

## SuperMOS – SOT23-6L -20V $BV_{DSS}$ , 82m $\Omega$ $R_{DS(on)}$ , P-channel MOSFET

### 1. Description

The FDC6312P-ES is P-Channel enhancement MOS Field Effect Transistor. Uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product FDC6312P-ES is Pb-free.

### 2. Features

- -20V,  $R_{DS(ON)}=82m\Omega(TYP.) @V_{GS}=-4.5V$   
 $R_{DS(ON)}=118m\Omega(TYP.) @V_{GS}=-2.5V$   
 $R_{DS(ON)}=180m\Omega(TYP.) @V_{GS}=-1.8V$
- Fast Switching
- High density cell design for low  $R_{DS(on)}$
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

### 3. Applications

- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

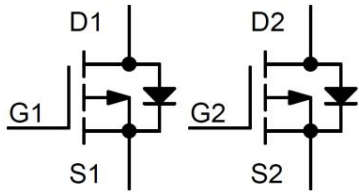
### 4. Ordering Information

| Part Number | Package  | Marking | Material     | Packing     | Quantity per reel | Flammability Rating | Reel Size |
|-------------|----------|---------|--------------|-------------|-------------------|---------------------|-----------|
| FDC6312P-ES | SOT23-6L | .6312P  | Halogen free | Tape & Reel | 3,000 PCS         | UL 94V-0            | 7 inches  |

### 5. Pin Configuration and Functions

## FDC6312P-ES

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| Pin | Function | Outline                                                                           | Circuit Diagram                                                                     |
|-----|----------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | Gate1    |  |  |
| 5   | Source1  |                                                                                   |                                                                                     |
| 6   | Drain1   |                                                                                   |                                                                                     |
| 3   | Gate2    |                                                                                   |                                                                                     |
| 2   | Source2  |                                                                                   |                                                                                     |
| 4   | Drain2   |                                                                                   |                                                                                     |

## 6. Specification

## Absolute Maximum Rating &amp; Thermal Characteristics

Ratings at 25 °C ambient temperature unless otherwise specified.

| Parameter                      |                           | Symbol     | Limit       | Unit             |
|--------------------------------|---------------------------|------------|-------------|------------------|
| Drain-Source Voltage           |                           | $BV_{DSS}$ | -20         | V                |
| Gate-Source Voltage            |                           | $V_{GS}$   | $\pm 12$    | V                |
| Continuous Drain Current       | $T_A = 25^\circ\text{C}$  | $I_D$      | -2          | A                |
|                                | $T_A = 100^\circ\text{C}$ |            | -1.3        |                  |
| Maximum Power Dissipation      | $T_A = 25^\circ\text{C}$  | $P_D$      | 0.8         | W                |
| Pulsed Drain Current           |                           | $I_{DM}$   | -8          | A                |
| Operating Junction Temperature |                           | $T_J$      | 150         | $^\circ\text{C}$ |
| Storage Temperature Range      |                           | $T_{stg}$  | -55 to +150 | $^\circ\text{C}$ |

## Thermal resistance ratings

| Single Operation                                               |                 |         |         |                    |
|----------------------------------------------------------------|-----------------|---------|---------|--------------------|
| Parameter                                                      | Symbol          | Typical | Maximum | Unit               |
| Junction-to-Ambient Thermal Resistance ( $t \leq 10\text{s}$ ) | $R_{\theta JA}$ |         | 156     | $^\circ\text{C/W}$ |

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## Electrical Characteristics

