

## N-Ch 60V Fast Switching MOSFETs

- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

### Product Summary

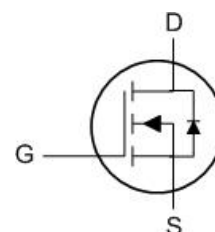
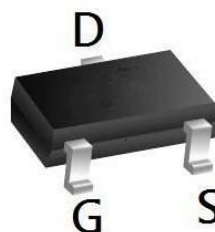


| BVDSS | RDSON | ID  |
|-------|-------|-----|
| 60V   | 40mΩ  | 5 A |

### Description

The UD6005L is the high cell density trenched P-ch MOSFETs, which provides excellent RDSON and efficiency for most of the small power switching and load switch applications. The UD6005L meet the RoHS and Green Product requirement with full function reliability approved.

### SOT 23-3L Pin Configurations



### Absolute Maximum Ratings (T<sub>C</sub>=25°C unless otherwise specified)

| Symbol                            | Parameter                               |                        | Max.        | Units |
|-----------------------------------|-----------------------------------------|------------------------|-------------|-------|
| V <sub>DSS</sub>                  | Drain-Source Voltage                    |                        | 60          | V     |
| V <sub>GSS</sub>                  | Gate-Source Voltage                     |                        | ±20         | V     |
| I <sub>D</sub>                    | Continuous Drain Current                | T <sub>C</sub> = 25°C  | 5           | A     |
|                                   |                                         | T <sub>C</sub> = 100°C | 3.8         | A     |
| I <sub>DM</sub>                   | Pulsed Drain Current <sup>note1</sup>   |                        | 30          | A     |
| P <sub>D</sub>                    | Power Dissipation                       | T <sub>C</sub> = 25°C  | 3           | W     |
| R <sub>θJC</sub>                  | Thermal Resistance, Junction to Case    |                        | 73          | °C/W  |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Temperature Range |                        | -55 to +175 | °C    |

**N-Ch 60V Fast Switching MOSFETs**
**Electrical Characteristics** ( $T_J=25^\circ\text{C}$  unless otherwise specified)

| Symbol                                                 | Parameter                                                 | Test Condition                                                                                               | Min. | Typ. | Max. | Units |
|--------------------------------------------------------|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------|------|------|-------|
| Off Characteristic                                     |                                                           |                                                                                                              |      |      |      |       |
| V <sub>(BR)DSS</sub>                                   | Drain-Source Breakdown Voltage                            | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                                                   | 60   | -    | -    | V     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current                           | V <sub>DS</sub> =60V, V <sub>GS</sub> =0V,                                                                   | -    | -    | 1.0  | μA    |
| I <sub>GSS</sub>                                       | Gate to Body Leakage Current                              | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V                                                                   | -    | -    | ±100 | nA    |
| On Characteristics                                     |                                                           |                                                                                                              |      |      |      |       |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                    | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                                     | 1    | 1.6  | 2.5  | V     |
| R <sub>DS(on)</sub>                                    | Static Drain-Source on-Resistance<br><small>note3</small> | V <sub>GS</sub> =10V, I <sub>D</sub> =15A                                                                    | -    | 40   | 49   | mΩ    |
|                                                        |                                                           | V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A                                                                   | -    | 45   | 63   |       |
| Dynamic Characteristics                                |                                                           |                                                                                                              |      |      |      |       |
| C <sub>iss</sub>                                       | Input Capacitance                                         | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V,<br>f=1.0MHz                                                       | -    | 825  | -    | pF    |
| C <sub>oss</sub>                                       | Output Capacitance                                        |                                                                                                              | -    | 49   | -    | pF    |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                              |                                                                                                              | -    | 41   | -    | pF    |
| Q <sub>g</sub>                                         | Total Gate Charge                                         | V <sub>DS</sub> =30V, I <sub>D</sub> =4.5A,<br>V <sub>GS</sub> =10V                                          | -    | 14   | -    | nC    |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                        |                                                                                                              | -    | 2.9  | -    | nC    |
| Q <sub>gd</sub>                                        | Gate-Drain(“Miller”) Charge                               |                                                                                                              | -    | 5.2  | -    | nC    |
| Switching Characteristics                              |                                                           |                                                                                                              |      |      |      |       |
| t <sub>d(on)</sub>                                     | Turn-on Delay Time                                        | V <sub>DS</sub> =30V,I <sub>D</sub> =2A,<br>R <sub>L</sub> =6.7Ω,R <sub>G</sub> =3Ω,<br>V <sub>GS</sub> =10V | -    | 5    | -    | ns    |
| t <sub>r</sub>                                         | Turn-on Rise Time                                         |                                                                                                              | -    | 2.6  | -    | ns    |
| t <sub>d(off)</sub>                                    | Turn-off Delay Time                                       |                                                                                                              | -    | 16.1 | -    | ns    |
| t <sub>f</sub>                                         | Turn-off Fall Time                                        |                                                                                                              | -    | 2.3  | -    | ns    |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                           |                                                                                                              |      |      |      |       |
| I <sub>S</sub>                                         | Maximum Continuous Drain to Source Diode Forward Current  |                                                                                                              | -    | -    | 5    | A     |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain to Source Diode Forward Current      |                                                                                                              | -    | -    | 30   | A     |
| V <sub>SD</sub>                                        | Drain to Source Diode Forward Voltage                     | V <sub>GS</sub> =0V, I <sub>S</sub> =15A                                                                     | -    | -    | 1.2  | V     |
| trr                                                    | Body Diode Reverse Recovery Time                          | T <sub>J</sub> =25℃,I <sub>F</sub> =15A,<br>dI/dt=100A/μs                                                    | -    | 35   | -    | ns    |
| Qrr                                                    | Body Diode Reverse Recovery Charge                        |                                                                                                              | -    | 53   | -    | nC    |

