

# FDC365P

## P-Channel PowerTrench® MOSFET -35V, -4.3A, 55mΩ

### Features

- Max  $r_{DS(on)}$  = 55mΩ at  $V_{GS} = -10V$ ,  $I_D = -4.2A$
- Max  $r_{DS(on)}$  = 80mΩ at  $V_{GS} = -4.5V$ ,  $I_D = -3.2A$
- RoHS Compliant

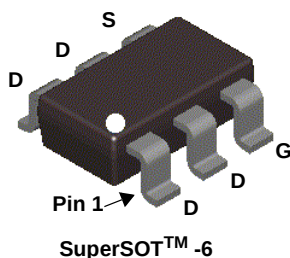


### General Description

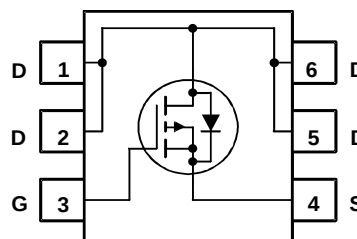
This P-Channel MOSFET has been produced using Fairchild Semiconductor's proprietary PowerTrench® technology to deliver low  $r_{DS(on)}$  and optimized  $Bvdss$  capability to offer superior performance benefit in the applications.

### Applications

- Inverter
- Power Supplies



SuperSOT™ -6



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

| Symbol         | Parameter                                        | Ratings     | Units            |
|----------------|--------------------------------------------------|-------------|------------------|
| $V_{DS}$       | Drain to Source Voltage                          | -35         | V                |
| $V_{GS}$       | Gate to Source Voltage                           | $\pm 20$    | V                |
| $I_D$          | -Continuous (Note 1a)                            | -4.3        | A                |
|                | -Pulsed                                          | -20         |                  |
| $P_D$          | Power Dissipation (Note 1a)                      | 1.6         | W                |
|                | Power Dissipation (Note 1b)                      | 0.8         |                  |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to +150 | $^\circ\text{C}$ |

### Thermal Characteristics

|                 |                                                   |     |                    |
|-----------------|---------------------------------------------------|-----|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1a) | 78  | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient (Note 1b) | 156 |                    |

### Package Marking and Ordering Information

| Device Marking | Device  | Package | Reel Size | Tape Width | Quantity   |
|----------------|---------|---------|-----------|------------|------------|
| .365P          | FDC365P | SSOT6   | 7"        | 8mm        | 3000 units |

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

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

**Off Characteristics**

|                                      |                                           |                                                            |     |     |           |                      |
|--------------------------------------|-------------------------------------------|------------------------------------------------------------|-----|-----|-----------|----------------------|
| $BV_{DSS}$                           | Drain to Source Breakdown Voltage         | $I_D = -250\mu\text{A}$ , $V_{GS} = 0\text{V}$             | -35 |     |           | V                    |
| $\frac{\Delta BV_{DSS}}{\Delta T_J}$ | Breakdown Voltage Temperature Coefficient | $I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$ |     | -26 |           | mV/ $^\circ\text{C}$ |
| $I_{DSS}$                            | Zero Gate Voltage Drain Current           | $V_{DS} = -28\text{V}$ , $V_{GS} = 0\text{V}$              |     |     | -1        | $\mu\text{A}$        |
| $I_{GSS}$                            | Gate to Source Leakage Current            | $V_{GS} = \pm 20\text{V}$ , $V_{DS} = 0\text{V}$           |     |     | $\pm 100$ | nA                   |

