

# FDW2520C

## Complementary PowerTrench® MOSFET

### General Description

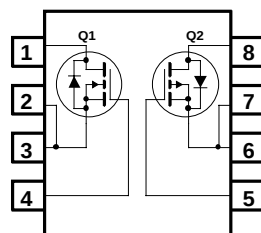
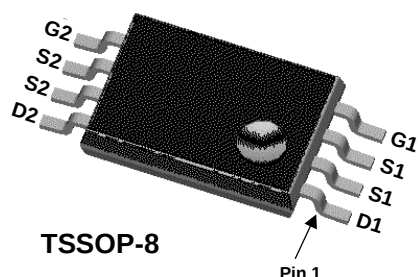
This complementary MOSFET device is produced using Fairchild's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain low gate charge for superior switching performance.

### Applications

- DC/DC conversion
- Power management
- Load switch

### Features

- **Q1: N-Channel**  
6 A, 20 V.  $R_{DS(ON)} = 18\text{ m}\Omega @ V_{GS} = 4.5\text{ V}$   
 $R_{DS(ON)} = 28\text{ m}\Omega @ V_{GS} = 2.5\text{ V}$
- **Q2: P-Channel**  
-4.4A, 20 V.  $R_{DS(ON)} = 35\text{ m}\Omega @ V_{GS} = -4.5\text{ V}$   
 $R_{DS(ON)} = 57\text{ m}\Omega @ V_{GS} = -2.5\text{ V}$
- High performance trench technology for extremely low  $R_{DS(ON)}$
- Low profile TSSOP-8 package



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

| Symbol                            | Parameter                                        | Q1          | Q2   | Units |
|-----------------------------------|--------------------------------------------------|-------------|------|-------|
| V <sub>DSS</sub>                  | Drain-Source Voltage                             | 20          | −20  | V     |
| V <sub>GSS</sub>                  | Gate-Source Voltage                              | ±12         | ±12  | V     |
| I <sub>D</sub>                    | Drain Current - Continuous (Note 1a)             | 6           | −4.4 | A     |
|                                   | - Pulsed                                         | 30          | −30  |       |
| P <sub>D</sub>                    | Power Dissipation (Note 1a)                      | 1.0         |      | W     |
|                                   | (Note 1b)                                        | 0.6         |      |       |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Junction Temperature Range | −55 to +150 |      | °C    |

### Thermal Characteristics

|                 |                                                   |     |                    |
|-----------------|---------------------------------------------------|-----|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 1a) | 125 | $^\circ\text{C/W}$ |
|                 | (Note 1b)                                         | 208 |                    |

### Package Marking and Ordering Information

| Device Marking | Device   | Reel Size | Tape width | Quantity   |
|----------------|----------|-----------|------------|------------|
| 2520C          | FDW2520C | 13"       | 12mm       | 2500 units |

