

### N-Channel Lateral DMOS FETs

SD5000I    SD5400CY  
 SD5000N    SD5401CY  
 SD5001N

### Product Summary

| Part Number | $V_{(BR)DS}$ Min (V) | $V_{GS(th)}$ Max (V) | $r_{DS(on)}$ Max ( $\Omega$ ) | $C_{rss}$ Max (pF) | $t_{ON}$ Max (ns) |
|-------------|----------------------|----------------------|-------------------------------|--------------------|-------------------|
| SD5000I     | 20                   | 1.5                  | 70 @ $V_{GS} = 5\text{ V}$    | 0.5                | 2                 |
| SD5000N     | 20                   | 1.5                  | 70 @ $V_{GS} = 5\text{ V}$    | 0.5                | 2                 |
| SD5001N     | 10                   | 1.5                  | 70 @ $V_{GS} = 5\text{ V}$    | 0.5                | 2                 |
| SD5400CY    | 20                   | 1.5                  | 75 @ $V_{GS} = 5\text{ V}$    | 0.5                | 2                 |
| SD5401CY    | 10                   | 1.5                  | 75 @ $V_{GS} = 5\text{ V}$    | 0.5                | 2                 |

For applications information see AN301, page 33.

### Features

- Quad SPST Switch with Zener Input Protection
- Low Interelectrode Capacitance and Leakage
- Ultra-High Speed Switching— $t_{ON}$ : 1 ns
- Ultra-Low Reverse Capacitance: 0.2 pF
- Low Guaranteed  $r_{DS}$  @ 5 V
- Low Turn-On Threshold Voltage

### Benefits

- High-Speed System Performance
- Low Insertion Loss at High Frequencies
- Low Transfer Signal Loss
- Simple Driver Requirement
- Single Supply Operation

### Applications

- Fast Analog Switch
- Fast Sample-and-Holds
- Pixel-Rate Switching
- Video Switch
- Multiplexer
- DAC Deglitchers
- High-Speed Driver

### Description

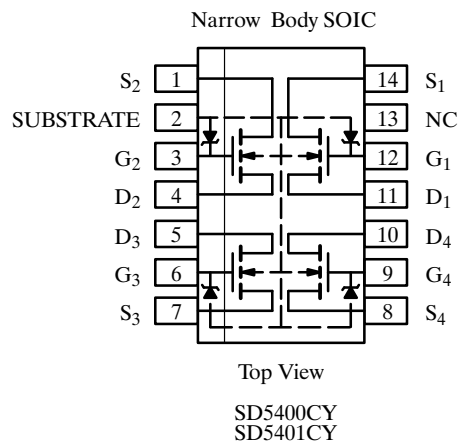
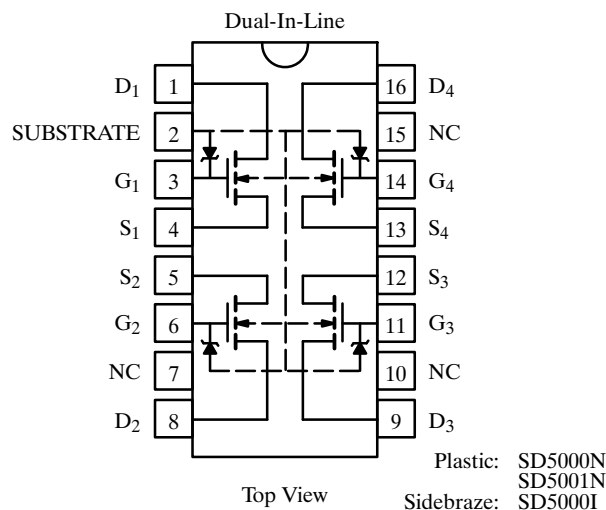
The SD5000/5400 series of monolithic switches features four individual double-diffused enhancement-mode MOSFETs built on a common substrate. These bidirectional devices provide low on-resistance and low interelectrode capacitances to minimize insertion loss and crosstalk.

low capacitance and ultra-fast switching speeds. For manufacturing reliability, these devices feature poly-silicon gates protected by Zener diodes.

The SD5000/5400 are rated to handle  $\pm 10\text{-V}$  analog signals, while the SD5001/5401 are rated for  $\pm 5\text{-V}$  signals.