**On Characteristics**

|                                        |                                                          |                                                                           |    |      |    |                      |
|----------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------|----|------|----|----------------------|
| $V_{GS(th)}$                           | Gate to Source Threshold Voltage                         | $V_{GS} = V_{DS}$ , $I_D = -250\mu\text{A}$                               | -1 | -1.8 | -3 | V                    |
| $\frac{\Delta V_{GS(th)}}{\Delta T_J}$ | Gate to Source Threshold Voltage Temperature Coefficient | $I_D = -250\mu\text{A}$ , referenced to $25^\circ\text{C}$                |    | 5.0  |    | mV/ $^\circ\text{C}$ |
| $r_{DS(on)}$                           | Static Drain to Source On Resistance                     | $V_{GS} = -10\text{V}$ , $I_D = -4.2\text{A}$                             |    | 45   | 55 | m $\Omega$           |
|                                        |                                                          | $V_{GS} = -4.5\text{V}$ , $I_D = -3.2\text{A}$                            |    | 70   | 80 |                      |
|                                        |                                                          | $V_{GS} = -10\text{V}$ , $I_D = -4.2\text{A}$ , $T_J = 125^\circ\text{C}$ |    | 69   | 90 |                      |
| $g_{FS}$                               | Forward Transconductance                                 | $V_{DS} = -10\text{V}$ , $I_D = -4.2\text{A}$                             |    | 8.7  |    | S                    |

**Dynamic Characteristics**

|           |                              |                                                                      |  |     |     |          |
|-----------|------------------------------|----------------------------------------------------------------------|--|-----|-----|----------|
| $C_{iss}$ | Input Capacitance            | $V_{DS} = -20\text{V}$ , $V_{GS} = 0\text{V}$ ,<br>$f = 1\text{MHz}$ |  | 530 | 705 | pF       |
| $C_{oss}$ | Output Capacitance           |                                                                      |  | 105 | 135 | pF       |
| $C_{rss}$ | Reverse Transfer Capacitance |                                                                      |  | 55  | 80  | pF       |
| $R_g$     | Gate Resistance              | $f = 1\text{MHz}$                                                    |  | 6.1 |     | $\Omega$ |

**Switching Characteristics**

|              |                               |                                                                                                 |                                                  |     |    |    |
|--------------|-------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------|-----|----|----|
| $t_{d(on)}$  | Turn-On Delay Time            | $V_{DD} = -20\text{V}$ , $I_D = -4.2\text{A}$ ,<br>$V_{GS} = -10\text{V}$ , $R_{GEN} = 6\Omega$ |                                                  | 7   | 13 | ns |
| $t_r$        | Rise Time                     |                                                                                                 |                                                  | 3   | 10 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time           |                                                                                                 |                                                  | 15  | 28 | ns |
| $t_f$        | Fall Time                     |                                                                                                 |                                                  | 3   | 10 | ns |
| $Q_g$        | Total Gate Charge             | $V_{GS} = 0\text{V}$ to $-10\text{V}$                                                           | $V_{DD} = -20\text{V}$ ,<br>$I_D = -4.2\text{A}$ | 11  | 15 | nC |
| $Q_g$        | Total Gate Charge             | $V_{GS} = 0\text{V}$ to $-5\text{V}$                                                            |                                                  | 6   | 9  | nC |
| $Q_{gs}$     | Gate to Source Charge         |                                                                                                 |                                                  | 1.7 |    | nC |
| $Q_{gd}$     | Gate to Drain "Miller" Charge |                                                                                                 |                                                  | 2.2 |    | nC |

**Drain-Source Diode Characteristics**

|          |                                       |                                                          |  |      |      |    |
|----------|---------------------------------------|----------------------------------------------------------|--|------|------|----|
| $V_{SD}$ | Source to Drain Diode Forward Voltage | $V_{GS} = 0\text{V}$ , $I_S = -1.3\text{A}$ (Note 2)     |  | -0.8 | -1.2 | V  |
| $t_{rr}$ | Reverse Recovery Time                 | $I_F = -4.2\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$ |  | 16   | 29   | ns |
| $Q_{rr}$ | Reverse Recovery Charge               |                                                          |  | 7    | 14   | nC |

## 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  $R_{\theta JA}$  is determined by the user's board design.



a.  $78^\circ\text{C/W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz. copper on FR-4 board.



b.  $156^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper.