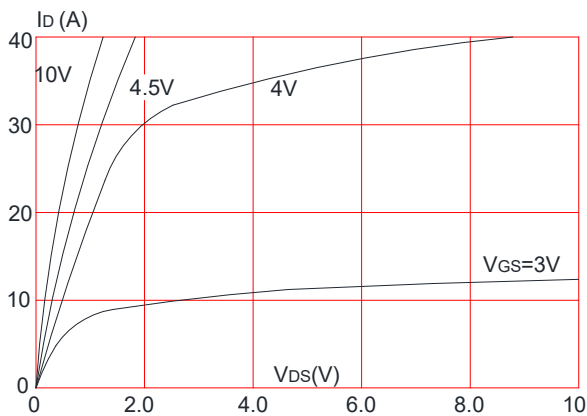
Notes: 1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition :  $T_J=25^\circ\text{C}, V_{DD}=30V, V_G=10V, L=0.5mH, R_g=25\Omega, I_{AS}=6.1A$

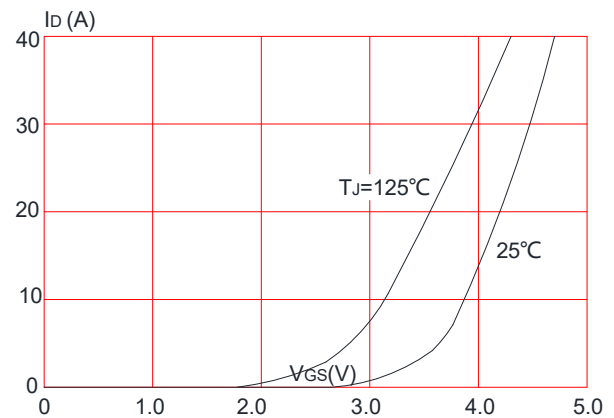
3. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 0.5\%$

### Typical Performance Characteristics

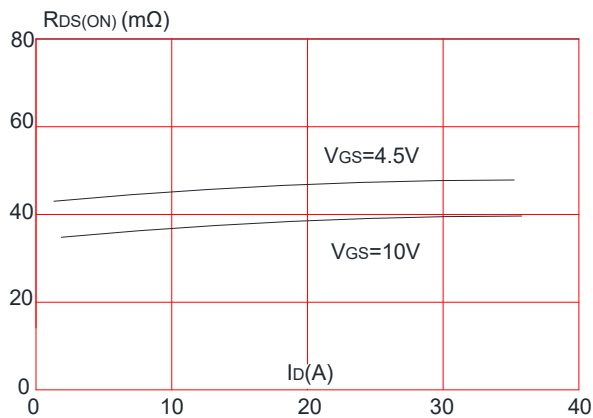
**Figure1: Output Characteristics**



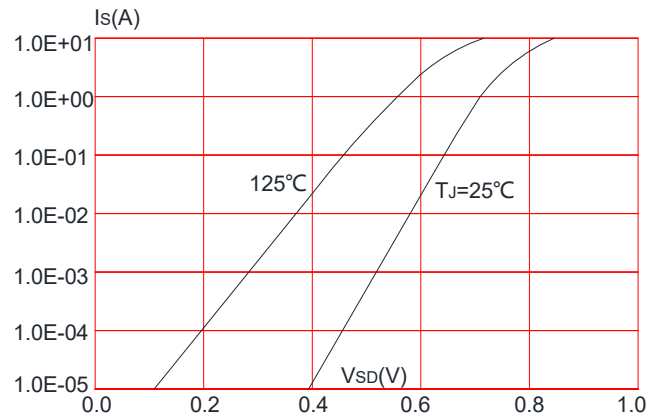
**Figure 2: Typical Transfer Characteristics**



