# LSU05N65A

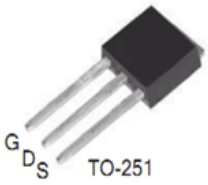
## N-Channel MOSFET

**Lead Free Package and Finish**

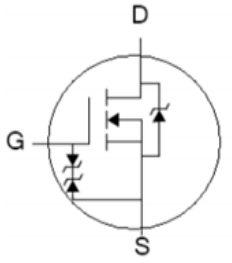
### Applications:
- Adaptor
- Charger
- SMPS

| $V_{DSS}$ | $R_{DS(ON)}$(Typ.) | $I_D$ |
|---|---|---|
| 650V | 2.3Ω | 5A |

### Features:
- RoHS Compliant
- Low ON Resistance
- Low Gate Charge
- Peak Current vs Pulse Width Curve
- Inductive Switching Curves




Packages
Not to Scale




### Ordering Information

| PART NUMBER | PACKAGE | BRAND |
|---|---|---|
| LSU05N65A | TO-251 | ***IPS*** |

### Absolute Maximum Ratings

$T_C$=25℃ unless otherwise specified

| Symbol | Parameter | LSU05N65A | Units |
|---|---|---|---|
| $V_{DSS}$ | Drain-to-Source Voltage | 650 | V |
| $I_D$ | Continuous Drain Current | 5 | A |
| $I_{DM}$ | Pulsed Drain Current, $V_{GS}$@10V (NOTE *2) | 20 | A |
| $P_D$ | Power Dissipation | 70 | W |
| | Derating Factor above 25℃ | 0.56 | W/℃ |
| $V_{GS}$ | Gate-to-Source Voltage | ±20 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy(L=10mH) | 150 | mJ |
| $E_{AR}$ | Avalanche Energy ,Repetitive | 30 | mJ |
| $I_{AR}$ | Avalanche Current | 2.5 | A |
| VESD(G-S) | Gate to Source ESD(HBM-C=100pF,R=1.5KΩ) | 3000 | V |
| $T_L$ | Maximum Temperature for Soldering | 300 | ℃ |
| $T_J$ and $T_{STG}$ | Operating Junction and Storage Temperature Range (NOTE *1) | -55 to150 | |

### Thermal Resistance

| Symbol | Parameter | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|
| $R_{\theta JC}$ | Junction-to-Case | | 1.78 | ℃/W | Water cooled heatsink, $P_D$ adjusted for a peak junction temperature of +150℃. |
| $R_{\theta JA}$ | Junction-to-Ambient | | 62.5 | | 1 cubic foot chamber, free air. |

**OFF Characteristics** $T_C$=25℃ unless otherwise specified

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain-to-Source Breakdown Voltage | 650 | -- | -- | V℃ | $V_{GS}$=0V, $I_D$=250μA |
| $I_{DSS}$ | Drain-to-Source Leakage Current | -- | -- | 1 | μA | $V_{DS}$=650V, $V_{GS}$=0V $T_J$=25℃ |
| | | -- | -- | 100 | | $V_{DS}$=520V, $V_{GS}$=0V $T_J$=125℃ |
| $I_{GSS}$ | Gate-to-Source Forward Leakage | -- | -- | +10 | uA | $V_{GS}$=+20V |
| | Gate-to-Source Reverse Leakage | -- | -- | -10 | | $V_{GS}$= -20V |

**ON Characteristics** $T_J$=25℃ unless otherwise specified

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $R_{DS(ON)}$ | StaticDrain-to-Source On-Resistance(NOTE *3) | -- | 2.3 | 2.8 | Ω | $V_{GS}$=10V, $I_D$=2.5A |
| $V_{GS(TH)}$ | Gate Threshold Voltage | 2 | -- | 4 | V | $V_{DS}$=$V_{GS}$,$I_D$=250μA |
| $g_{fs}$ | Forward Transconductance(NOTE *3) | -- | 3.5 | -- | S | $V_{DS}$=15V, $I_D$=2.5A |