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

## Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

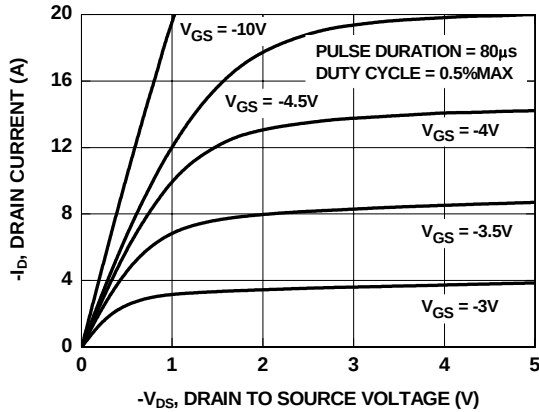


Figure 1. On-Region Characteristics

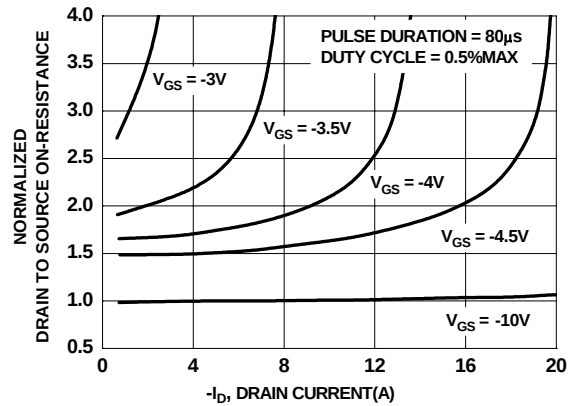


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

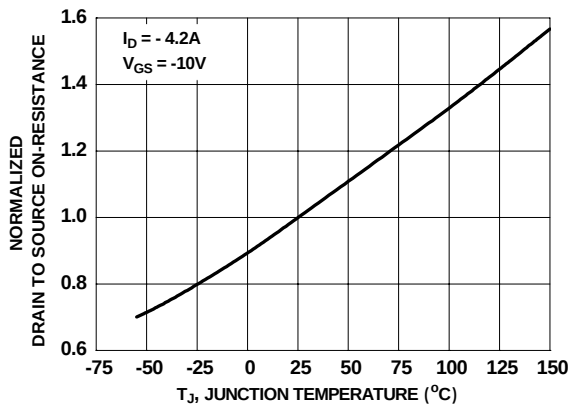


Figure 3. Normalized On-Resistance vs Junction Temperature

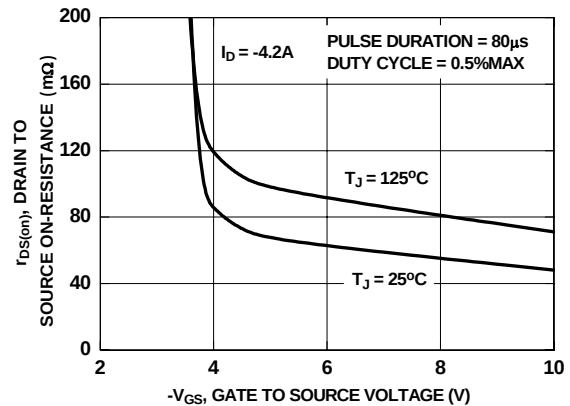


Figure 4. On-Resistance vs Gate to Source Voltage

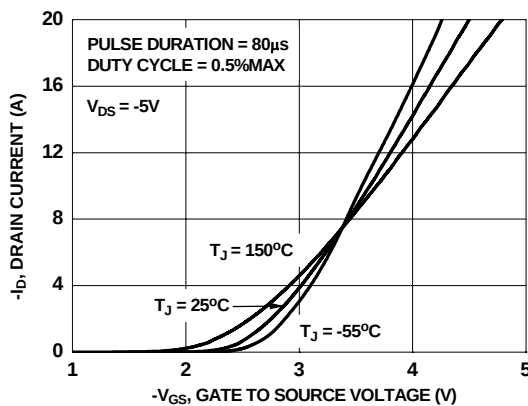


