

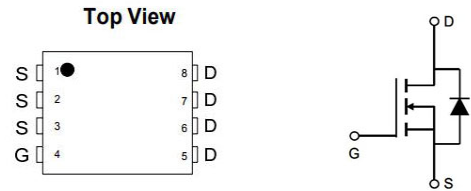
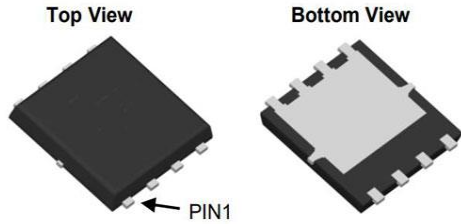
**40V /30A Single N Power MOSFET**
**General Description**

40V /30A Single N Power MOSFET

 Very low on-resistance  $R_{DS(on)}$  @  $V_{GS}=4.5\text{ V}$ 

Pb-free lead plating; RoHS compliant

|                             |      |            |
|-----------------------------|------|------------|
| $V_{DS}$                    | 40   | V          |
| $R_{DS(on),TYP@V_{GS}=10V}$ | 9.0  | m $\Omega$ |
| $R_{DS(on),TYP@V_{GS}=4.5}$ | 12.0 | m $\Omega$ |
| $I_D$                       | 30   | A          |



| Part ID     | Package Type | Marking | Tape and reel information |
|-------------|--------------|---------|---------------------------|
| SM66406D1RL | DFN5x6       | 6406    | 3000                      |


 100% UIS Tested  
 100% Kg Tested

| Parameter   | Symbol         | Maximum          | Units      |
|---|----------------|------------------|------------|
| Drain-Source Voltage                                      | $V_{DS}$       | 40               | V          |
| Gate-Source Voltage                                       | $V_{GS}$       | 20               | $\pm V$    |
| Continuous Drain Current <sup>A</sup>                     | $I_D$          | $T_A=25^\circ C$ | A          |
|   |                | $T_A=70^\circ C$ |            |
| Pulsed Drain Current <sup>B</sup>                         | $I_{DM}$       | 48.0             |            |
| Avalanche Current <sup>G</sup>                            | $I_{AR}$       | 9.6              |            |
| Repetitive avalanche energy $L=0.1\text{mH}$ <sup>G</sup> | $E_{AR}$       | 22.1             | mJ         |
| Power Dissipation <sup>A</sup>                            | $P_D$          | $T_A=25^\circ C$ | W          |
|   |                | $T_A=70^\circ C$ |            |
| Junction and Storage Temperature Range                    | $T_J, T_{STG}$ | -55 to 150       | $^\circ C$ |

**Thermal Characteristics**

| Parameter                                | Symbol          | Typ          | Max | Units        |
|--|-----------------|--------------|-----|--------------|
| Maximum Junction-to-Ambient <sup>A</sup> | $R_{\theta JA}$ | 23           | 35  | $^\circ C/W$ |
| Maximum Junction-to-Ambient <sup>A</sup> |                 | Steady State | 47  | 56           |
| Maximum Junction-to-Lead <sup>c</sup>    | $R_{\theta JL}$ | 14           | 22  | $^\circ C/W$ |



**STATIC PARAMETERS**

| Symbol              | Parameter                             | Conditions  | Min | Typ         | Max          | Units |
|---------------------|---------------------------------------|---|-----|-------------|--------------|-------|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage        | I <sub>D</sub> = -250uA, V <sub>GS</sub> = 0V   | 40  |             |              | V     |
| I <sub>DSS</sub>    | Zero Gate Voltage Drain Current       | V <sub>DS</sub> =40V, V <sub>GS</sub> =0V   |     |             | 1<br>5       | uA    |
| I <sub>GSS</sub>    | Gate-Body leakage current             | V <sub>DS</sub> = 0V, V <sub>GS</sub> = ±20V  |     |             | ±100         | nA    |
| V <sub>GS(th)</sub> | Gate Threshold Voltage                | V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250µA                                | 1.3 | 1.9         | 2.5          | V     |
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance     | V <sub>GS</sub> =10V, I <sub>D</sub> =20A<br>V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A |     | 9.0<br>12.0 | 11.0<br>15.6 | mΩ    |
| g <sub>FS</sub>     | Forward Transconductance              | V <sub>DS</sub> =5V, I <sub>D</sub> =20A  |     | 59          |              | S     |
| V <sub>SD</sub>     | Diode Forward Voltage                 | I <sub>S</sub> =1A, V <sub>GS</sub> =114V   |     | 0.72        | 1            | V     |
| I <sub>S</sub>      | Maximum Body-Diode Continuous Current |   |     |             | 30           | A     |

