**NIKO-SEM**

# Dual N-Channel Enhancement Mode Field Effect Transistor

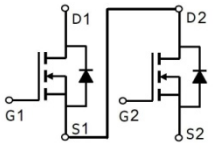
**P0903YK**

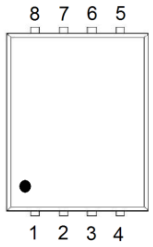
**PDFN 5x6P**

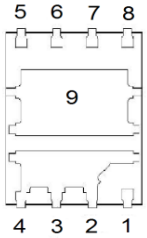
**Halogen-Free & Lead-Free**

## PRODUCT SUMMARY

| | $V_{(BR)DSS}$ | $R_{DS(ON)}$ | $I_D$[3] |
|---|---|---|---|
| Q2 | 30V | 9mΩ | 51A |
| Q1 | 30V | 16mΩ | 31A |




1 : G1
2,3,4 : D1
5,6,7 : S2
8 : G2
9 : S1/D2

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25 °C Unless Otherwise Noted)

| PARAMETERS/TEST CONDITIONS | | SYMBOL | Q2 | Q1 | UNITS |
|---|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 30 | 30 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | ±20 | V |
| Continuous Drain Current[3] | $T_C$ = 25 °C | $I_D$ | 51 | 31 | A |
| | $T_C$ = 100 °C | | 32 | 20 | |
| Pulsed Drain Current[1] | | $I_{DM}$ | 100 | 80 | |
| Continuous Drain Current | $T_A$ = 25 °C | $I_D$ | 11 | 8.5 | |
| | $T_A$ = 70 °C | | 9 | 6.7 | |
| Avalanche Current | | $I_{AS}$ | 23 | 17 | |
| Avalanche Energy | L = 0.1mH | $E_{AS}$ | 24 | 14.5 | mJ |
| Power Dissipation | $T_C$ = 25 °C | $P_D$ | 39 | 27 | W |
| | $T_C$ = 100 °C | | 15 | 11 | |
| Power Dissipation | $T_A$ = 25 °C | $P_D$ | 2 | 1.8 | W |
| | $T_A$ = 70 °C | | 1,3 | 1.1 | |
| Operating Junction & Storage Temperature Range | | $T_j$, $T_{stg}$ | -55 to 150 | | °C |

## THERMAL RESISTANCE RATINGS

| THERMAL RESISTANCE | SYMBOL | | TYPICAL | MAXIMUM | UNITS |
|---|---|---|---|---|---|
| Junction-to-Ambient[2] | $R_{\theta JA}$ | Q2 | | 60 | °C / W |
| | $R_{\theta JA}$ | Q1 | | 67 | |
| Junction-to-Case | $R_{\theta JC}$ | Q2 | | 3.2 | |
| | $R_{\theta JC}$ | Q1 | | 4.5 | |

[1]Pulse width limited by maximum junction temperature $T_{J(MAX)}$=150°C.
[2]The value of $R_{\theta JA}$ is measured with the device mounted on 1in$^2$ FR-4 board with 2oz. Copper, in a still air environment with $T_A$ =25°C. The value in any given application depends on the user's specific board design.
[3]Package limitation current :Q1=20A,Q2=23A

