

Complementary Enhancement Mode MOSFET

1. Product Information

1.1 Features

- Surface-mounted package
- Advanced trench cell design

1.2 Applications

- MB and NB
- Motor drivers
- Half – bridge Drivers

1.3 Quick reference

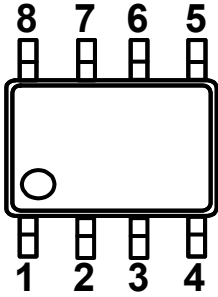
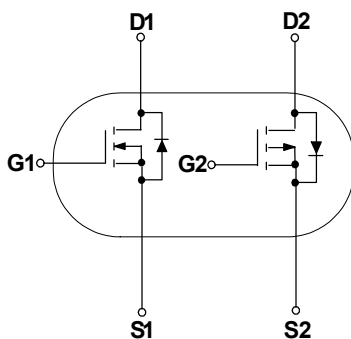
N-channel

- $BV \leq 60\text{ V}$
- $P_{tot} \leq 2\text{ W}$
- $I_D \leq 5.9\text{ A}$
- $R_{DS(ON)} \leq 38\text{ m}\Omega @ V_{GS} = 10\text{ V}$
- $R_{DS(ON)} \leq 50\text{ m}\Omega @ V_{GS} = 4.5\text{ V}$

P-channel

- $BV \leq -60\text{ V}$
- $P_{tot} \leq 2\text{ W}$
- $I_D \leq -4.4\text{ A}$
- $R_{DS(ON)} \leq 67\text{ m}\Omega @ V_{GS} = -10\text{ V}$
- $R_{DS(ON)} \leq 88\text{ m}\Omega @ V_{GS} = -4.5\text{ V}$

2. Pin Description

| Pin | Description | Simplified Outline | Symbol |
|-----|-------------|---|---|
| 1 | Source(S1) |  Top View SOP-8L |  |
| 2 | Gate(G1) | | |
| 3 | Source(S2) | | |
| 4 | Gate(G2) | | |
| 5,6 | Drain(D2) | | |
| 7,8 | Drain(D1) | | |

3. Limiting Values

| Symbol | Parameter | Conditions | Min | Max | Unit |
|--------------------|---|---|------|--------|--------|
| N-channel | | | | | |
| V _{DS} | Drain-Source Voltage | T _A = 25 °C | - | 60 | V |
| V _{GS} | Gate-Source Voltage | T _A = 25 °C | - | ± 20 | V |
| I _D * | Drain Current | T _A = 25 °C, V _{GS} = -10 V | - | 5.9 | A |
| | | T _A = 100 °C, V _{GS} = -10 V | - | 3.7 | A |
| I _{DM} ** | Pulsed Drain Current | T _A = 25 °C, V _{GS} = -10 V | - | 23.6 | A |
| P-channel | | | | | |
| V _{DS} | Drain-Source Voltage | T _A = 25 °C | - | - 60 | V |
| V _{GS} | Gate-Source Voltage | T _A = 25 °C | - | ± 20 | V |
| I _D * | Drain Current | T _A = 25 °C, V _{GS} = - 10 V | - | - 4.4 | A |
| | | T _A = 100 °C, V _{GS} = - 10 V | - | - 2.8 | A |
| I _{DM} ** | Pulsed Drain Current | T _A = 25 °C, V _{GS} = - 10 V | - | - 17.6 | A |
| P _{tot} | Total Power Dissipation | T _A = 25 °C | - | 2 | W |
| T _{stg} | Storage Temperature | | - 55 | 150 | °C |
| T _J | Junction Temperature | | - 55 | 150 | °C |
| R _{θJA} * | Thermal Resistance- Junction to Ambient | | - | 62.5 | °C / W |

Notes :

* Surface Mounted on 1 in² pad area, t ≤ 10 sec

** Pulse width ≤ 10 μs, duty cycle ≤ 1 %

4. Marking Information

| Product Name | Marking |
|--------------|---|
| KJ4716S | <div style="display: inline-block; background-color: black; color: white; padding: 2px;">4716</div> <div style="display: inline-block; background-color: black; color: white; padding: 2px;">YWWXXX</div> YWWXXX: Date Code |

5. Ordering Code

| Product Name | Package | Reel Size | Tape width | Quantity | Note |
|--------------|---------|-----------|------------|----------|------|
| KJ4716S | SOP8 | | | 3000 | |

Note: KUAJIEXIN defines “ Green ” as lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900 ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500 ppm by weight; Follow IEC 61249-2-21 and IPC / JEDEC J-STD-020C)

6. Electrical Characteristics ($T_A = 25\text{ }^\circ\text{C}$ Unless Otherwise Noted)

N-channel:

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--|----------------------------------|---|-----|------|-----------|---------------|
| Static Characteristics | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 60 | - | - | V |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_{DS} = 250\text{ }\mu\text{A}$ | 1 | - | 2.5 | V |
| I_{DSS} | Zero Gate Voltage Source Current | $V_{DS} = 48\text{ V}, V_{GS} = 0\text{ V}$ | - | - | 1 | μA |
| | | $T_J = 85\text{ }^\circ\text{C}$ | - | - | 30 | μA |
| I_{GSS} | Gate Leakage Current | $V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$ | - | - | ± 100 | nA |
| $R_{DS(on)}^a$ | Drain-Source On-State Resistance | $V_{GS} = 10\text{ V}, I_D = 4\text{ A}$ | - | 30 | 38 | m Ω |
| | | $V_{GS} = 4.5\text{ V}, I_D = 3\text{ A}$ | - | 38 | 50 | |
| Diode Characteristics | | | | | | |
| V_{SD}^a | Diode Forward Voltage | $I_{SD} = 1\text{ A}, V_{GS} = 0\text{ V}$ | - | 0.8 | 1.2 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 4\text{ A}, di_{SD}/dt = 100\text{ A}/\mu\text{s}$ | - | 37 | - | ns |
| Q_{rr} | Reverse Recovery Charge | | - | 3.8 | - | nC |
| Dynamic Characteristics^b | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}$ Frequency = 1 MHz | - | 1042 | - | pF |
| C_{oss} | Output Capacitance | | - | 48.6 | - | |
| C_{rss} | Reverse Transfer Capacitance | | - | 38 | - | |
| $t_d(on)$ | Turn-on Delay Time | $V_{DS} = 30\text{ V}, V_{GEN} = 10\text{ V},$ $R_G = 6\text{ }\Omega, R_L = 7.5\text{ }\Omega,$ $I_D = 4\text{ A}$ | - | 4.8 | - | ns |
| t_r | Turn-on Rise Time | | - | 18.5 | - | |
| $t_d(off)$ | Turn-off Delay Time | | - | 14.5 | - | |
| t_f | Turn-off Fall Time | | - | 18 | - | |
| Gate Charge Characteristics^b | | | | | | |
| Q_g | Total Gate Charge | $V_{DS} = 30\text{ V}, V_{GS} = 10\text{ V},$ $I_{DS} = 4\text{ A}$ | - | 19 | - | nC |
| Q_{gs} | Gate-Source Charge | | - | 4.2 | - | |
| Q_{gd} | Gate-Drain Charge | | - | 2.6 | - | |

Notes :

 a : Pulse test ; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$

b : Guaranteed by design, not subject to production testing

7. Electrical Characteristics ($T_A=25\text{ }^\circ\text{C}$ Unless Otherwise Noted)

P-channel:

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--|--------------------------------|--|------|------|-----------|---------------|
| Static Characteristics | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $V_{GS} = 0\text{ V}$, $I_{DS} = -250\text{ }\mu\text{A}$ | -60 | - | - | V |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$, $I_{DS} = -250\text{ }\mu\text{A}$ | -1 | - | -2.5 | V |
| I_{DSS} | Drain Leakage Current | $V_{DS} = -48\text{ V}$, $V_{GS} = 0\text{ V}$ | - | - | -1.0 | μA |
| I_{GSS} | Gate Leakage Current | $V_{GS} = 0\text{ V}$, $V_{GS} = \pm 20\text{ V}$ | - | - | ± 100 | nA |
| $R_{DS(on)}^a$ | On-State Resistance | $V_{GS} = -10\text{ V}$, $I_{DS} = -3\text{ A}$ | - | 53 | 67 | m Ω |
| | | $V_{GS} = -4.5\text{ V}$, $I_{DS} = -2\text{ A}$ | - | 67 | 88 | |
| Diode Characteristics | | | | | | |
| V_{SD}^a | Diode Forward Voltage | $I_{SD} = -1\text{ A}$, $V_{GS} = 0\text{ V}$ | - | -0.8 | -1.2 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = -3\text{ A}$, $dI_{SD}/dt = 100\text{ A}/\mu\text{s}$ | - | 32 | - | ns |
| Q_{rr} | Reverse Recovery Charge | | - | 8.5 | - | nC |
| Dynamic Characteristics^b | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS} = 0\text{ V}$, $V_{DS} = -25\text{ V}$ Frequency = 1 MHz | - | 1325 | - | pF |
| C_{oss} | Output Capacitance | | - | 75 | - | |
| C_{rss} | Reverse Transfer Capacitance | | - | 58 | - | |
| $t_d(on)$ | Turn-on Delay Time | $V_{DS} = -30\text{ V}$, $V_{GEN} = -10\text{ V}$, $R_G = 3.3\text{ }\Omega$, $R_L = 10\text{ }\Omega$, $I_{DS} = -3\text{ A}$ | - | 8.6 | - | ns |
| t_r | Turn-on Rise Time | | - | 30 | - | |
| $t_d(off)$ | Turn-off Delay Time | | - | 253 | - | |
| t_f | Turn-off Fall Time | | - | 104 | - | |
| Gate Charge Characteristics^b | | | | | | |
| Q_g | Total Gate Charge | $V_{DS} = -30\text{ V}$, $V_{GS} = -10\text{ V}$, $I_{DS} = -3\text{ A}$ | - | 25 | - | nC |
| Q_{gs} | Gate-Source Charge | | - | 5.8 | - | |
| Q_{gd} | Gate-Drain Charge | | - | 3.1 | - | |

Notes :

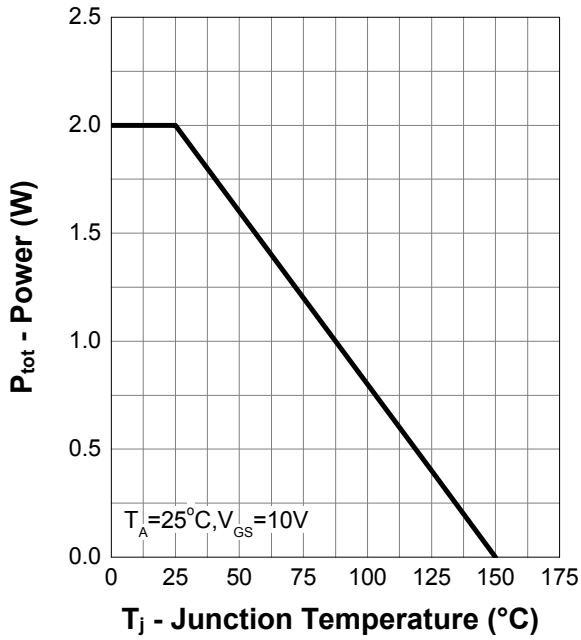
 a : Pulse test ; pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$