**DYNAMIC PARAMETERS**

| Symbol           | Parameter                    | Conditions  | Min | Typ  | Max  | Units |
|------------------|------------------------------|---|-----|------|------|-------|
| C <sub>iss</sub> | Input Capacitance            | V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz |     | 1480 | 1805 | pF    |
| C <sub>oss</sub> | Output Capacitance           |   |     | 245  | 301  | pF    |
| C <sub>rss</sub> | Reverse Transfer Capacitance |   |     | 13   | 15   | pF    |
| R <sub>g</sub>   | Gate resistance              | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz  |     |      | 1.5  | Ω     |

**SWITCHING PARAMETERS**

| Symbol               | Parameter                          | Conditions  | Min | Typ  | Max | Units |
|----------------------|------------------------------------|---|-----|------|-----|-------|
| Q <sub>g</sub> (10V) | Total Gate Charge                  | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, I <sub>D</sub> =20A                         |     | 8.5  |     | nC    |
| Q <sub>g</sub> 4.5V) | Total Gate Charge                  |   |     | 4.25 |     |       |
| Q <sub>gs</sub>      | Gate Source Charge                 |   |     | 2.1  |     |       |
| Q <sub>gd</sub>      | Gate Drain Charge                  |   |     | 3    |     |       |
| t <sub>D(on)</sub>   | Turn-On DelayTime                  | V <sub>GS</sub> =10V, V <sub>DS</sub> =15V, R <sub>L</sub> =0.75Ω, R <sub>GEN</sub> =3Ω |     | 5.5  |     | ns    |
| t <sub>r</sub>       | Turn-On Rise Time                  |   |     | 4.4  |     |       |
| t <sub>D(off)</sub>  | Turn-Off DelayTime                 |   |     | 15.4 |     |       |
| t <sub>f</sub>       | Turn-Off Fall Time                 |   |     | 4.95 |     |       |
| t <sub>rr</sub>      | Body Diode Reverse Recovery Time   | I <sub>F</sub> =-8A, dI/dt=500A/µs  |     | 11   |     | ns    |
| Q <sub>rr</sub>      | Body Diode Reverse Recovery Charge | I <sub>F</sub> =18A, dI/dt=500A/µs  |     | 21   |     | nC    |

## TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

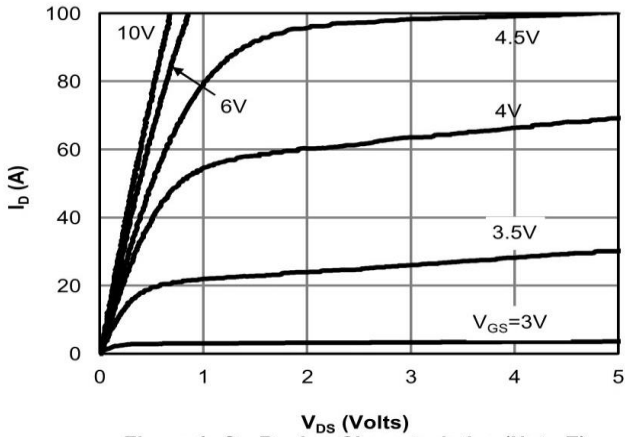


Figure 1: On-Region Characteristics (Note E)

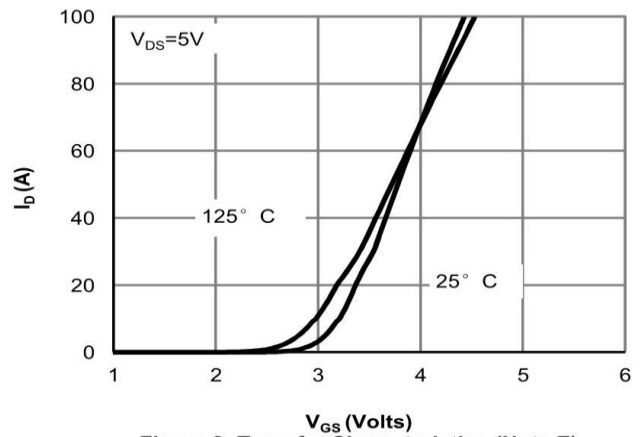


Figure 2: Transfer Characteristics (Note E)

