



ON Semiconductor®

## FDC6327C

### Dual N & P-Channel 2.5V Specified PowerTrench™ MOSFET

#### General Description

These N & P-Channel 2.5V specified MOSFETs are produced using ON Semiconductor's advanced PowerTrench process that has been especially tailored to minimize on-state resistance and yet maintain low gate charge for superior switching performance.

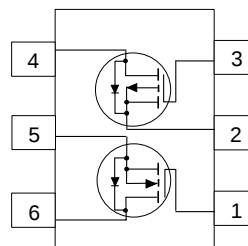
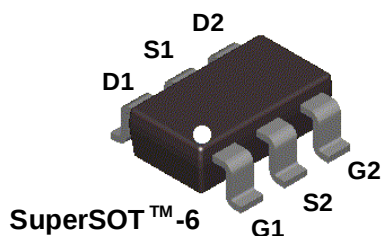
These devices have been designed to offer exceptional power dissipation in a very small footprint for applications where the bigger more expensive SO-8 and TSSOP-8 packages are impractical.

#### Applications

- DC/DC converter
- Load switch
- Motor driving

#### Features

- N-Channel 2.7A, 20V:  $R_{DS(on)} = 0.08\Omega @ V_{GS} = 4.5V$   
 $R_{DS(on)} = 0.12\Omega @ V_{GS} = 2.5V$
- P-Channel -1.6A, -20V:  $R_{DS(on)} = 0.17\Omega @ V_{GS} = -4.5V$   
 $R_{DS(on)} = 0.25\Omega @ V_{GS} = -2.5V$
- Fast switching speed.
- Low gate charge.
- High performance trench technology for extremely low  $R_{DS(on)}$ .
- SuperSOT™-6 package: small footprint (72% smaller than SO-8); low profile (1mm thick).



#### Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

| Symbol           | Parameter                              | N-Channel | P-Channel | Units |
|------------------|----------------------------------------|-----------|-----------|-------|
| V <sub>DSS</sub> | Drain-Source Voltage                   | 20        | -20       | V     |
| V <sub>GSS</sub> | Gate-Source Voltage                    | ±8        | ±8        | V     |
| I <sub>D</sub>   | Drain Current   - Continuous (Note 1a) | 2.7       | -1.9      | A     |
|                  |                                        |           |           |       |

#### Thermal Characteristics

|                 |                                                   |     |                    |
|-----------------|---------------------------------------------------|-----|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 1a) | 130 | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case (Note 1)     | 60  | $^\circ\text{C/W}$ |

#### Package Marking and Ordering Information

| Device Marking | Device   | Reel Size | Tape Width | Quantity |
|----------------|----------|-----------|------------|----------|
| .327           | FDC6327C | 7"        | 8mm        | 3000     |

**Electrical Characteristics** $T_A = 25^\circ\text{C}$  unless otherwise noted

| Symbol | Parameter | Test Conditions | Type | Min | Typ | Max | Units |
|--------|-----------|-----------------|------|-----|-----|-----|-------|
|--------|-----------|-----------------|------|-----|-----|-----|-------|

**Off Characteristics**

|                              |                                           |                                                                                                                                         |              |           |           |         |                      |
|------------------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------|-----------|---------|----------------------|
| $BV_{DSS}$                   | Drain-Source Breakdown Voltage            | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$<br>$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$                             | N-Ch<br>P-Ch | 20<br>-20 |           |         | V                    |
| $\Delta BV_{DSS}/\Delta T_J$ | Breakdown Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$<br>$I_D = -250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$ | N-Ch<br>P-Ch |           | 12<br>-19 |         | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                    | Zero Gate Voltage Drain Current           | $V_{DS} = 16\text{ V}, V_{GS} = 0\text{ V}$<br>$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$                                             | N-Ch<br>P-Ch |           |           | 1<br>-1 | $\mu\text{A}$        |
| $I_{GSSF}$                   | Gate-Body Leakage, Forward                | $V_{GS} = 8\text{ V}, V_{DS} = 0\text{ V}$                                                                                              | All          |           |           | 100     | nA                   |
| $I_{GSSR}$                   | Gate-Body Leakage, Reverse                | $V_{GS} = -8\text{ V}, V_{DS} = 0\text{ V}$                                                                                             | All          |           |           | -100    | nA                   |

