

# 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

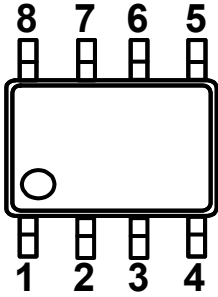
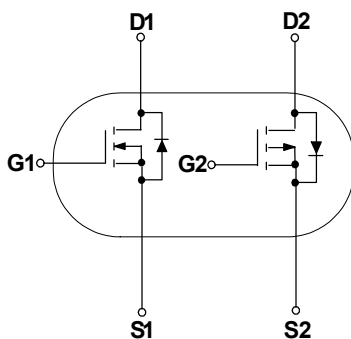
#### N-channel

- $BV \leq 30\text{ V}$
- $P_{tot} \leq 2\text{ W}$
- $I_D \leq 9.1\text{ A}$
- $R_{DS(ON)} \leq 16\text{ m}\Omega @ V_{GS} = 10\text{ V}$
- $R_{DS(ON)} \leq 20\text{ m}\Omega @ V_{GS} = 4.5\text{ V}$

#### P-channel

- $BV \leq -30\text{ V}$
- $P_{tot} \leq 2\text{ W}$
- $I_D \leq -6.3\text{ A}$
- $R_{DS(ON)} \leq 33\text{ m}\Omega @ V_{GS} = -10\text{ V}$
- $R_{DS(ON)} \leq 47\text{ m}\Omega @ V_{GS} = -4.5\text{ V}$

## 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
<b>N-channel</b>					
V <sub>DS</sub>	Drain-Source Voltage	T <sub>A</sub> = 25 °C	-	30	V
V <sub>GS</sub>	Gate-Source Voltage	T <sub>A</sub> = 25 °C	-	± 20	V
I <sub>D</sub> *	Drain Current	T <sub>A</sub> = 25 °C, V <sub>GS</sub> = -10 V	-	9.1	A
		T <sub>A</sub> = 100 °C, V <sub>GS</sub> = -10 V	-	5.7	A
I <sub>DM</sub> **	Pulsed Drain Current	T <sub>A</sub> = 25 °C, V <sub>GS</sub> = -10 V	-	36.4	A
<b>P-channel</b>					
V <sub>DS</sub>	Drain-Source Voltage	T <sub>A</sub> = 25 °C	-	- 30	V
V <sub>GS</sub>	Gate-Source Voltage	T <sub>A</sub> = 25 °C	-	± 20	V
I <sub>D</sub> *	Drain Current	T <sub>A</sub> = 25 °C, V <sub>GS</sub> = - 10 V	-	- 6.3	A
		T <sub>A</sub> = 100 °C, V <sub>GS</sub> = - 10 V	-	- 4	A
I <sub>DM</sub> **	Pulsed Drain Current	T <sub>A</sub> = 25 °C, V <sub>GS</sub> = - 10 V	-	- 25	A
P <sub>tot</sub>	Total Power Dissipation	T <sub>A</sub> = 25 °C	-	2	W
T <sub>stg</sub>	Storage Temperature		- 55	150	°C
T <sub>J</sub>	Junction Temperature		- 55	150	°C
R <sub>θJA</sub> *	Thermal Resistance- Junction to Ambient		-	62.5	°C / W

Notes :

\* Surface Mounted on 1 in<sup>2</sup> pad area, t ≤ 10 sec

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

### 4. Marking Information

Product Name	Marking
KJ4616S	 <b>4616</b> <b>YWWXXX</b>

YWW: Date Code

### 5. Ordering Code

Product Name	Package	Reel Size	Tape width	Quantity	Note
KJ4616S	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
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30	-	-	V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{DS} = 250\text{ }\mu\text{A}$	1.0	-	2.0	V
$I_{DSS}$	Zero Gate Voltage Source Current	$V_{DS} = 24\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	$\mu\text{A}$
		$T_J = 85\text{ }^\circ\text{C}$	-	-	30	$\mu\text{A}$
$I_{GSS}$	Gate Leakage Current	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	-	-	$\pm 100$	nA
$R_{DS(on)}^a$	Drain-Source On-State Resistance	$V_{GS} = 10\text{ V}, I_D = 9\text{ A}$	-	12	16	m $\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 5\text{ A}$	-	15.5	20	
<b>Diode Characteristics</b>						
$V_{SD}^a$	Diode Forward Voltage	$I_{SD} = 9\text{ A}, V_{GS} = 0\text{ V}$	-	-	1.3	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 9\text{ A}, di_{SD}/dt = 100\text{ A}/\mu\text{s}$	-	34	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	7.1	-	nC
<b>Dynamic Characteristics<sup>b</sup></b>						
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 15\text{ V}$ Frequency = 1 MHz	-	1147	-	pF
$C_{oss}$	Output Capacitance		-	106	-	
$C_{rss}$	Reverse Transfer Capacitance		-	90	-	
$t_d(on)$	Turn-on Delay Time	$V_{DS} = 15\text{ V}, V_{GEN} = 10\text{ V},$ $R_G = 4.5\text{ }\Omega, R_L = 1.6\text{ }\Omega,$ $I_D = 9\text{ A}$	-	7	-	ns
$t_r$	Turn-on Rise Time		-	30	-	
$t_d(off)$	Turn-off Delay Time		-	19	-	
$t_f$	Turn-off Fall Time		-	18	-	
<b>Gate Charge Characteristics<sup>b</sup></b>						
$Q_g$	Total Gate Charge	$V_{DS} = 15\text{ V}, V_{GS} = 10\text{ V},$ $I_{DS} = 9\text{ A}$	-	22	-	nC
$Q_{gs}$	Gate-Source Charge		-	5	-	
$Q_{gd}$	Gate-Drain Charge		-	3.3	-	