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

| Symbol                                 | Parameter                                      | Test Conditions                                                                                                                                                                                                                                                                                                                                                | Type             | Min         | Typ                              | Max                              | Units        |
|----------------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------|----------------------------------|----------------------------------|--------------|
| Off Characteristics                    |                                                |                                                                                                                                                                                                                                                                                                                                                                |                  |             |                                  |                                  |              |
| BV <sub>DSS</sub>                      | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA<br>V <sub>GS</sub> = 0 V, I <sub>D</sub> = −250 μA                                                                                                                                                                                                                                                              | Q1<br>Q2         | 20<br>−20   |                                  |                                  | V            |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$   | Breakdown Voltage Temperature Coefficient      | I <sub>D</sub> = 250 μA, Referenced to 25°C<br>I <sub>D</sub> = −250 μA, Referenced to 25°C                                                                                                                                                                                                                                                                    | Q1<br>Q2         |             | 14<br>−17                        |                                  | mV/°C        |
| I <sub>DSS</sub>                       | Zero Gate Voltage Drain Current                | V <sub>DS</sub> = 16 V, V <sub>GS</sub> = 0 V<br>V <sub>DS</sub> = −16 V, V <sub>GS</sub> = 0 V                                                                                                                                                                                                                                                                | Q1<br>Q2         |             |                                  | 1<br>−1                          | μA           |
| I <sub>GSS</sub>                       | Gate-Body Leakage                              | V <sub>GS</sub> = ±12 V, V <sub>DS</sub> = 0 V<br>V <sub>GS</sub> = ±12 V, V <sub>DS</sub> = 0 V                                                                                                                                                                                                                                                               | Q1<br>Q2         |             |                                  | ±100<br>±100                     | nA           |
| On Characteristics (Note 2)            |                                                |                                                                                                                                                                                                                                                                                                                                                                |                  |             |                                  |                                  |              |
| V <sub>GS(th)</sub>                    | Gate Threshold Voltage                         | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA<br>V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = −250 μA                                                                                                                                                                                                                                    | Q1<br>Q2         | 0.4<br>−0.4 | 1.0<br>−1.0                      | 1.5<br>−1.5                      | V            |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate Threshold Voltage Temperature Coefficient | I <sub>D</sub> = 250 μA, Referenced to 25°C<br>I <sub>D</sub> = −250 μA, Referenced to 25°C                                                                                                                                                                                                                                                                    | Q1<br>Q2         |             | −3.3<br>3.1                      |                                  | mV/°C        |
| R <sub>DS(on)</sub>                    | Static Drain-Source On-Resistance              | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 6 A<br>V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 5 A<br>V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 6 A, T <sub>J</sub> = 125°C<br>V <sub>GS</sub> = −4.5 V, I <sub>D</sub> = −4.4 A<br>V <sub>GS</sub> = −2.5 V, I <sub>D</sub> = −3.3 A<br>V <sub>GS</sub> = −4.5 V, I <sub>D</sub> = −4.4 A, T <sub>J</sub> = 125°C | Q1<br><br><br>Q2 |             | 14<br>19<br>19<br>28<br>43<br>39 | 18<br>28<br>29<br>35<br>57<br>56 | mΩ<br><br>mΩ |
| I <sub>D(on)</sub>                     | On-State Drain Current                         | V <sub>GS</sub> = 4.5 V, V <sub>DS</sub> = 5 V<br>V <sub>GS</sub> = −4.5 V, V <sub>DS</sub> = −5 V                                                                                                                                                                                                                                                             | Q1<br>Q2         | 30<br>−30   |                                  |                                  | A            |
| g <sub>FS</sub>                        | Forward Transconductance                       | V <sub>DS</sub> = 5 V, I <sub>D</sub> = 6 A<br>V <sub>DS</sub> = −5 V, I <sub>D</sub> = −4.4 A                                                                                                                                                                                                                                                                 | Q1<br>Q2         |             | 30<br>17                         |                                  | S            |