**Dynamic Characteristics** Essentially independent of operating temperature

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $C_{iss}$ | Input Capacitance | -- | 560 | -- | pF | $V_{GS}$= 0V,$V_{DS}$ = 25V f =1.0MHz |
| $C_{oss}$ | Output Capacitance | -- | 50 | -- | | |
| $C_{rss}$ | Reverse Transfer Capacitance | -- | 2.2 | -- | | |
| $Q_g$ | Total Gate Charge | -- | 13 | -- | nC | $I_D$=5A,$V_{DD}$=520V $V_{GS}$ = 10V |
| $Q_{gs}$ | Gate-to-Source Charge | -- | 2.7 | -- | | |
| $Q_{gd}$ | Gate-to-Drain (“Miller”) Charge | -- | 5.5 | -- | | |

**Resistive Switching Characteristics** Essentially independent of operating temperature

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $t_{d(ON)}$ | Turn-on Delay Time | -- | 14 | | ns | $V_{DD}$=325V, $I_D$=5A, $V_G$=10V $R_G$=10Ω |
| $t_{rise}$ | Rise Time | -- | 22 | | | |
| $t_{d(OFF)}$ | Turn-Off Delay Time | -- | 29 | | | |
| $t_{fall}$ | Fall Time | -- | 15 | | | |

**Source-Drain Diode Characteristics** Tc=25℃ unless otherwise specified

| Symbol | Parameter | Min. | Typ. | Max. | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current (Body Diode) | -- | -- | 5 | A | $T_C$=25℃ |
| $I_{SM}$ | Maximum Pulsed Current (Body Diode) | -- | -- | 20 | A | |
| $V_{SD}$ | Diode Forward Voltage | -- | -- | 1.5 | V | $I_{SD}$=5A, $V_{GS}$=0V |
| $t_{rr}$ | Reverse Recovery Time | -- | 250 | -- | ns | $I_F$= $I_S$ di/dt=100A/us |
| $Q_{rr}$ | Reverse Recovery Charge | -- | 1200 | -- | nC | |

Notes:

*1. $T_J$ = +25℃ to +150℃.

*2. Repetitive rating; pulse width limited by maximum junction temperature.

*3. Pulse width < 380μs; duty cycle < 2%.