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
<b>Static Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$ , $I_{DS} = -250\text{ }\mu\text{A}$	-30	-	-	V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_{DS} = -250\text{ }\mu\text{A}$	-1.0	-	-2.0	V
$I_{DSS}$	Drain Leakage Current	$V_{DS} = -24\text{ V}$ , $V_{GS} = 0\text{ V}$	-	-	-1.0	$\mu\text{A}$
$I_{GSS}$	Gate Leakage Current	$V_{GS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$	-	-	$\pm 100$	nA
$R_{DS(on)}^a$	On-State Resistance	$V_{GS} = -10\text{ V}$ , $I_{DS} = -6\text{ A}$	-	25	33	m $\Omega$
		$V_{GS} = -4.5\text{ V}$ , $I_{DS} = -3\text{ A}$	-	36	47	
<b>Diode Characteristics</b>						
$V_{SD}^a$	Diode Forward Voltage	$I_{SD} = -6\text{ A}$ , $V_{GS} = 0\text{ V}$	-	-	-1.3	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = -6\text{ A}$ , $dI_{SD}/dt = 100\text{ A}/\mu\text{s}$	-	9.8	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	1	-	nC
<b>Dynamic Characteristics<sup>b</sup></b>						
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{ V}$ , $V_{DS} = -15\text{ V}$ Frequency = 1 MHz	-	1292	-	pF
$C_{oss}$	Output Capacitance		-	118	-	
$C_{rss}$	Reverse Transfer Capacitance		-	98	-	
$t_d(on)$	Turn-on Delay Time	$V_{DS} = -15\text{ V}$ , $V_{GEN} = -10\text{ V}$ , $R_G = 4.5\text{ }\Omega$ , $R_L = 2.5\text{ }\Omega$ , $I_{DS} = -6\text{ A}$	-	14	-	ns
$t_r$	Turn-on Rise Time		-	42	-	
$t_d(off)$	Turn-off Delay Time		-	141	-	
$t_f$	Turn-off Fall Time		-	75	-	
<b>Gate Charge Characteristics<sup>b</sup></b>						
$Q_g$	Total Gate Charge	$V_{DS} = -15\text{ V}$ , $V_{GS} = -10\text{ V}$ , $I_{DS} = -6\text{ A}$	-	22	-	nC
$Q_{gs}$	Gate-Source Charge		-	5.8	-	
$Q_{gd}$	Gate-Drain Charge		-	3.3	-	

Notes :

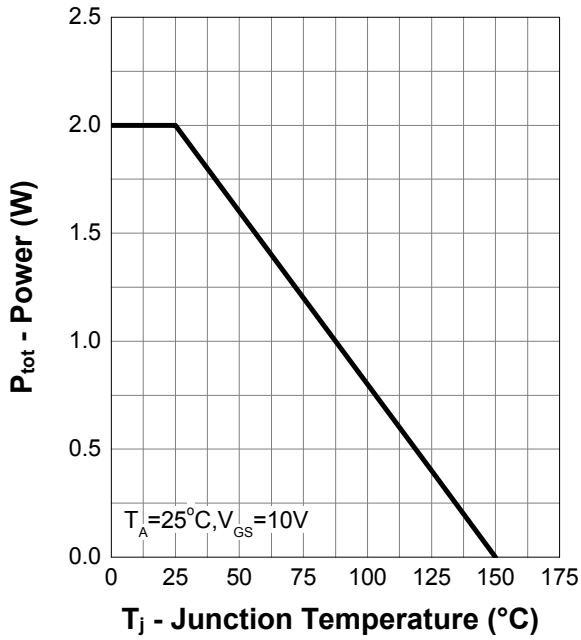
 a : Pulse test ; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ 

b : Guaranteed by design, not subject to production testing

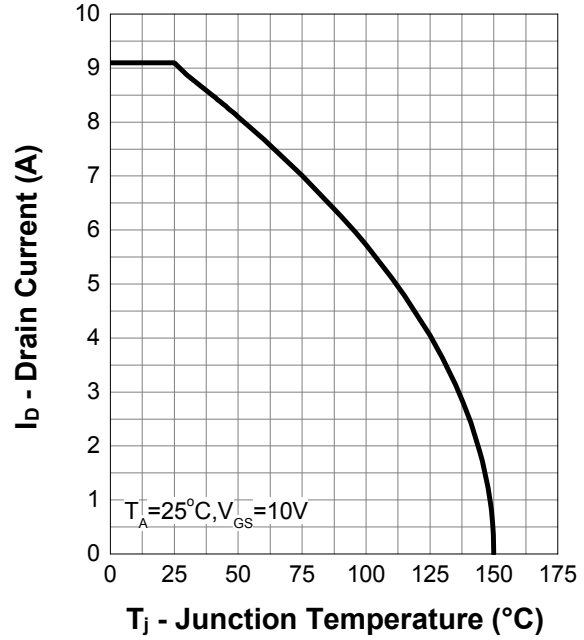
## 8. Typical Characteristics (Cont.)

