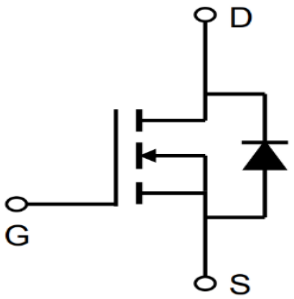
# WLP160N04

## 40V N-Channel Enhancement Mode MOSFET

## Description

These N-Channel enhancement mode power field effect transistors are using shielded gate trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance,provide superior switching performance, and with stand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.




### General Features

$V_{DS}$ = 40V $I_D$ =160 A

$R_{DS(ON)}$ < 3.0mΩ @ $V_{GS}$=10V

### Application

Battery protection

Load switch

Uninterruptible power supply

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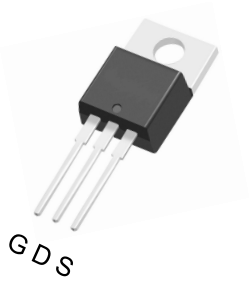


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### Absolute Maximum Ratings ($T_C$=25℃unless otherwise noted)

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 40 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1,6] | 160 | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1,6] | 142 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | 400 | A |
| EAS | Single Pulse Avalanche Energy[3] | 400 | mJ |
| $I_{AS}$ | Avalanche Current | 40 | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[4] | 178 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1] | 50 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | 0.7 | ℃/W |

## Electrical Characteristics ($T_J$=25℃, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| BVDSS | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | 40 | --- | --- | V |
| RDS(ON) | Static Drain-Source On-Resistance[2] | $V_{GS}$=10V , $I_D$=20A | --- | 1.9 | 3.0 | mΩ |
| | | $V_{GS}$=4.5V , $I_D$=20A | --- | 2.3 | 3.5 | |
| VGS(th) | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 1.2 | 1.6 | 2.2 | V |
| IDSS | Drain-Source Leakage Current | $V_{DS}$=32V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=32V , $V_{GS}$=0V , $T_J$=55℃ | | | 5 | |
| IGSS | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=5V , $I_D$=20A | --- | 53 | --- | S |
| $R_g$ | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 1.0 | --- | Ω |
| $Q_g$ | Total Gate Charge (4.5V) | $V_{DS}$=15V , $V_{GS}$=10V , $I_D$=20A | --- | 45 | --- | nC |
| Qgs | Gate-Source Charge | | --- | 12 | --- | |
| Qgd | Gate-Drain Charge | | --- | 18.5 | --- | |
| Td(on) | Turn-On Delay Time | $V_{DD}$=15V , $V_{GS}$=10V , $R_G$=3.3Ω, $I_D$=20A | --- | 18.5 | --- | ns |
| $T_r$ | Rise Time | | --- | 9 | --- | |
| Td(off) | Turn-Off Delay Time | | --- | 58.5 | --- | |
| $T_f$ | Fall Time | | --- | 32 | --- | |
| Ciss | Input Capacitance | $V_{DS}$=20V , $V_{GS}$=0V , f=1MHz | --- | 3972 | --- | pF |
| Coss | Output Capacitance | | --- | 1119 | --- | |
| Crss | Reverse Transfer Capacitance | | --- | 82 | --- | |
| $I_S$ | Continuous Source Current[1,6] | $V_G$=$V_D$=0V , Force Current | --- | --- | 150 | A |
| $V_{SD}$ | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | --- | --- | 1.2 | V |

**Note :**

1、The data tested by surface mounted on a 1 inch 2 FR-4 board with 2OZ copper.

2、The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3、The EAS data shows Max. rating . The test condition is V DD =25V,V GS =10V,L=0.5mH,I AS =40A

4、The power dissipation is limited by 150℃ junction temperature

5、The data is theoretically the same as I D and I DM , in real applications , should be limited by total power dissipation.

