

### General Description

The WSK140N03 is the highest performance trench N-ch MOSFET with extreme high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The WSK140N03 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

### Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

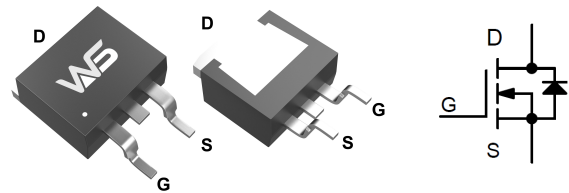
### Product Summary

| BVDSS | RDSON | ID   |
|-------|-------|------|
| 30V   | 4mΩ   | 140A |

### Applications

- High Frequency Point-of-Load Synchronous Buck Converter
- Networking DC-DC Power System

### TO-263-2L Pin Configuration



### Absolute Maximum Ratings

| Symbol                | Parameter                                  | Rating     | Units      |
|-----------------------|--|------------|------------|
| $V_{DS}$              | Drain-Source Voltage                       | 30         | V          |
| $V_{GS}$              | Gate-Source Voltage                        | $\pm 20$   | V          |
| $I_D@T_C=25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V^1$ | 140        | A          |
| $I_D@T_C=100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V^1$ | 72         | A          |
| $I_{DM}$              | Pulsed Drain Current <sup>2</sup>          | 225        | A          |
| EAS                   | Single Pulse Avalanche Energy <sup>3</sup> | 145        | mJ         |
| $I_{AS}$              | Avalanche Current                          | 53.8       | A          |
| $P_D@T_C=25^\circ C$  | Total Power Dissipation <sup>3</sup>       | 86.8       | W          |
| $P_D@T_A=25^\circ C$  | Total Power Dissipation <sup>3</sup>       | 2          | W          |
| $T_{STG}$             | Storage Temperature Range                  | -55 to 150 | $^\circ C$ |
| $T_J$                 | Operating Junction Temperature Range       | -55 to 150 | $^\circ C$ |

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

| Symbol                              | Parameter                                      | Conditions  | Min. | Typ.  | Max. | Unit  |
|-------------------------------------|--|---|------|-------|------|-------|
| BV <sub>DSS</sub>                   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA  | 30   | ---   | ---  | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BVDSS Temperature Coefficient                  | Reference to 25°C, I <sub>D</sub> =1mA  | ---  | 0.098 | ---  | V/°C  |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =10V, I <sub>D</sub> =12A   | ---  | ---   | 4    | mΩ    |
|                                     |  | V <sub>GS</sub> =4.5V, I <sub>D</sub> =12A  | ---  | ---   | 6    | mΩ    |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA                                  | 1    | ---   | 2.5  | V     |
| ΔV <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient    |   | ---  | -6.57 | ---  | mV/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current                   | V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                           | ---  | ---   | 1    | uA    |
|                                     |  | V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                           | ---  | ---   | 2    |       |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V  | ---  | ---   | ±100 | nA    |
| g <sub>fs</sub>                     | Forward Transconductance                       | V <sub>DS</sub> =5V, I <sub>D</sub> =30A  | ---  | 26.5  | ---  | S     |
| Q <sub>g</sub>                      | Total Gate Charge (10V)                        | V <sub>DS</sub> =20V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =12A                          | ---  | 31.6  | ---  | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                             |   | ---  | 6.1   | ---  |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                              |   | ---  | 13.8  | ---  |       |
| T <sub>d(on)</sub>                  | Turn-On Delay Time                             | V <sub>DD</sub> =15V, V <sub>GS</sub> =10V,<br>R <sub>G</sub> =1.5Ω, I <sub>D</sub> =20A. | ---  | 11.2  | ---  | ns    |
| T <sub>r</sub>                      | Rise Time                                      |   | ---  | 49    | ---  |       |
| T <sub>d(off)</sub>                 | Turn-Off Delay Time                            |   | ---  | 35    | ---  |       |
| T <sub>f</sub>                      | Fall Time                                      |   | ---  | 7.8   | ---  |       |
| C <sub>iss</sub>                    | Input Capacitance                              | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz   | ---  | 3075  | ---  | pF    |
| C <sub>oss</sub>                    | Output Capacitance                             |   | ---  | 400   | ---  |       |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                   |   | ---  | 315   | ---  |       |

