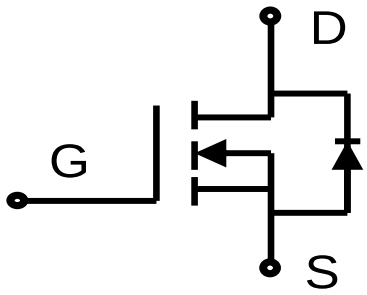
# WLP25N60EP

## N-Ch 500V 25A Power MOSFET

## Description

The Power MOSFET is fabricated using the advanced planar VDMOS technology. The resulting device has low conduction resistance, superior switching performance and high avalanche energy.




N-Channel MOSFET

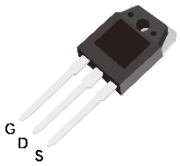
## Features

- Low $R_{DS(on)}$
- Low gate charge (typ. $Q_g$ = 77nC)
- 100% UIS tested
- RoHS compliant

## Pin Configuration

## Applications

- Power factor correction.
- Switched mode power supplies.




**TO-3P**

## Product Summary

| | |
|---|---|
| $V_{DSS}$ | 500V |
| $I_D$ | 25A |
| $R_{DS(on),max}$ | 0.2Ω |
| $Q_{g,typ}$ | 77nC |

## Absolute Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DSS}$ | 500 | V |
| Continuous drain current ( $T_C$ = 25°C ) | $I_D$ | 25 | A |
| ( $T_C$ = 100°C ) | | 18.6 | A |
| Pulsed drain current [1] | $I_{DM}$ | 100 | A |
| Gate-Source voltage | $V_{GSS}$ | ±30 | V |
| Avalanche energy, single pulse [2] | $E_{AS}$ | 1280 | mJ |
| Power Dissipation ( $T_C$ = 25°C ) | $P_D$ | 403 | W |
| Operating junction and storage temperature range | $T_J$, $T_{STG}$ | -55 to +150 | °C |
| Continuous diode forward current | $I_S$ | 25 | A |
| Diode pulse current | $I_{S,pulse}$ | 100 | A |

## Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal resistance, Junction-to-case | $R_{\theta JC}$ | 0.31 | °C/W |
| Thermal resistance, Junction-to-ambient [3] | $R_{\theta JA}$ | 58.18 | °C/W |
| Soldering temperature, wavesoldering only allowed at leads. (1.6mm from case for 10s) | $T_{sold}$ | 260 | °C |

## Package Marking and Ordering Information

| Device | Device Package | Marking | Units/Tube |
|---|---|---|---|
| WLP25N60EP | TO-3P | WLP25N60EP | 30 |

## Electrical Characteristics

$T_c$ = 25°C unless otherwise noted

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | |
| Drain-source breakdown voltage | $BV_{DSS}$ | $V_{GS}$=0 V, $I_D$=0.25 mA | 500 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=0.25 mA | 2 | - | 4 | V |
| Drain cut-off current | $I_{DSS}$ | $V_{DS}$=500 V, $V_{GS}$=0 V,<br>$T_j$ = 25°C<br>$T_j$ = 125°C | <br>-<br>- | <br>-<br>- | <br>1<br>100 | <br>μA |
| Gate leakage current, Forward | $I_{GSSF}$ | $V_{GS}$=20 V, $V_{DS}$=0 V | - | - | 100 | nA |
| Gate leakage current, Reverse | $I_{GSSR}$ | $V_{GS}$=-20 V, $V_{DS}$=0 V | - | - | -100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}$=10 V, $I_D$=12.5 A | - | 0.16 | 0.2 | Ω |
| **Dynamic characteristics** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{DS}$ = 500 V, $V_{GS}$ = 0 V, | - | 3901 | - | pF |
| Output capacitance | $C_{oss}$ | f = 250 kHz | - | 91 | - | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 10.6 | - | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$ = 250 V, $I_D$ = 29 A | - | 37.9 | - | ns |
| Rise time | $t_r$ | $R_G$ = 10 Ω, $V_{GS}$=10 V | - | 104.0 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 90.1 | - | |
| Fall time | $t_f$ | | - | 20.5 | - | |
| **Gate charge characteristics** | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=400 V, $I_D$=29 A, | - | 18.5 | - | nC |
| Gate to drain charge | $Q_{gd}$ | $V_{GS}$=0 to 10 V | - | 27.5 | - | |
| Gate charge total | $Q_g$ | | - | 77.8 | - | |
| Gate plateau voltage | $V_{plateau}$ | | - | 4.8 | - | V |
| **Reverse diode characteristics** | | | | | | |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0 V, $I_F$=25 A | - | - | 1.3 | V |
| Reverse recovery time | $t_{rr}$ | $V_R$=400 V, $I_F$=29 A, | - | 385.7 | - | ns |
| Reverse recovery charge | $Q_{rr}$ | $dI_F/dt$=100 A/μs | - | 5.6 | - | μC |
| Peak reverse recovery current | $I_{rrm}$ | | - | 22.9 | - | A |