6、Package limitation current is 180A

## Typical Characteristics

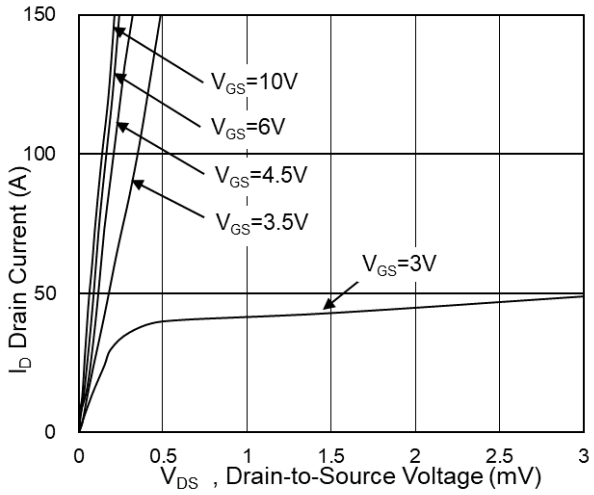


**Fig.1 Typical Output Characteristics**

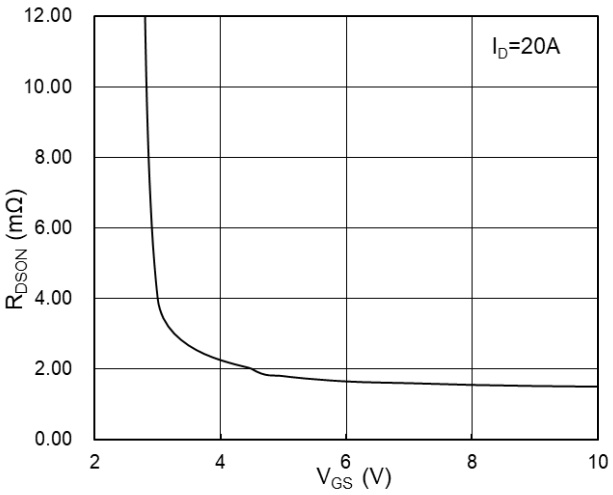


**Fig.2 On-Resistance vs G-S Voltage**

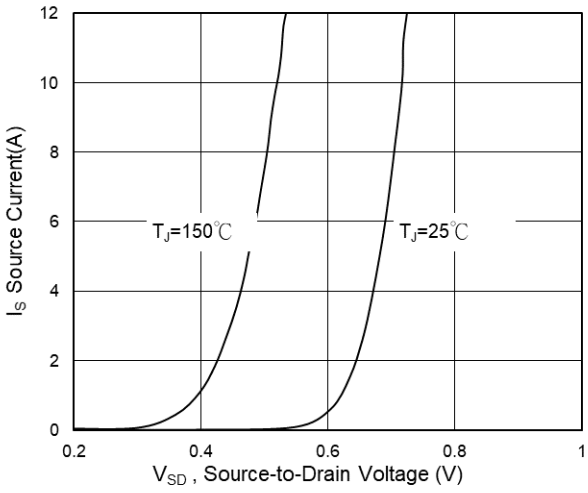


**Fig.3 Source Drain Forward Characteristics**

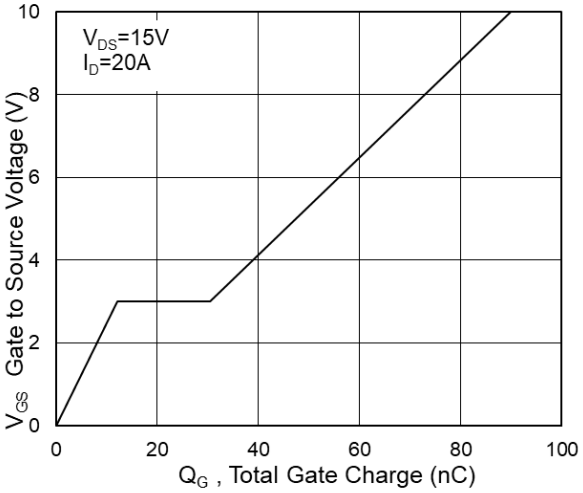


**Fig.4 Gate-Charge Characteristics**

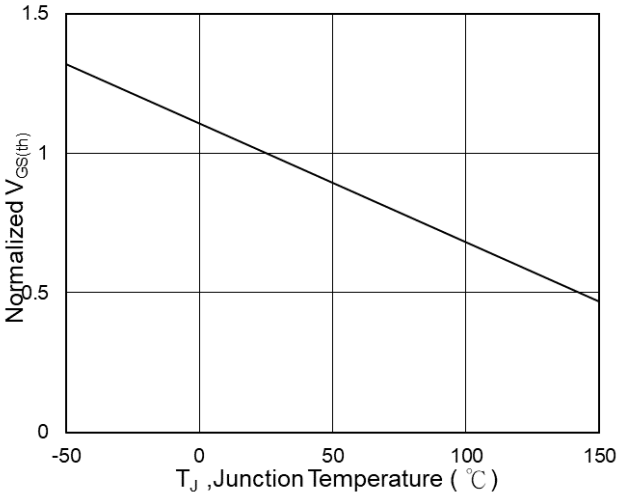


**Fig.5 Normalized $V_{GS(th)}$ vs $T_J$**

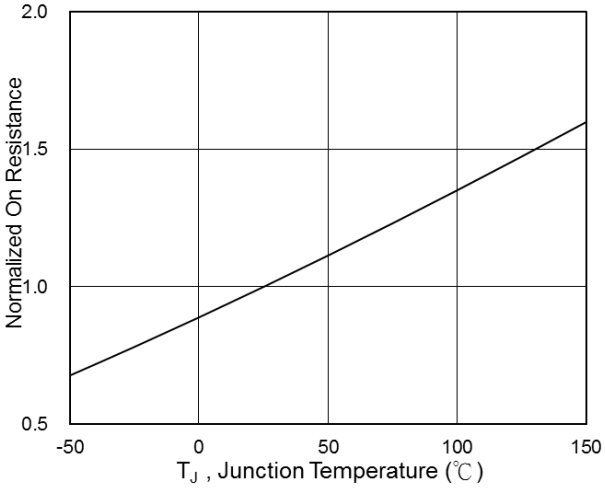


**Fig.6 Normalized $R_{DSON}$ vs $T_J$**

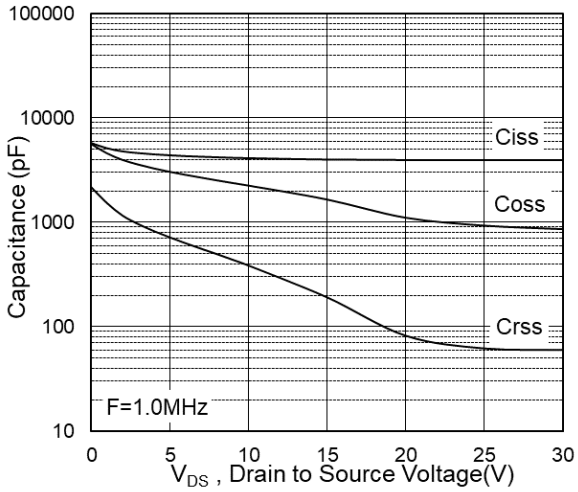