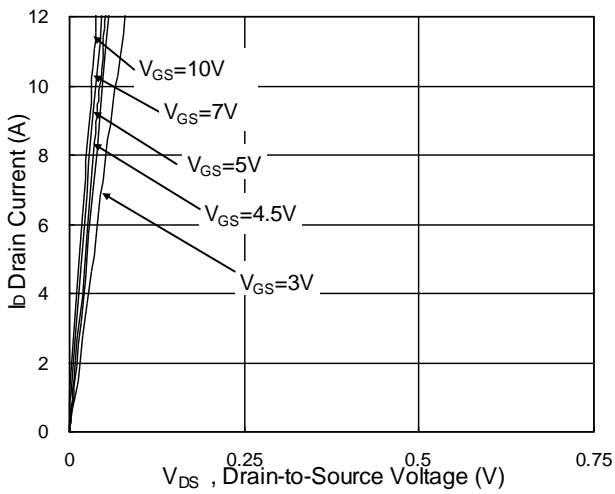
**Diode Characteristics**

| Symbol          | Parameter                                | Conditions  | Min. | Typ. | Max. | Unit |
|-----------------|--|---|------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current <sup>1,6</sup> | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current             | ---  | ---  | 110  | A    |
| I <sub>SM</sub> | Pulsed Source Current <sup>2,6</sup>     |   | ---  | ---  | 225  | A    |
| V <sub>SD</sub> | Diode Forward Voltage <sup>2</sup>       | V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C | ---  | ---  | 1.2  | V    |

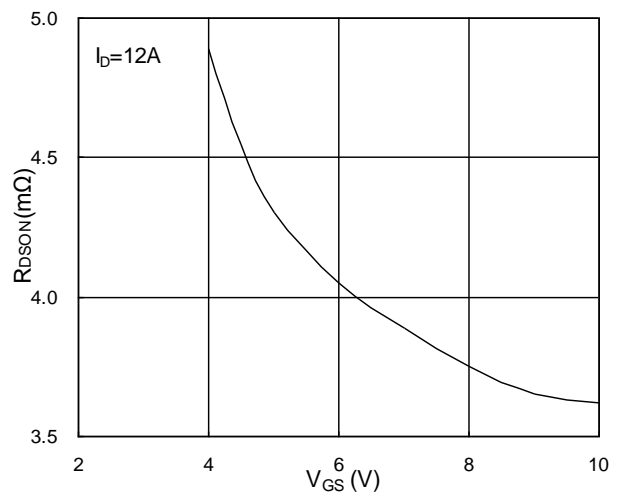
Note :

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper, t<sub>≤</sub>10sec.
- The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- The EAS data shows Max. rating. The test condition is V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.1mH, I<sub>AS</sub>=53.8A
- The power dissipation is limited by 150°C junction temperature
- The Min. value is 100% EAS tested guarantee.
- The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

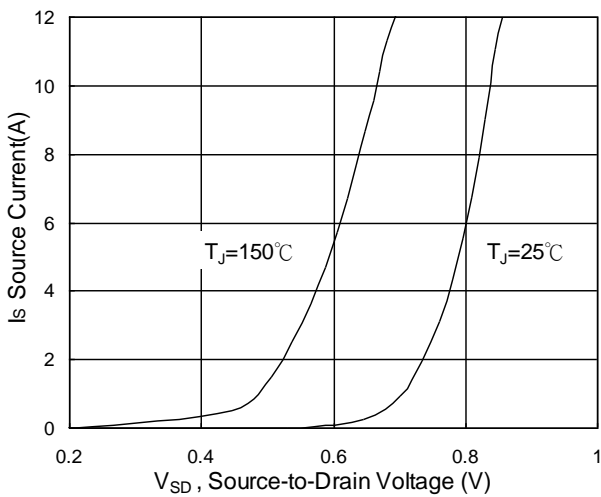
**Typical Characteristics**



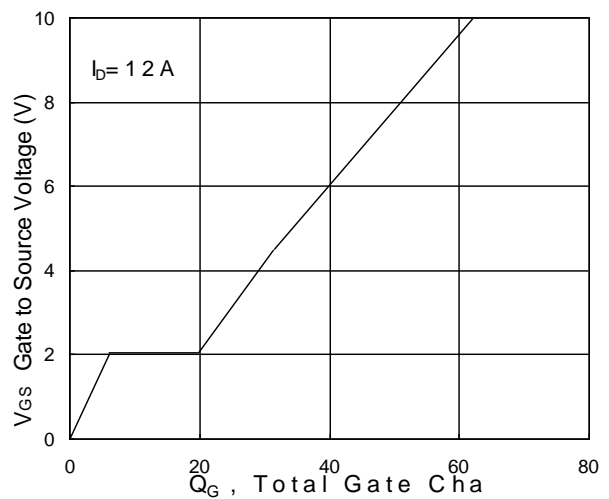
**Fig.1 Typical Output Characteristics**