| Dynamic Characteristics                |                                                |                                                                                                                                                                                                                                                                                                                                                                |                  |             |                                  |                                  |              |
| C <sub>iss</sub>                       | Input Capacitance                              | Q1:<br>V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V,<br>f = 1.0 MHz                                                                                                                                                                                                                                                                                           | Q1<br>Q2         |             | 1325<br>1330                     |                                  | pF           |
| C <sub>oss</sub>                       | Output Capacitance                             | Q2:<br>f = 1.0 MHz                                                                                                                                                                                                                                                                                                                                             | Q1<br>Q2         |             | 358<br>552                       |                                  | pF           |
| C <sub>rss</sub>                       | Reverse Transfer Capacitance                   | V <sub>DS</sub> = −10 V, V <sub>GS</sub> = 0 V,<br>f = 1.0 MHz                                                                                                                                                                                                                                                                                                 | Q1<br>Q2         |             | 168<br>153                       |                                  | pF           |
| Switching Characteristics              |                                                |                                                                                                                                                                                                                                                                                                                                                                |                  |             |                                  |                                  |              |
| t <sub>d(on)</sub>                     | Turn-On Delay Time                             | Q1:<br>V <sub>DD</sub> = 10 V, I <sub>D</sub> = 1 A,<br>V <sub>GS</sub> = 4.5V, R <sub>GEN</sub> = 6 Ω                                                                                                                                                                                                                                                         | Q1<br>Q2         |             | 6<br>12                          | 20<br>25                         | ns           |
| t <sub>r</sub>                         | Turn-On Rise Time                              | Q2:<br>V <sub>DD</sub> = 10 V, I <sub>D</sub> = 1 A,<br>V <sub>GS</sub> = 4.5V, R <sub>GEN</sub> = 6 Ω                                                                                                                                                                                                                                                         | Q1<br>Q2         |             | 11<br>19                         | 40<br>40                         | ns           |
| t <sub>d(off)</sub>                    | Turn-Off Delay Time                            | V <sub>DD</sub> = −10 V, I <sub>D</sub> = −1 A,<br>V <sub>GS</sub> = −4.5V, R <sub>GEN</sub> = 6 Ω                                                                                                                                                                                                                                                             | Q1<br>Q2         |             | 32<br>60                         | 60<br>100                        | ns           |
| t <sub>f</sub>                         | Turn-Off Fall Time                             |                                                                                                                                                                                                                                                                                                                                                                | Q1<br>Q2         |             | 19<br>37                         | 34<br>70                         | ns           |
| Q <sub>g</sub>                         | Total Gate Charge                              | Q1:<br>V <sub>DS</sub> = 10 V, I <sub>D</sub> = 6 A,<br>V <sub>GS</sub> = 4.5 V                                                                                                                                                                                                                                                                                | Q1<br>Q2         |             | 14<br>14                         | 20<br>20                         | nC           |
| Q <sub>gs</sub>                        | Gate-Source Charge                             | Q2:<br>V <sub>DS</sub> = −5 V, I <sub>D</sub> = −4.4 A,<br>V <sub>GS</sub> = −4.5 V                                                                                                                                                                                                                                                                            | Q1<br>Q2         |             | 2.6<br>3.0                       |                                  | nC           |
| Q <sub>gd</sub>                        | Gate-Drain Charge                              |                                                                                                                                                                                                                                                                                                                                                                | Q1<br>Q2         |             | 3.7<br>3.9                       |                                  | nC           |