Notes:

1. Pulse width limited by maximum junction temperature.
2. IAS=16A, L=10mH, VDD=60V, Starting Tj= 25°C.
3. The value of $R_{thJA}$ is measured by placing the device in a still air box which is one cubic foot.

## Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

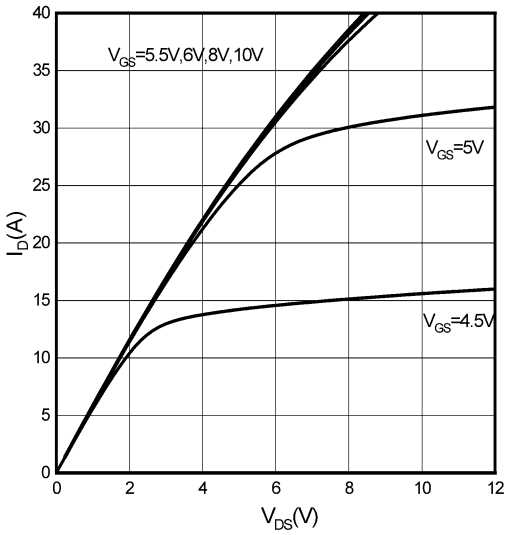



Figure 2. Transfer Characteristics

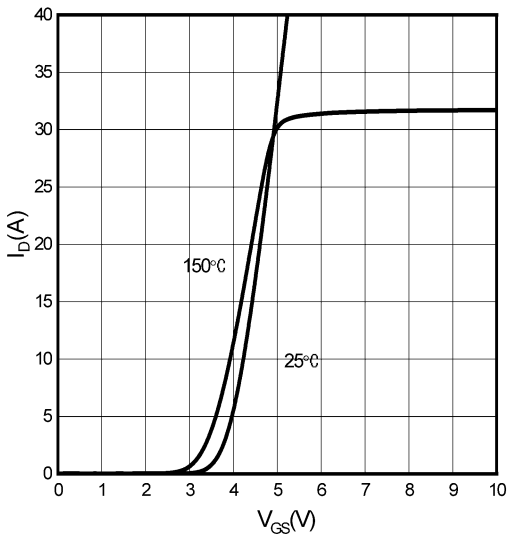



Figure 3. On-Resistance vs. Drain Current

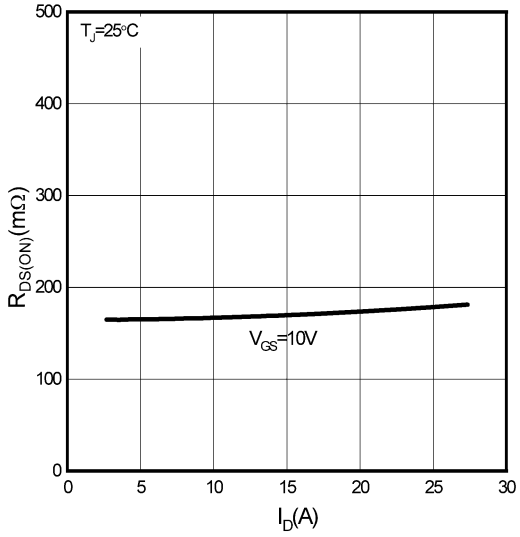



Figure 4.On-Resistance vs.Temperature

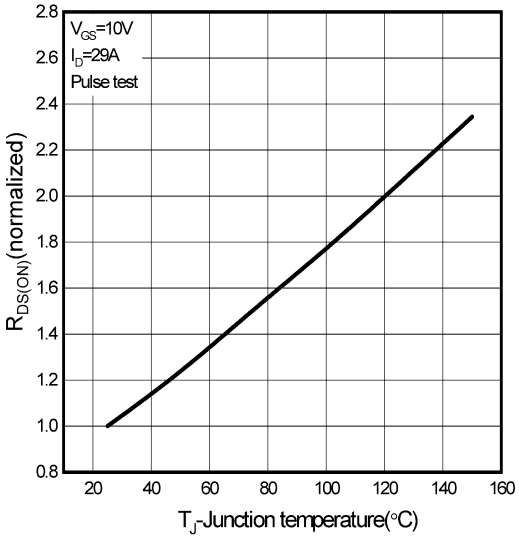



Figure 5.Breakdown Voltage vs.Temperature

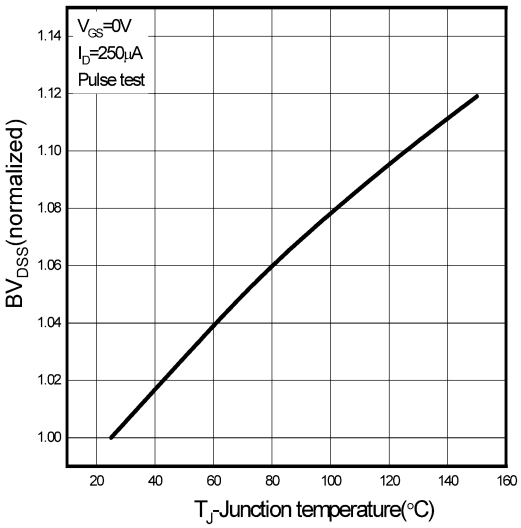



Figure 6.Threshold Voltage vs.Temperature