b : Guaranteed by design, not subject to production testing

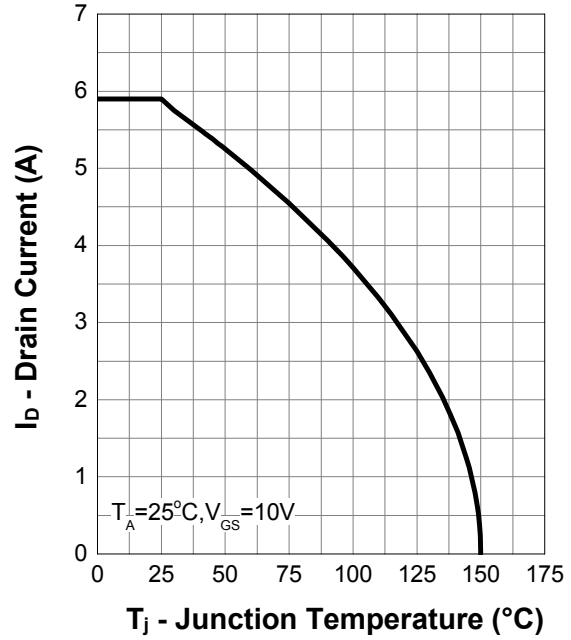
8. Typical Characteristics (Cont.)

N-channel:

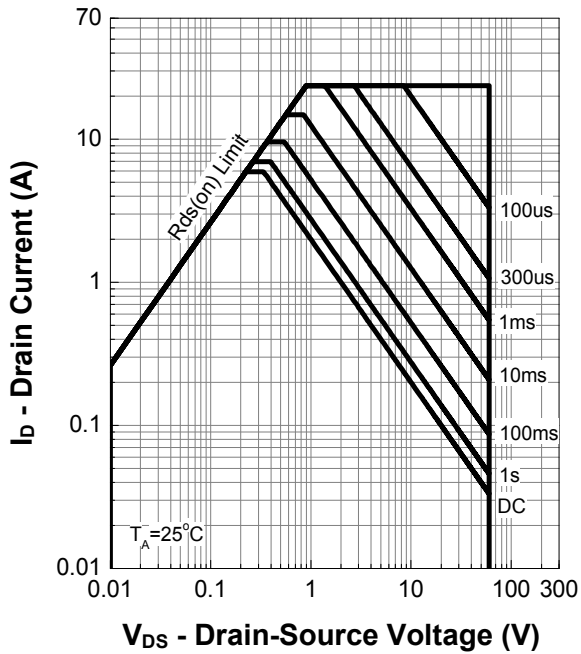
Power Capability



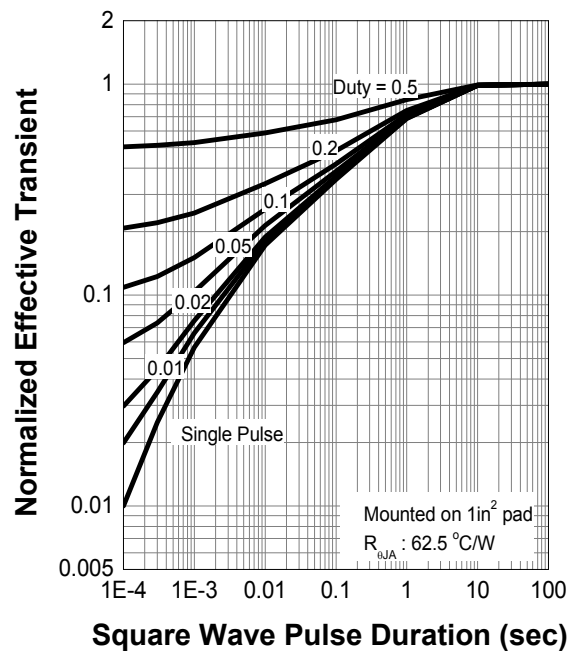
Current Capability



Safe Operation Area



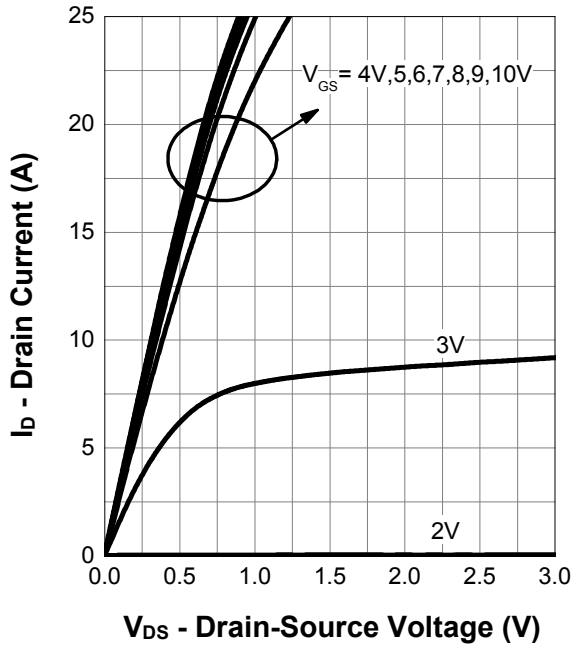
Transient Thermal Impedance



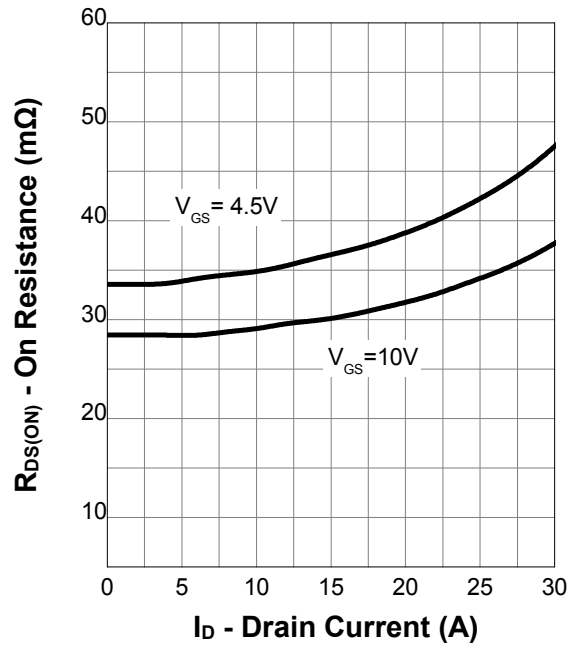
8. Typical Characteristics (Cont.)

N-channel:

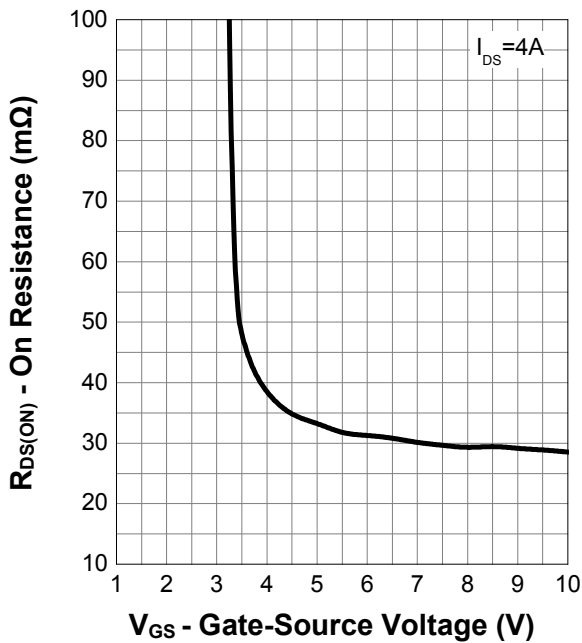
Output Characteristics



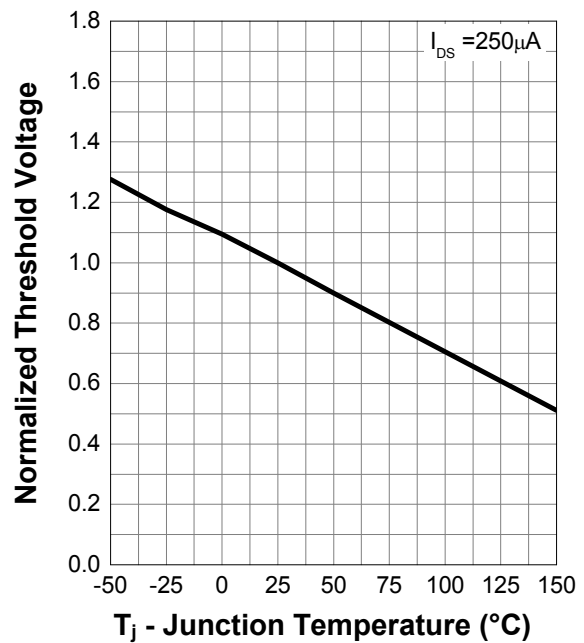
On Resistance



Transfer Characteristics



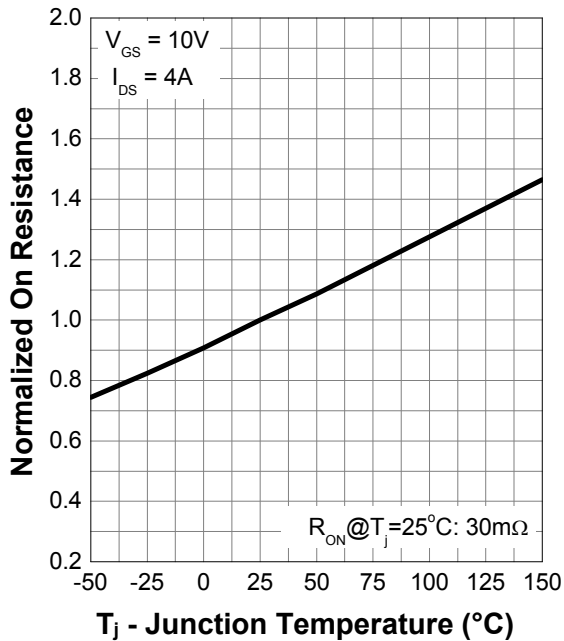
Normalized Threshold Voltage



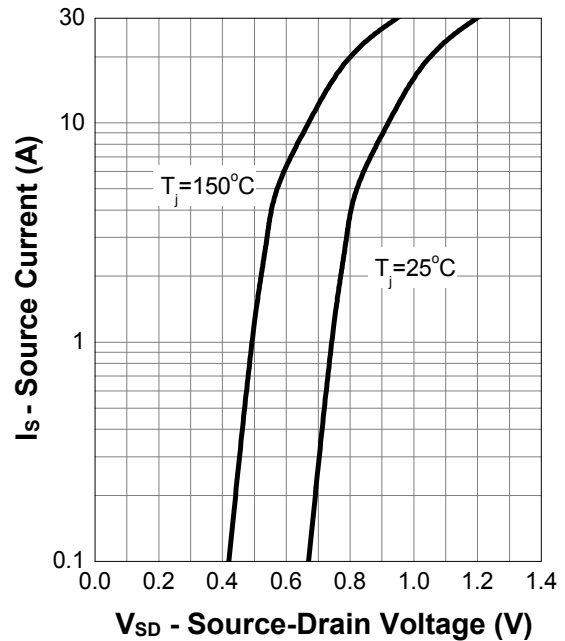
8. Typical Characteristics (Cont.)