N-channel:

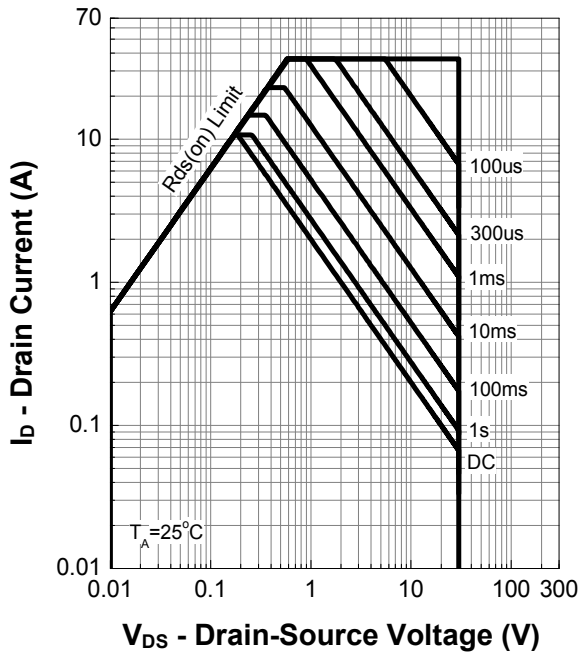
Power Capability



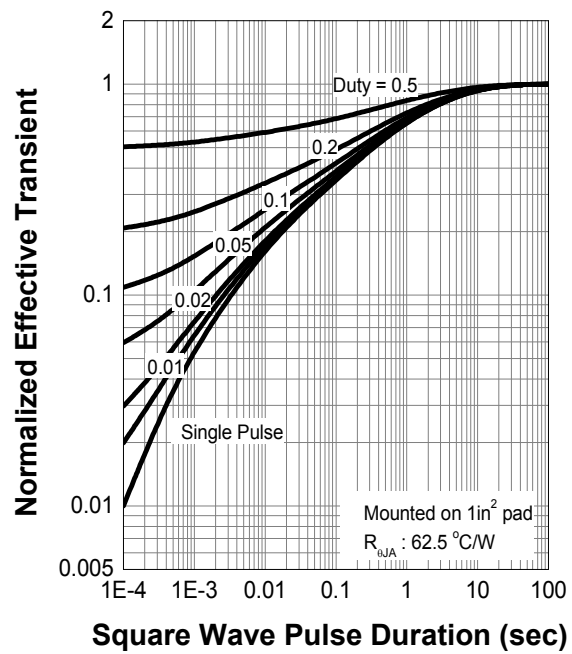
Current Capability



Safe Operation Area



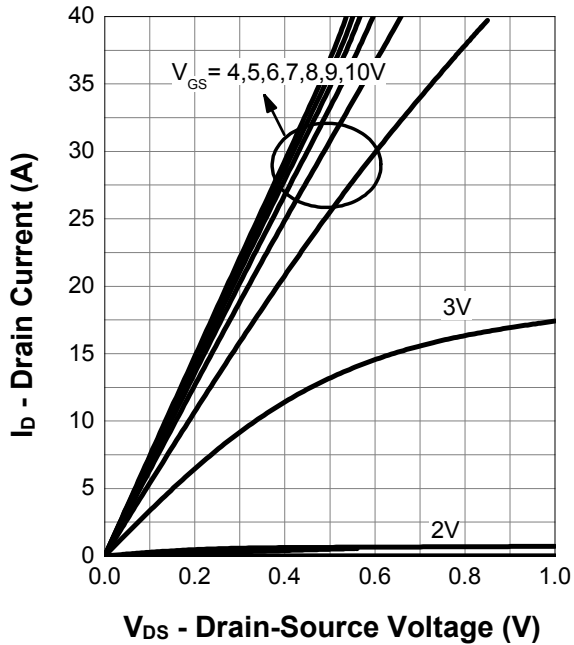
Transient Thermal Impedance



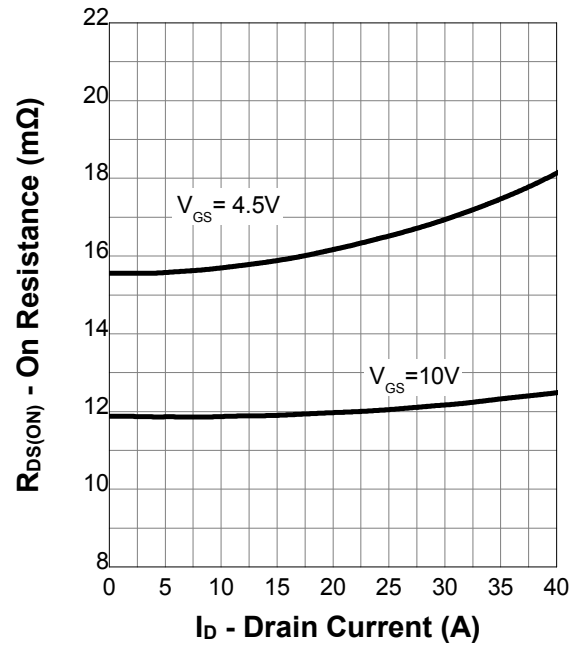
## 8. Typical Characteristics (Cont.)