Figure 5. Transfer Characteristics

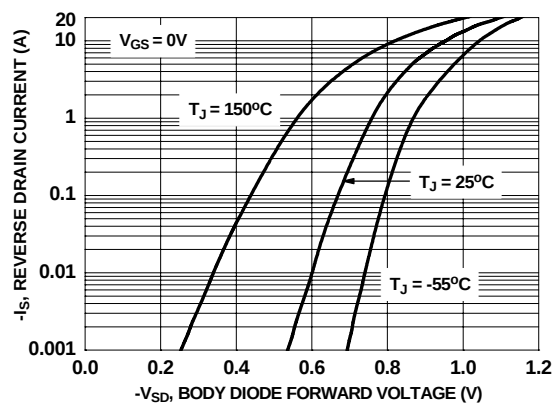


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

# Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

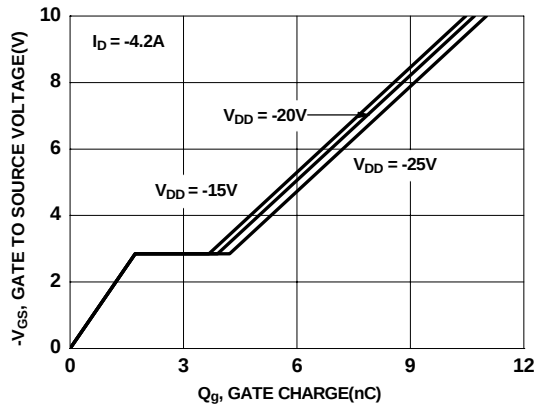


Figure 7. Gate Charge Characteristics

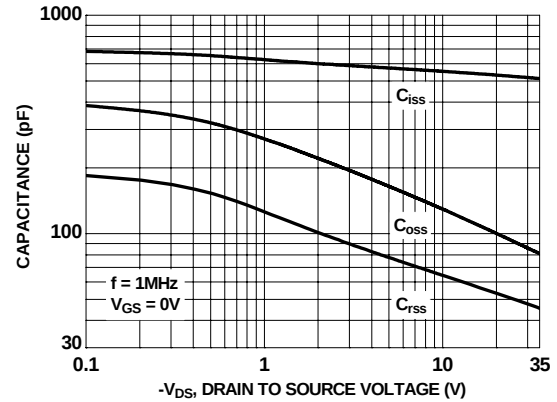


Figure 8. Capacitance vs Drain to Source Voltage

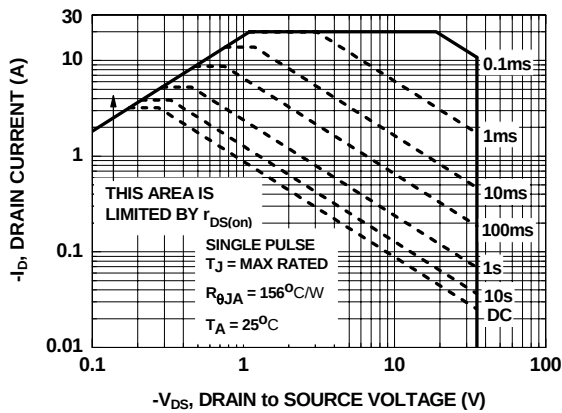


Figure 9. Forward Bias Safe Operating Area

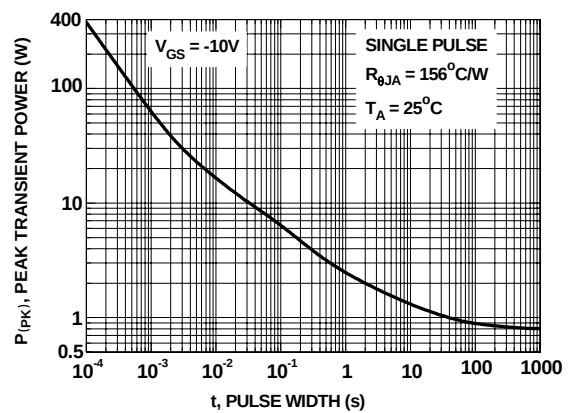


Figure 10. Single Pulse Maximum Power Dissipation