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

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

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

|          |                                                       |                                                      |    |  |      |       |   |
|----------|-------------------------------------------------------|------------------------------------------------------|----|--|------|-------|---|
| $I_S$    | Maximum Continuous Drain-Source Diode Forward Current |                                                      | Q1 |  |      | 0.83  | A |
|          |                                                       |                                                      | Q2 |  |      | -0.83 |   |
| $V_{SD}$ | Drain-Source Diode Forward Voltage                    | $V_{GS} = 0\text{ V}, I_S = 0.83\text{ A}$ (Note 2)  | Q1 |  | 0.5  | 1.2   | V |
|          |                                                       | $V_{GS} = 0\text{ V}, I_S = -0.83\text{ A}$ (Note 2) | Q2 |  | -0.7 | -1.2  |   |

**Notes:**

1.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal 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  $R_{\theta CA}$  is determined by the user's board design.

- a)  $R_{\theta JA}$  is  $125^\circ\text{C/W}$  (steady state) when mounted on a 1 inch<sup>2</sup> copper pad on FR-4.
- b)  $R_{\theta JA}$  is  $208^\circ\text{C/W}$  (steady state) when mounted on a minimum copper pad on FR-4.

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

## Typical Characteristics: Q1

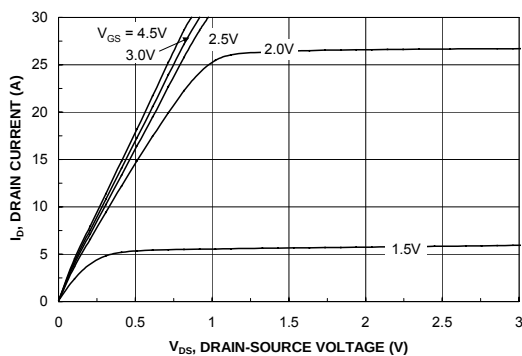


Figure 1. On-Region Characteristics.

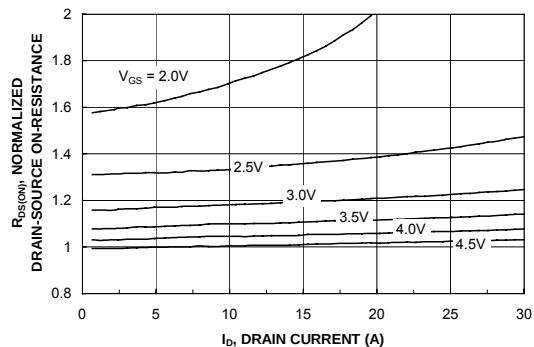


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

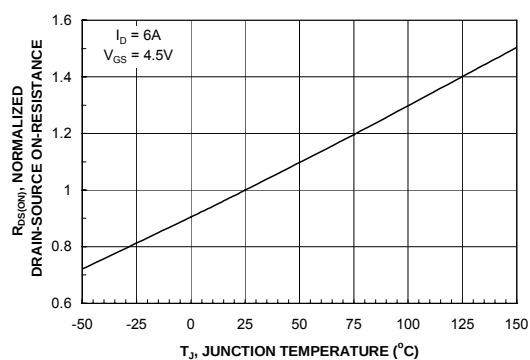


Figure 3. On-Resistance Variation with Temperature.

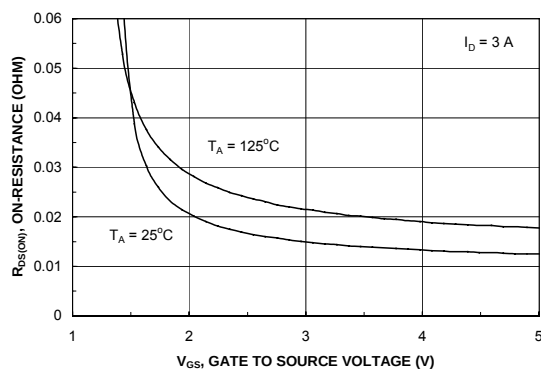


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

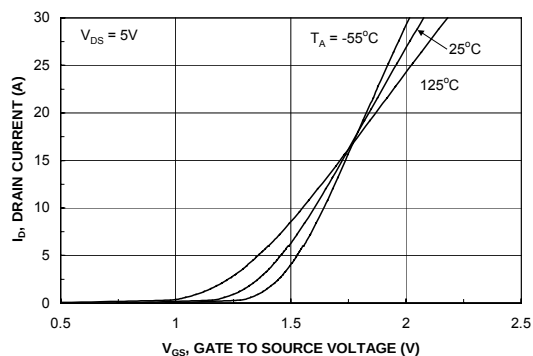


Figure 5. Transfer Characteristics.

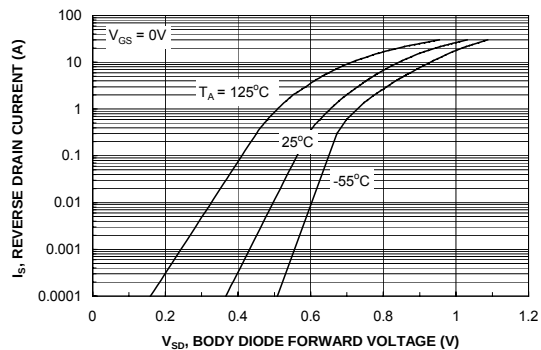


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Characteristics: Q1

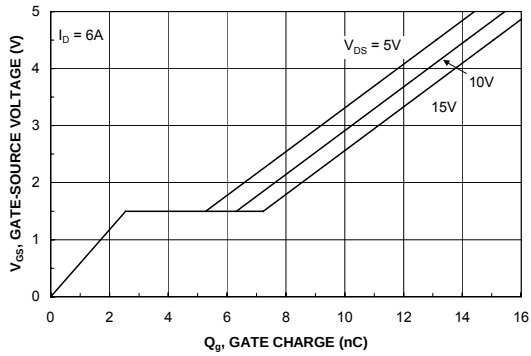


Figure 7. Gate Charge Characteristics.