Built on Siliconix' proprietary DMOS process, the SD5000/5400 series utilizes lateral construction to achieve

For similar products packaged in TO-206AF (TO-72) and TO-253 (SOT-143) see the SD211DE/SST211 series.



## SD5000/5400 Series

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### Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ Unless Otherwise Noted)

|  |              |
|--|--------------|
| Gate-Drain, Gate-Source Voltage (SD5000, SD5400) | +30 V/–25 V  |
| (SD5001, SD5401)                                 | +25 V/–15 V  |
| Gate-Substrate Voltage (SD5000, SD5400)          | +30 V/–0.3 V |
| (SD5001, SD5401)                                 | +25 V/–0.3 V |
| Drain-Source Voltage (SD5000, SD5400)            | 20 V         |
| (SD5001, SD5401)                                 | 10 V         |
| Drain-Source-Substrate Voltage (SD5000, SD5400)  | 25 V         |
| (SD5001, SD5401)                                 | 15 V         |

|   |              |
|---|--------------|
| Drain Current   | 50 mA        |
| Lead Temperature ( $1/16''$ from case for 10 seconds) | 300°C        |
| Storage Temperature                                   | –65 to 150°C |
| Operating Junction Temperature                        | –55 to 150°C |
| Power Dissipation <sup>a, b</sup> : (Package)         | 500 mW       |
| (Each Device)   | 300 mW       |

Notes:

- a. SD5000/SD5001 derate 5 mW/°C above 25°C
- b. SD5400/SD5401 derate 4 mW/°C above 25°C