At TA = 25°C unless otherwise specified

| Parameter                                 | Symbol              | Test Conditions                                                                         | Min. | Typ.  | Max. | Unit |
|-------------------------------------------|---------------------|-----------------------------------------------------------------------------------------|------|-------|------|------|
| OFF CHARACTERISTICS                       |                     |                                                                                         |      |       |      |      |
| Drain-to-Source Breakdown Voltage         | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA                                             | -20  |       |      | V    |
| Zero Gate Voltage Drain Current           | I <sub>DSS</sub>    | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V                                              |      |       | -1   | uA   |
| Gate-to-source Leakage Current            | I <sub>GSS</sub>    | V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V                                              |      |       | ±100 | nA   |
| ON CHARACTERISTICS                        |                     |                                                                                         |      |       |      |      |
| Gate Threshold Voltage                    | V <sub>GS(TH)</sub> | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA                               | -0.4 | -0.62 | -1.0 | V    |
| Drain-to-source On-resistance             | R <sub>DS(on)</sub> | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-2A                                             |      | 82    | 95   | mΩ   |
|                                           |                     | V <sub>GS</sub> =-2.5A, I <sub>D</sub> =-1.5A                                           |      | 118   | 138  |      |
|                                           |                     | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-1A                                             |      | 180   | 210  |      |
| CHARGES, CAPACITANCES AND GATE RESISTANCE |                     |                                                                                         |      |       |      |      |
| Input Capacitance                         | C <sub>ISS</sub>    | V <sub>GS</sub> =0V, V <sub>DS</sub> =-10V<br>f=1MHz                                    |      | 185   |      | pF   |
| Output Capacitance                        | C <sub>OSS</sub>    |                                                                                         |      | 35    |      |      |
| Reverse Transfer Capacitance              | C <sub>RSS</sub>    |                                                                                         |      | 25    |      |      |
| Total Gate Charge                         | Q <sub>G</sub>      | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-10V<br>I <sub>D</sub> =-2A                    |      | 2.2   |      | nC   |
| Gate-to-Source Charge                     | Q <sub>GS</sub>     |                                                                                         |      | 0.5   |      |      |
| Gate-to-Drain Charge                      | Q <sub>GD</sub>     |                                                                                         |      | 0.5   |      |      |
| SWITCHING CHARACTERISTICS                 |                     |                                                                                         |      |       |      |      |
| Turn-On Delay Time                        | t <sub>d(ON)</sub>  | V <sub>GS</sub> =-4.5V, V <sub>DS</sub> =-10V<br>R <sub>L</sub> =5Ω, R <sub>G</sub> =3Ω |      | 10    |      | ns   |
| Rise Time                                 | t <sub>r</sub>      |                                                                                         |      | 30    |      |      |
| Turn-Off Delay Time                       | t <sub>d(OFF)</sub> |                                                                                         |      | 62    |      |      |
| Fall Time                                 | t <sub>f</sub>      |                                                                                         |      | 50    |      |      |
| BODY DIODE CHARACTERISTICS                |                     |                                                                                         |      |       |      |      |
| Forward Voltage                           | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> =-2A                                                |      |       | -1.5 | V    |

