 1.0 | 100 | nA |
| $I_{G2SS}$ | Gate 2 Leakage Current | $V_{G2S}$ = 10V, $V_{G1S} = V_{DS}$ = 0 | — | 1.0 | 100 | — | 1.0 | 100 | nA |
| $V_{T1}$ | Gate 1-Source Threshold Voltage | $V_{DS} = V_{G1S}$, $V_{G2S}$ = 10V, $I_D$ = 1µA | 0.1 | 1.0 | 2.0 | 0.1 | 0.5 | 1.5 | V |
| $V_{T2}$ | Gate 2-Source Threshold Voltage | $V_{G1S}$ = 4V, $V_{DS} = V_{G2S}$ $I_D$ = 1µA | 0.1 | 1.0 | 2.0 | — | — | — | V |
| | | $V_{G1S}$ = 5V, $V_{DS} = V_{G2S}$ $I_D$ = 1µA | — | — | — | 0.1 | 0.5 | 1.5 | V |
| $r_{DS(on)}$ | Drain-Source ON Resistance | $I_D$ = 1mA, $V_{G1S}$ = 5V $V_{G2S}$ = 10V | — | 90 | 130 | — | 65 | 100 | Ω |
| **Dynamic** | | | | | | | | | |
| $g_{fs}$ | Common-Source Forward Transcond. | $V_{DS}$ = 15V, $I_D$ = 18mA $V_{G2S}$ = 10V, f = 1KHz | 8.0 | 10 | — | 13 | 15 | — | mmhos |
| $c_{iss}$ | Common-Source Input Capacitance | $V_{DS}$ = 15V, $I_D$ = 18mA $V_{G2S}$ = 10V, f = 1MHz | — | 2.5 | 3.0 | — | 3.3 | 3.6 | pF |
| $c_{oss}$ | Common-Source Output Capacitance | $V_{DS}$ = 15V, $V_{G1S}$ = 0 $V_{G2S}$ = 10V, F = 1MHz | — | 1.0 | 1.2 | — | 1.0 | 1.3 | pF |
| $c_{rss}$ | Common-Source Reverse Transfer Capacitance | $V_{DS}$ = 15V, $V_{G1S}$ = 0 $V_{G2S}$ = 10V, F = 1MHz | — | .03 | — | — | .03 | — | pF |
| $Re_{(Y11)}$ | Input Admittance | $V_{DS}$ = 15V, ID = 18mA, $V_{G2S}$ = 10V, f = 200MHz | — | — | — | — | 1.11 | — | mmhos |
| $Im_{(Y11)}$ | Input Admittance | $V_{DS}$ = 15V, ID = 18mA, $V_{G2S}$ = 10V, f = 200MHz | — | — | — | — | 4.76 | — | mmhos |

# N-CHANNEL ENHANCEMENT-MODE DUAL GATE DMOS FET

**SD304**
**SD306**

## ELECTRICAL CHARACTERISTICS: ($T_A$ = +25°C unless otherwise noted)

| Symbol | Parameter | Test Conditions | SD304 Min | SD304 Typ | SD304 Max | SD306 Min | SD306 Typ | SD306 Max | Units |
|---|---|---|---|---|---|---|---|---|---|
| Re(Y22) | Output Admittance | $V_{DS}$ = 15V, $I_D$ = 18mA<br>$V_{G2S}$ = 10V, f = 200MHz | — | — | — | — | 1.05 | — | mmhos |
| IM (Y22) | Output Admittance | $V_{DS}$ = 15V, $I_D$ = 18mA<br>$V_{G2S}$ = 10V, f = 200MHz | — | — | — | — | 1.54 | — | mmhos |
| Re (Y21) | Forward Transmittance | $V_{DS}$ = 15V, $I_D$ = 18mA<br>$V_{G2S}$ = 10V, f = 200MHz | — | — | — | — | 13.23 | — | mmhos |
| Im (Y21) | Forward Transmittance | $V_{DS}$ = 15V, $I_D$ = 18mA<br>$V_{G2S}$ = 10V, f = 200MHz | — | — | — | — | –5.62 | — | mmhos |
| Re (Y12) | Reverse Transmittance | $V_{DS}$ = 15V, $I_D$ = 18mA<br>$V_{G2S}$ = 10V, f = 200MHz | — | — | — | — | 0.01 | — | mmhos |
| Im (Y12) | Reverse Transmittance | $V_{DS}$ = 15V, $I_D$ = 18mA<br>$V_{G2S}$ = 10V, f = 200MHz | — | — | — | — | –0.04 | — | mmhos |
| $G_{ps}$ | Power Gain | f = 500MHz, $I_D$ = 18mA<br>$V_{DS}$ = 15V, $V_{G2S}$ = 10V | 13 | 16 | — | — | — | — | dB |
| | | f = 200MHz, $I_D$ = 18mA<br>$V_{DS}$ = 15V, $V_{G2S}$ = 10V | — | — | — | 17 | 20 | — | |
| NF | Noise Figure | f = 500MHz, $I_D$ = 18mA<br>$V_{DS}$ = 15V, $V_{G2S}$ = 10V | — | 5.0 | 6.0 | — | — | — | dB |
| | | f = 200MHz, $I_D$ = 18ma<br>$V_{DS}$ = 15V, $V_{G2S}$ = 10V | — | — | — | — | 1.5 | 2.5 | |
| AGC($V_{G2S}$) | Range of Automatic Gain Control | $V_{G1S}$ ≅ 3.5V, f = 500MHz<br>$V_{DS}$ = 15V,<br>$V_{G2S}$ = 10V to 0V | — | 40 | — | — | — | — | dB |
| | | $V_{G1S}$ ≅ 2.5V, f = 200MHz<br>$V_{DS}$ = 15V,<br>$V_{G2S}$ = 10V to 0V | — | — | — | — | 50 | — | |
| $E_{INT}$ | Interfering Signal at Gate for 1% Cross-Modulation Distortion (Peak Voltage ref. to 50 ohm system) | fo = 500MHz, $I_D$ = 18mA<br>$V_{DS}$ = 15V, $V_{G2S}$ = 10V<br>f = 501MHz | — | 200 | — | — | — | — | mV |
| | | fo = 200MHz, $I_D$ = 18mA<br>$V_{DS}$ = 15V, $V_{G2S}$ = 10V<br>f = 196MHz | — | — | — | — | 480 | — | |
| $G_{psc}$ | Conversion Power Gain ($I_D$ = 8mA) | $V_{DS}$ = 15V, $V_{G1S}$ = $V_{G2S}$<br>f = 200MHz<br>f = 245MHz | — | — | — | 14 | 17 | — | dB |

14