**On Characteristics** (Note 2)

|                                |                                                |                                                                                                                                                                                                                                                                                                                                                |                                              |             |                                                    |                                              |                      |
|--------------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------|----------------------------------------------------|----------------------------------------------|----------------------|
| $V_{GS(th)}$                   | Gate Threshold Voltage                         | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$<br>$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$                                                                                                                                                                                                                                            | N-Ch<br>P-Ch                                 | 0.4<br>-0.4 | 0.9<br>-0.9                                        | 1.5<br>-1.5                                  | V                    |
| $\Delta V_{GS(th)}/\Delta T_J$ | Gate Threshold Voltage Temperature Coefficient | $I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$<br>$I_D = -250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$                                                                                                                                                                                                        | N-Ch<br>P-Ch                                 |             | -2.1<br>2.3                                        |                                              | mV/ $^\circ\text{C}$ |
| $R_{DS(on)}$                   | Static Drain-Source On-Resistance              | $V_{GS} = 4.5\text{ V}, I_D = 2.7\text{ A}$<br>$V_{GS} = 4.5\text{ V}, I_D = 2.7\text{ A}, T_J = 125^\circ\text{C}$<br>$V_{GS} = 2.5\text{ V}, I_D = 2.2\text{ A}$<br>$V_{GS} = -4.5\text{ V}, I_D = -1.6\text{ A}$<br>$V_{GS} = -4.5\text{ V}, I_D = -1.6\text{ A}, T_J = 125^\circ\text{C}$<br>$V_{GS} = -2.5\text{ V}, I_D = -1.3\text{ A}$ | N-Ch<br>N-Ch<br>N-Ch<br>P-Ch<br>P-Ch<br>P-Ch |             | 0.069<br>0.094<br>0.093<br>0.141<br>0.203<br>0.205 | 0.08<br>0.13<br>0.12<br>0.17<br>0.27<br>0.25 | $\Omega$             |
| $I_{D(on)}$                    | On-State Drain Current                         | $V_{GS} = 4.5\text{ V}, V_{DS} = 5\text{ V}$<br>$V_{GS} = -4.5\text{ V}, V_{DS} = -5\text{ V}$                                                                                                                                                                                                                                                 | N-Ch<br>P-Ch                                 | 8<br>-8     |                                                    |                                              | A                    |
| $g_{FS}$                       | Forward Transconductance                       | $V_{DS} = 5\text{ V}, I_D = 2.7\text{ A}$<br>$V_{DS} = -5\text{ V}, I_D = -1.9\text{ A}$                                                                                                                                                                                                                                                       | N-Ch<br>P-Ch                                 |             | 7.7<br>4.5                                         |                                              | S                    |

**Dynamic Characteristics**

|           |                              |                                                                              |              |  |            |  |    |
|-----------|------------------------------|------------------------------------------------------------------------------|--------------|--|------------|--|----|
| $C_{iss}$ | Input Capacitance            | N-Channel<br>$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$ | N-Ch<br>P-Ch |  | 325<br>315 |  | pF |
| $C_{oss}$ | Output Capacitance           | P-Channel<br>$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$ | N-Ch<br>P-Ch |  | 75<br>65   |  | pF |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                                              | N-Ch<br>P-Ch |  | 35<br>24   |  | pF |

**Electrical Characteristics (continued)**  $T_A = 25^\circ\text{C}$  unless otherwise noted

| Symbol | Parameter | Test Conditions | Type | Min | Typ | Max | Units |
|--------|-----------|-----------------|------|-----|-----|-----|-------|
|--------|-----------|-----------------|------|-----|-----|-----|-------|