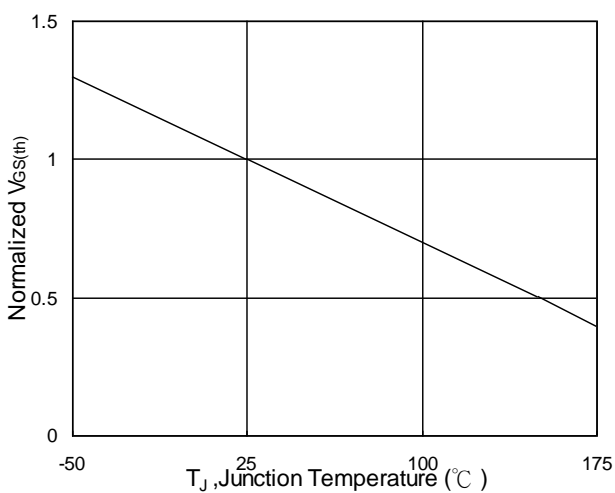
**Fig.2 On-Resistance vs. G-S Voltage**



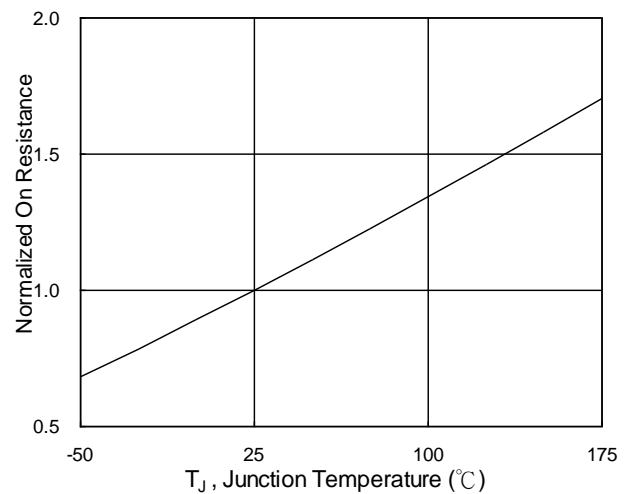
**Fig.3 Forward Characteristics of Reverse**



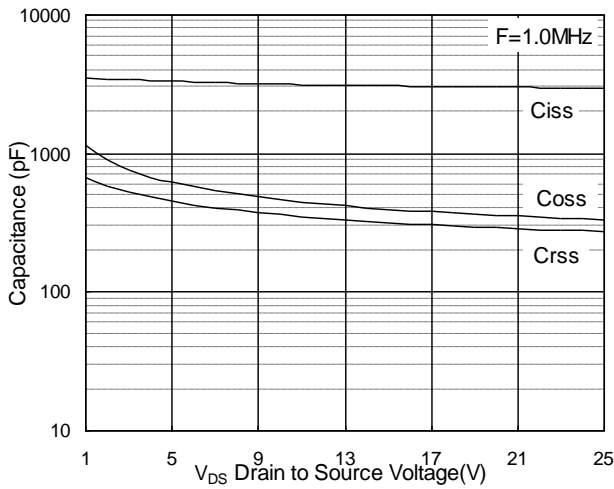
**Fig.4 Gate-Charge Characteristics**



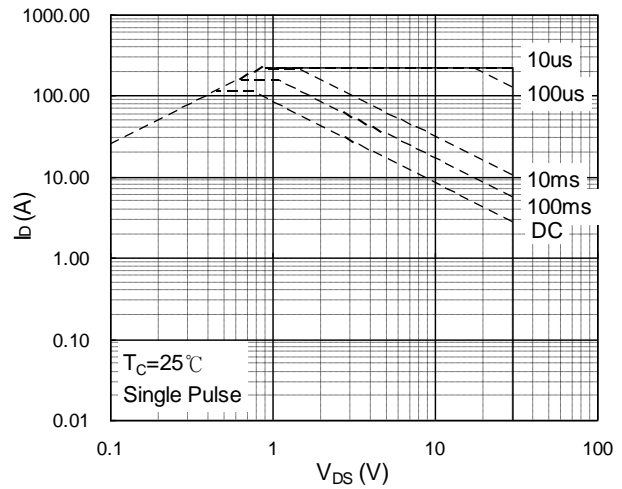
**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**