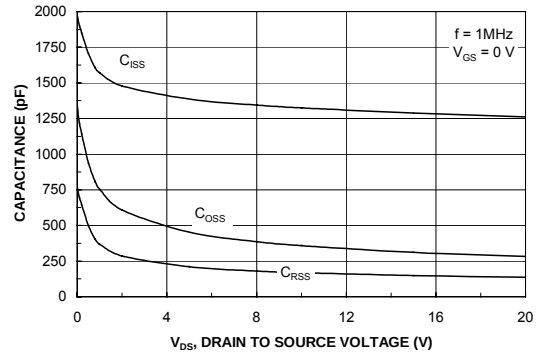


Figure 8. Capacitance Characteristics.

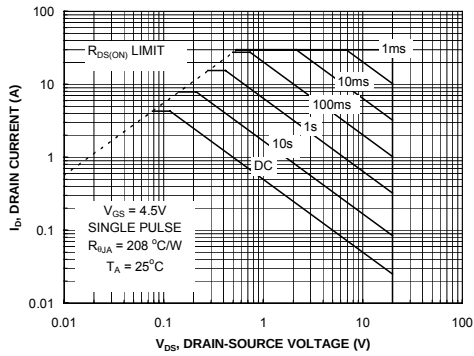


Figure 9. Maximum Safe Operating Area.

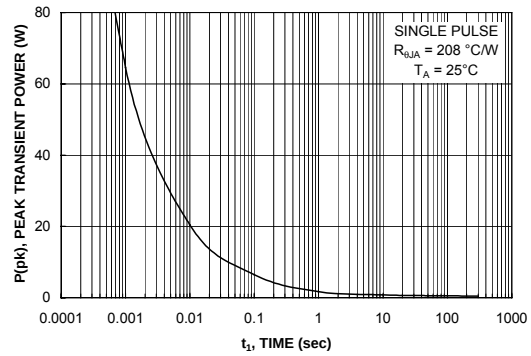


Figure 10. Single Pulse Maximum Power Dissipation.

## Typical Characteristics: Q2

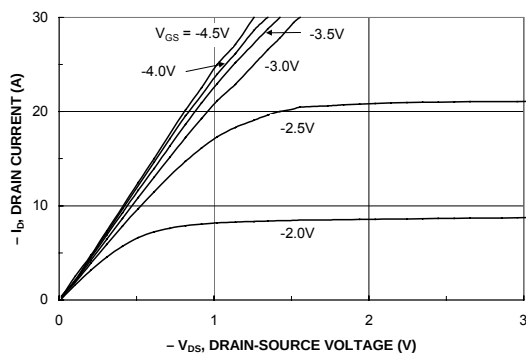


Figure 11. On-Region Characteristics.

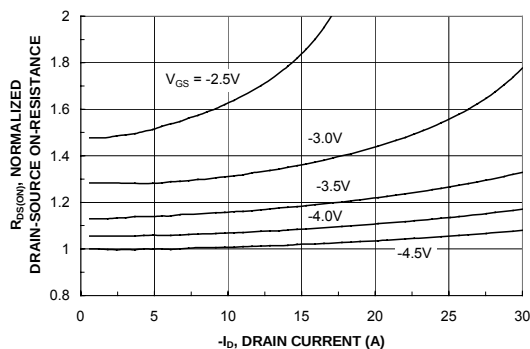


Figure 12. On-Resistance Variation with Drain Current and Gate Voltage.

