

# P-Channel Enhancement Mode MOSFET

## 1. Product Information

### 1.1 Features

- Surface-mounted package
- Extremely low threshold voltage
- Advanced trench cell design
- ESD protected

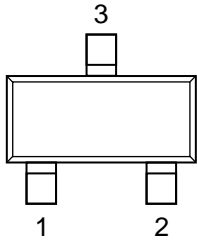
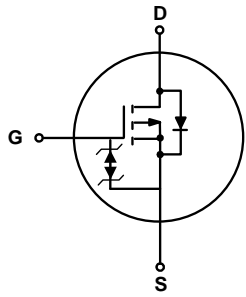
### 1.2 Applications

- Portable appliances
- Battery management
- High speed switch
- Low power DC to DC Converter

### 1.3 Quick reference

- $BV \leq -20\text{ V}$
- $R_{DS(ON)} \leq 37\text{ m}\Omega @ V_{GS} = -4.5\text{ V}$
- $P_{tot} \leq 0.83\text{ W}$
- $R_{DS(ON)} \leq 52\text{ m}\Omega @ V_{GS} = -2.5\text{ V}$
- $I_D \leq -4\text{ A}$
- $R_{DS(ON)} \leq 72\text{ m}\Omega @ V_{GS} = -1.8\text{ V}$

## 2. Pin Description

Pin	Description	Simplified Outline	Symbol
1	Gate(G)	 Top View SOT-23	
2	Source(S)		
3	Drain(D)		

### 3. Limiting Values

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>DS</sub>	Drain-Source Voltage	T <sub>A</sub> = 25 °C	- 20	-	V
V <sub>GS</sub>	Gate-Source Voltage	T <sub>A</sub> = 25 °C	-	± 8	V
I <sub>D</sub> *	Drain Current	T <sub>A</sub> = 25 °C, V <sub>GS</sub> = - 4.5 V	-	- 4	A
I <sub>DM</sub> **	Pulsed Drain Current	T <sub>A</sub> = 25 °C, V <sub>GS</sub> = - 4.5 V	-	- 16	A
P <sub>tot</sub>	Total Power Dissipation	T <sub>A</sub> = 25 °C	-	0.83	W
		T <sub>A</sub> = 100 °C	-	0.3	
T <sub>stg</sub>	Storage Temperature		- 55	150	°C
T <sub>J</sub>	Junction Temperature		-	150	°C
I <sub>S</sub>	Diode Forward Current	T <sub>A</sub> = 25 °C	-	- 1	A
R <sub>θJA</sub>	Thermal Resistance- Junction to Ambient		-	150	°C / W

Notes :

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

\*\* Pulse width ≤ 300 μs, duty cycle ≤ 2 %

### 4. Marking Information

Product Name	Marking
KJ3415E	<b>3415E</b>

### 5. Ordering Code

Product Name	Package	Reel Size	Tape width	Quantity	Note
KJ3415E	SOT-23			3000	

Note: KJX 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<sub>A</sub> = 25 °C Unless Otherwise Noted)