### Specifications<sup>a</sup>

| Parameter                          | Symbol <sup>b</sup> | Test Conditions <sup>b</sup>  | Typ <sup>c</sup>                       | Limits           |     |                  |     | Unit |          |
|------------------------------------|---------------------|---|--|------------------|-----|------------------|-----|------|----------|
|                                    |                     |   |  | SD5000<br>SD5400 |     | SD5001<br>SD5401 |     |      |          |
|                                    |                     |   |  | Min              | Max | Min              | Max |      |          |
| <b>Static</b>                      |                     |   |  |                  |     |                  |     |      |          |
| Drain-Source Breakdown Voltage     | $V_{(BR)DS}$        | $V_{GS} = V_{BS} = -5\text{ V}, I_D = 10\text{ nA}$   | 30                                     | 20               |     | 10               |     | V    |          |
| Source-Drain Breakdown Voltage     | $V_{(BR)SD}$        | $V_{GD} = V_{BD} = -5\text{ V}, I_S = 10\text{ nA}$   | 22                                     | 20               |     | 10               |     |      |          |
| Drain-Substrate Breakdown Voltage  | $V_{(BR)DBO}$       | $V_{GB} = 0\text{ V}, I_D = 10\text{ nA}, \text{Source Open}$                                 | 35                                     | 25               |     | 15               |     |      |          |
| Source-Substrate Breakdown Voltage | $V_{(BR)SBO}$       | $V_{GB} = 0\text{ V}, I_S = 10\text{ }\mu\text{A}, \text{Drain Open}$                         | 35                                     | 25               |     | 15               |     |      |          |
| Drain-Source Leakage               | $I_{DS(off)}$       | $V_{GS} = V_{BS} = -5\text{ V}$   | $V_{DS} = 10\text{ V}$                 | 0.4              |     |                  | 10  | nA   |          |
|                                    |                     |   | $V_{DS} = 15\text{ V}$                 | 0.7              |     |                  |     |      |          |
|                                    |                     |   | $V_{DS} = 20\text{ V}$                 | 0.9              |     | 10               |     |      |          |
| Source-Drain Leakage               | $I_{SD(off)}$       | $V_{GD} = V_{BD} = -5\text{ V}$   | $V_{SD} = 10\text{ V}$                 | 0.5              |     |                  | 10  |      |          |
|                                    |                     |   | $V_{SD} = 15\text{ V}$                 | 0.8              |     |                  |     |      |          |
|                                    |                     |   | $V_{SD} = 20\text{ V}$                 | 1                |     | 10               |     |      |          |
| Gate Leakage                       | $I_{GBS}$           | $V_{DB} = V_{SB} = 0\text{ V}, V_{GB} = 30\text{ V}$  | 0.01                                   |                  | 100 |                  | 100 |      |          |
| Threshold Voltage                  | $V_{GS(th)}$        | $V_{DS} = V_{GS}, I_D = 1\text{ }\mu\text{A}, V_{SB} = 0\text{ V}$                            | 0.8                                    | 0.1              | 1.5 | 0.1              | 1.5 | V    |          |
| Drain-Source On-Resistance         | $r_{DS(on)}$        | $V_{SB} = 0\text{ V}$<br>$I_D = 1\text{ mA}$  | SD5000 Series<br>$V_{GS} = 5\text{ V}$ | 58               |     | 70               |     | 70   | $\Omega$ |
|                                    |                     |   | SD5400 Series<br>$V_{GS} = 5\text{ V}$ | 60               |     | 75               |     | 75   |          |
|                                    |                     |   | $V_{GS} = 10\text{ V}$                 | 38               |     |                  |     |      |          |
|                                    |                     |   | $V_{GS} = 15\text{ V}$                 | 30               |     |                  |     |      |          |
|                                    |                     |   | $V_{GS} = 20\text{ V}$                 | 26               |     |                  |     |      |          |
| Resistance Match                   | $\Delta r_{DS(on)}$ | $V_{GS} = 5\text{ V}$   | 1                                      |                  | 5   |                  | 5   |      |          |
| <b>Dynamic</b>                     |                     |   |  |                  |     |                  |     |      |          |
| Forward Transconductance           | $g_{fs}$            | $V_{DS} = 10\text{ V}$<br>$V_{SB} = 0\text{ V}$<br>$I_D = 20\text{ mA}$<br>$f = 1\text{ kHz}$ | SD5000 Series                          | 12               | 10  |                  | 10  |      | mS       |
|                                    |                     |   | SD5400 Series                          | 11               | 9   |                  | 9   |      |          |
| Gate Node Capacitance              | $C_{(GS+GD+GB)}$    | $V_{DS} = 10\text{ V}$<br>$f = 1\text{ MHz}$<br>$V_{GS} = V_{BS} = -15\text{ V}$              | SD5000 Series                          | 2.5              |     | 3.5              |     | 3.5  | pF       |
| Drain Node Capacitance             | $C_{(GD+DB)}$       |   |  | 1.1              |     | 2                |     | 2    |          |
| Source Node Capacitance            | $C_{(GS+SB)}$       |   |  | 3.7              |     | 5                |     | 5    |          |
| Reverse Transfer Capacitance       | $C_{rss}$           |   |  | 0.2              |     | 0.5              |     | 0.5  |          |
| Crosstalk                          |                     | $f = 3\text{ kHz}$  |  | –107             |     |                  |     |      | dB       |