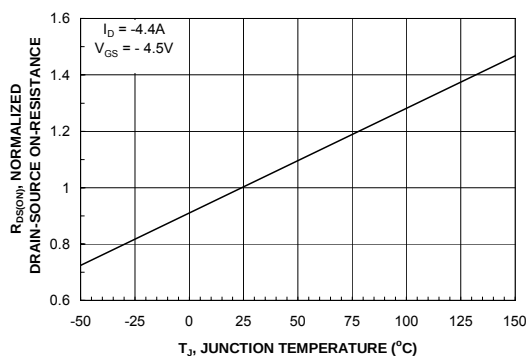


Figure 13. On-Resistance Variation with Temperature.

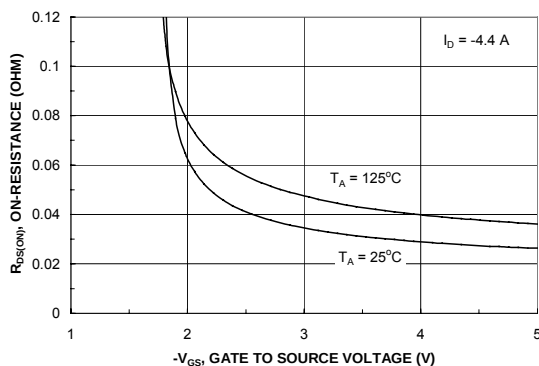


Figure 14. On-Resistance Variation with Gate-to-Source Voltage.

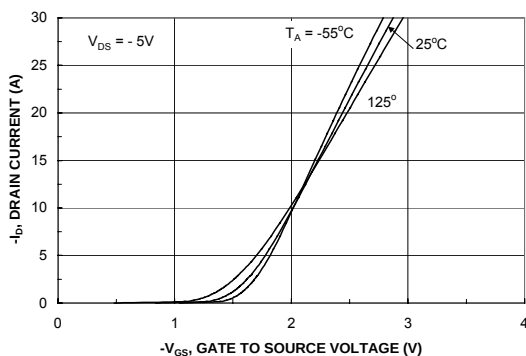


Figure 15. Transfer Characteristics.

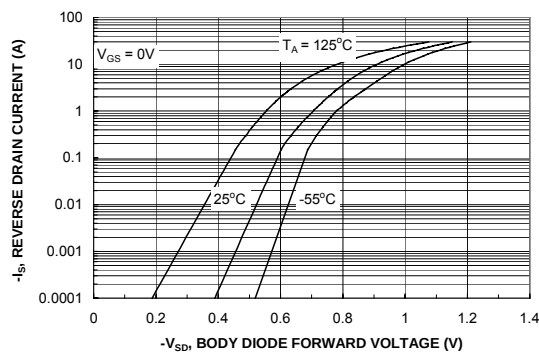


Figure 16. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Characteristics: Q2

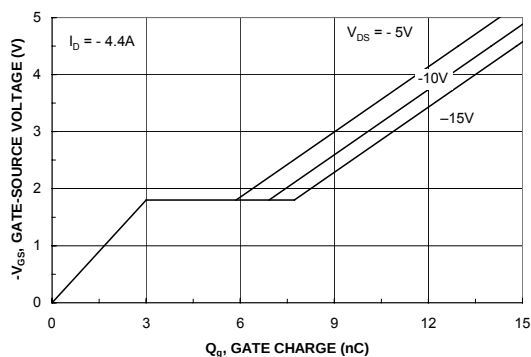


Figure 17. Gate Charge Characteristics.