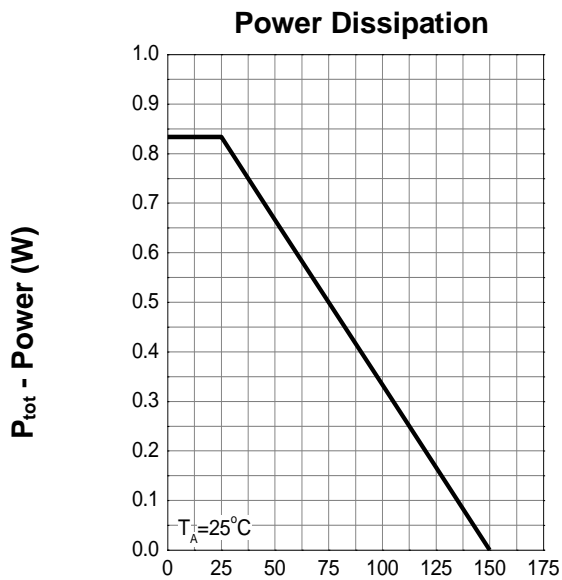
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static Characteristics</b>						
B <sub>V</sub> DSS	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>DS</sub> = - 250 μA	- 20	-	-	V
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>DS</sub> = - 250 μA	- 0.5	-	- 1	V
I <sub>DSS</sub>	Drain Leakage Current	V <sub>DS</sub> = - 16 V, V <sub>GS</sub> = 0V	-	-	- 1	μA
		T <sub>J</sub> = 85 °C	-	-	- 30	μA
I <sub>GSS</sub>	Gate Leakage Current	V <sub>GS</sub> = ± 8 V, V <sub>DS</sub> = 0 V	-	-	± 10	μA
R <sub>DS(ON)</sub> <sup>a</sup>	On-State Resistance	V <sub>GS</sub> = - 4.5 V, I <sub>DS</sub> = - 4 A	-	30	37	m Ω
		V <sub>GS</sub> = - 2.5 V, I <sub>DS</sub> = - 3 A	-	42	52	
		V <sub>GS</sub> = - 1.8 V, I <sub>DS</sub> = - 2 A	-	57	72	
<b>Diode Characteristics</b>						
V <sub>SD</sub> <sup>a</sup>	Diode Forward Voltage	I <sub>SD</sub> = - 1 A, V <sub>GS</sub> = 0V	-0.5	-	- 1.3	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>SD</sub> = - 4 A, dI <sub>SD</sub> / dt = 100 A / μs	-	49.5	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	16.5	-	nC
<b>Dynamic Characteristics<sup>b</sup></b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = - 10 V Frequency = 1 MHz	-	1121	-	pF
C <sub>oss</sub>	Output Capacitance		-	161	-	
C <sub>rss</sub>	Reverse Transfer Capacitance		-	148	-	
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DS</sub> = - 10 V, V <sub>GEN</sub> = - 4.5 V, R <sub>G</sub> = 3.3 Ω, R <sub>L</sub> = 2.5 Ω, I <sub>DS</sub> = - 4 A	-	5.5	-	ns
t <sub>r</sub>	Turn-on Rise Time		-	60.5	-	
t <sub>d(off)</sub>	Turn-off Delay Time		-	89	-	
t <sub>f</sub>	Turn-off Fall Time		-	73	-	
<b>Gate Charge Characteristics<sup>b</sup></b>						
Q <sub>g</sub>	Total Gate Charge	V <sub>GS</sub> = - 4.5 V, V <sub>DS</sub> = - 10 V, I <sub>DS</sub> = - 4 A	-	17.4	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	1.9	-	
Q <sub>gd</sub>	Gate-Drain Charge		-	4.1	-	

Notes :

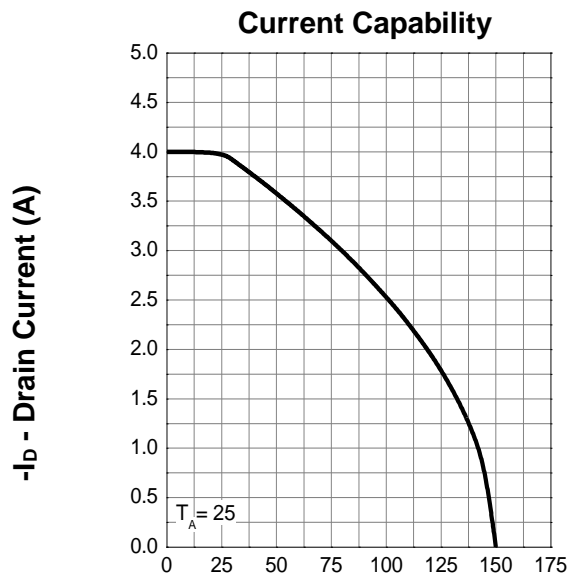
a : Pulse test ; pulse width ≤ 300 μs, duty cycle ≤ 2 %