## Specifications<sup>a</sup>

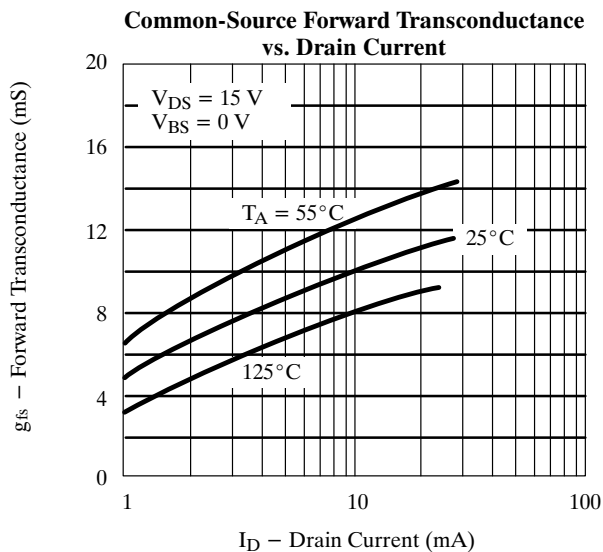
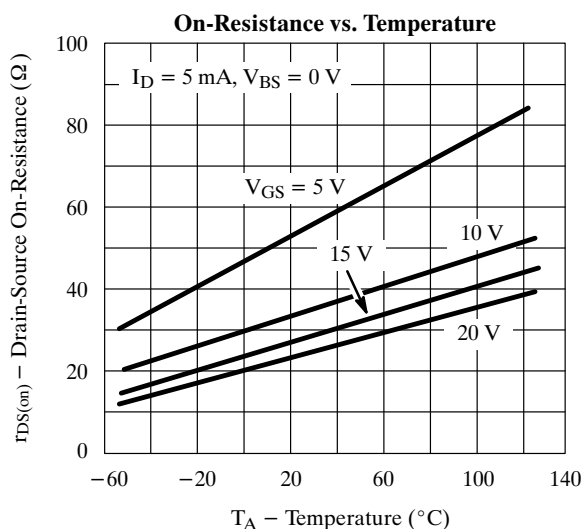
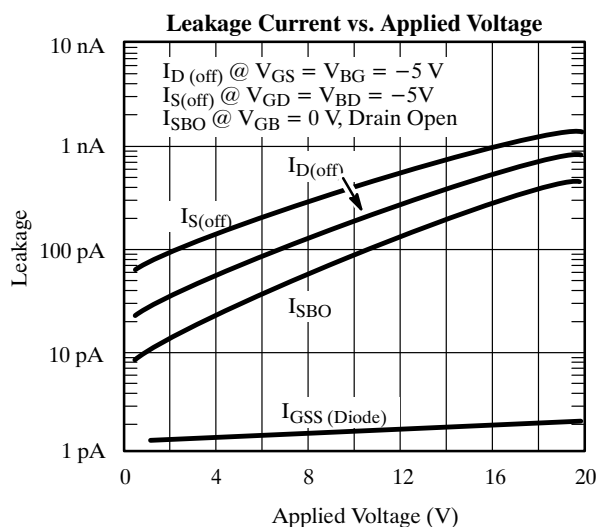
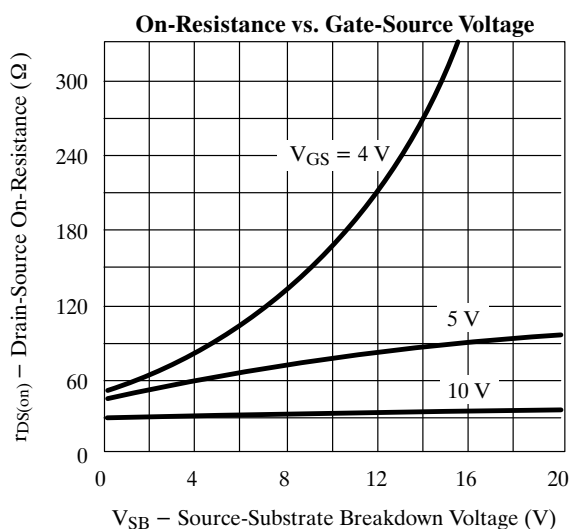
| Parameter        | Symbol <sup>b</sup> | Test Conditions <sup>b</sup>   | Typ <sup>c</sup> | Limits           |     |                  |     | Unit |
|------------------|---------------------|--|------------------|------------------|-----|------------------|-----|------|
|                  |                     |  |                  | SD5000<br>SD5400 |     | SD5001<br>SD5401 |     |      |
|                  |                     |  |                  | Min              | Max | Min              | Max |      |
| <b>Switching</b> |                     |  |                  |                  |     |                  |     |      |
| Turn-On Time     | $t_{d(on)}$         | $V_{SB} = 5\text{ V}, V_{IN} 0\text{ to }5\text{ V}, R_G = 25\ \Omega$<br>$V_{DD} = 5\text{ V}, R_L = 680\ \Omega$ | 0.5              |                  | 1   |                  | 1   | ns   |
|                  | $t_r$               |  | 0.6              |                  | 1   |                  | 1   |      |
| Turn-Off Time    | $t_{d(off)}$        |  | 2                |                  |     |                  |     |      |
|                  | $t_f$               |  | 6                |                  |     |                  |     |      |

Notes:

- a.  $T_A = 25^\circ\text{C}$  unless otherwise noted.
- b. B is the body (substrate) and  $V_{(BR)}$  is breakdown.
- c. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