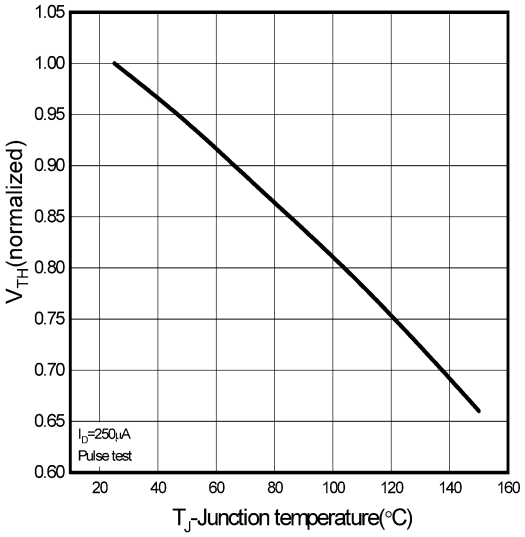


Figure 7.Rds(on) vs. Gate Voltage

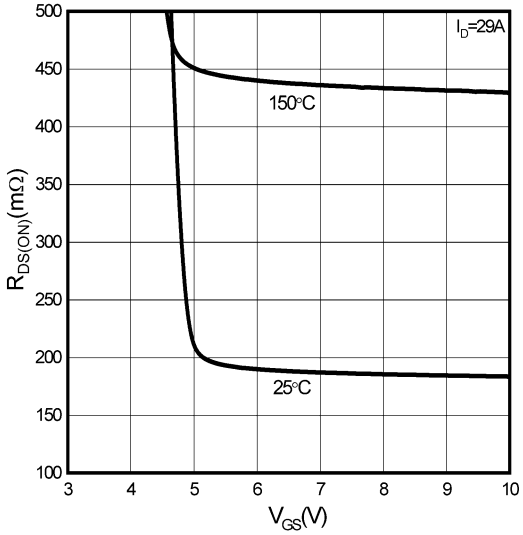



Figure 8.Body-Diode Characteristics

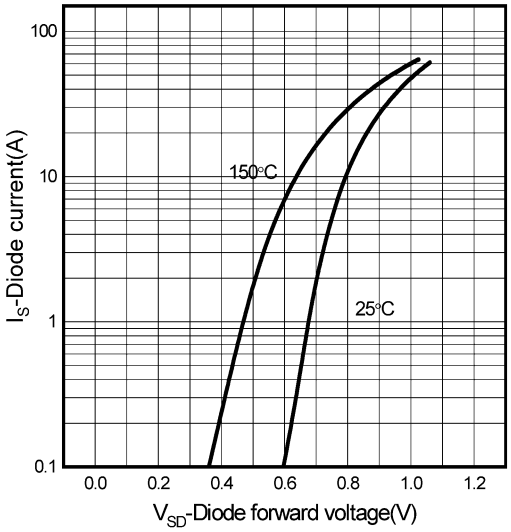



Figure 9.Capacitance Characteristics

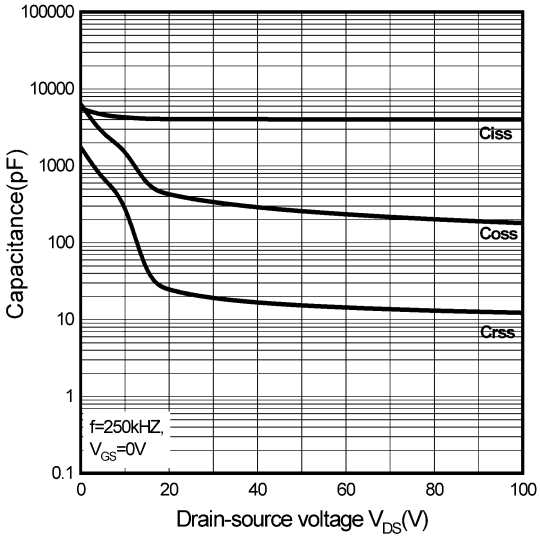



Figure 10.Gate Charge Characteristics