b : Guaranteed by design, not subject to production testing

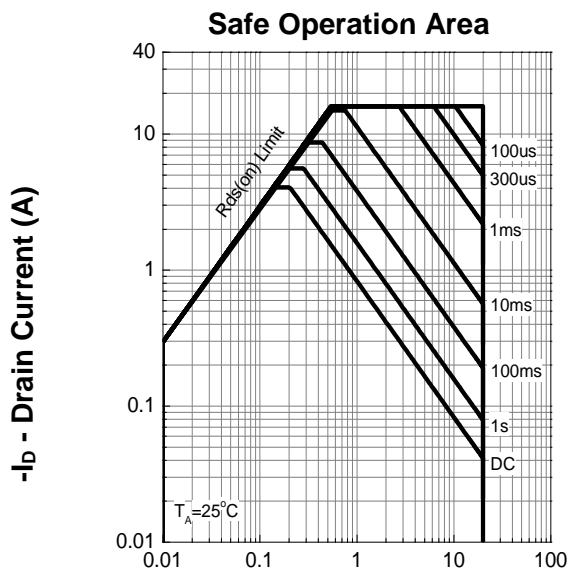
## 7. Typical Characteristics



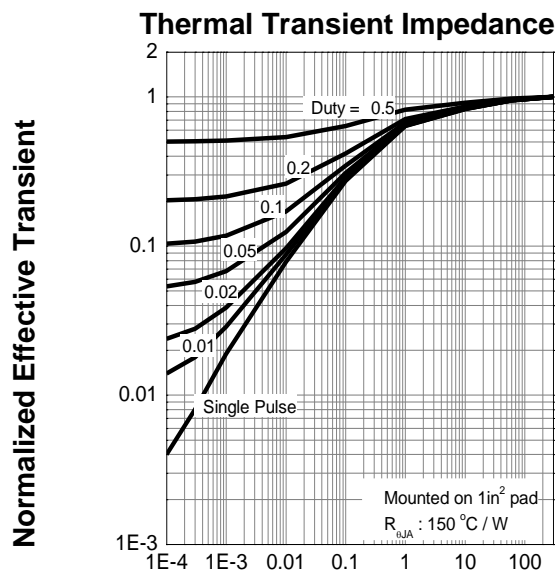
$T_j$  - Junction Temperature ( $^\circ\text{C}$ )



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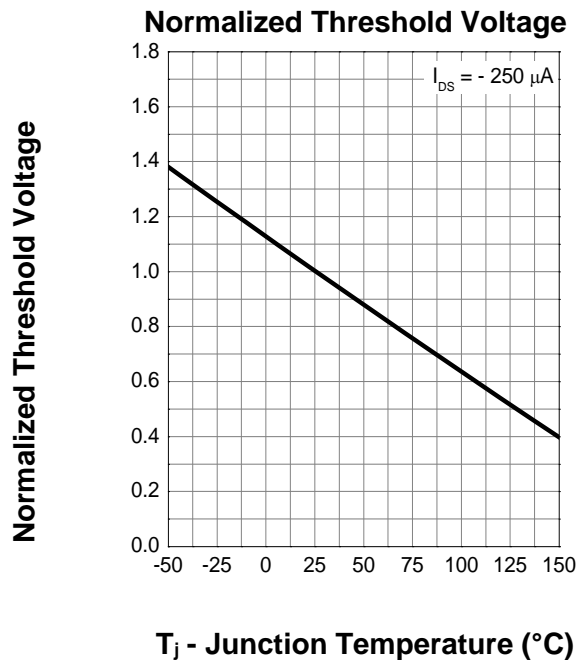
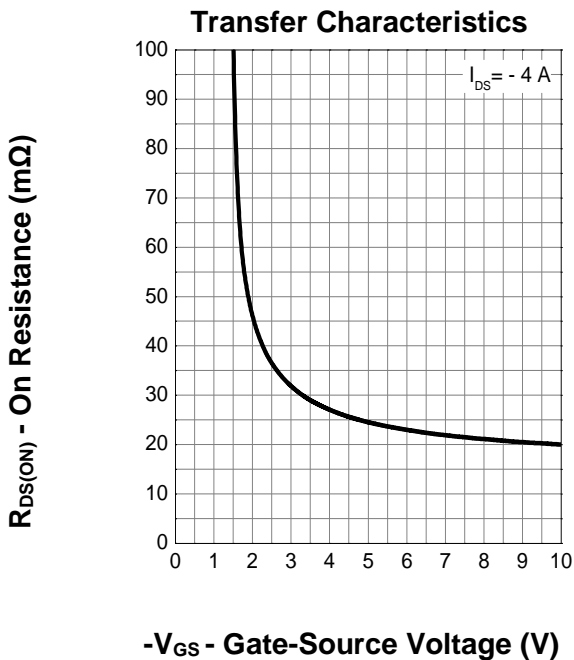
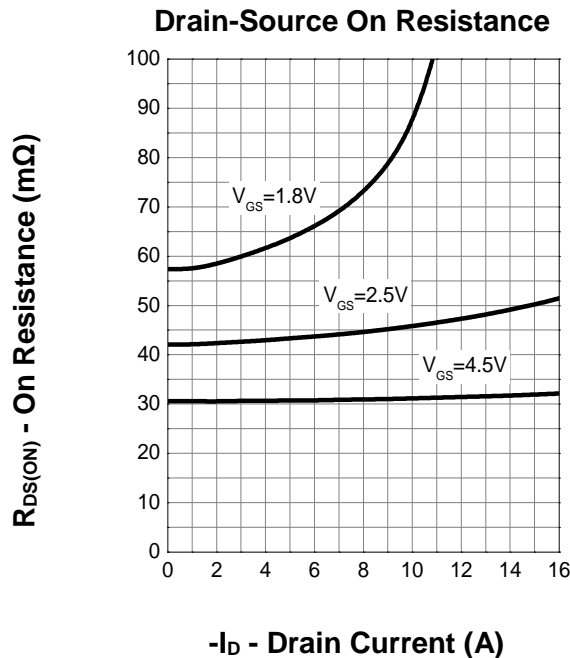
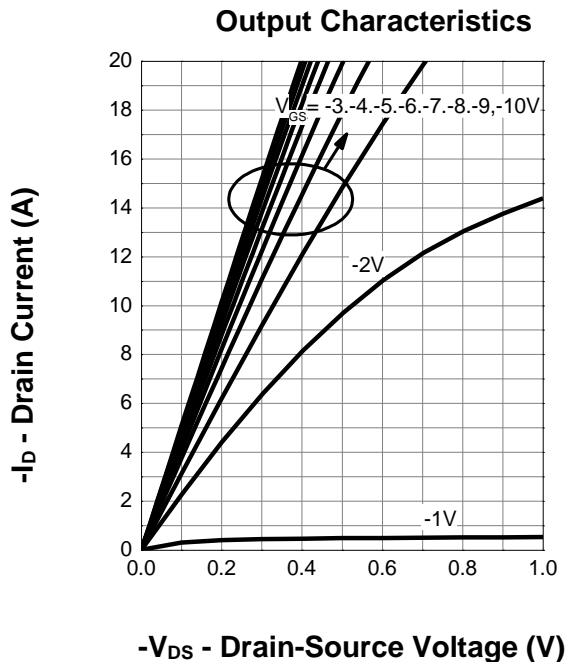