**Switching Characteristics** (Note 2)

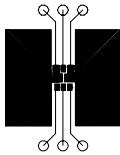
|              |                     |                                                                                                                  |              |  |              |            |    |
|--------------|---------------------|------------------------------------------------------------------------------------------------------------------|--------------|--|--------------|------------|----|
| $t_{d(on)}$  | Turn-On Delay Time  | N-Channel<br>$V_{DD} = 10\text{ V}$ , $I_D = 1\text{ A}$ ,<br>$V_{GS} = 4.5\text{ V}$ , $R_{GEN} = 6\ \Omega$    | N-Ch<br>P-Ch |  | 5<br>7       | 15<br>14   | ns |
| $t_r$        | Turn-On Rise Time   |                                                                                                                  | N-Ch<br>P-Ch |  | 9<br>14      | 18<br>25   | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | P-Channel<br>$V_{DD} = -10\text{ V}$ , $I_D = -1\text{ A}$ ,<br>$V_{GS} = -4.5\text{ V}$ , $R_{GEN} = 6\ \Omega$ | N-Ch<br>P-Ch |  | 12<br>14     | 22<br>25   | ns |
| $t_f$        | Turn-Off Fall Time  |                                                                                                                  | N-Ch<br>P-Ch |  | 3<br>3       | 9<br>9     | ns |
| $Q_g$        | Total Gate Charge   | N-Channel<br>$V_{DS} = 10\text{ V}$ , $I_D = 2.7\text{ A}$ , $V_{GS} = 4.5\text{ V}$                             | N-Ch<br>P-Ch |  | 3.25<br>2.85 | 4.5<br>4.0 | nC |
| $Q_{gs}$     | Gate-Source Charge  | P-Channel                                                                                                        | N-Ch<br>P-Ch |  | 0.65<br>0.68 |            | nC |
| $Q_{gd}$     | Gate-Drain Charge   | $V_{DS} = -10\text{ V}$ , $I_D = -1.9\text{ A}$ , $V_{GS} = -4.5\text{ V}$                                       | N-Ch<br>P-Ch |  | 0.90<br>0.65 |            | nC |

**Drain-Source Diode Characteristics and Maximum Ratings**

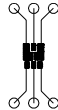
|          |                                                       |                                                                                                                 |              |  |               |             |   |
|----------|-------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------|--|---------------|-------------|---|
| $I_S$    | Maximum Continuous Drain-Source Diode Forward Current |                                                                                                                 | N-Ch<br>P-Ch |  |               | 0.8<br>-0.8 | A |
| $V_{SD}$ | Drain-Source Diode Forward Voltage                    | $V_{GS} = 0\text{ V}$ , $I_S = 0.8\text{ A}$ (Note 2)<br>$V_{GS} = 0\text{ V}$ , $I_S = -0.8\text{ A}$ (Note 2) | N-Ch<br>P-Ch |  | 0.76<br>-0.79 | 1.2<br>-1.2 | V |

**Notes:**

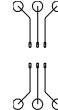
- 1:  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta JA}$  is determined by the user's board design. Both devices are assumed to be operating and sharing the dissipated heat energy equally.



a)  $130^\circ\text{C/W}$  when mounted on a  $0.125\text{ in}^2$  pad of 2 oz. copper.



b)  $140^\circ\text{C/W}$  when mounted on a  $0.005\text{ in}^2$  pad of 2 oz. copper.



c)  $180^\circ\text{C/W}$  when mounted on a  $0.0015\text{ in}^2$  pad of 2 oz. copper.