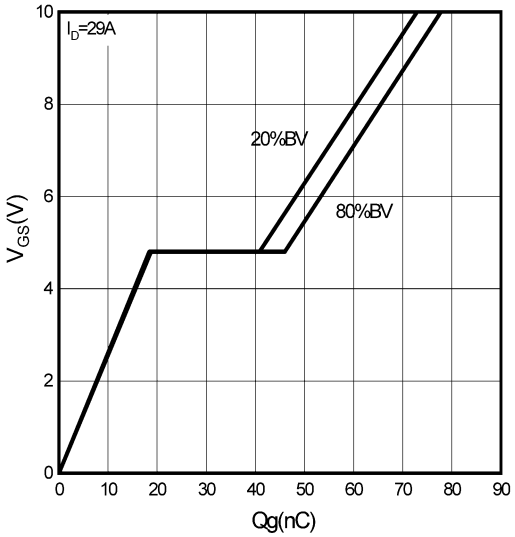



Figure 11.Drain Current Derating

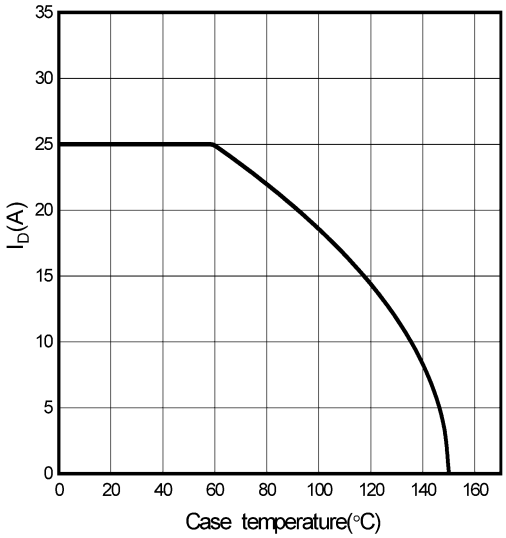



Figure 12.Power Dissipation vs.Temperature

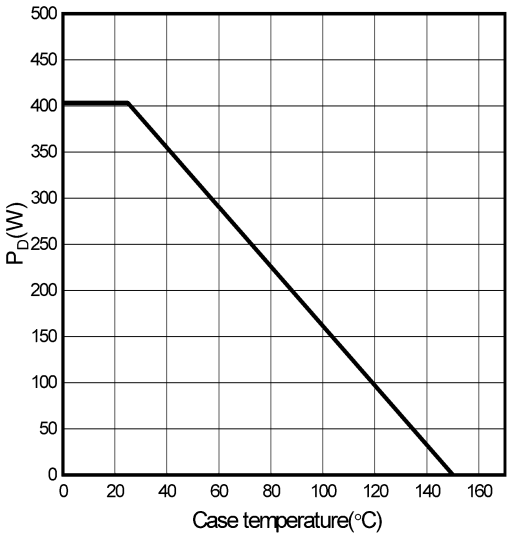


Figure 13. Safe Operating Area

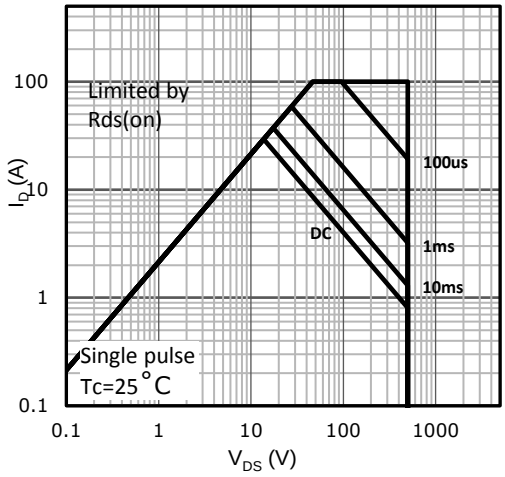
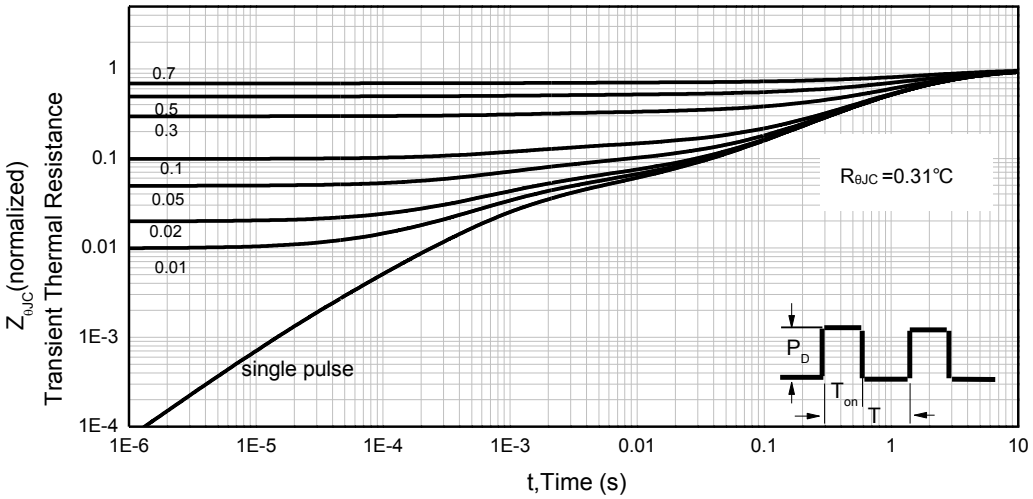
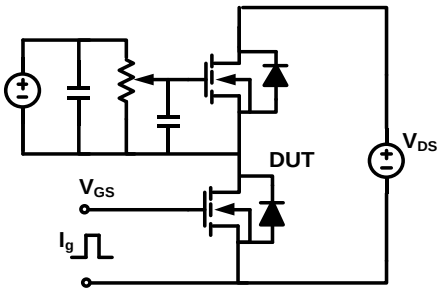