$-V_{DS}$  - Drain-Source Voltage (V)

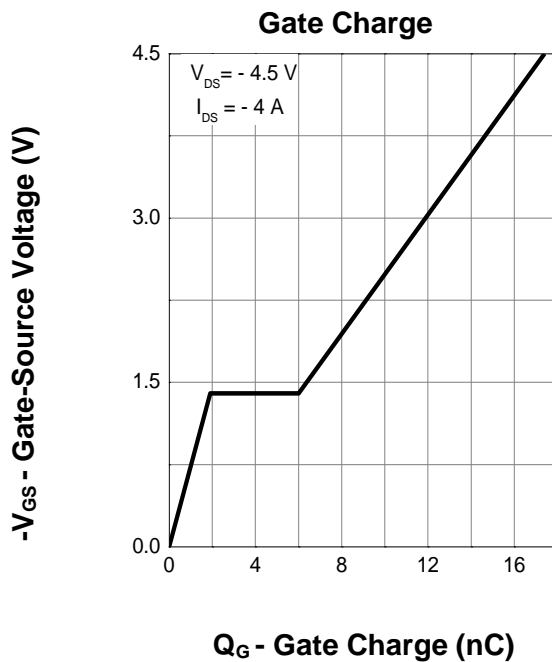
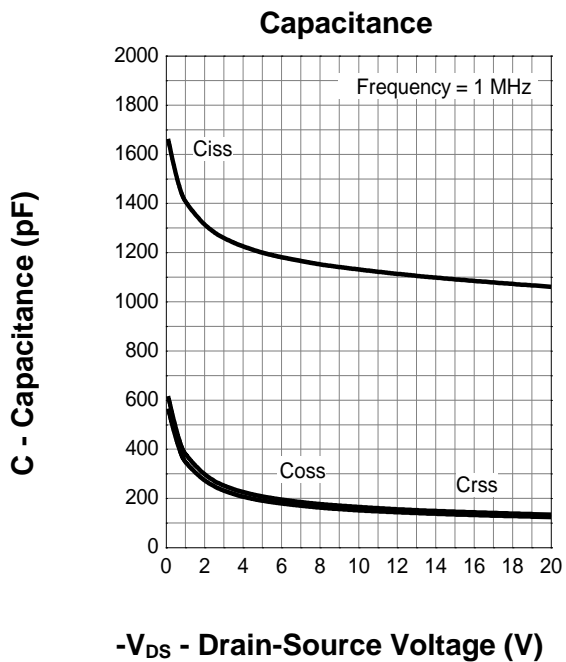
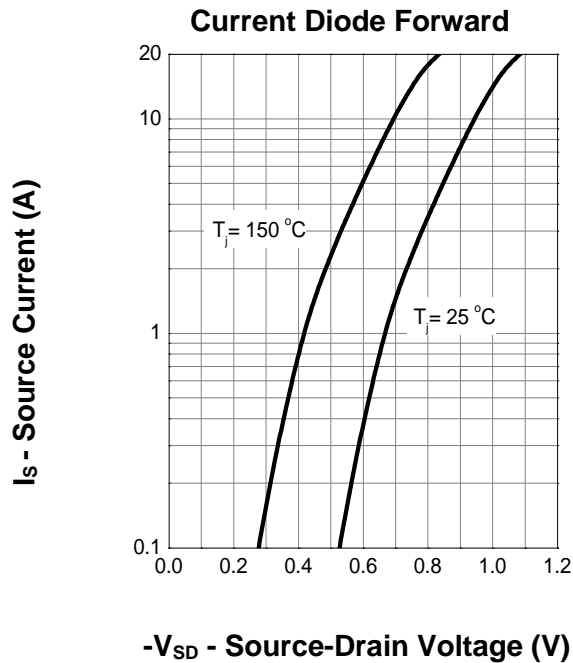
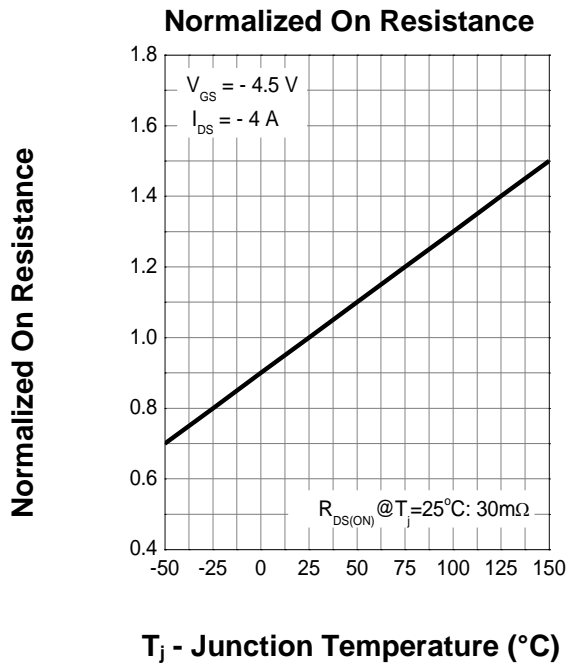