Fig.7 Capacitance

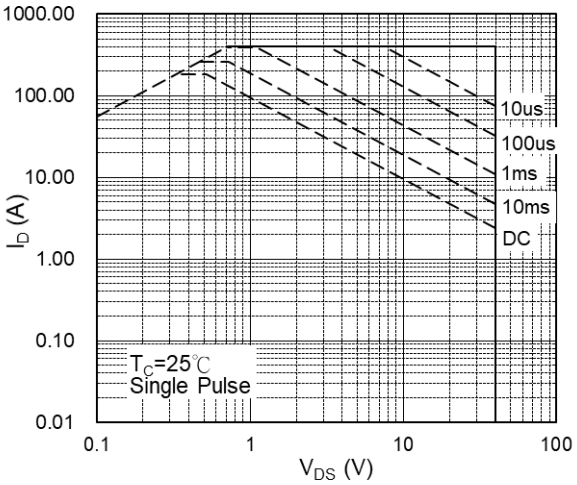


Fig.8 Safe Operating Area

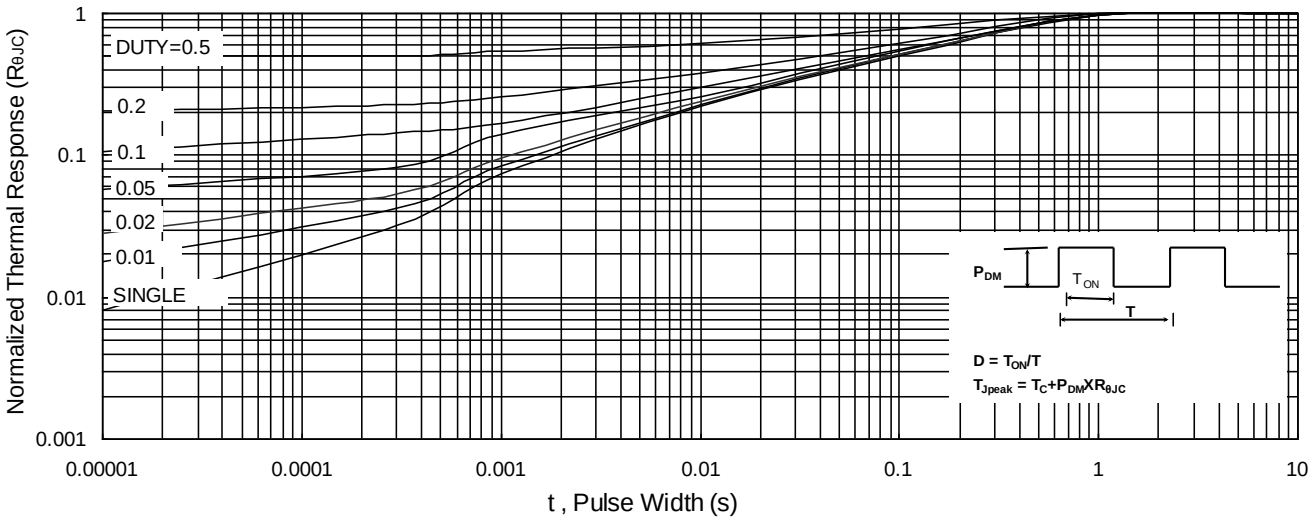


Fig.9 Normalized Maximum Transient Thermal Impedance

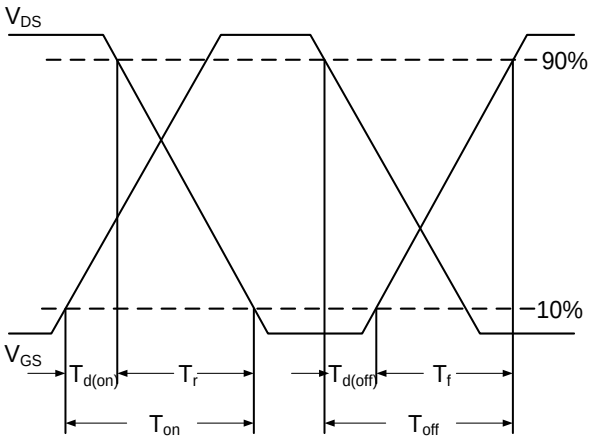


Fig.10 Switching Time Waveform

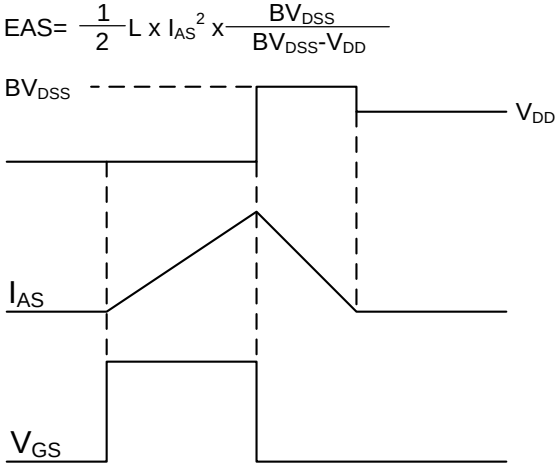


Fig.11 Unclamped Inductive Switching Waveform

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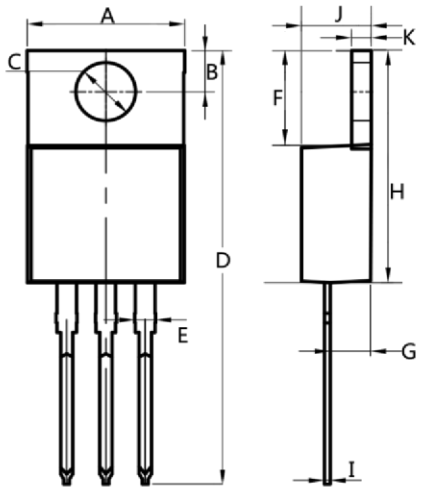


| Dim. | Min. | Max. |
|---|---|---|
| A | 10.0 | 10.4 |
| B | 2.5 | 3.0 |
| C | 3.5 | 4.0 |