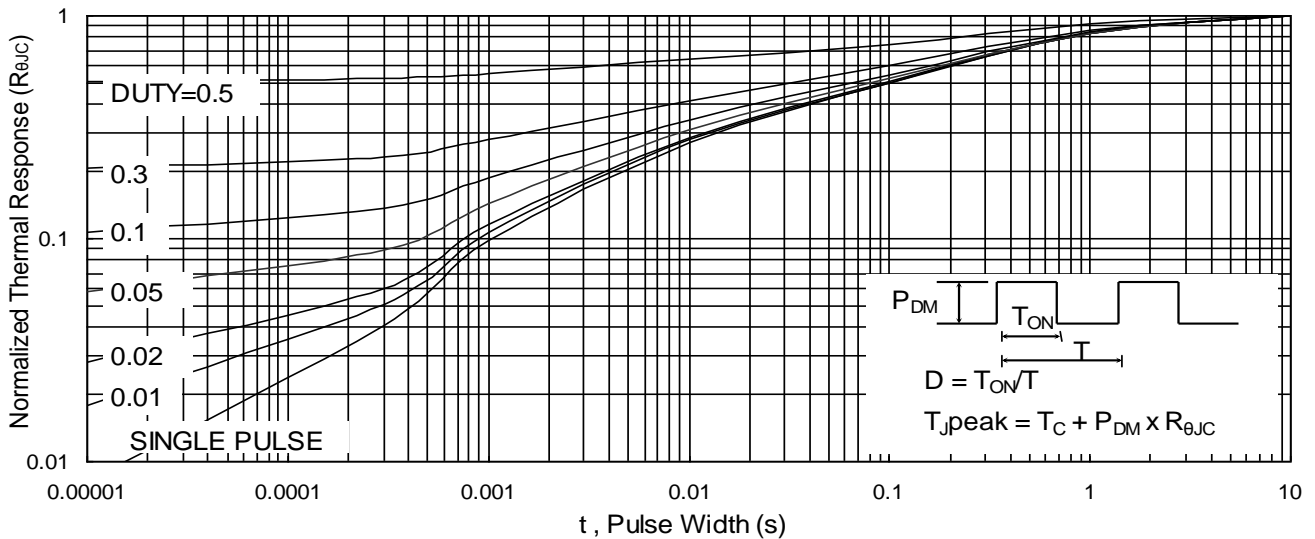
**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**



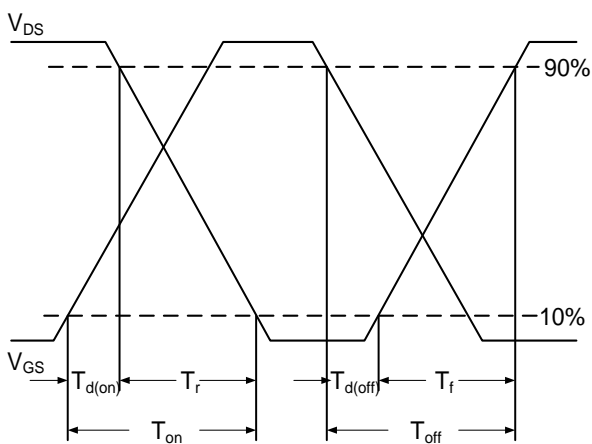
**Fig.7 Capacitance**



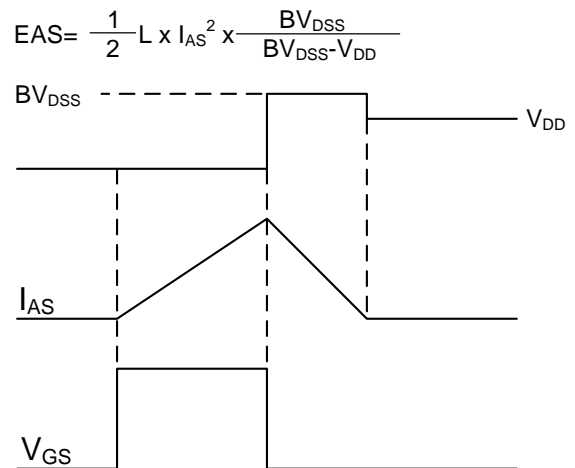
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**



**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**



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