N-channel:

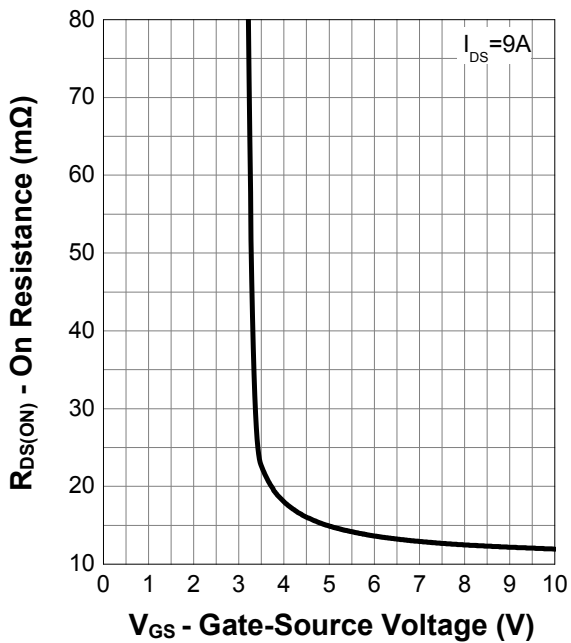
Output Characteristics



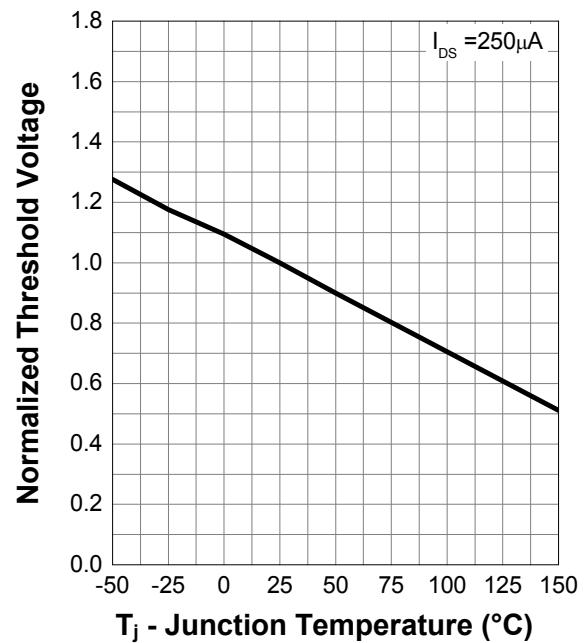
On Resistance



Transfer Characteristics



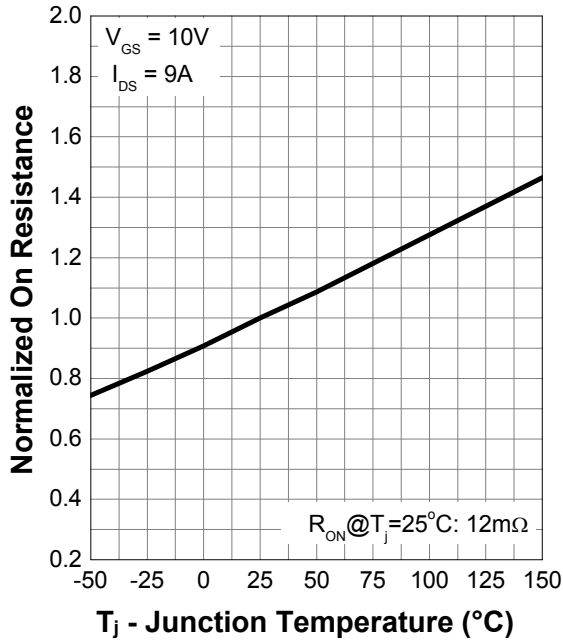
Normalized Threshold Voltage



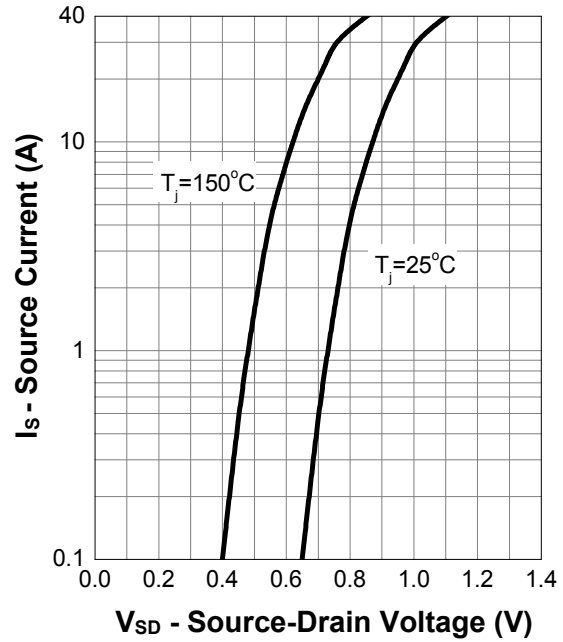
## 8. Typical Characteristics (Cont.)