| D | 28.0 | 30.0 |
| E | 1.1 | 1.5 |
| F | 6.2 | 6.6 |
| G | 2.9 | 3.3 |
| H | 15.0 | 16.0 |
| I | 0.35 | 0.45 |
| J | 4.3 | 4.7 |
| K | 1.2 | 1.4 |
| All Dimensions in millimeter | | |

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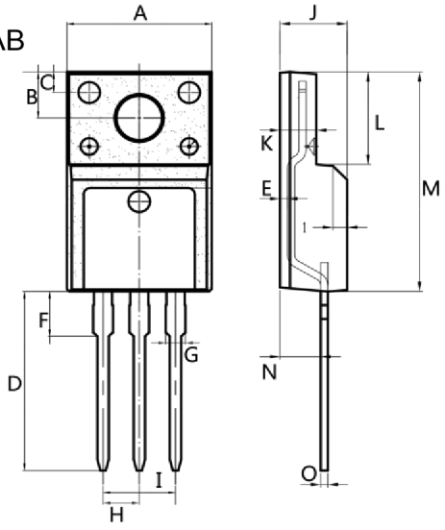


| Dim. | Min. | Max. |
|---|---|---|
| A | 9.9 | 10.3 |
| B | 2.9 | 3.5 |
| C | 1.15 | 1.45 |
| D | 12.75 | 13.25 |
| E | 0.55 | 0.75 |
| F | 3.1 | 3.5 |
| G | 1.25 | 1.45 |
| H | Typ 2.54 | |
| I | Typ 5.08 | |
| J | 4.55 | 4.75 |
| K | 2.4 | 2. 7 |
| L | 6.35 | 6.75 |
| M | 15.0 | 16.0 |