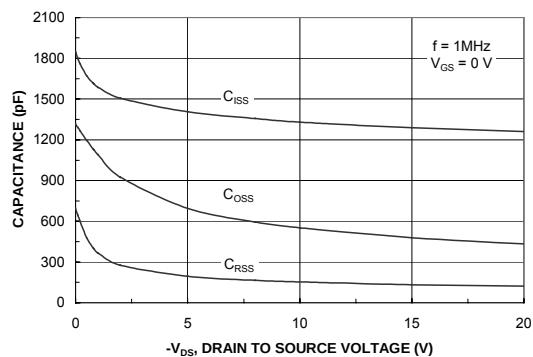


Figure 18. Capacitance Characteristics.

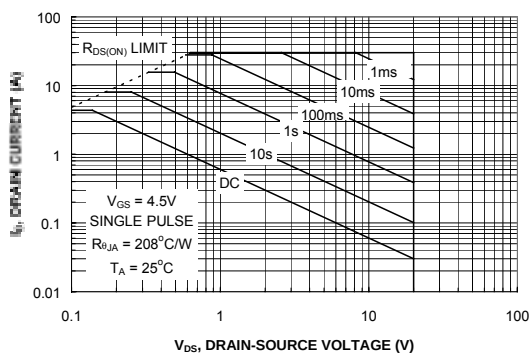


Figure 19. Maximum Safe Operating Area.

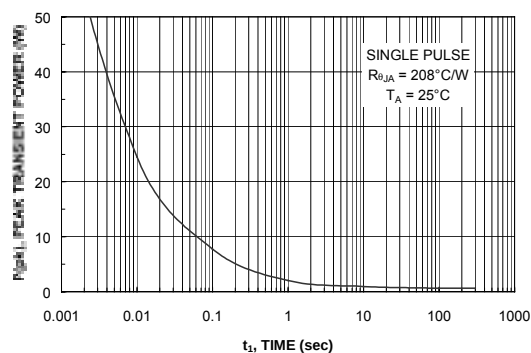


Figure 20. Single Pulse Maximum Power Dissipation.

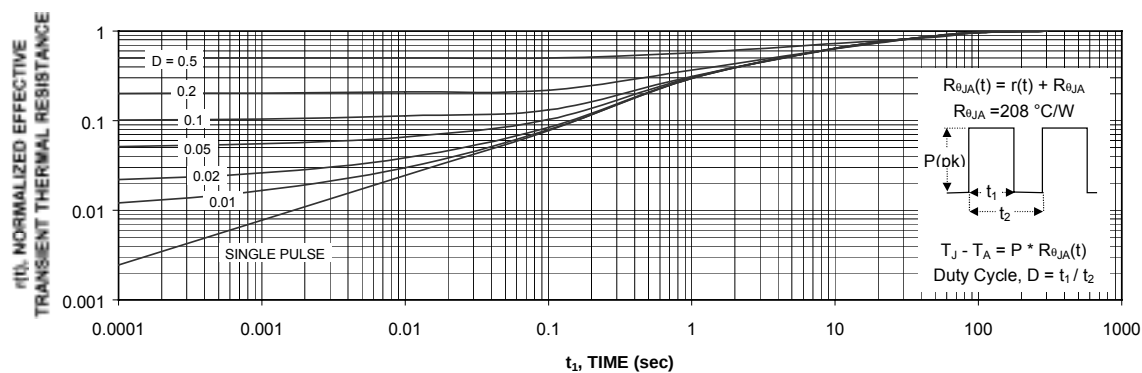


Figure 21. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b.  
Transient thermal response will change depending on the circuit board design.



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Наша организация особенно сильна в поставках модулей, микросхем, пассивных компонентов, ксайленсах (XC), EPF, EPM и силовой электроники.

Большой выбор предлагаемой продукции, различные виды оплаты и доставки, позволят Вам сэкономить время и получить максимум выгоды от сотрудничества с нами!

## Перечень производителей, продукцию которых мы поставляем на российский рынок





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качества выпускаемой продукции

С удовольствием будем прорабатывать для Вас поставки всех необходимых компонентов по текущим запросам для скорейшего выявления групп элементов, по которым сотрудничество именно с нашей компанией будет для Вас максимально выгодным!

С уважением,

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