N-channel:

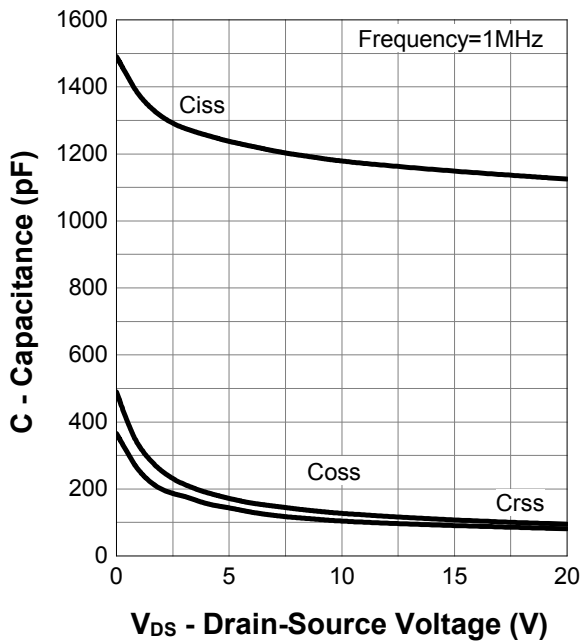
Normalized On Resistance



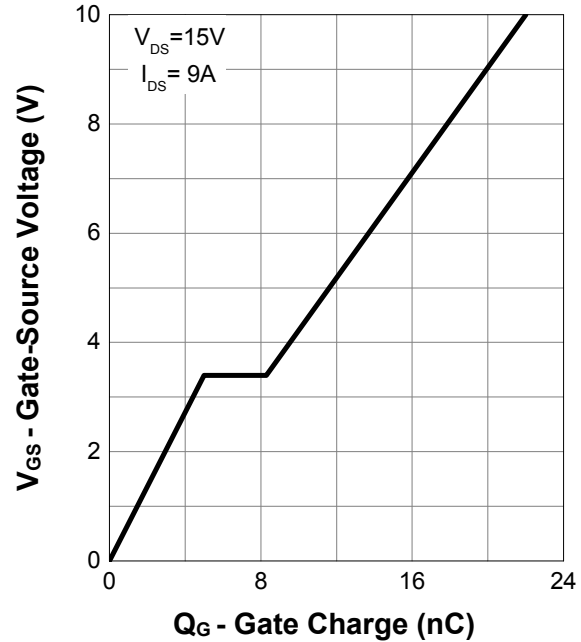
Diode Forward Current



Capacitance



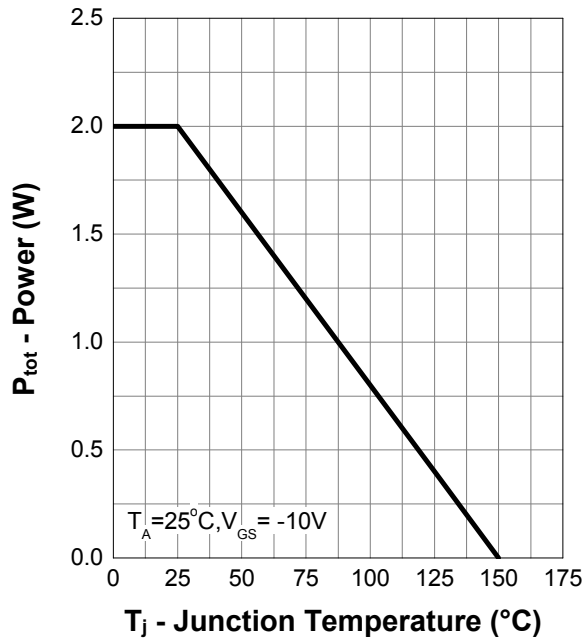
Gate Charge



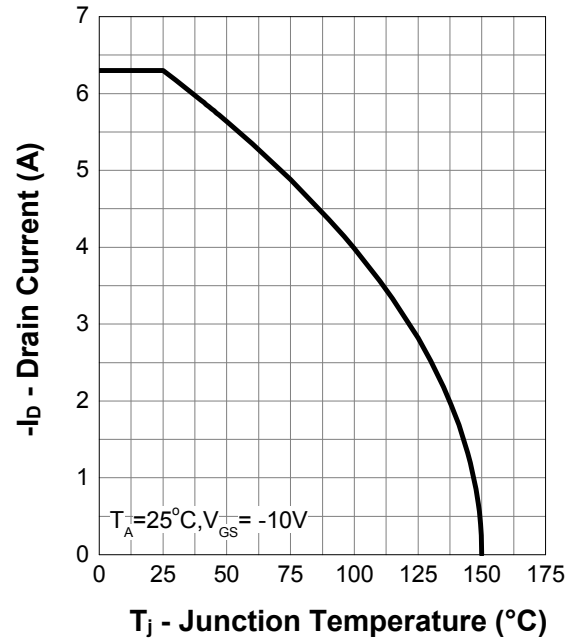
## 8. Typical Characteristics (Cont.)