Scale 1 : 1 on letter size paper

2: Pulse Test: Pulse Width  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

## Typical Characteristics: N-Channel

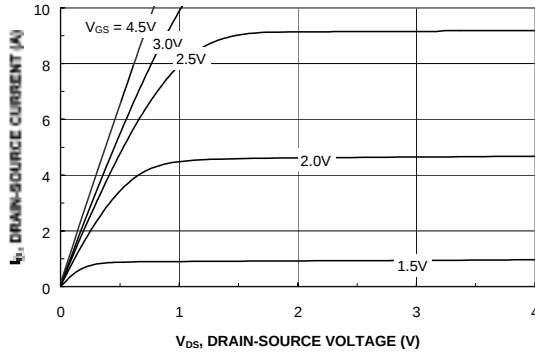


Figure 1. On-Region Characteristics.

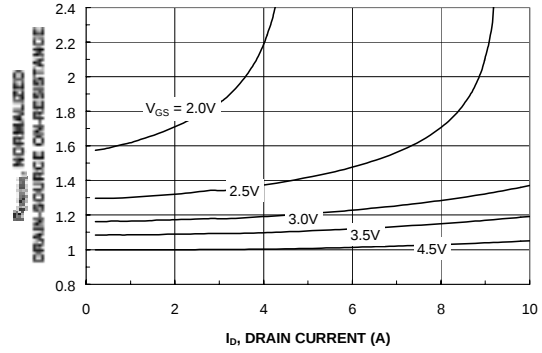


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

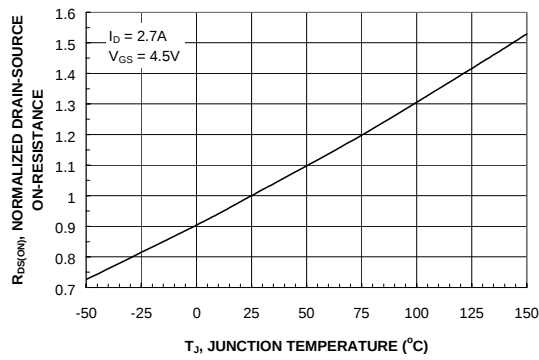


Figure 3. On-Resistance Variation with Temperature.

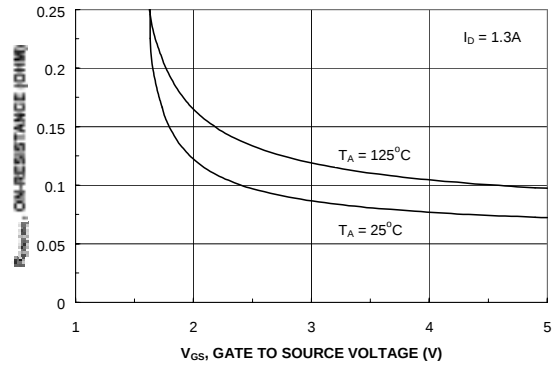


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

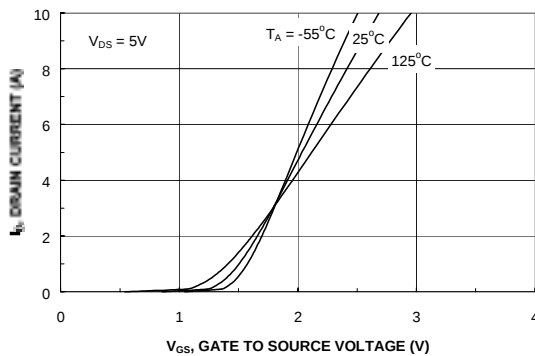


Figure 5. Transfer Characteristics.

