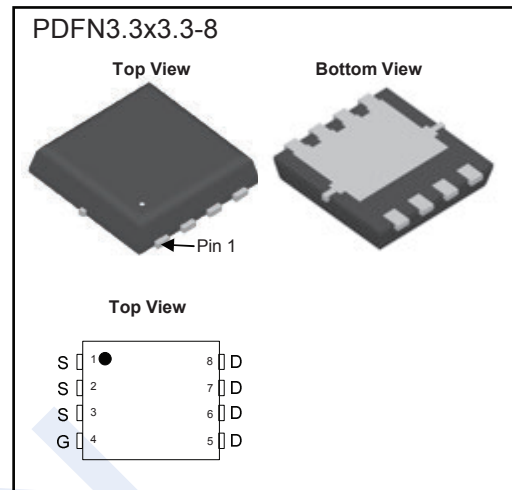
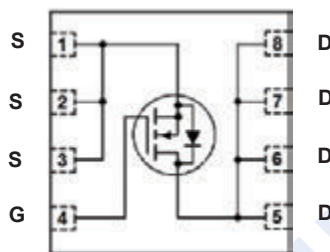


## N-Channel MOSFET

## 2KK5139DFN

## ■ Features

- $V_{DS} (V) = 40 V$
- $I_D = 100 A$
- $R_{DS(ON)} (at V_{GS} = 10 V) = 3.5 m\Omega (Typ.)$

■ Absolute Maximum Ratings ( $T_C = 25^\circ C$  unless otherwise noted)

Parameter	Symbol	Rating	Unit	
Drain-Source Voltage	$V_{DS}$	40	V	
Gate-Source Voltage	$V_{GS}$	$\pm 20$		
Continuous Drain Current	$I_D$	$T_C = 25^\circ C$	100	A
		$T_C = 100^\circ C$		
Pulsed Drain Current (Note 1)	$I_{DM}$	320		
Power Dissipation	$P_D$	$T_C = 25^\circ C$	49	W
		$T_A = 25^\circ C$	2.5	
Single Pulse Avalanche Current (Note 2)	$I_{AS}$	50	A	
Single Pulse Avalanche Energy (Note 2)	$E_{AS}$	65	mJ	
Thermal Resistance, Junction- to-Ambient	$R_{\theta JA}$	50	$^\circ C/W$	
Thermal Resistance, Junction- to-Case	$R_{\theta JC}$	2.55		
Junction Temperature	$T_J$	150	$^\circ C$	
Storage Temperature Range	$T_{stg}$	-55 to 150		

## Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. EAS condition :  $T_J = 25^\circ C, V_{DD} = 25V, V_G = 10V, L = 1mH, I_{AS} = 30A$ .

## N-Channel MOSFET

## 2KK5139DFN

■ Electrical Characteristics ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D = 250 \mu\text{A}$ , $V_{GS} = 0\text{V}$	40			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 40\text{V}$ , $V_{GS} = 0\text{V}$			1	$\mu\text{A}$
		$V_{DS} = 40\text{V}$ , $V_{GS} = 0\text{V}$ , $T_J = 125^\circ\text{C}$			100	
Gate to Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{V}$ , $V_{GS} = \pm 20\text{V}$			$\pm 100$	nA
<b>On Characteristics (Note 1)</b>						
Gate to Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$	1.0		2.4	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{V}$ , $I_D = 50\text{A}$		3.5	4.0	m $\Omega$
		$V_{GS} = 4.5\text{V}$ , $I_D = 50\text{A}$		5.3		
Forward Transconductance	$g_{FS}$	$V_{DS} = 10\text{V}$ , $I_D = 50\text{A}$		120		S
<b>Dynamic Characteristics (Note 1)</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{V}$ , $V_{DS} = 20\text{V}$ , $f = 1\text{MHz}$		3800	5100	pF
Output Capacitance	$C_{oss}$			820	1100	
Reverse Transfer Capacitance	$C_{rss}$			44		
Gate Resistance	$R_g$	$V_{GS} = 0\text{V}$ , $V_{DS} = 0\text{V}$ , $F = 1\text{MHz}$		1.5		$\Omega$
<b>Switching Characteristics (Note 1)</b>						
Total Gate Charge	$Q_g$	$V_{GS} = 10\text{V}$ , $V_{DD} = 20\text{V}$ , $I_D = 30\text{A}$		12		nC
Gate Source Charge	$Q_{gs}$			6.1		
Gate Drain Charge	$Q_{gd}$			5.0		
Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10\text{V}$ , $V_{DD} = 20\text{V}$ , $I_D = 30\text{A}$ , $R_G = 1.6\Omega$		7.9		ns
Turn-On Rise Time	$t_r$			4.6		
Turn-Off Delay Time	$t_{d(off)}$			31		
Turn-Off Fall Time	$t_f$			5.0		
<b>Drain-Source Diode Characteristics</b>						
Body Diode Reverse Recovery Time	$t_{rr}$	$I_S = 50\text{A}$ , $di/dt = 100\text{A}/\mu\text{s}$		32		ns
Body Diode Reverse Recovery Charge	$Q_{rr}$			35		nC
Maximum Body-Diode Continuous Current	$I_S$	$V_G = V_D = 0\text{V}$ , Force Current			50	A
Diode Forward Voltage (Note 1)	$V_{SD}$	$V_{GS} = 0\text{V}$ , $I_S = 50\text{A}$		0.84	1.2	V

Notes:

1. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

## ■ Marking

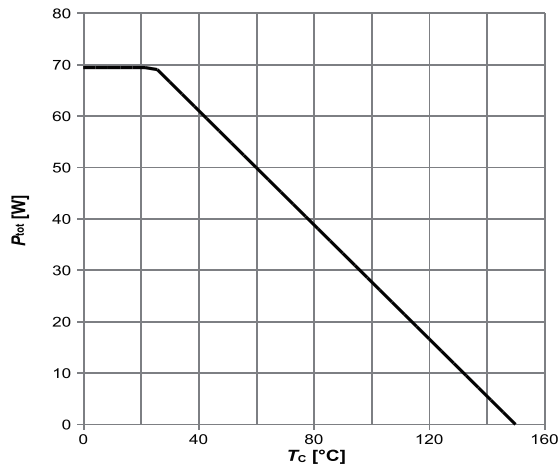
Marking	K5139 KC***
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# N-Channel MOSFET

## 2KK5139DFN

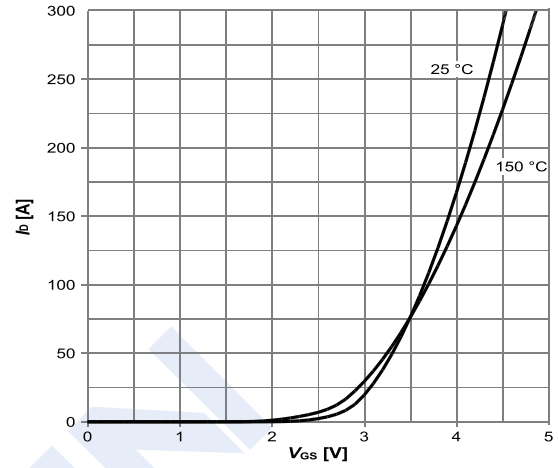
### Typical Electrical Characteristics

Diagram 1: Power dissipation



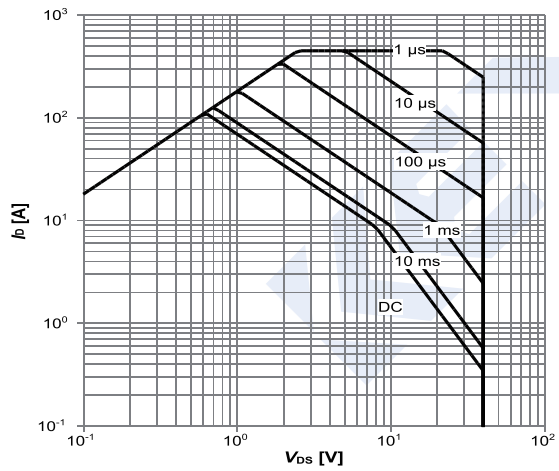
$P_{tot}=f(T_c)$

Diagram 2: Typ. transfer characteristics



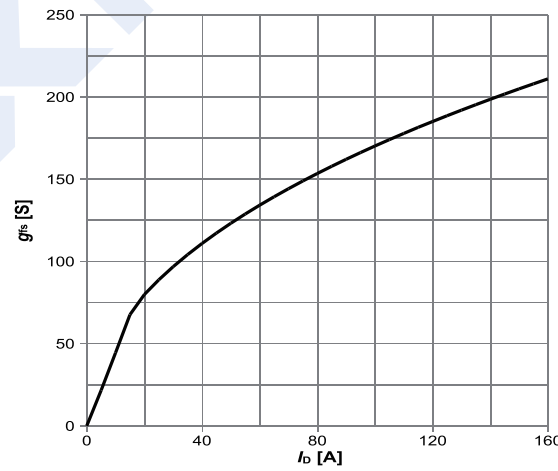
$I_D=f(V_{GS}); |V_{DS}|>2|I_D|R_{DS(on)max}; \text{parameter: } T_j$

Diagram 3: Safe operating area



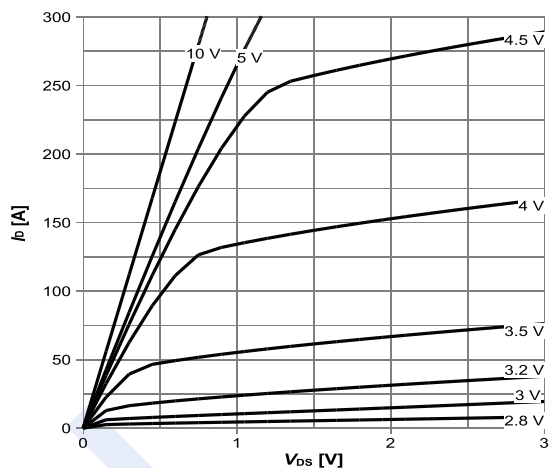
$I_D=f(V_{DS}); T_c=25\text{ °C}; D=0; \text{parameter: } t_p$

Diagram 4: Typ. forward transconductance



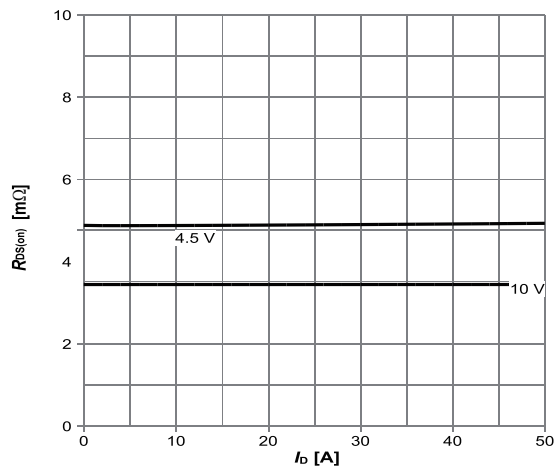
$g_{fs}=f(I_D); T_j=25\text{ °C}$

Diagram 5: Typ. output characteristics



$I_D=f(V_{DS}); T_j=25\text{ °C}; \text{parameter: } V_{GS}$

Diagram 6: Typ. drain-source on resistance

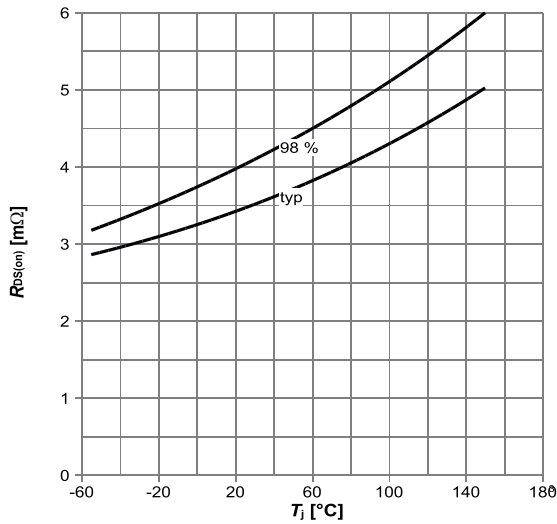


$R_{DS(on)}=f(I_D); T_j=25\text{ °C}; \text{parameter: } V_{GS}$

# N-Channel MOSFET

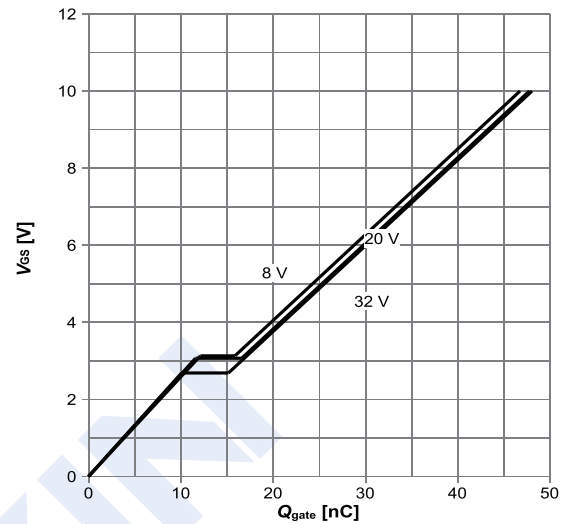
## 2KK5139DFN

Diagram 7: Drain-source on-state resistance



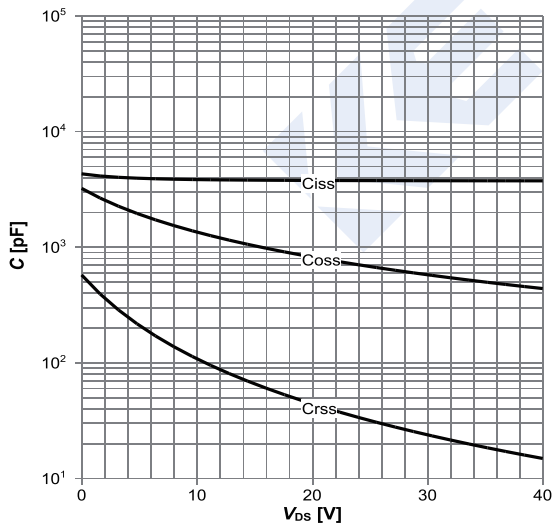
$R_{DS(on)}=f(T_j)$ ;  $I_D=50\text{ A}$ ;  $V_{GS}=10\text{ V}$

Diagram 8 : Typ. gate charge



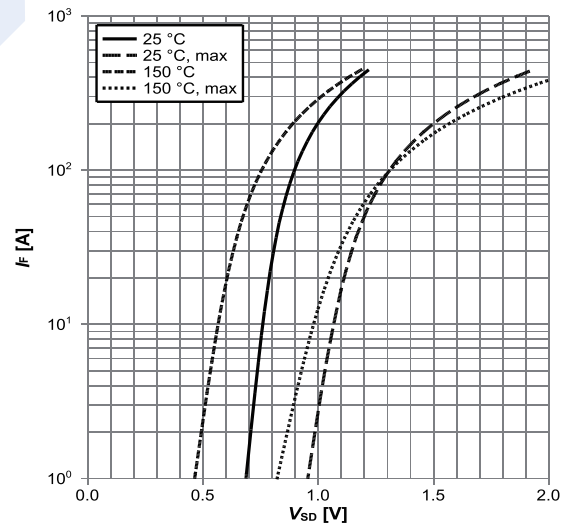
$V_{GS}=f(Q_{gate})$ ;  $I_D=30\text{ A}$  pulsed; parameter:  $V_{DD}$

Diagram 9 : Typ. capacitances



$C=f(V_{DS})$ ;  $V_{GS}=0\text{ V}$ ;  $f=1\text{ MHz}$

Diagram 10 : Forward characteristics of reverse diode

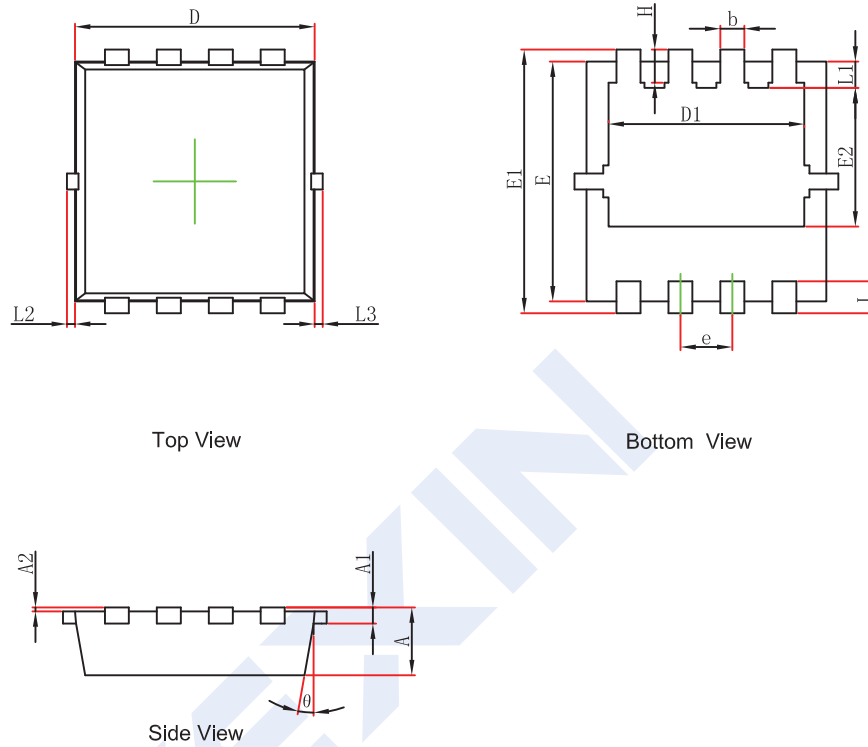


$I_f=f(V_{SD})$ ; parameter:  $T_j$

## N-Channel MOSFET

## 2KK5139DFN

## ■ PDFN3.3x3.3-8 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.650	0.850	0.026	0.033
A1	0.152 REF.		0.006 REF.	
A2	0~0.05		0~0.002	
D	3.050	3.250	0.114	0.122
D1	2.300	2.600	0.091	0.102
E	2.900	3.100	0.114	0.122
E1	3.150	3.450	0.124	0.136
E2	1.535	1.935	0.060	0.076
b	0.200	0.400	0.008	0.016
e	0.550	0.750	0.022	0.030
L	0.300	0.500	0.012	0.020
L1	0.180	0.480	0.007	0.019
L2	0~0.100		0~0.004	
L3	0~0.100		0~0.004	
H	0.315	0.515	0.012	0.020
$\theta$	9°	13°	9°	13°