P-channel:

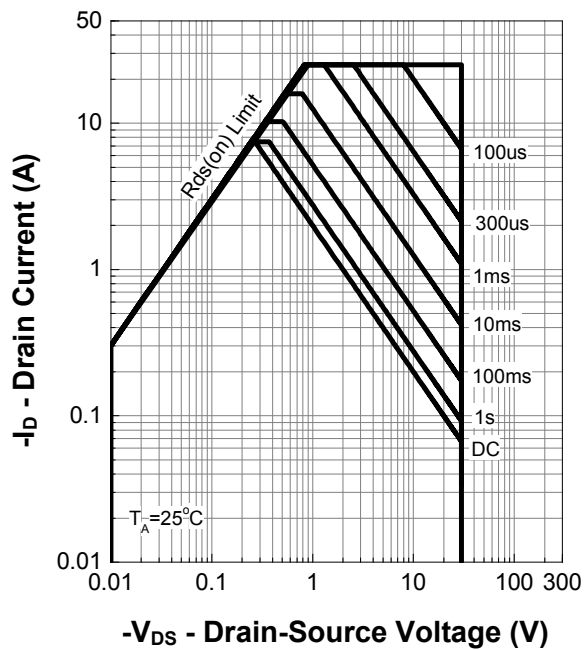
Power Capability



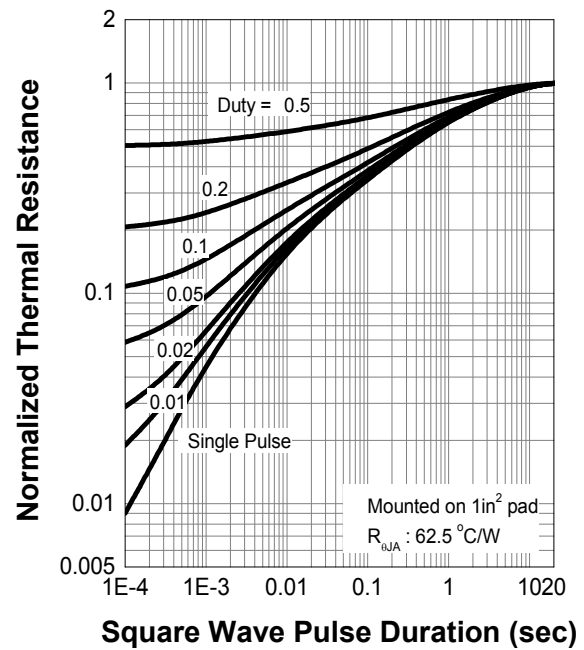
Current Capability



Safe Operation Area



Transient Thermal Impedance

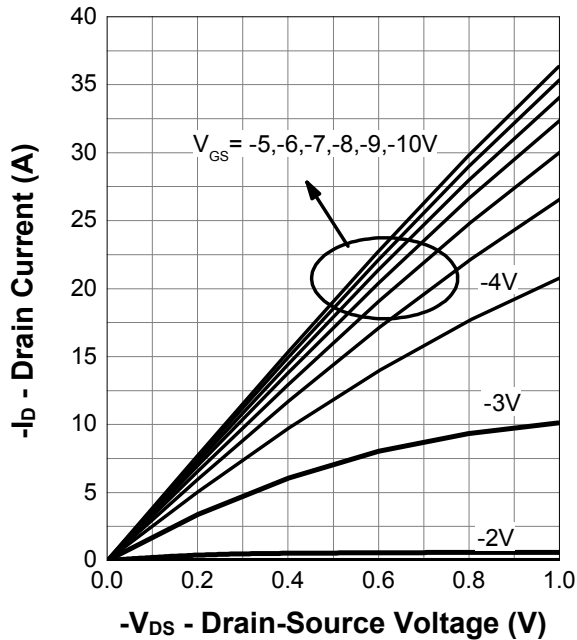




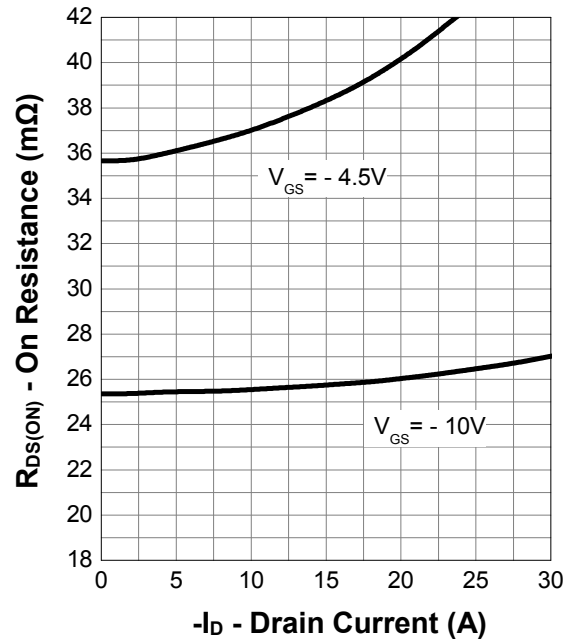
## 8. Typical Characteristics (Cont.)