| N | 2.75 | 3.15 |
| O | 0.45 | 0.60 |
| All Dimensions in millimeter | | |

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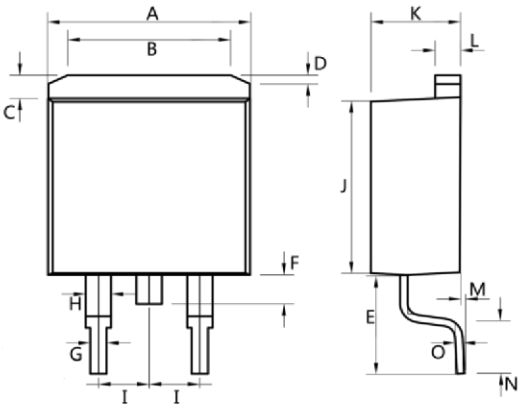


| Dim. | Min. | Max. |
|---|---|---|
| A | 10.0 | 10. 5 |
| B | 7.25 | 7.75 |
| C | 1.3 | 1.5 |
| D | 0.55 | 0.75 |
| E | 5.0 | 6.0 |
| F | 1.4 | 1.6 |
| G | 0.75 | 0.95 |
| H | 1.15 | 1.35 |
| I | Typ 2.54 | |
| J | 8.4 | 8.6 |
| K | 4.4 | 4.6 |
| L | 1.25 | 1.45 |
| M | 0.02 | 0.1 |
| N | 2.4 | 2.8 |
| O | 0.35 | 0.45 |
| All Dimensions in millimeter | | |

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