Square Wave Pulse Duration (sec)

## 7. Typical Characteristics (cont.)

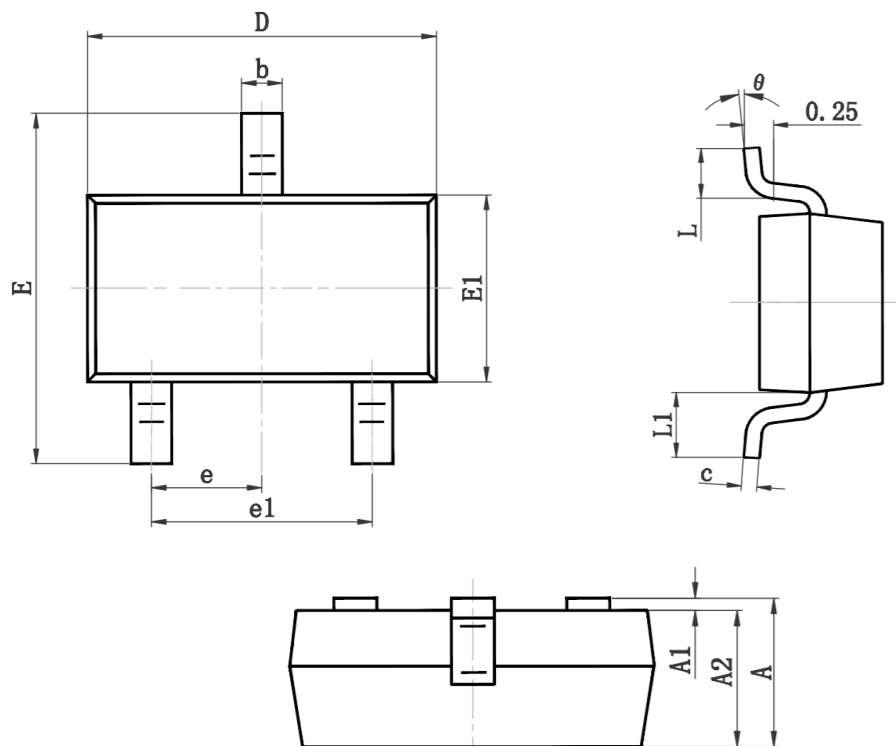


## 7. Typical Characteristics (cont.)



## 8. Package Dimensions

SOT-23



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	2.250	2.550
E1	1.200	1.400
e	0.950 TYP.	
e1	1.800	2.000
L	0.300	0.500
L1	0.550 REF.	
$\theta$	0°	8°