## 7. Typical Characteristics

Figure 1: Output Characteristics

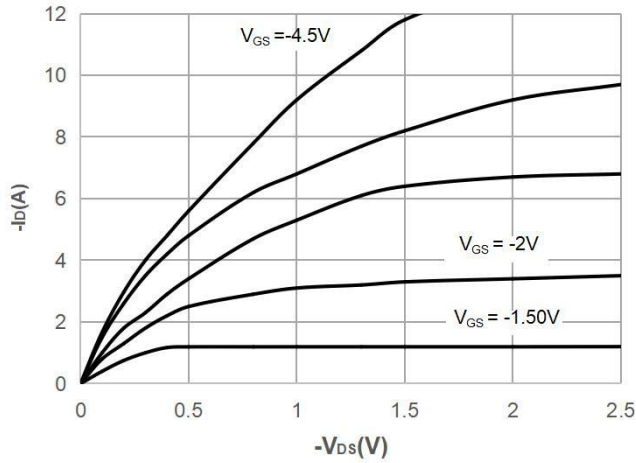


Figure 2: Typical Transfer Characteristics

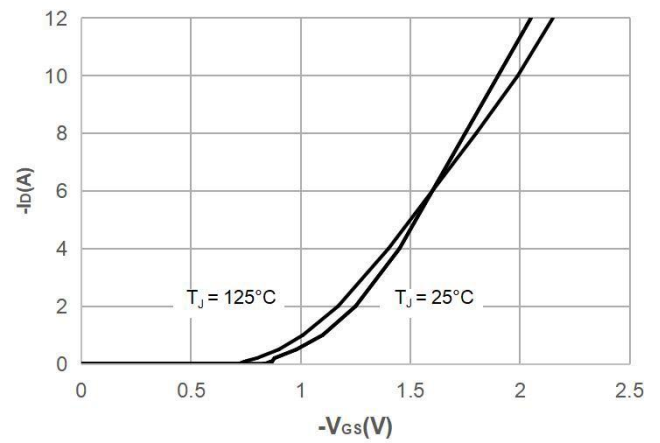


Figure 3: On-resistance vs. Drain Current

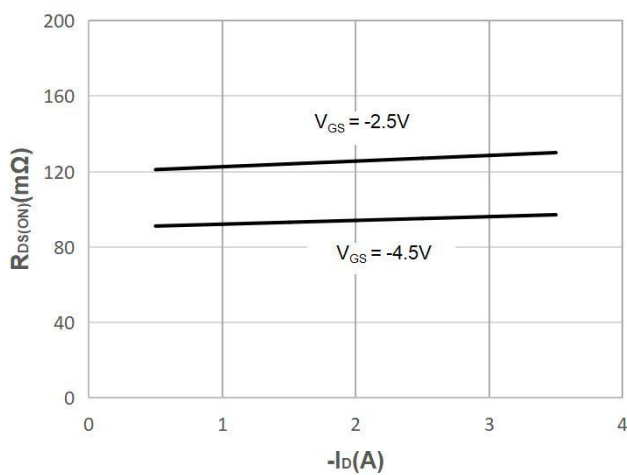


Figure 4: Body Diode Characteristics

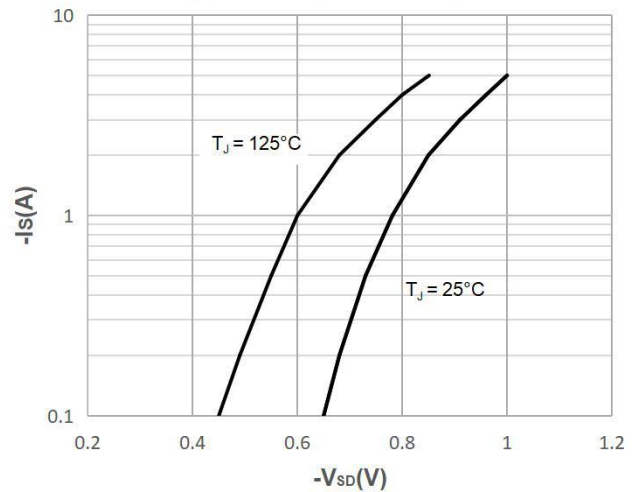


Figure 5: Gate Charge Characteristics

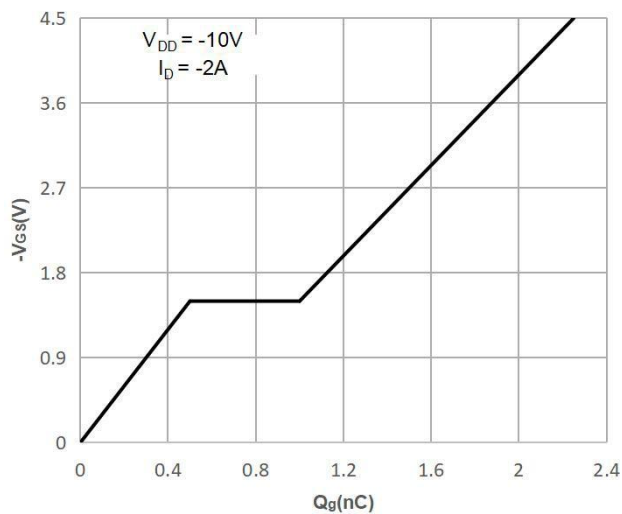
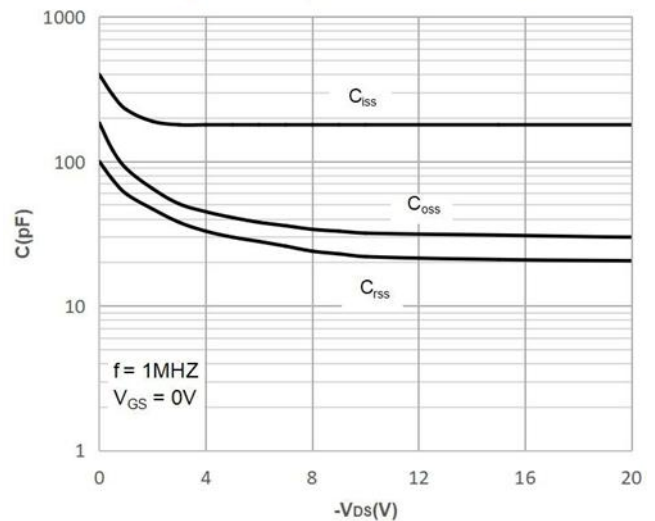
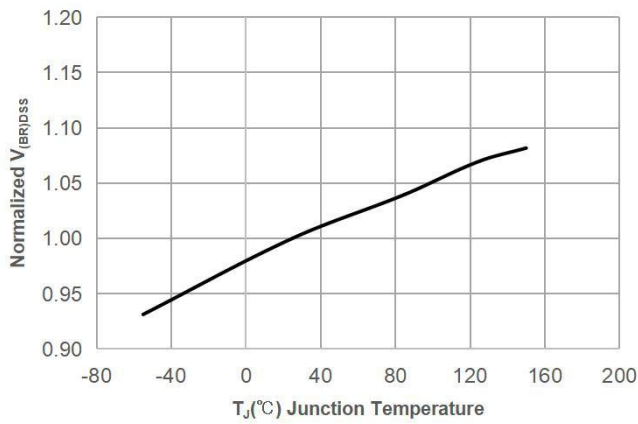


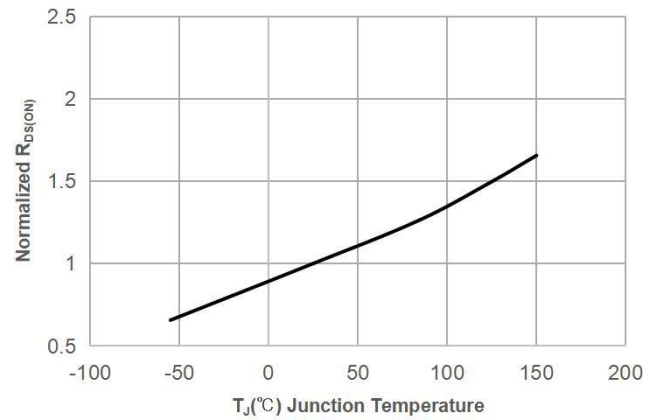
Figure 6: Capacitance Characteristics



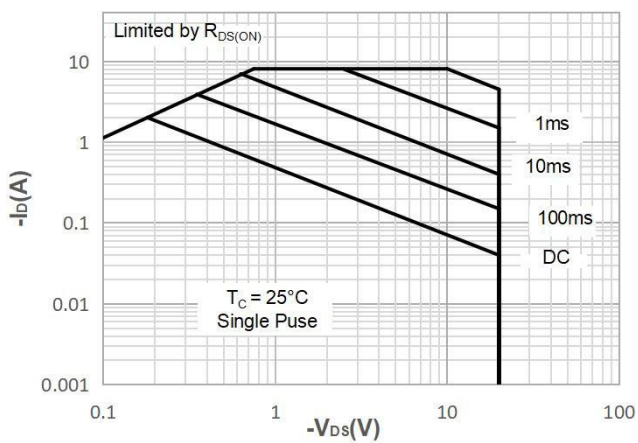
**Figure 7: Normalized Breakdown voltage vs. Junction Temperature**



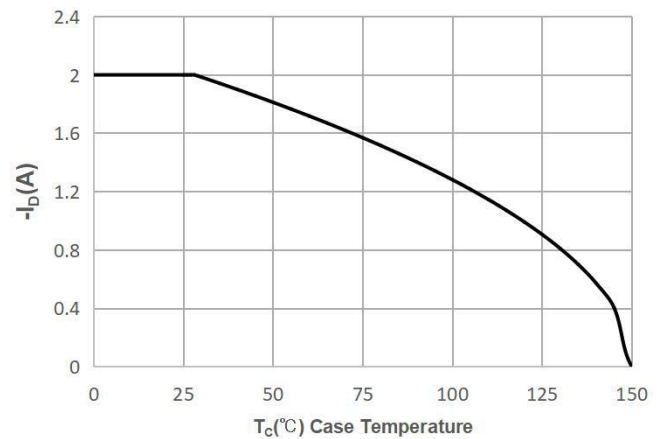
**Figure 8: Normalized on Resistance vs. Junction Temperature**



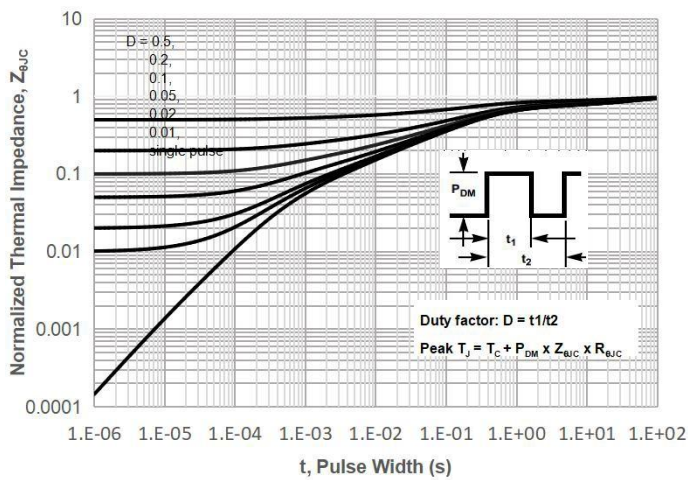
**Figure 9: Maximum Safe Operating Area**



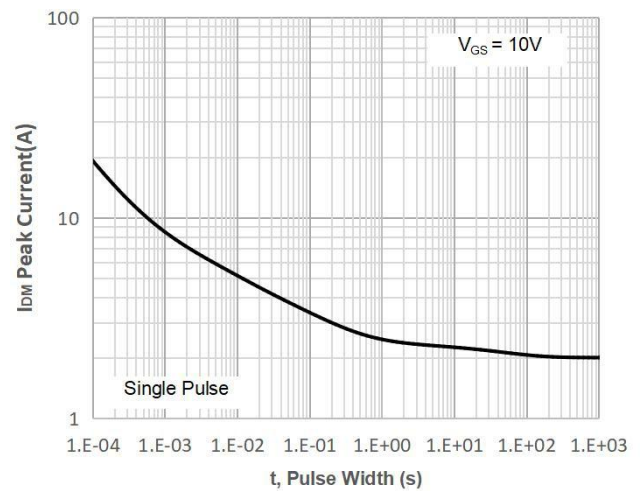
**Figure 10: Maximum Continuous Drain Current vs. Case Temperature**



**Figure 11: Normalized Maximum Transient Thermal Impedance**



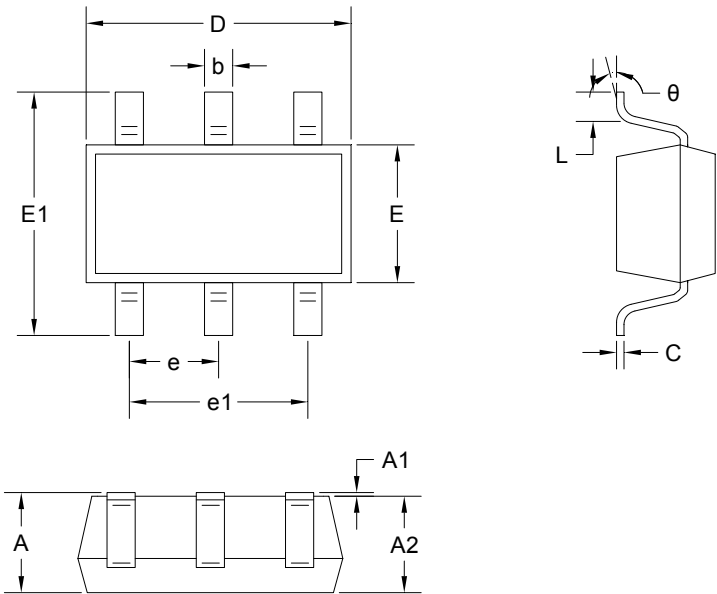
**Figure 12: Peak Current Capacity**



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8. Dimension (SOT23-6L)



Unit: mm

| Symbol |     | A     | A1    | A2       | b     | c     | D     |
|--------|-----|-------|-------|----------|-------|-------|-------|
| Spec   | Min | 1.050 | 0.000 | 1.050    | 0.300 | 0.100 | 2.820 |
|        | Max | 1.250 | 0.100 | 1.150    | 0.500 | 0.200 | 3.020 |
| Symbol |     | E     | E1    | e        | e1    | L     | θ     |
| Spec   | Min | 1.500 | 2.650 | 0.950BSC | 1.800 | 0.300 | 0°    |
|        | Max | 1.700 | 2.950 |          | 2.000 | 0.600 | 8°    |

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