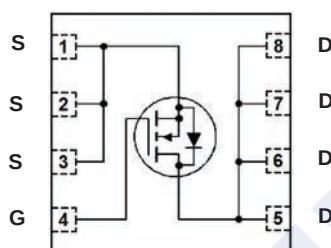


## N-Channel MOSFET

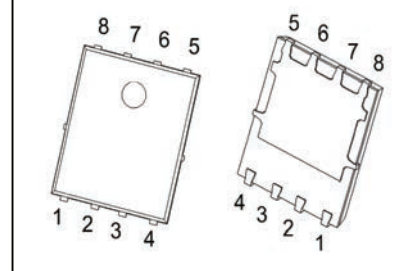
## 2KK5120DFN

## ■ Features

- $V_{DS} (V) = 40 V$
- $I_D = 150 A$
- $R_{DS(ON)}$  (at  $V_{GS} = 10 V$ )  $< 1.8 m\Omega$



PDFN5x6-8

■ 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                      |                      | $V_{GS}$        | ±20        |      |
| Continuous Drain Current                 | $T_c = 25^{\circ}C$  | $I_D$           | 150        | A    |
|                                          | $T_c = 100^{\circ}C$ |                 | 100        |      |
| Pulsed Drain Current (Note 1)            |                      | $I_{DM}$        | 560        |      |
| Power Dissipation                        |                      | $P_D$           | 92.6       | W    |
| Power Dissipation – Derate above 25°C    |                      |                 | 0.74       | W/°C |
| Single Pulse Avalanche Energy (Note 2)   |                      | $E_{AS}$        | 450        | mJ   |
| Single Pulse Avalanche Current (Note 2)  |                      | $I_{AS}$        | 30         | A    |
| Thermal Resistance, Junction- to-Ambient |                      | $R_{\theta JA}$ | 62         | °C/W |
| Thermal Resistance, Junction- to-Case    |                      | $R_{\theta JC}$ | 1.35       |      |
| Junction Temperature                     |                      | $T_J$           | 150        | °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

## 2KK5120DFN

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

| Parameter                             | Symbol              | Test Conditions                                                                           | Min | Typ  | Max  | Unit |
|---------------------------------------|---------------------|-------------------------------------------------------------------------------------------|-----|------|------|------|
| Off Characteristics                   |                     |                                                                                           |     |      |      |      |
| Drain-Source Breakdown Voltage        | BV <sub>DSS</sub>   | I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0V                                             | 40  |      |      | V    |
| Zero Gate Voltage Drain Current       | I <sub>DSS</sub>    | V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V                                             |     |      | 1    | μA   |
|                                       |                     | V <sub>DS</sub> = 32 V, V <sub>GS</sub> = 0 V, T <sub>J</sub> =125℃                       |     |      | 10   |      |
| Gate to Source Leakage Current        | I <sub>GSS</sub>    | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V                                            |     |      | ±100 | nA   |
| On Characteristics (Note 1)           |                     |                                                                                           |     |      |      |      |
| Gate to Source Threshold Voltage      | V <sub>GS(th)</sub> | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                | 1.0 |      | 2.0  | V    |
| Static Drain-Source On-Resistance     | R <sub>DS(on)</sub> | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 50 A                                             |     |      | 1.8  | mΩ   |
|                                       |                     | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 25 A                                            |     |      | 2.4  |      |
| Forward Transconductance              | g <sub>FS</sub>     | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 50 A                                             |     | 120  |      | S    |
| Dynamic Characteristics (Note 1)      |                     |                                                                                           |     |      |      |      |
| Input Capacitance                     | C <sub>iss</sub>    | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 20 V, f = 1 MHz                                  |     | 2500 |      | pF   |
| Output Capacitance                    | C <sub>oss</sub>    |                                                                                           |     | 230  |      |      |
| Reverse Transfer Capacitance          | C <sub>rss</sub>    |                                                                                           |     | 3.2  |      |      |
| Gate Resistance                       | R <sub>g</sub>      | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHZ                                          |     | 2.0  | 4.8  | Ω    |
| Switching Characteristics (Note 1)    |                     |                                                                                           |     |      |      |      |
| Total Gate Charge                     | Q <sub>g</sub>      | V <sub>GS</sub> = 10V, V <sub>DS</sub> = 20 V, I <sub>D</sub> = 50 A                      |     | 75   |      | nC   |
| Gate Source Charge                    | Q <sub>gs</sub>     |                                                                                           |     | 24   |      |      |
| Gate Drain Charge                     | Q <sub>gd</sub>     |                                                                                           |     | 19   |      |      |
| Turn-On DelayTime                     | t <sub>d(on)</sub>  | V <sub>GS</sub> = 10V, V <sub>DD</sub> = 20 V, I <sub>D</sub> = 50A, R <sub>G</sub> = 3 Ω |     | 20   |      | ns   |
| Turn-On Rise Time                     | t <sub>r</sub>      |                                                                                           |     | 32   |      |      |
| Turn-Off DelayTime                    | t <sub>d(off)</sub> |                                                                                           |     | 98   |      |      |
| Turn-Off Fall Time                    | t <sub>f</sub>      |                                                                                           |     | 32   |      |      |
| Drain-Source Diode Characteristics    |                     |                                                                                           |     |      |      |      |
| Body Diode Reverse Recovery Time      | t <sub>rr</sub>     | I <sub>S</sub> = 50A, di/dt = 100 A/μs                                                    |     | 64   |      | ns   |
| Body Diode Reverse Recovery Charge    | Q <sub>rr</sub>     |                                                                                           |     | 98   |      | nC   |
| Maximum Body-Diode Continuous Current | I <sub>S</sub>      | V <sub>G</sub> =V <sub>D</sub> =0V , Force Current                                        |     |      | 200  | A    |
| Diode Forward Voltage                 | V <sub>SD</sub>     | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 1 A                                               |     |      | 1    | V    |

Notes:

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

## ■ Marking

|         |                |
|---------|----------------|
| Marking | K5120<br>KC*** |
|---------|----------------|

## N-Channel MOSFET

## 2KK5120DFN

## ■ Typical Electrical Characteristics

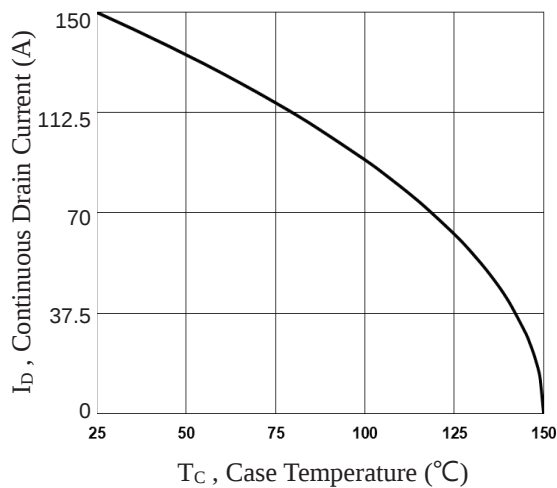
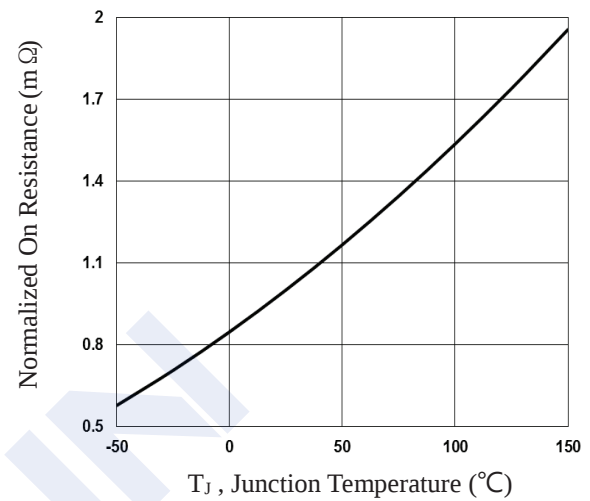
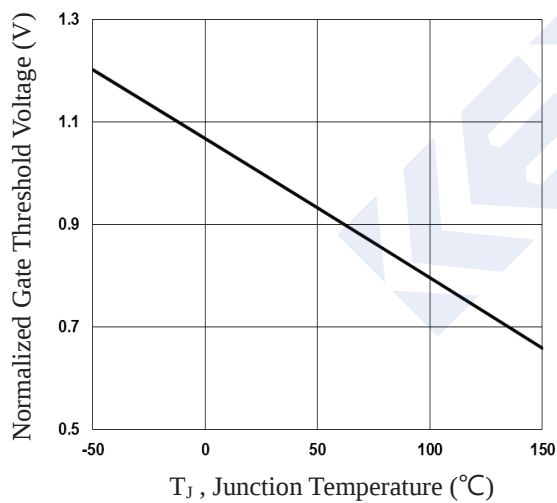
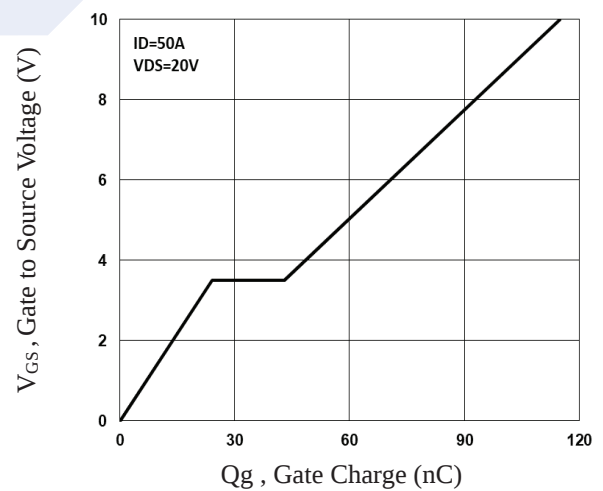
Fig.1 Continuous Drain Current vs.  $T_C$ Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$ Fig.3 Normalized  $V_{th}$  vs.  $T_J$ 

Fig.4 Gate Charge Characteristics

## N-Channel MOSFET

## 2KK5120DFN

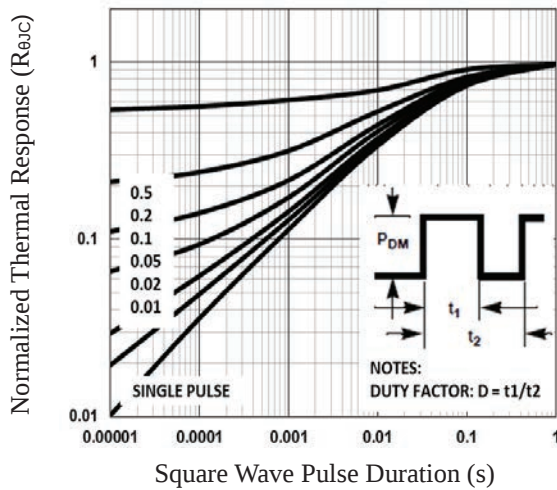


Fig.5 Normalized Transient Impedance

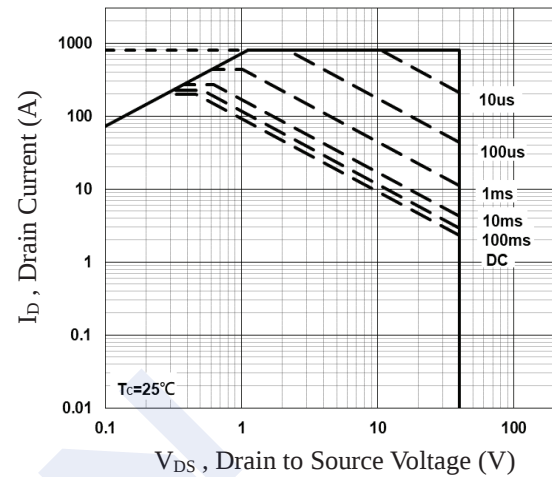


Fig.6 Maximum Safe Operation Area

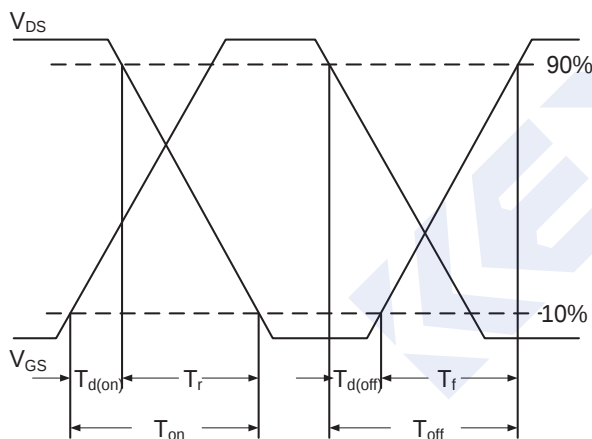


Fig.7 Switching Time Waveform

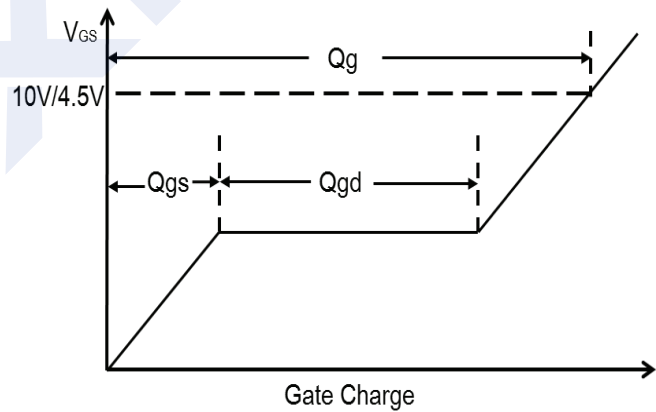
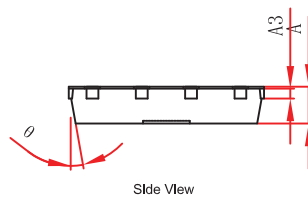
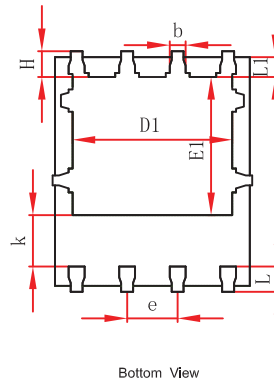
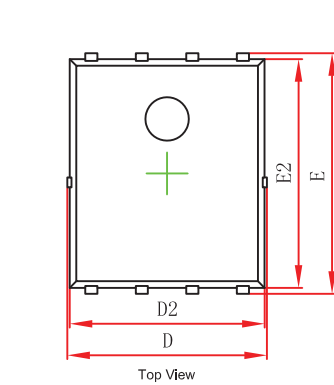


Fig.8 Gate Charge Waveform

## N-Channel MOSFET

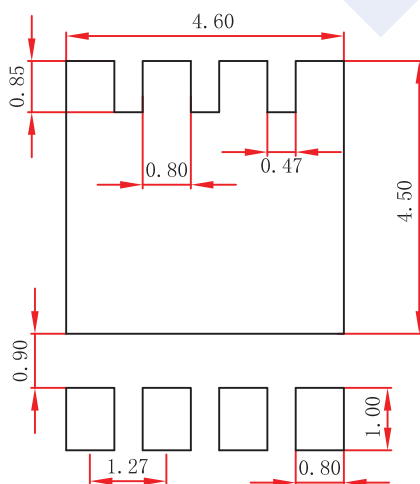
## 2KK5120DFN

## ■ PDFN5x6-8 Package Outline Dimensions



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min.                      | Max.  | Min.                 | Max.  |
| A      | 0.900                     | 1.000 | 0.035                | 0.039 |
| A3     | 0.254REF.                 |       | 0.010REF.            |       |
| D      | 4.944                     | 5.096 | 0.195                | 0.201 |
| E      | 5.974                     | 6.126 | 0.235                | 0.241 |
| D1     | 3.910                     | 4.110 | 0.154                | 0.162 |
| E1     | 3.375                     | 3.575 | 0.133                | 0.141 |
| D2     | 4.824                     | 4.976 | 0.190                | 0.196 |
| E2     | 5.674                     | 5.826 | 0.223                | 0.229 |
| k      | 1.190                     | 1.390 | 0.047                | 0.055 |
| b      | 0.350                     | 0.450 | 0.014                | 0.018 |
| e      | 1.270TYP.                 |       | 0.050TYP.            |       |
| L      | 0.559                     | 0.711 | 0.022                | 0.028 |
| L1     | 0.424                     | 0.576 | 0.017                | 0.023 |
| H      | 0.574                     | 0.726 | 0.023                | 0.029 |
| θ      | 10°                       | 12°   | 10°                  | 12°   |

## ■ PDFN5x6-8 Suggested Pad Layout



## Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.