Test Circuits and Waveforms

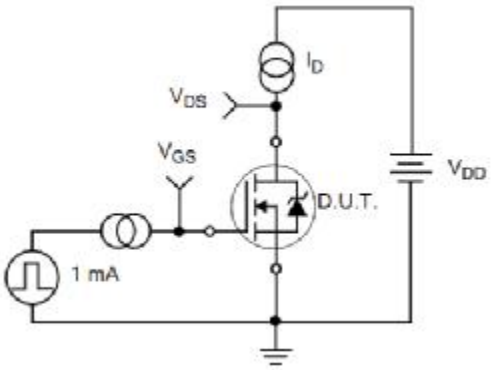



Figure 1. Gate Charge Test Circuit

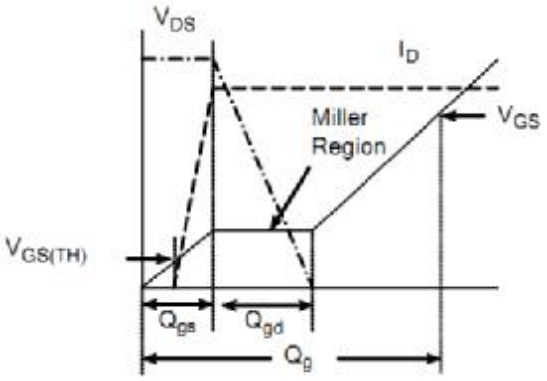



Figure 2. Gate Charge Waveforms

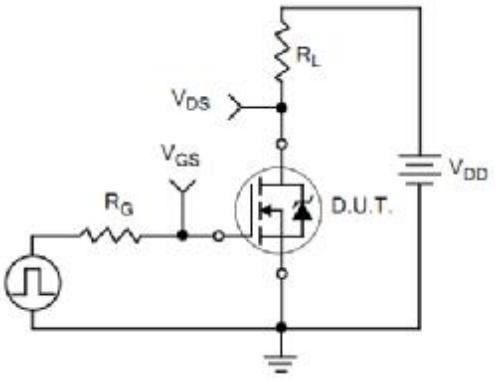



Figure 3. Resistive Switching Test Circuit

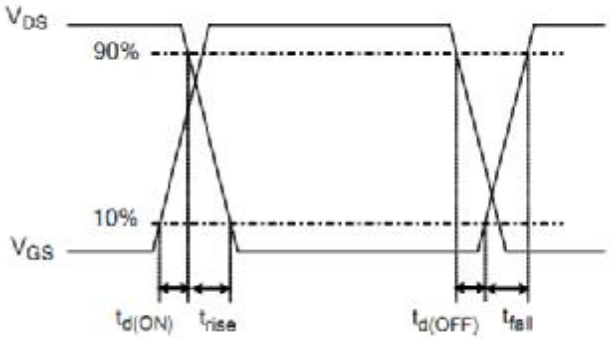



Figure 4. Resistive Switching Waveforms

Test Circuits and Waveforms

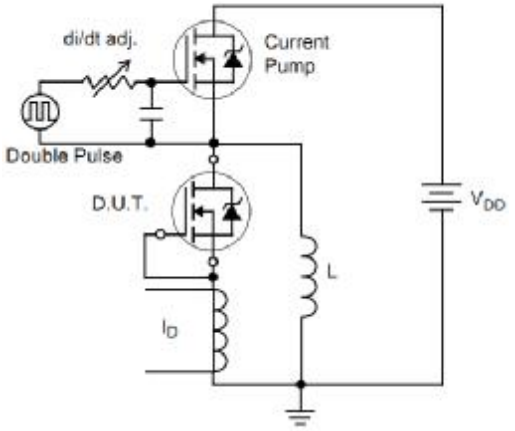



Figure 5. Diode Reverse Recovery Test Circuit

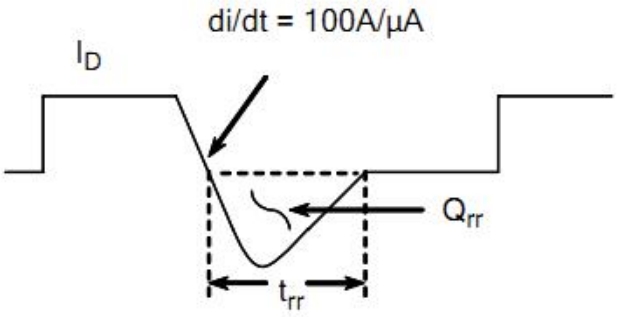



Figure 6. Diode Reverse Recovery Waveform

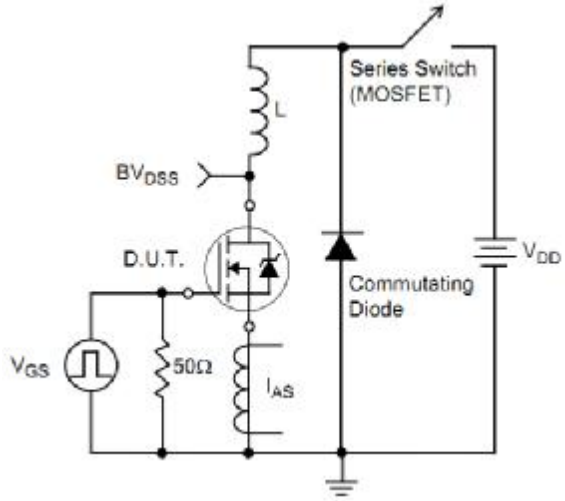
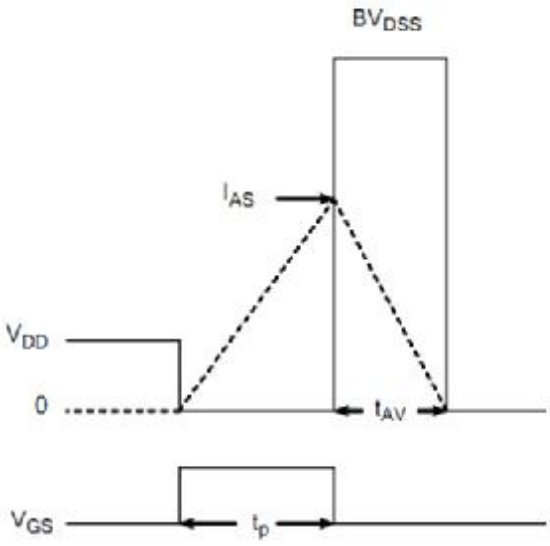



Figure7. Unclamped Inductive Switching Test Circuit




$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

Figure 8. Unclamped Inductive Switching Waveform

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