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## Typical Characteristics

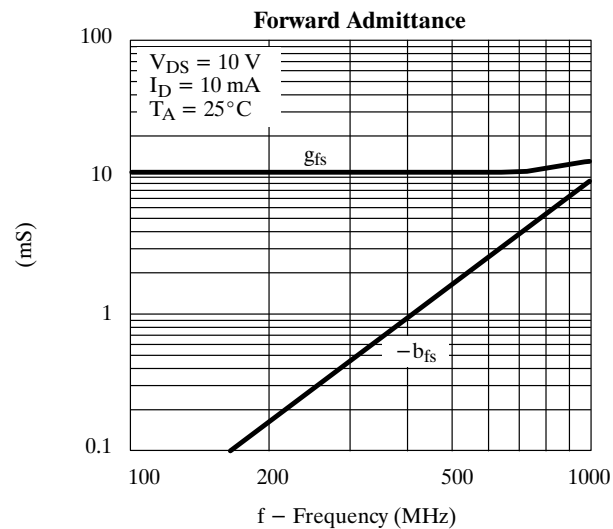
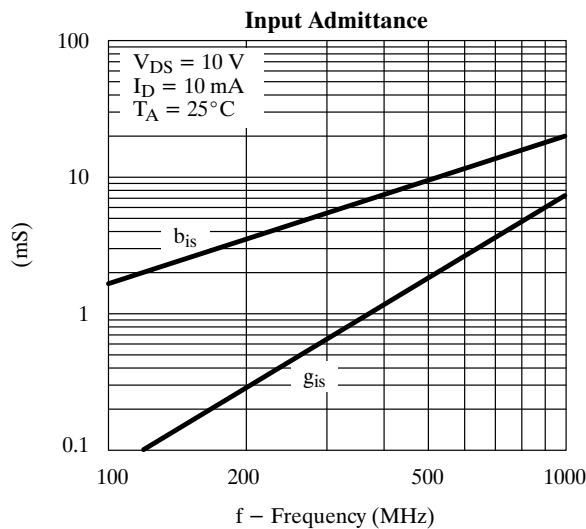
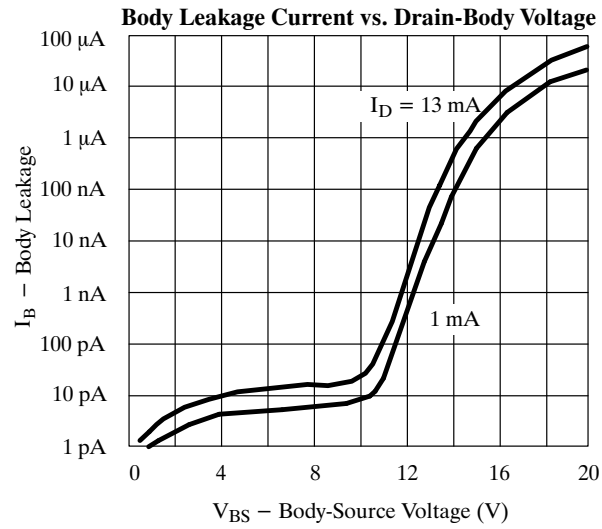
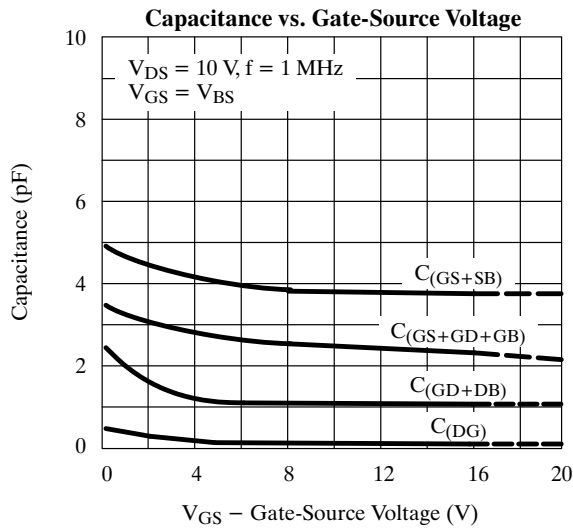
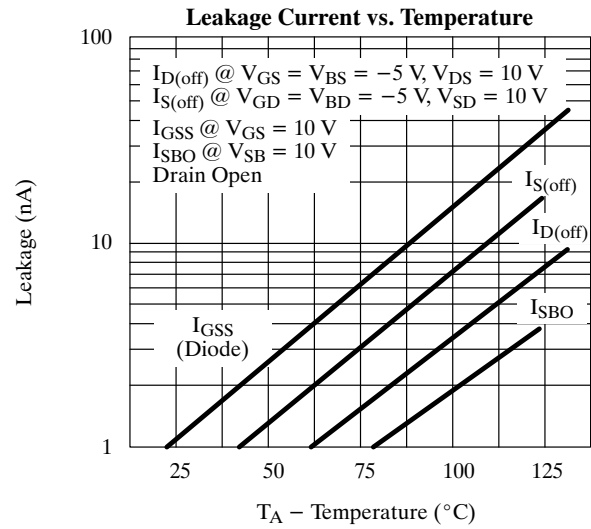
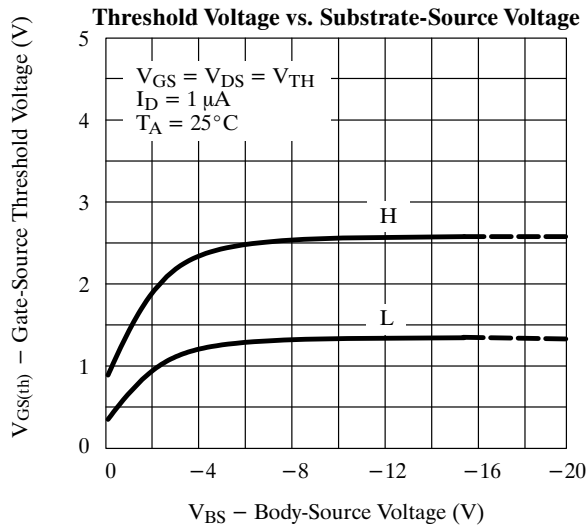