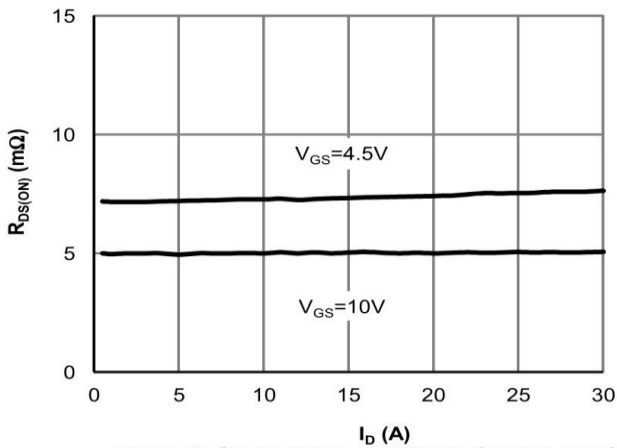


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

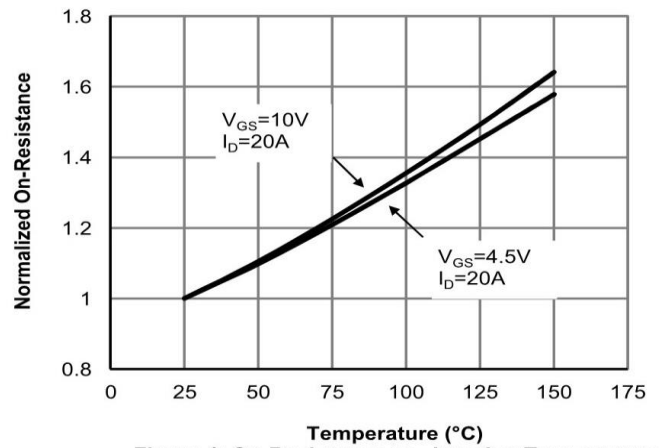


Figure 4: On-Resistance vs. Junction Temperature (Note E)

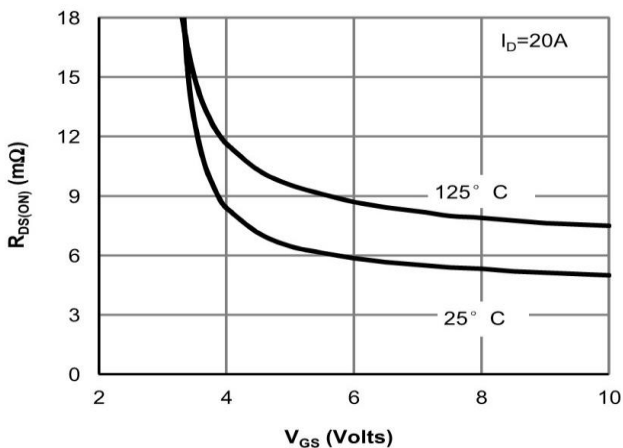


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

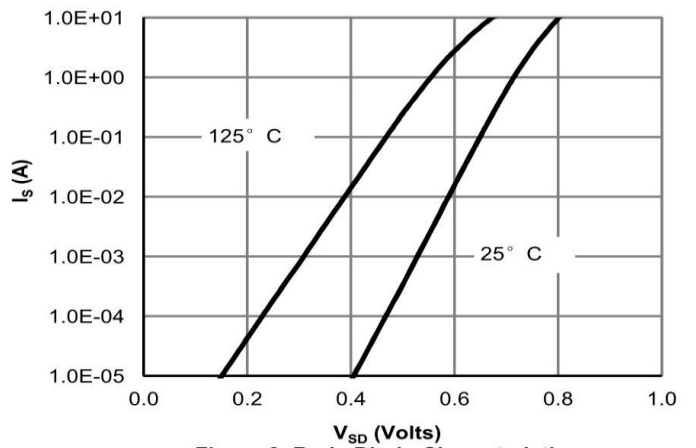


Figure 6: Body-Diode Characteristics (Note E)