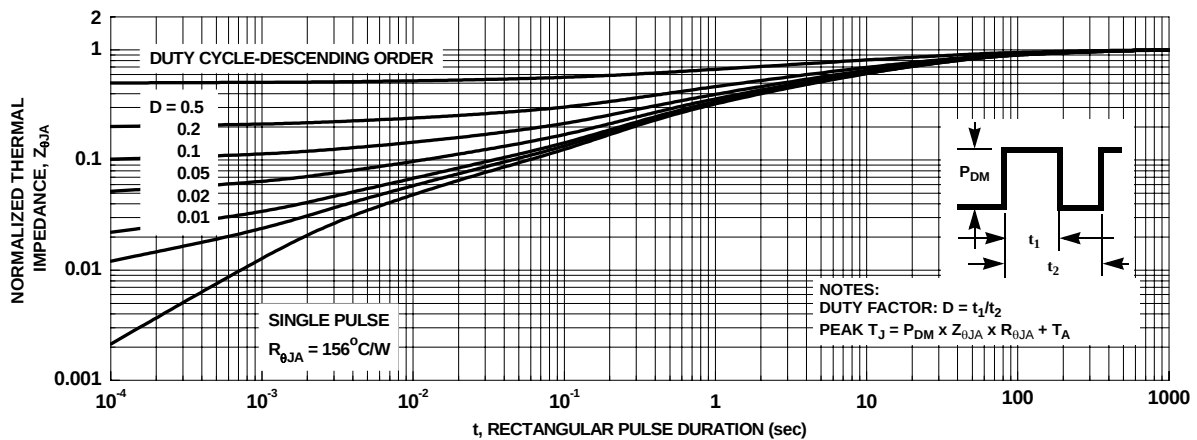
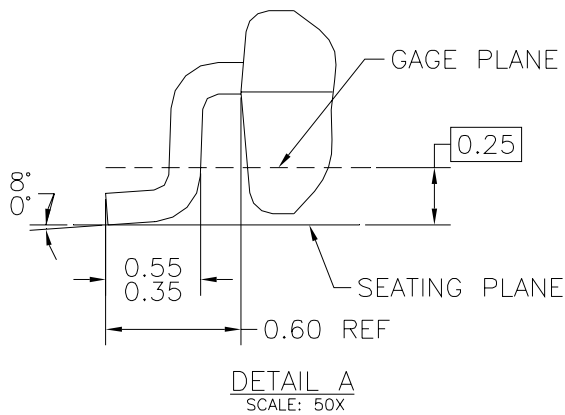
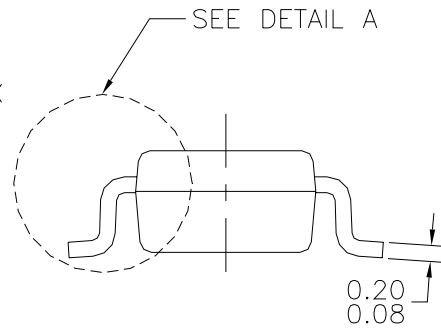
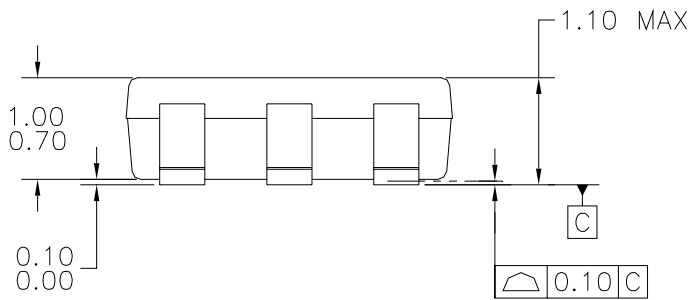
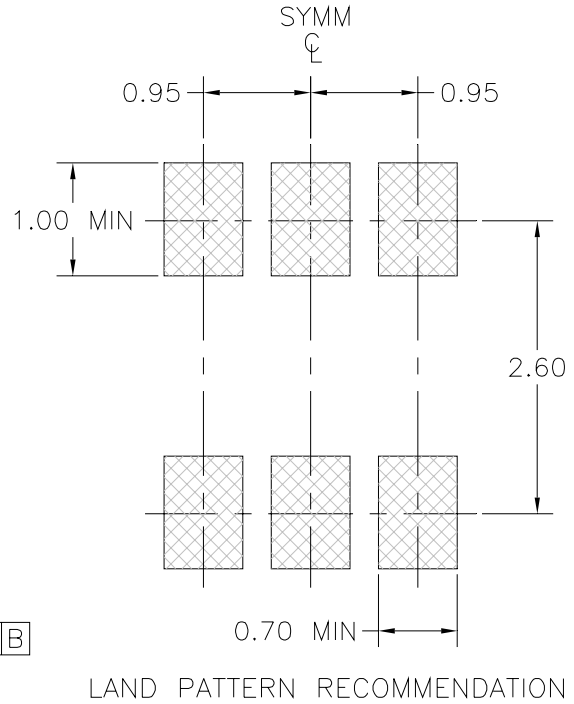
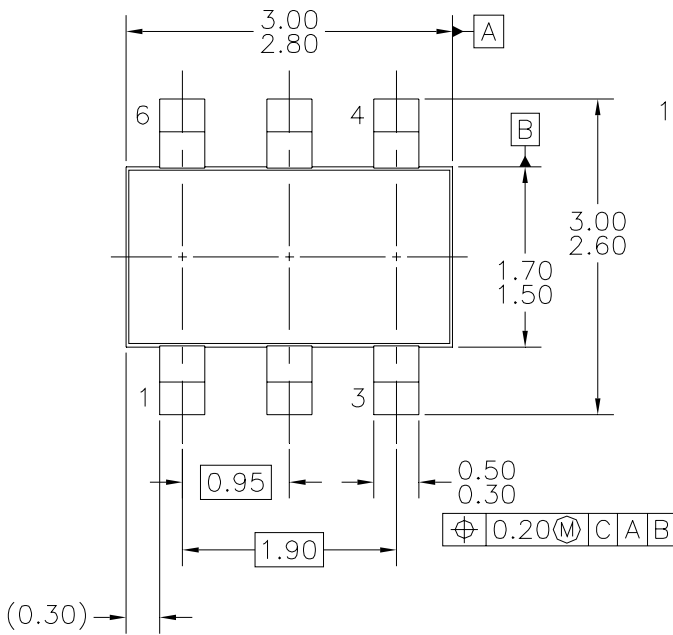


Figure 11. Transient Thermal Response Curve

# Dimensional Outline and Pad Layout



NOTES: UNLESS OTHERWISE SPECIFIED

- A) THIS PACKAGE CONFORMS TO JEDEC MO-193. VAR. AA, ISSUE C, DATED JANUARY 2000.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.

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| FastvCore™               | OPTOPLANAR®          | SuperFET™                  | UniFET™              |
| FPS™                     | ®                    | SuperSOT™-3                | VCX™                 |
| FRFET®                   | PDP-SPM™             | SuperSOT™-6                |                      |
| Global Power ResourceSM  | Power220®            |                            |                      |

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