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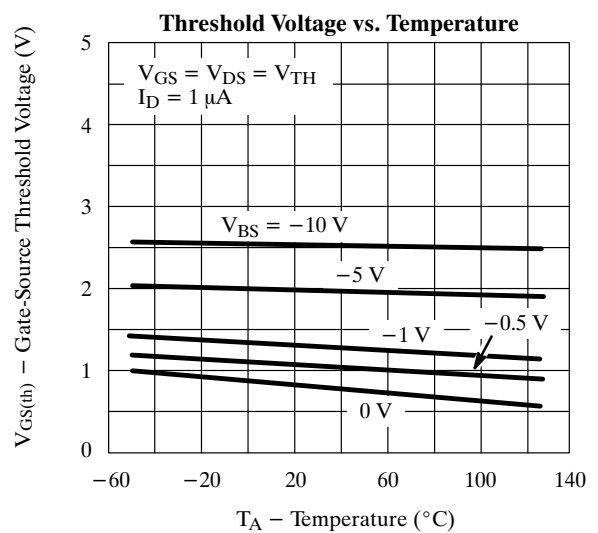
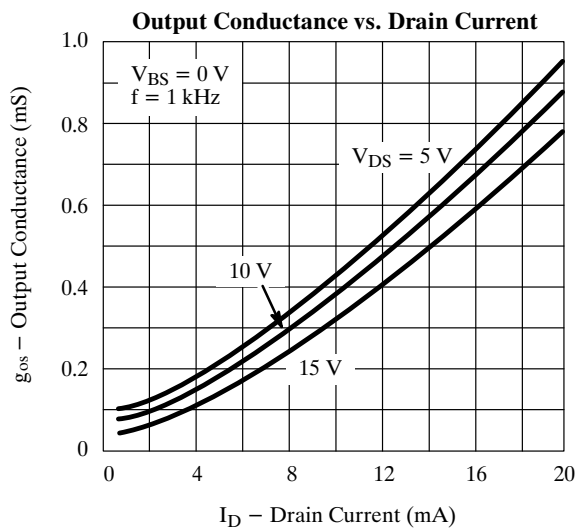
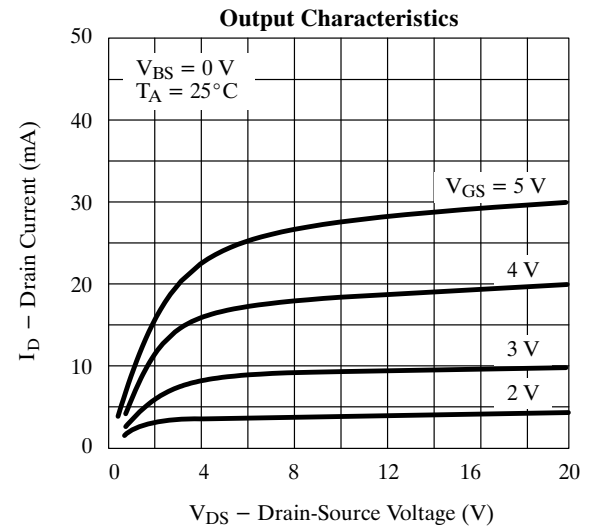
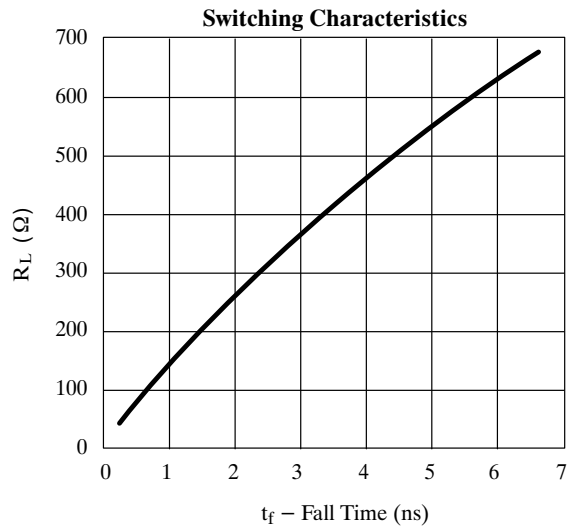
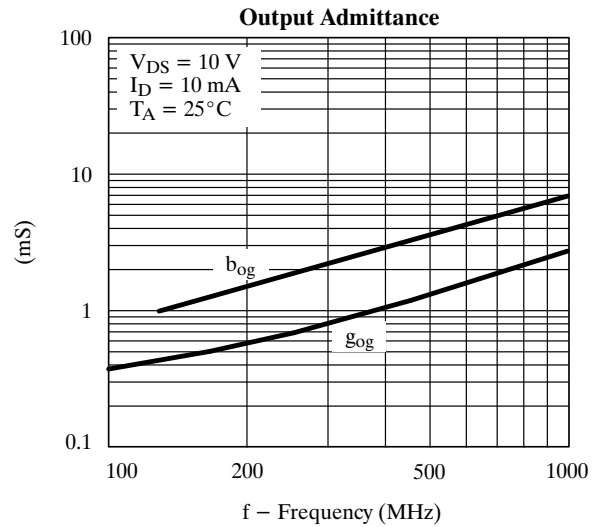
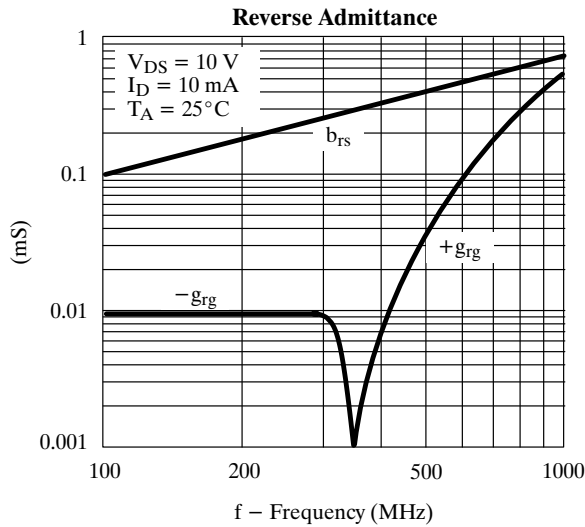
# TEMIC

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## Typical Characteristics (Cont'd)



## Typical Characteristics (Cont'd)



## SD5000/5400 Series

### Switching Time Test Circuit