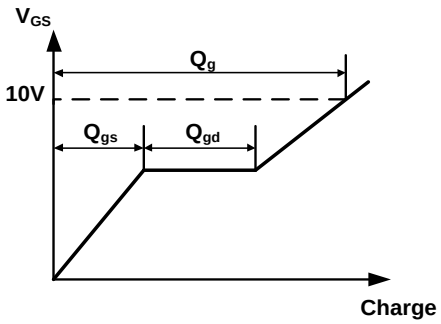

Figure 14. Normalized Maximum Transient Thermal Impedance (RthJC)



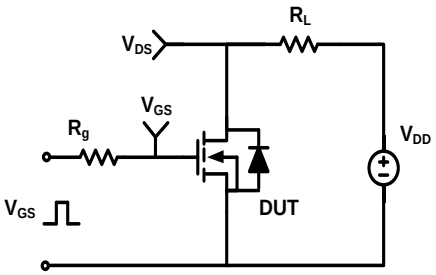
## Test Circuit & Waveforms

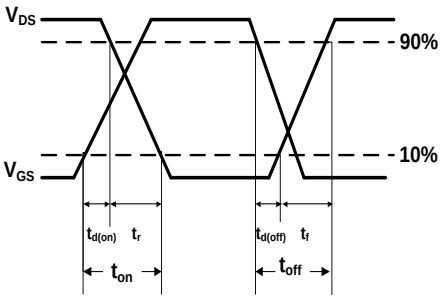
### Gate Charge Test Circuit & Waveform



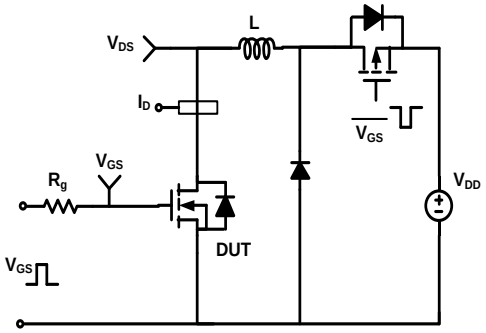



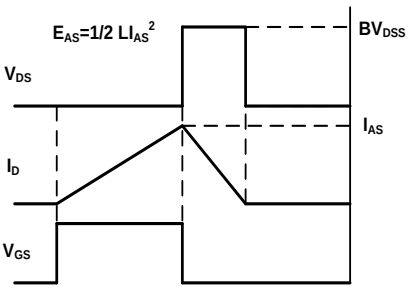

### Resistive Switching Test Circuit & Waveform



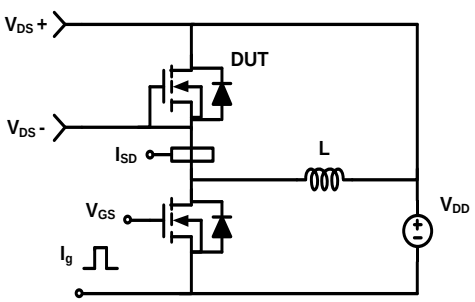



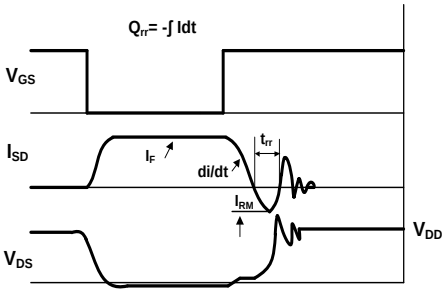

### Unclamped Inductive Switching (UIS) Test Circuit & Waveform




### Diode Recovery Test Circuit & Waveform



## Mechanical Dimensions for TO-3P