N-channel:

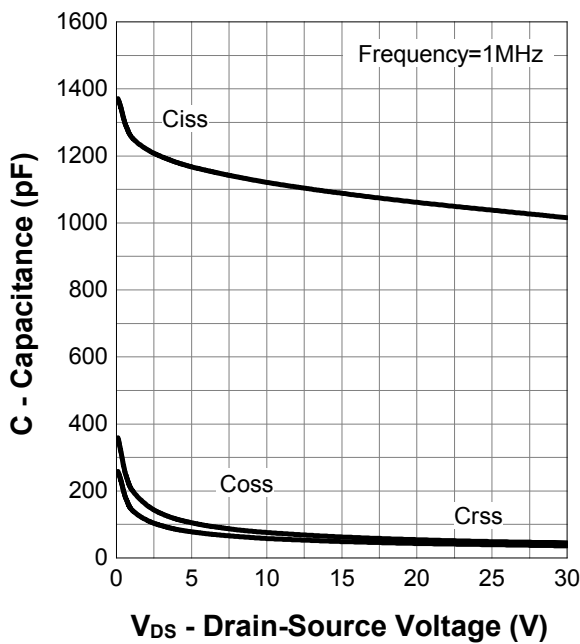
Normalized On Resistance



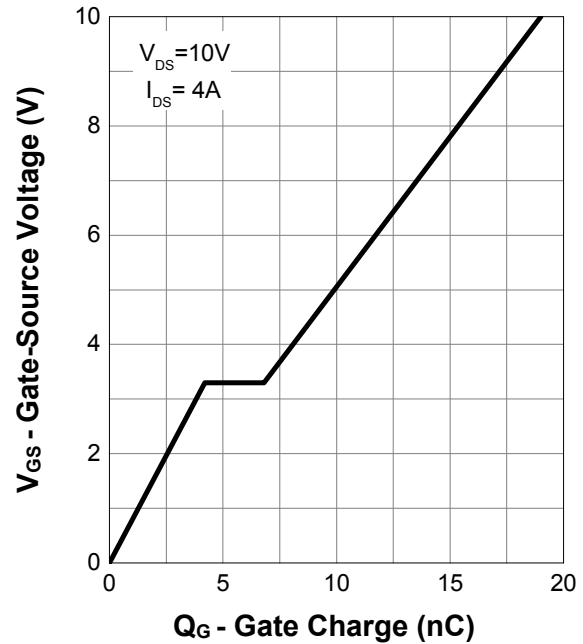
Diode Forward Current



Capacitance



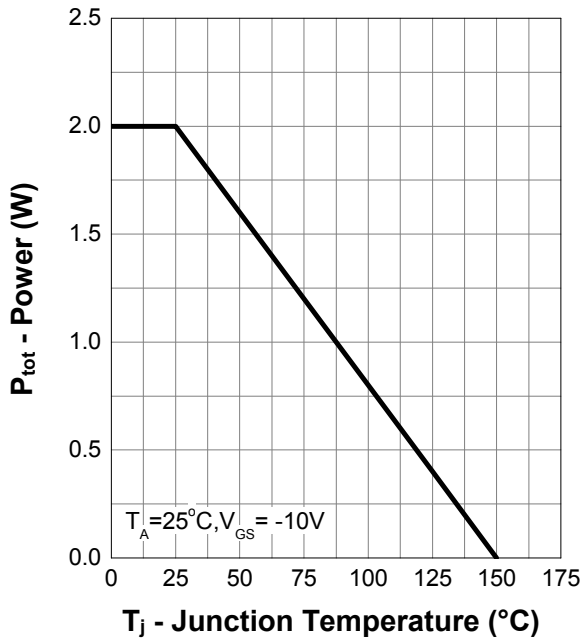
Gate Charge



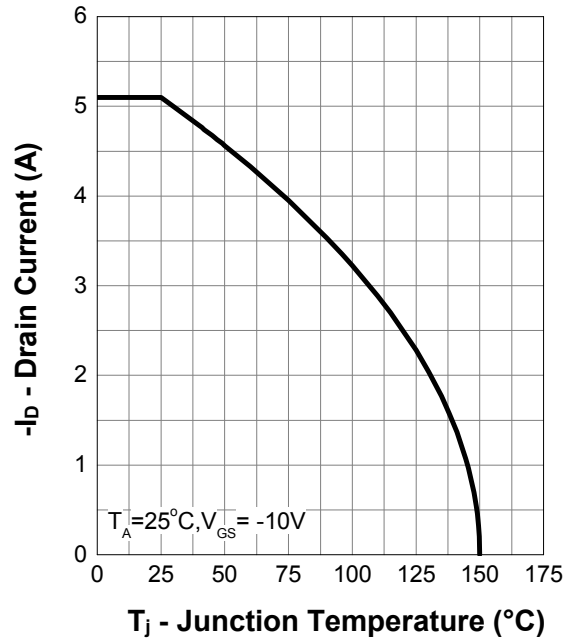
8. Typical Characteristics (Cont.)