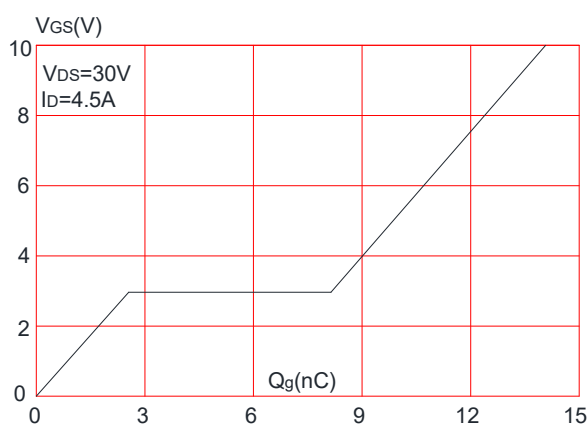
**Figure 3: On-resistance vs. Drain Current**



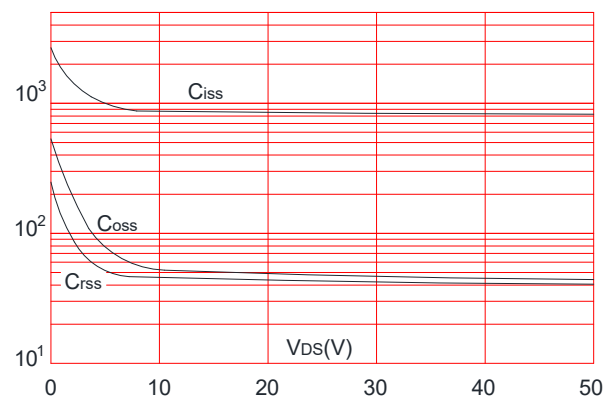
**Figure 4: Body Diode Characteristics**



**Figure 5: Gate Charge Characteristics**

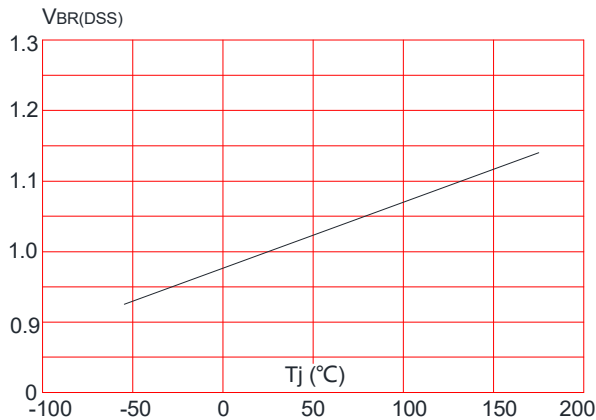


**Figure 6: Capacitance Characteristics**

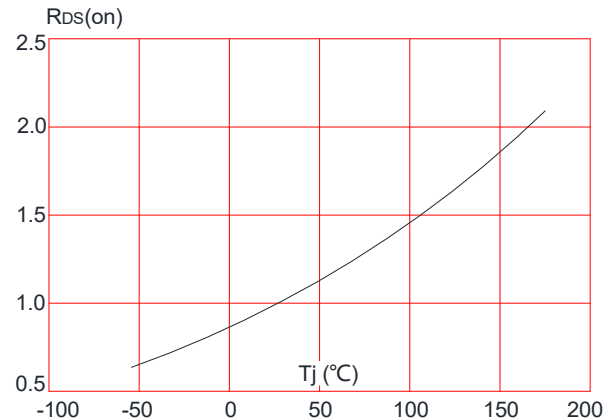


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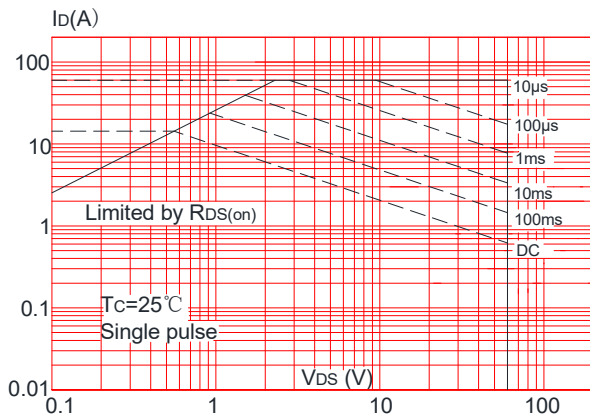
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