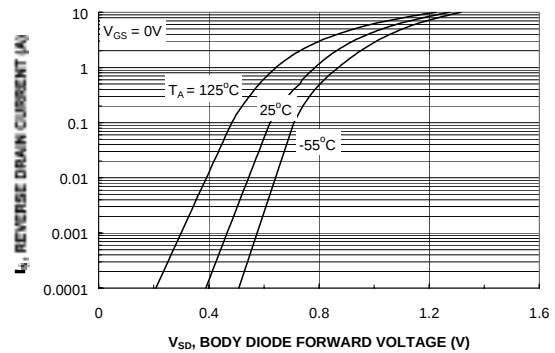


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

# Typical Characteristics: N-Channel (continued)

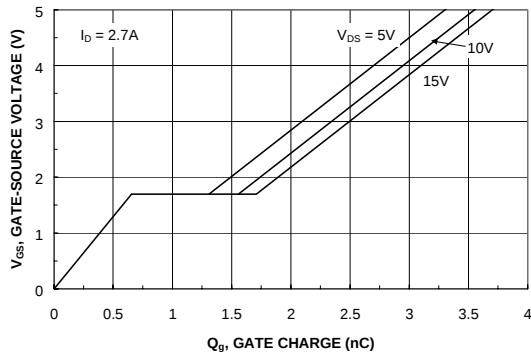


Figure 7. Gate-Charge Characteristics.

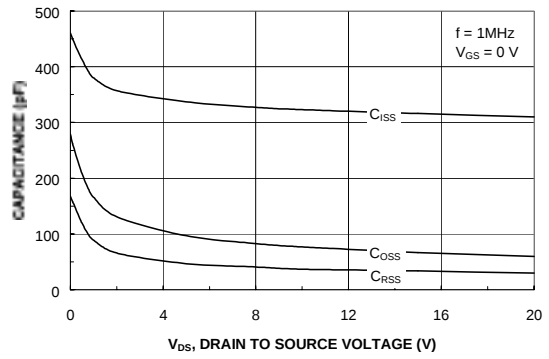


Figure 8. Capacitance Characteristics.

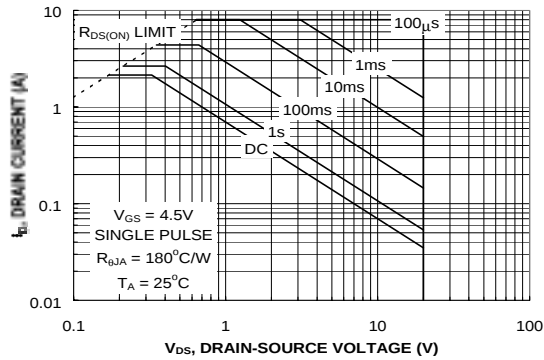


Figure 9. Maximum Safe Operating Area.

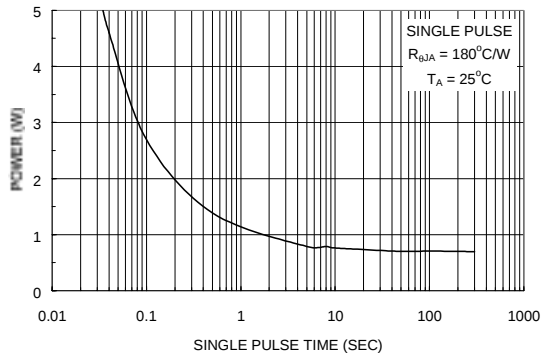


Figure 10. Single Pulse Maximum Power Dissipation.

## Typical Characteristics: P-Channel

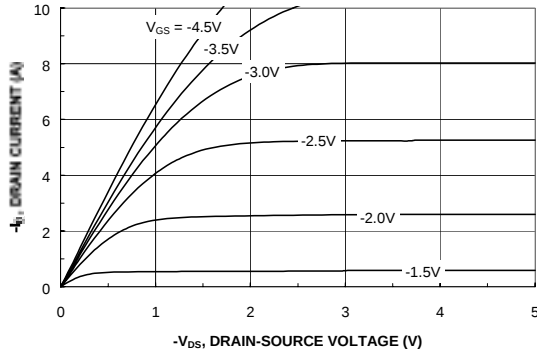


Figure 11. On-Region Characteristics.