**ELECTRICAL CHARACTERISTICS ($T_J$ = 25 °C, Unless Otherwise Noted)**

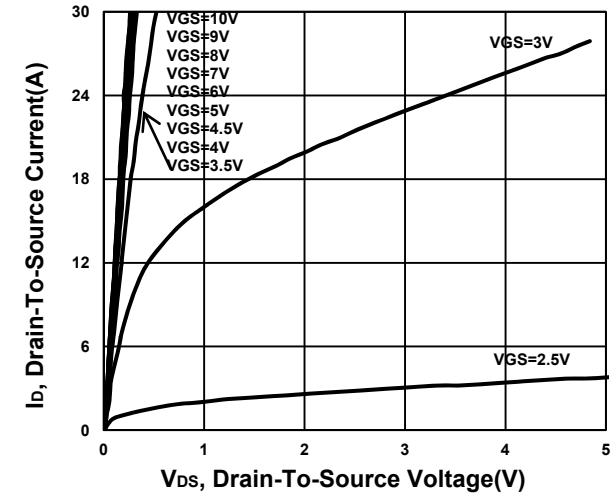
| PARAMETER | SYMBOL | TEST CONDITIONS | | LIMITS MIN | LIMITS TYP | LIMITS MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **STATIC** | | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | Q2 | 30 | | | V |
| | | | Q1 | 30 | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | Q2 | 1 | 1.6 | 3 | |
| | | | Q1 | 1 | 1.6 | 3 | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | Q2 | | | ±100 | nA |
| | | | Q1 | | | ±100 | |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 24V, $V_{GS}$ = 0V | Q2 | | | 1 | μA |
| | | | Q1 | | | 1 | |
| | | $V_{DS}$ = 20V, $V_{GS}$ = 0V, $T_J$ = 55 °C | Q2 | | | 10 | |
| | | | Q1 | | | 10 | |
| Drain-Source On-State Resistance[1] | $R_{DS(ON)}$ | $V_{GS}$ =4.5V, $I_D$ = 9A | Q2 | | 9.9 | 14.5 | mΩ |
| | | $V_{GS}$ =4.5V, $I_D$ = 6.8A | Q1 | | 16 | 25 | |
| | | $V_{GS}$ = 10V, $I_D$ = 11A | Q2 | | 7.9 | 9 | |
| | | $V_{GS}$ = 10V, $I_D$ = 8.5A | Q1 | | 12 | 16 | |
| Forward Transconductance[1] | $g_{fs}$ | $V_{DS}$ = 5V, $I_D$ = 11A | Q2 | | 50 | | S |
| | | $V_{DS}$ = 5V, $I_D$ = 8.5A | Q1 | | 36 | | |
| **DYNAMIC** | | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 15V, f = 1MHz | Q2 | | 954 | | pF |
| | | | Q1 | | 535 | | |
| Output Capacitance | $C_{oss}$ | | Q2 | | 124 | | |
| | | | Q1 | | 81 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | Q2 | | 104 | | |
| | | | Q1 | | 75 | | |
| Gate Resistance | $R_g$ | $V_{GS}$ = 0V, $V_{DS}$ = 0V, f = 1MHz | Q2 | | 2.1 | | Ω |
| | | | Q1 | | 2.3 | | |
| Total Gate Charge[2] | $Q_g$ VGS = 10V | Q2 $V_{DS}$ = 15V , $V_{GS}$ = 10V, $I_D$ = 11A Q1 $V_{DS}$ = 15V , $V_{GS}$ = 10V, $I_D$ = 8.5A | Q2 | | 21.7 | | nC |
| | | | Q1 | | 15.1 | | |
| | $Q_g$ VGS = 4.5V | | Q2 | | 11.5 | | |
| | | | Q1 | | 8.3 | | |
| Gate-Source Charge[2] | $Q_{gs}$ | | Q2 | | 3.3 | | |
| | | | Q1 | | 2 | | |
| Gate-Drain Charge[2] | $Q_{gd}$ | | Q2 | | 5.6 | | |
| | | | Q1 | | 5 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Turn-On Delay Time[2] | $t_{d(on)}$ | Q2<br>$V_{DS}$=15V ,<br>$I_D$≅11A,$V_{GS}$=10V,$R_{GEN}$=6Ω<br>Q1<br>$V_{DS}$=15V ,<br>$I_D$≅8.5A, $V_{GS}$=10V,$R_{GEN}$ =6Ω | Q2 | | 24 | | nS |
| | | | Q1 | | 20 | | |
| Rise Time[2] | $t_r$ | | Q2 | | 16 | | |
| | | | Q1 | | 16 | | |
| Turn-Off Delay Time[2] | $t_{d(off)}$ | | Q2 | | 44 | | |
| | | | Q1 | | 53 | | |
| Fall Time[2] | $t_f$ | | Q2 | | 23 | | |
| | | | Q1 | | 33 | | |
| **SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_J$ = 25 °C)** | | | | | | | |
| Continuous Current[3] | $I_S$ | | Q2 | | | 51 | A |
| | | | Q1 | | | 31 | |
| Forward Voltage[1] | $V_{SD}$ | $I_F$ =11A, $V_{GS}$ = 0V | Q2 | | | 1.2 | V |
| | | $I_F$ = 8.5A, $V_{GS}$ = 0V | Q1 | | | 1 | |
| Reverse Recovery Time | $t_{rr}$ | Q2<br>$I_F$ = 11A, $dI_F/dt$ = 100A / μS<br>Q1<br>$I_F$ = 8.5A, $dI_F/dt$ = 100A / μS | Q2 | | 17 | | nS |
| | | | Q1 | | 15 | | |
| Reverse Recovery Charge | $Q_{rr}$ | | Q2 | | 7 | | nC |
| | | | Q1 | | 5.6 | | |