P-channel:

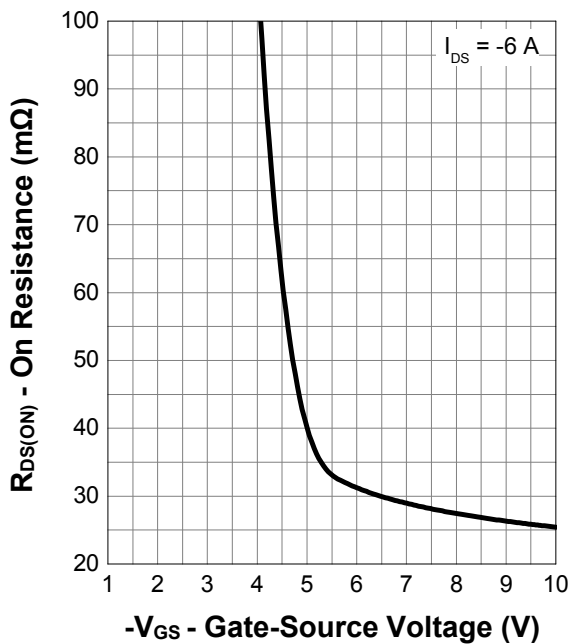
Output Characteristics



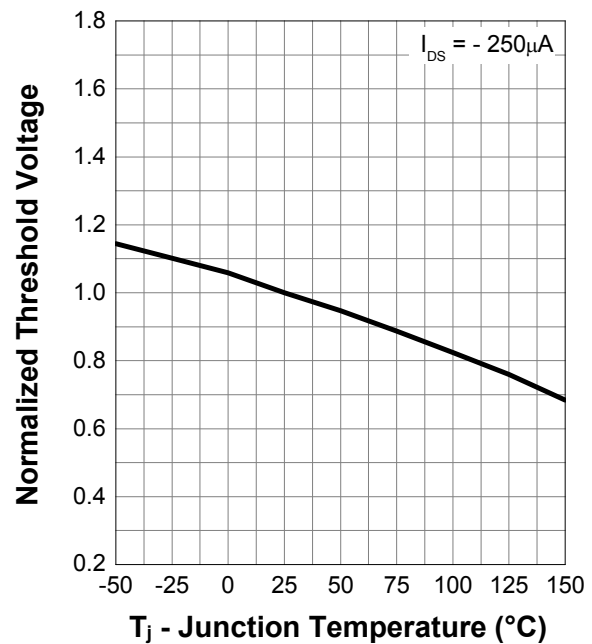
Drain-Source On Resistance



Transfer Characteristics



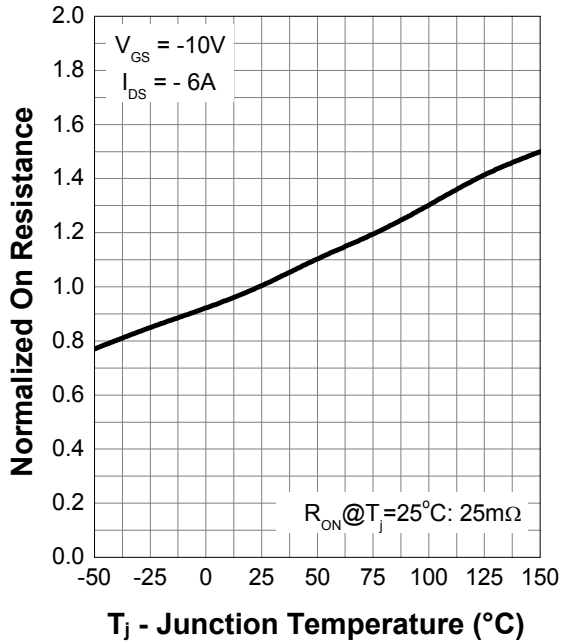
Normalized Threshold Voltage



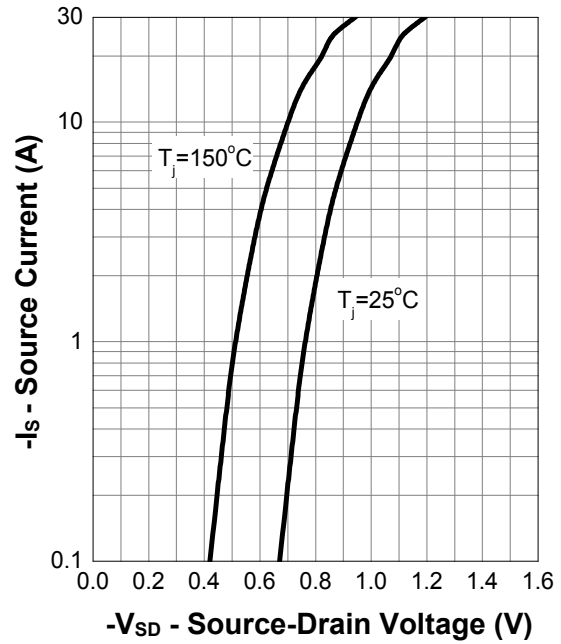
## 8. Typical Characteristics (Cont.)