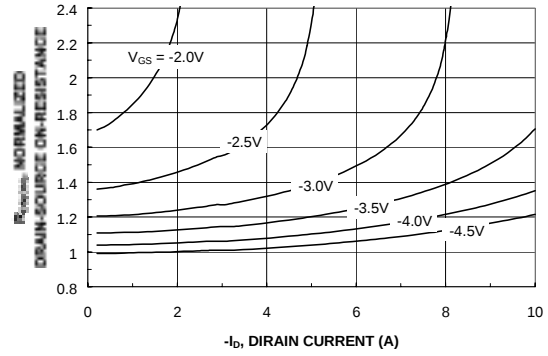


Figure 12. On-Resistance Variation with Drain Current and Gate Voltage.

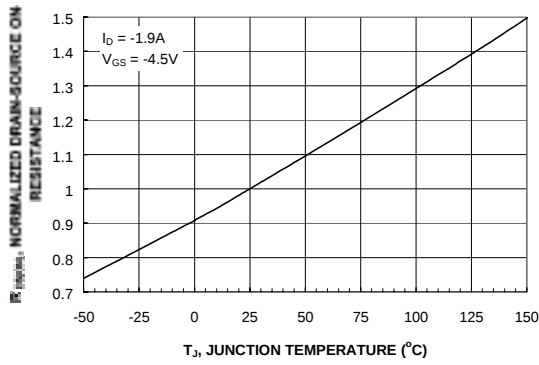


Figure 13. On-Resistance Variation with Temperature.

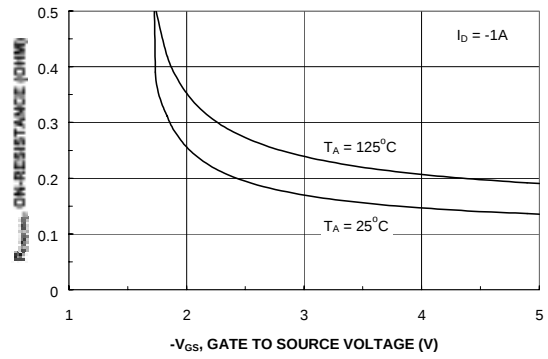


Figure 14. On-Resistance Variation with Gate-to-Source Voltage.

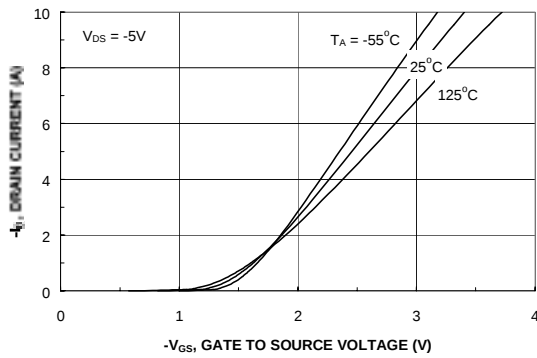


Figure 15. Transfer Characteristics.

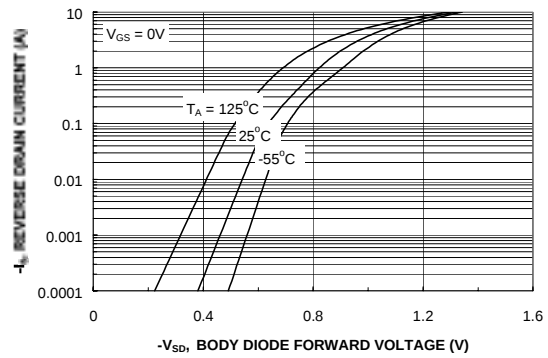


Figure 16. Body Diode Forward Voltage Variation with Source Current and Temperature.