P-channel:

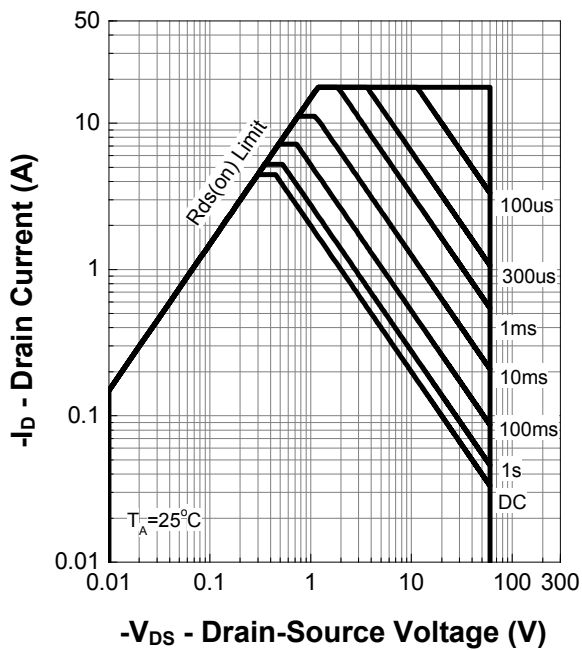
Power Capability



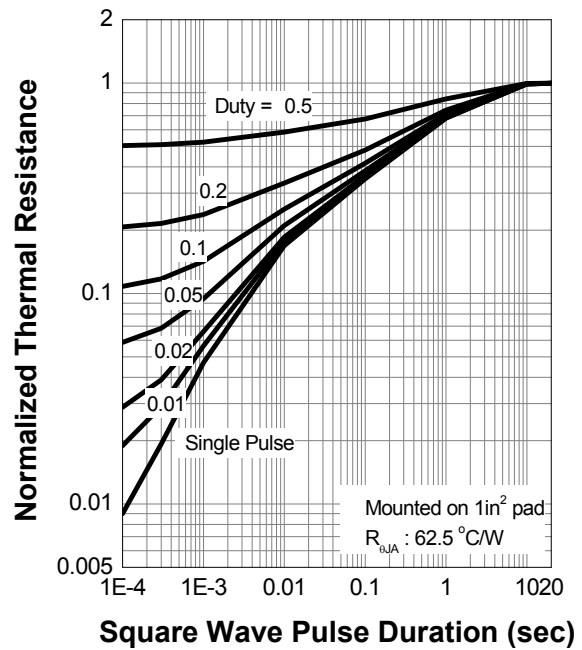
Current Capability



Safe Operation Area



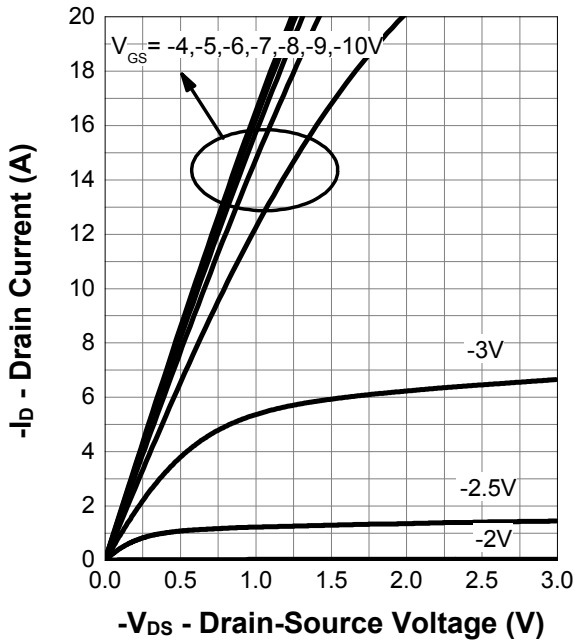
Transient Thermal Impedance



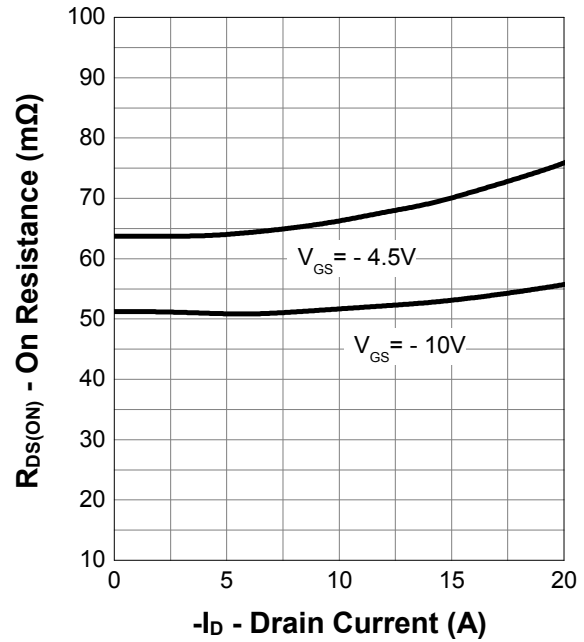
8. Typical Characteristics (Cont.)