P-channel:

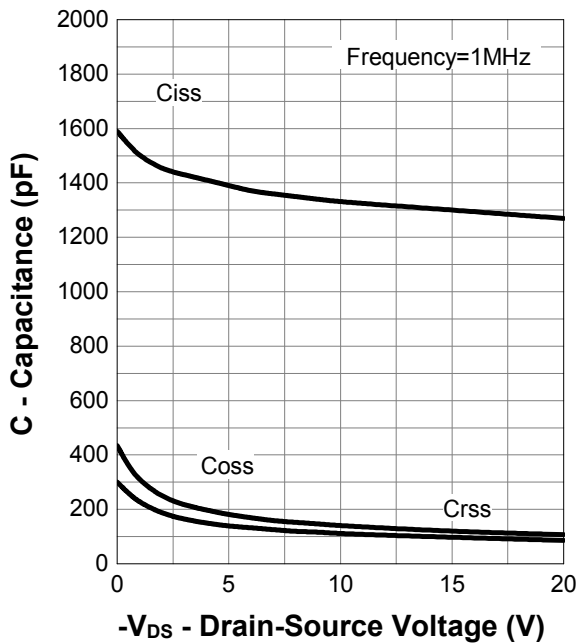
Normalized On Resistance



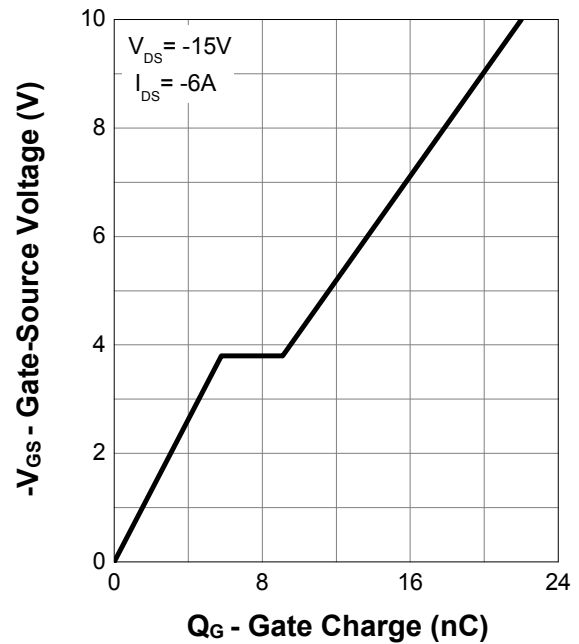
Diode Forward Current



Capacitance

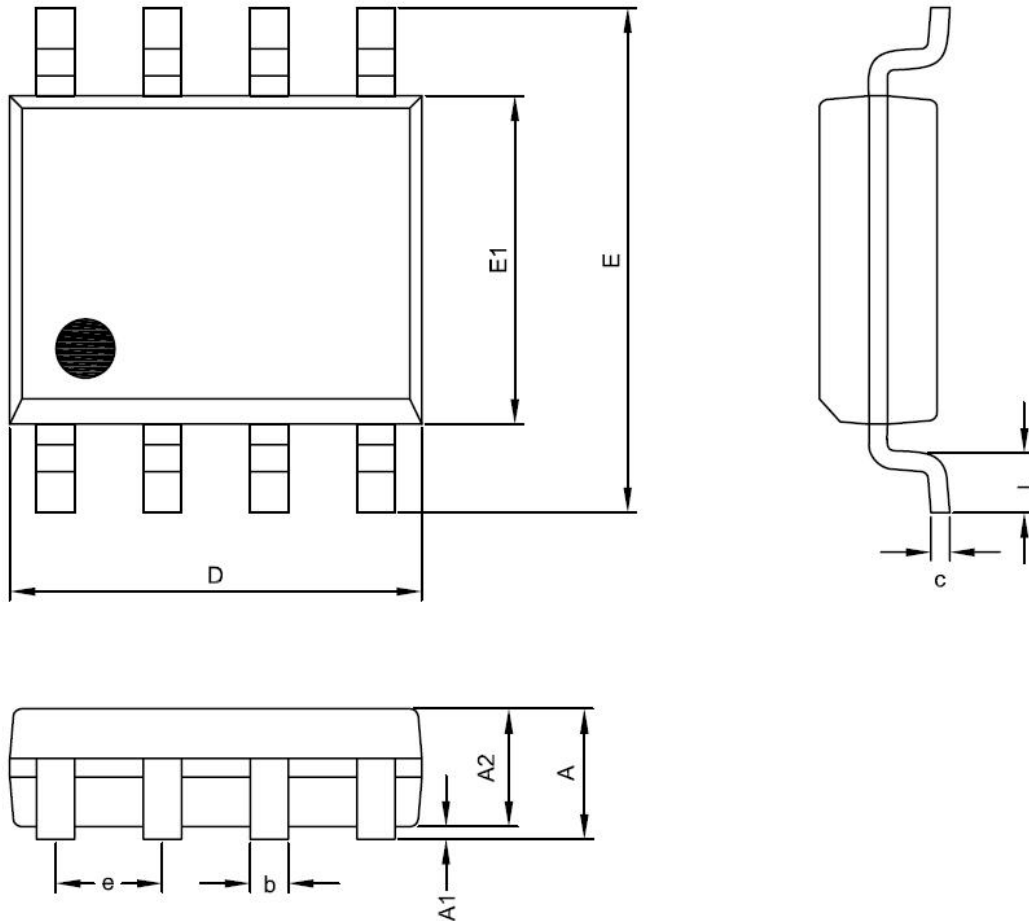


Gate Charge



## 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.