# Typical Characteristics: P-Channel (continued)

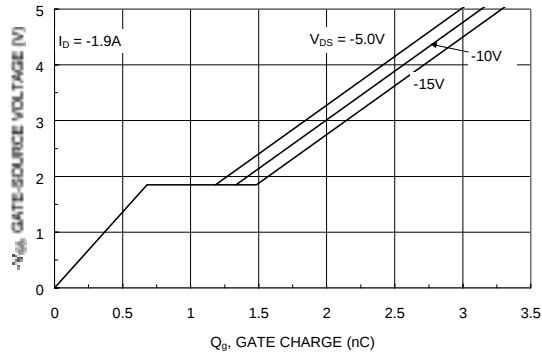


Figure 17. Gate-Charge Characteristics.

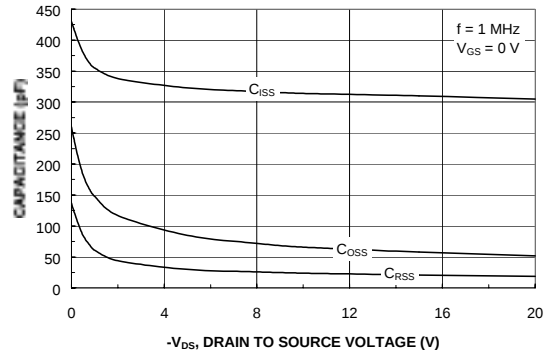


Figure 18. Capacitance Characteristics.

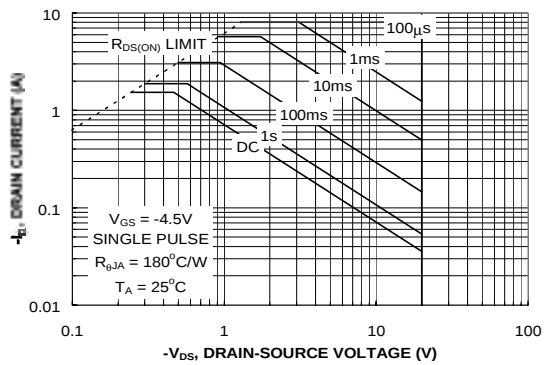


Figure 19. Maximum Safe Operating Area.

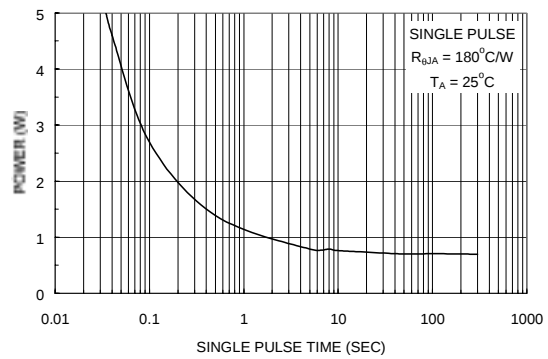


Figure 20. Single Pulse Maximum Power Dissipation.

# Typical Characteristics: N & P-Channel (continued)

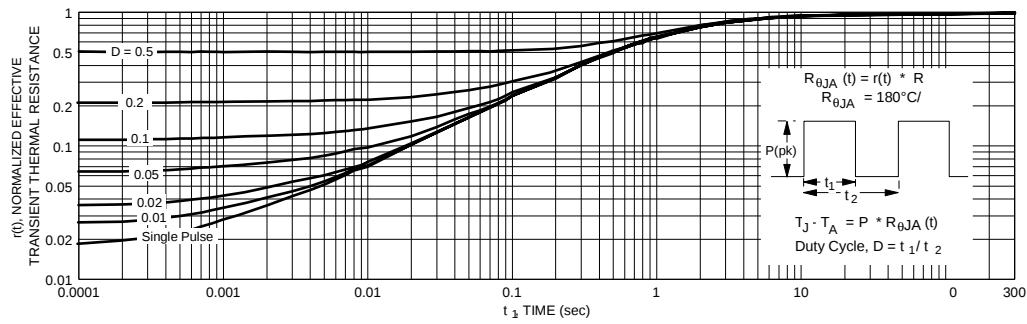


Figure 21. Transient Thermal Response Curve.

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