P-channel:

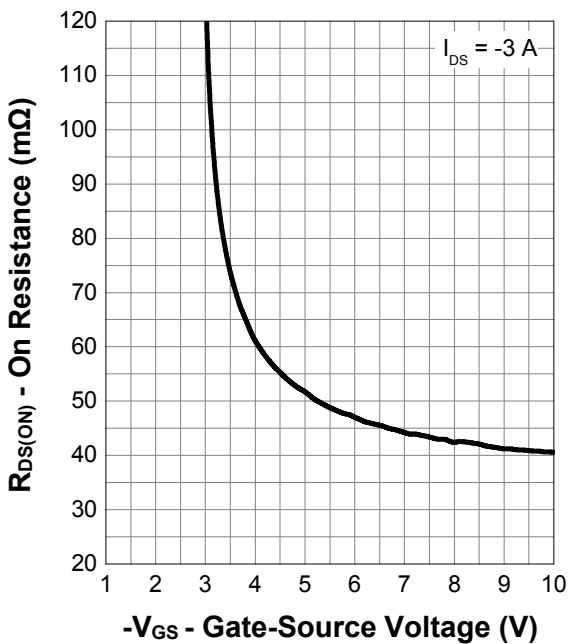
Output Characteristics



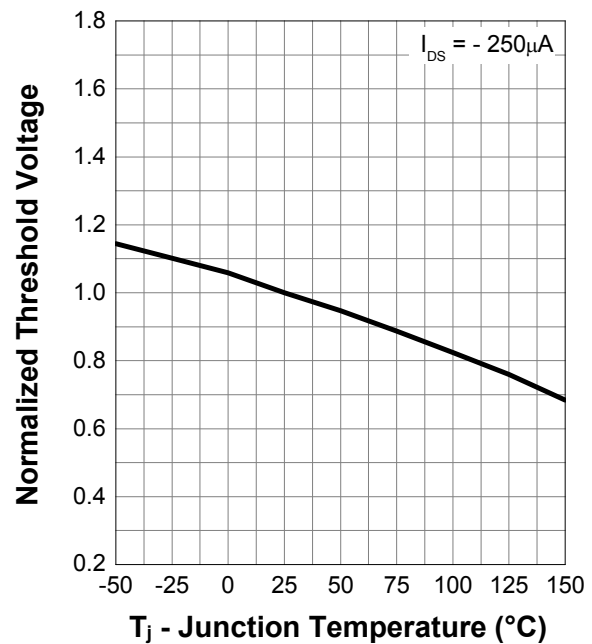
Drain-Source On Resistance



Transfer Characteristics



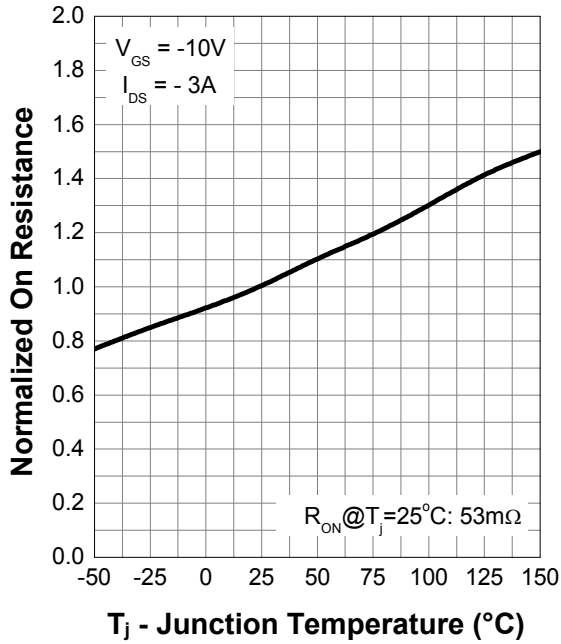
Normalized Threshold Voltage



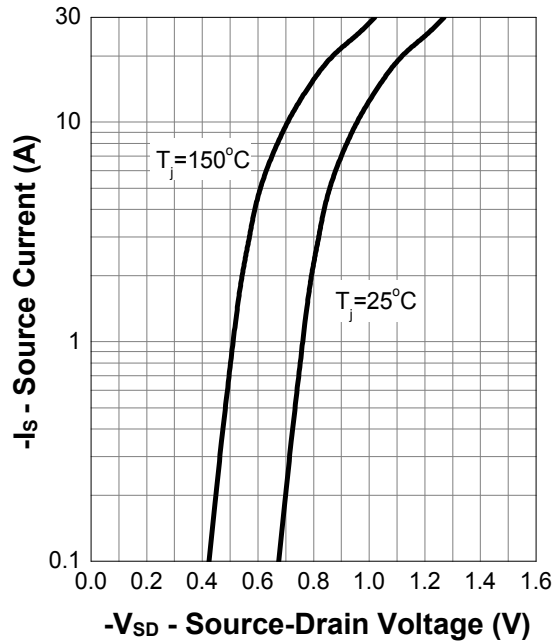
8. Typical Characteristics (Cont.)

P-channel:

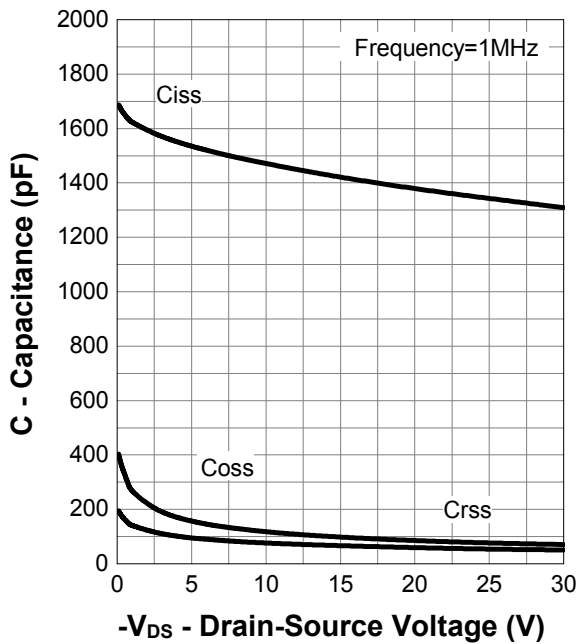
Normalized On Resistance



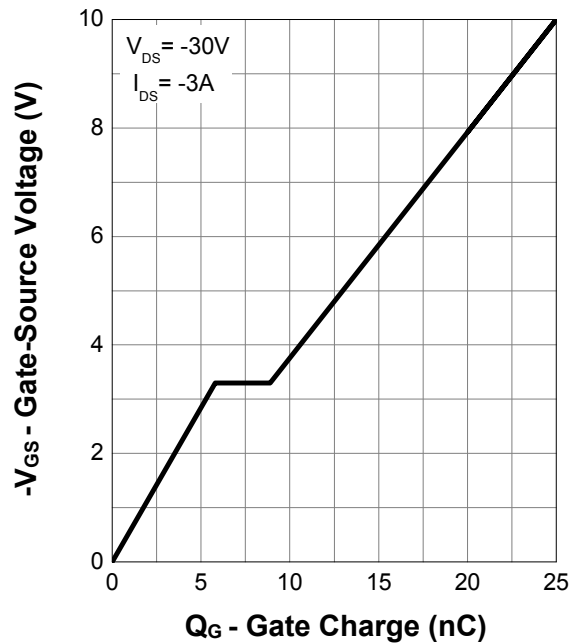
Diode Forward Current



Capacitance

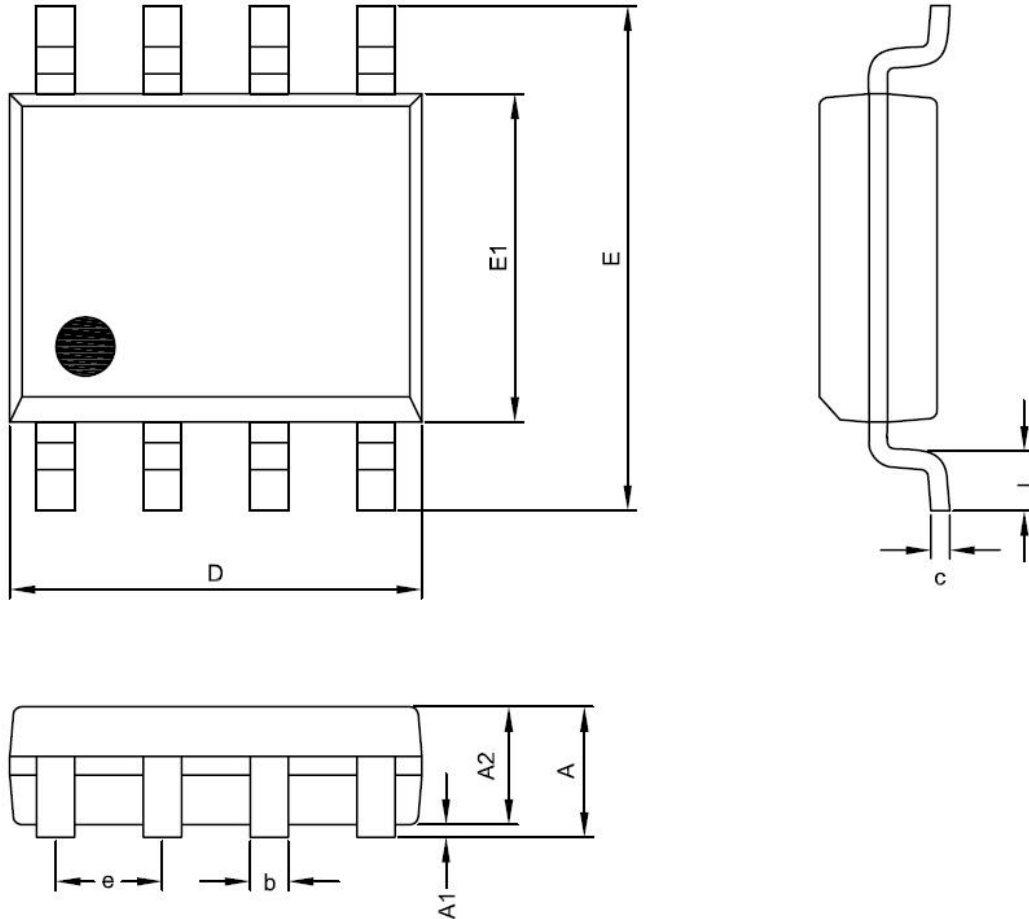


Gate Charge



9. Package Dimensions

SOP- 8L



| Symbol | Dimensions In Millimeters | |
|--------|---------------------------|------|
| | MIN. | MAX. |
| A | 1.35 | 1.75 |
| A1 | 0.00 | 0.25 |
| A2 | 1.15 | 1.50 |
| D | 4.80 | 5.00 |
| E | 5.80 | 6.20 |
| E1 | 3.80 | 4.00 |
| c | 0.19 | 0.27 |
| b | 0.33 | 0.53 |
| e | 1.27 BSC | |
| L | 0.40 | 1.27 |

Notes :

1. Jedec outline : MS-012AA
2. Dimensions " D " does not include mold flash, protrusions and gate burrs shall not exceed .15 mm (.006 in) per side .
3. Dimensions " E1 " does not include inter-lead flash, or protrusions. Inter-lead flash and protrusions shall not exceed .25 mm (.010 in) per side.