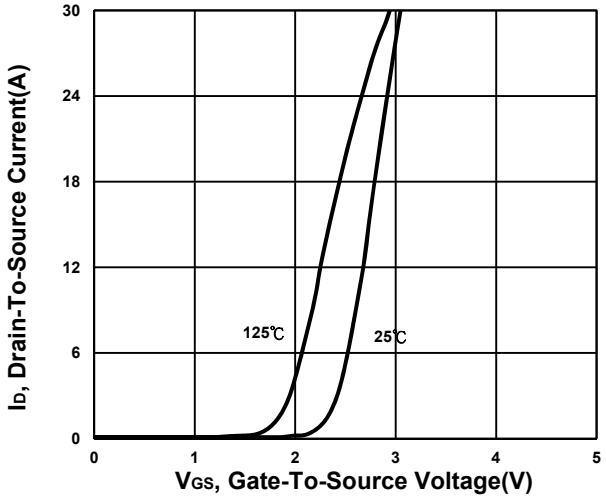
[1]Pulse test : Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.
[2]Independent of operating temperature.
[3]Package limitation current :Q1=20A,Q2=23A

## TYPICAL PERFORMANCE CHARACTERISTICS
## Q2

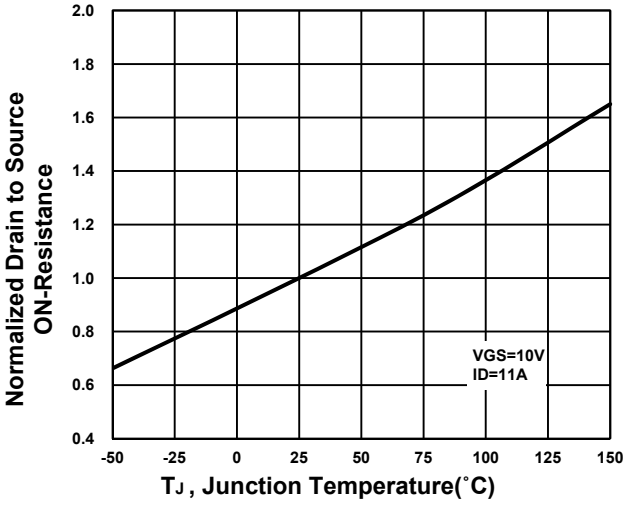
### Output Characteristics



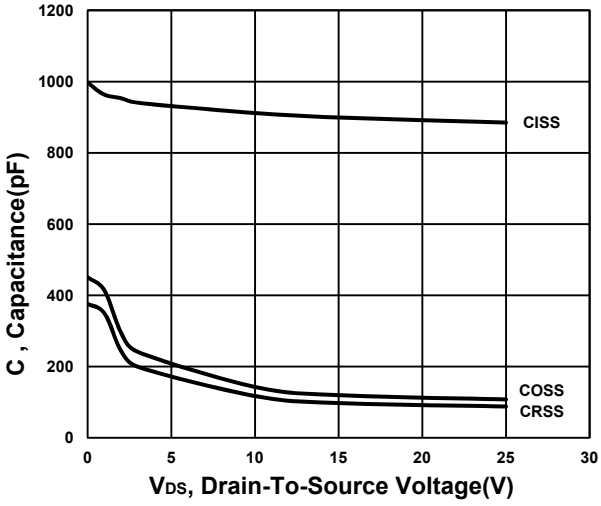

### Transfer Characteristics



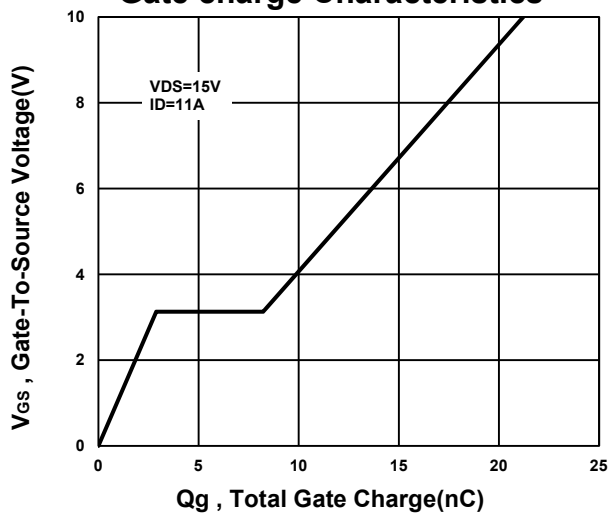

### On-Resistance VS Temperature



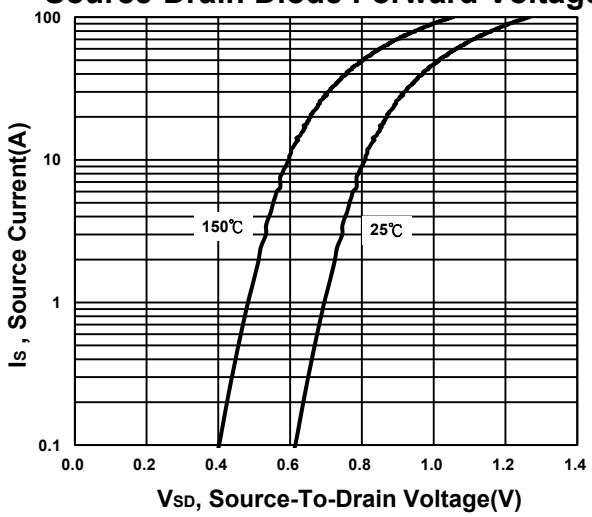

### Capacitance Characteristic



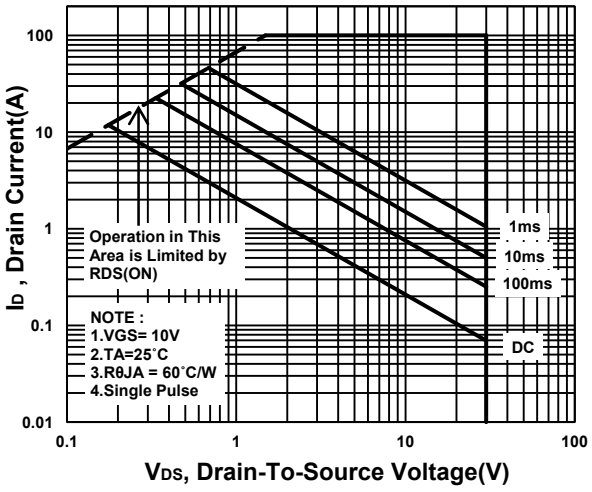

### Gate charge Characteristics



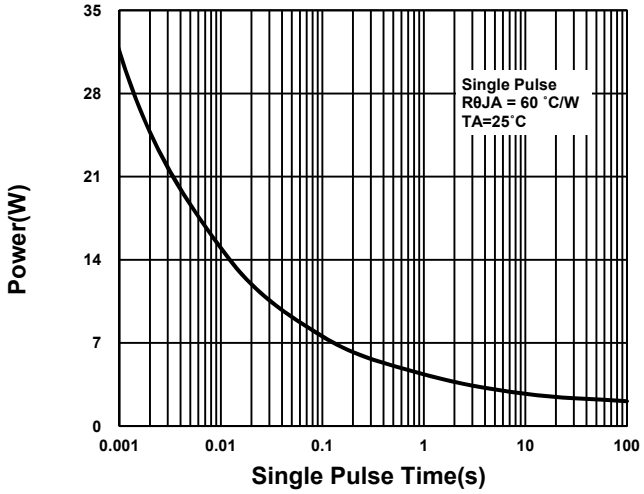

### Source-Drain Diode Forward Voltage



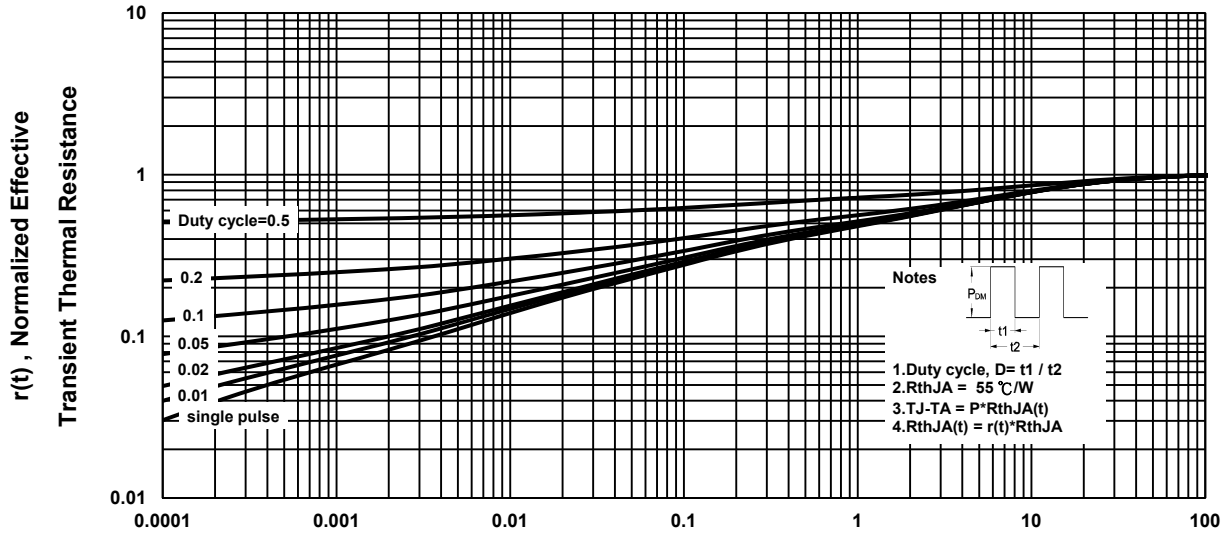
## Safe Operating Area




## Single Pulse Maximum Power Dissipation

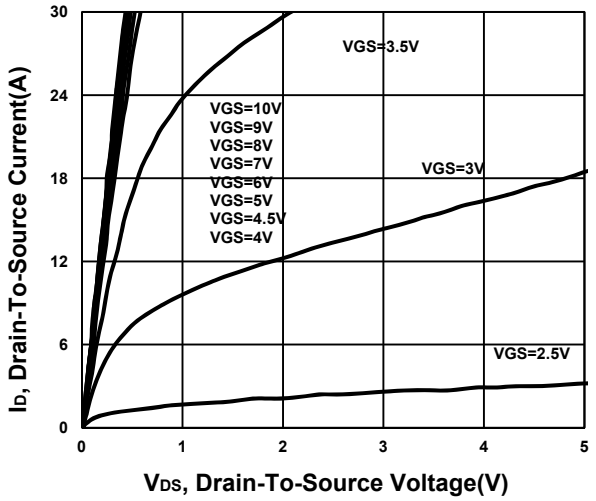



## Transient Thermal Response Curve

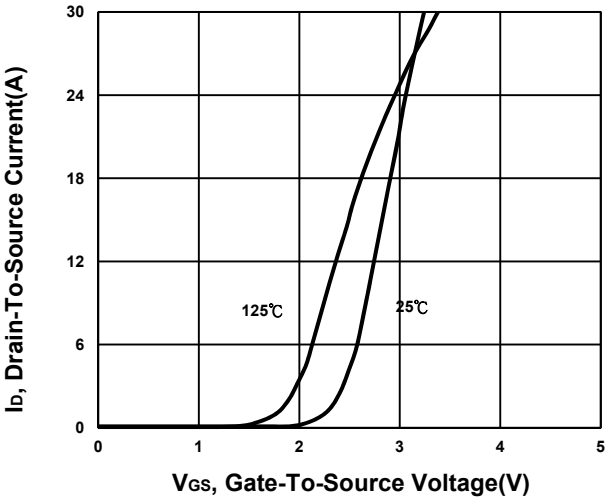


## TYPICAL PERFORMANCE CHARACTERISTICS
## Q1

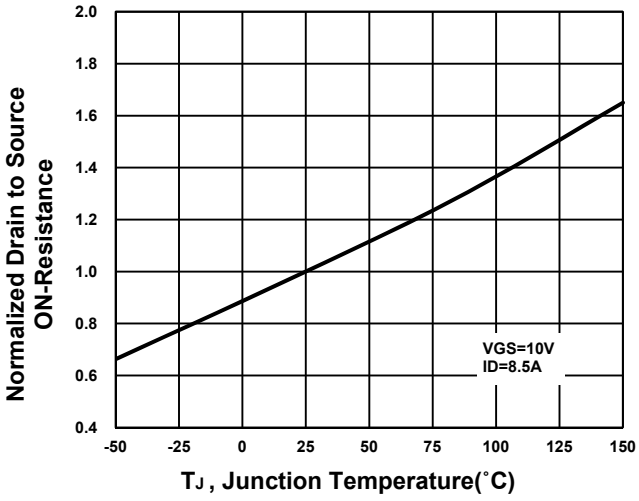
### Output Characteristics



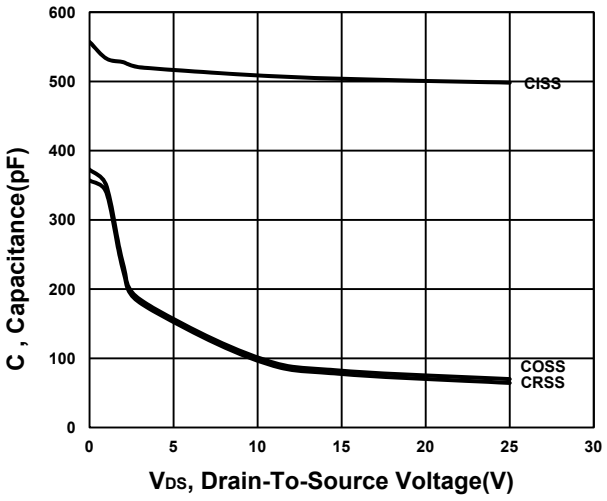

### Transfer Characteristics



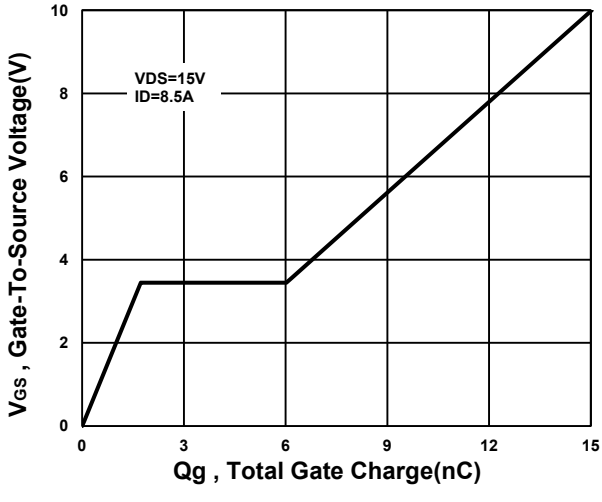

### On-Resistance VS Temperature



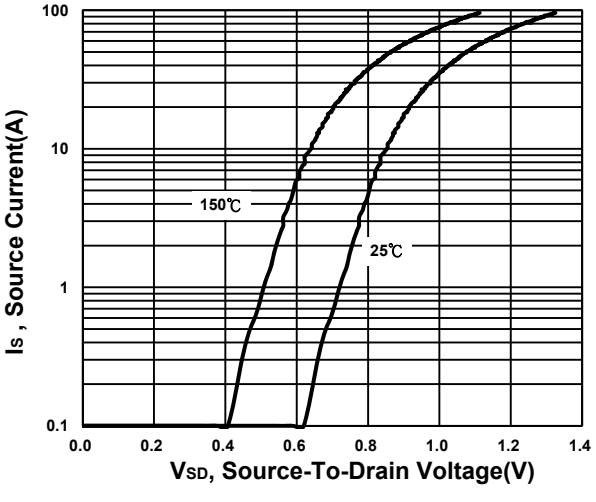

### Capacitance Characteristic



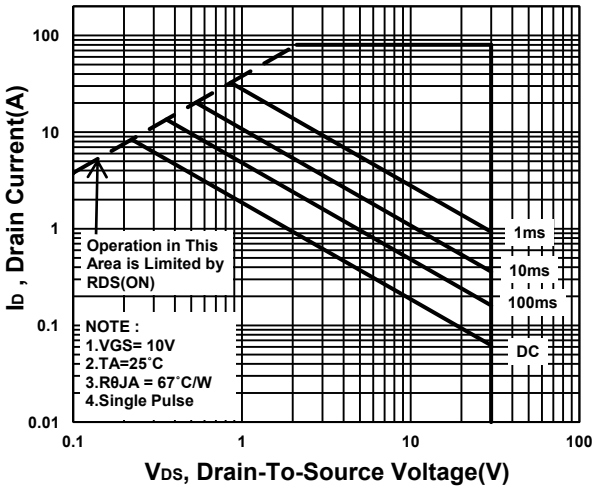

### Gate charge Characteristics



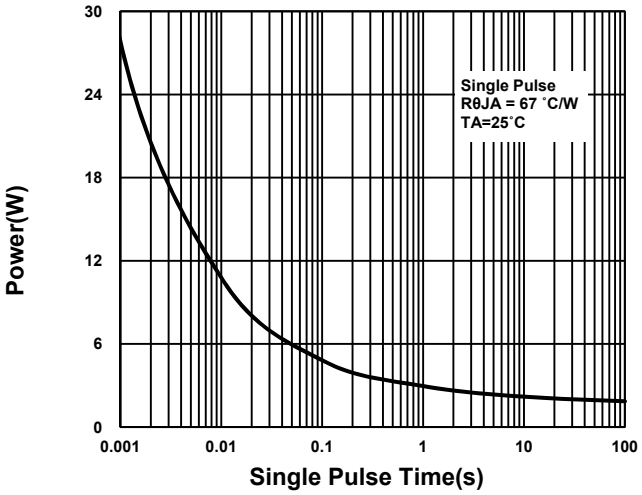

### Source-Drain Diode Forward Voltage



## Safe Operating Area




## Single Pulse Maximum Power Dissipation




## Transient Thermal Response Curve