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

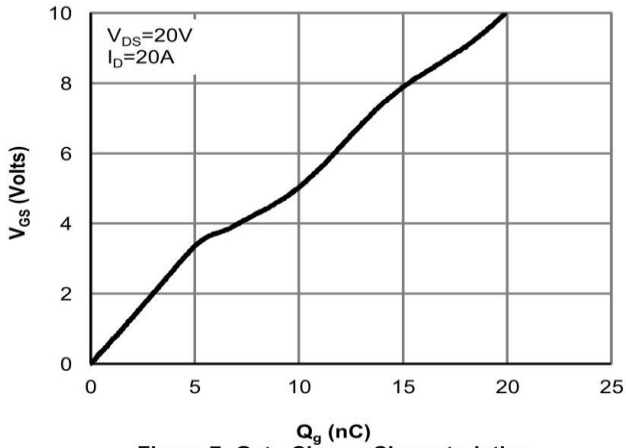


Figure 7: Gate-Charge Characteristics

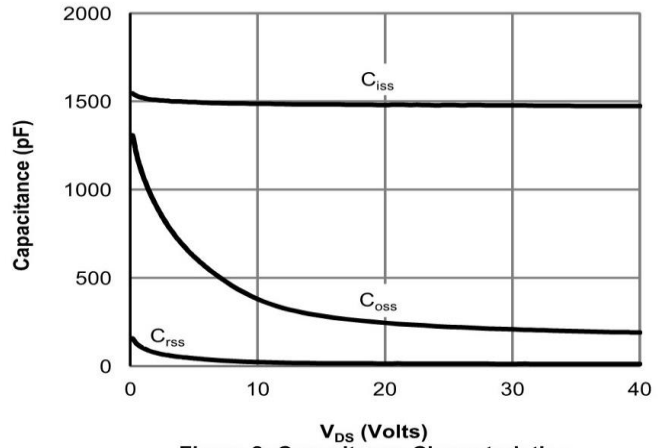


Figure 8: Capacitance Characteristics

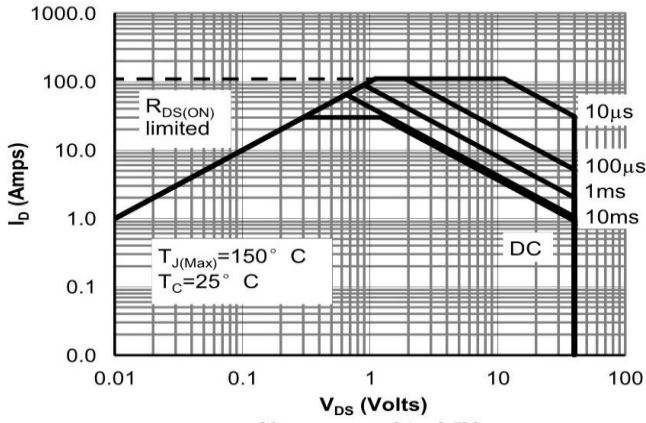


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

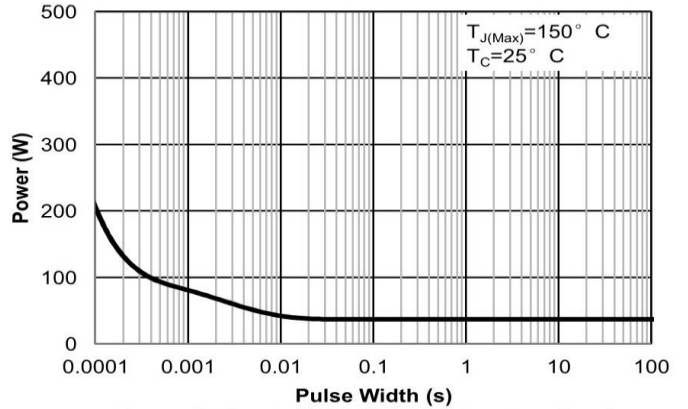


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

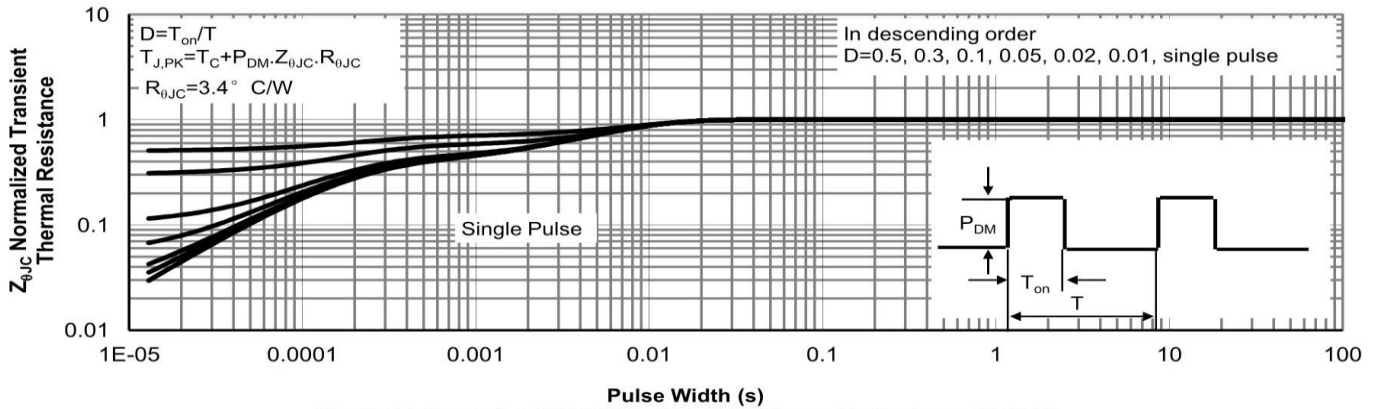


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

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