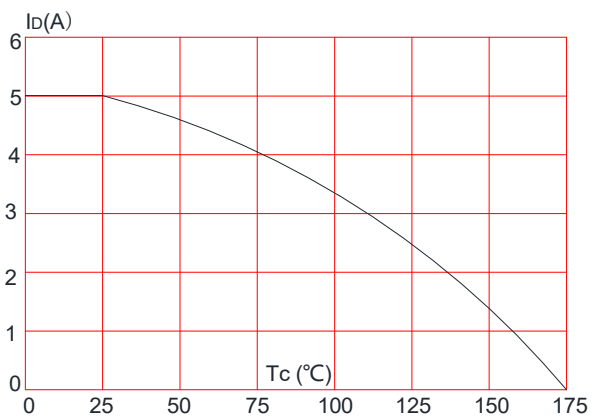
**Figure 8:** Normalized on Resistance vs. Junction Temperature



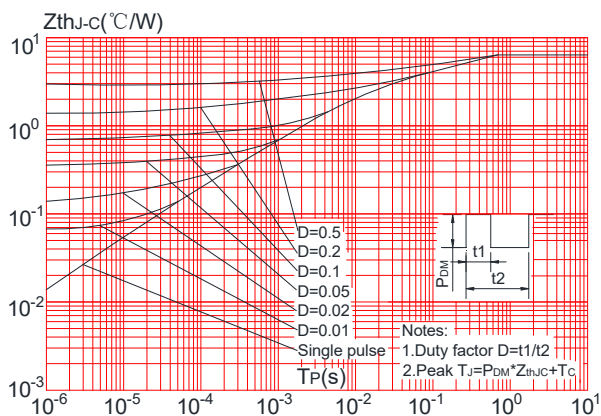
**Figure 9:** Maximum Safe Operating Area



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

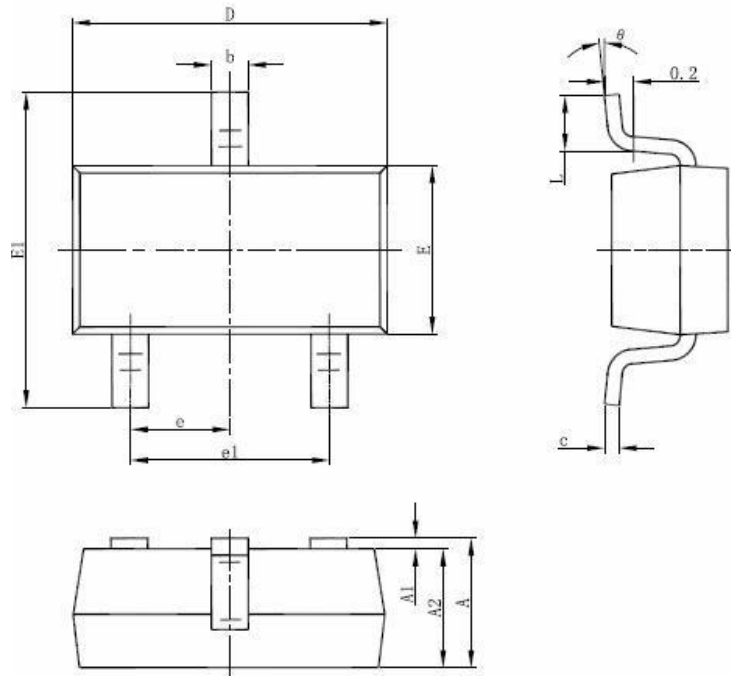


**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case





SOT-23-3L Package Information



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.050                     | 1.250 | 0.041                | 0.049 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 1.050                     | 1.150 | 0.041                | 0.045 |
| b      | 0.300                     | 0.500 | 0.012                | 0.020 |
| c      | 0.100                     | 0.200 | 0.004                | 0.008 |
| D      | 2.820                     | 3.020 | 0.111                | 0.119 |
| E      | 1.500                     | 1.700 | 0.059                | 0.067 |
| E1     | 2.650                     | 2.950 | 0.104                | 0.116 |
| e      | 0.950(BSC)                |       | 0.037(BSC)           |       |
| e1     | 1.800                     | 2.000 | 0.071                | 0.079 |
| L      | 0.300                     | 0.600 | 0.012                | 0.024 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |