# NIKO-SEM

## N-Channel Enhancement Mode Field Effect Transistor

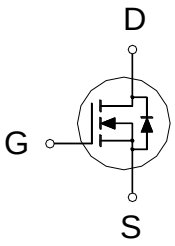
# P1406BV

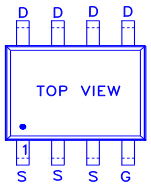
**SOP-8**

**Halogen-Free & Lead-Free**

### PRODUCT SUMMARY

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ | $I_D$ |
|---|---|---|
| 60V | 12.5mΩ | 12A |




G: GATE
D: DRAIN
S: SOURCE

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

| PARAMETERS/TEST CONDITIONS | | SYMBOL | LIMITS | UNITS |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 60 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current | $T_A$ = 25 ° C | $I_D$ | 12 | A |
| | $T_A$ = 70 ° C | | 10 | |
| Pulsed Drain Current[1] | | $I_{DM}$ | 40 | |
| Avalanche Current | | $I_{AS}$ | 39 | |
| Avalanche Energy | L = 0.1mH | $E_{AS}$ | 76 | mJ |
| Power Dissipation[3] | $T_A$ = 25 ° C | $P_D$ | 4 | W |
| | $T_A$ = 70 ° C | | 2.6 | |
| 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] | t ≦10s | $R_{\theta JA}$ | | 30 | ° C / W |
| Junction-to-Ambient | Steady-State | $R_{\theta JA}$ | | 56 | |
| Junction-to-Case | Steady-State | $R_{\theta JC}$ | | 25 | |

[1]Pulse width limited by maximum junction temperature.
[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.
[3]The Power dissipation is based on $R_{\theta JA}$ t ≦10s value.

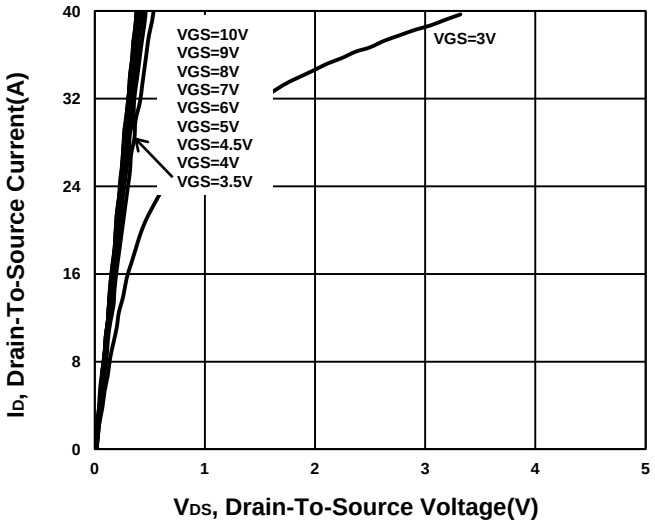
### .ELECTRICAL CHARACTERISTICS ($T_J$ = 25 ° C, Unless Otherwise Noted)

| PARAMETER | SYMBOL | TEST CONDITIONS | LIMITS | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| **STATIC** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | 60 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 1.3 | 1.8 | 2.3 | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | | | ±100 | nA |

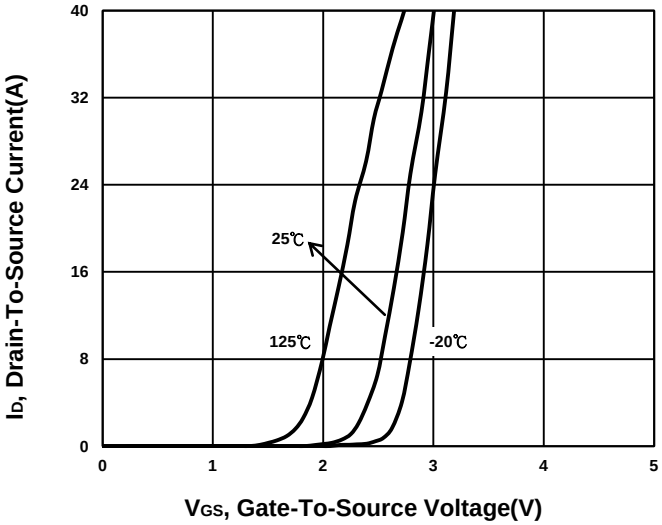
| | | | | | | |
|---|---|---|---|---|---|---|
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 48V, $V_{GS}$ = 0V | | | 1 | μA |
| | | $V_{DS}$ = 40V, $V_{GS}$ = 0V, $T_J$ = 55 ° C | | | 10 | |
| Drain-Source On-State Resistance[1] | $R_{DS(ON)}$ | $V_{GS}$ = 4.5V, $I_D$ = 10A | | 11 | 16 | mΩ |
| | | $V_{GS}$ =10V, $I_D$ = 10A | | 9.8 | 12.5 | |
| Forward Transconductance[1] | $g_{fs}$ | $V_{DS}$ = 5V, $I_D$ = 10A | | 50 | | S |
| **DYNAMIC** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 25V, f = 1MHz | | 1901 | | pF |
| Output Capacitance | $C_{oss}$ | | | 239 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 177 | | |
| Gate Resistance | $R_g$ | $V_{GS}$ = 0V, $V_{DS}$ = 0V, f = 1MHz | | 0.7 | | Ω |
| Total Gate Charge[2] | $Q_{g(VGS=10V)}$ | $V_{DS}$ = 30V , $I_D$ =10A | | 48 | | nC |
| | $Q_{g(VGS=4.5V)}$ | | | 27 | | |
| Gate-Source Charge[2] | $Q_{gs}$ | | | 5 | | |
| Gate-Drain Charge[2] | $Q_{gd}$ | | | 15 | | |
| Turn-On Delay Time[2] | $t_{d(on)}$ | $V_{DS}$ = 30V , $I_D \cong$ 10A, $V_{GS}$ = 10V, $R_{GEN}$ =6Ω | | 20 | | nS |
| Rise Time[2] | $t_r$ | | | 12 | | |
| Turn-Off Delay Time[2] | $t_{d(off)}$ | | | 58 | | |
| Fall Time[2] | $t_f$ | | | 10 | | |
| **SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_J$ = 25 ° C)** | | | | | | |
| Continuous Current | $I_S$ | | | | 3 | A |
| Forward Voltage[1] | $V_{SD}$ | $I_F$ = 10A, $V_{GS}$ = 0V | | | 1.3 | V |
| Diode Reverse Recovery Time | $t_{rr}$ | $I_F$= 10A, dI/dt=100A/μs | | 26 | | nS |
| Diode Reverse Recovery Charge | $Q_{rr}$ | | | 17 | | nC |

[1]Pulse test : Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.
[2]Independent of operating temperature.

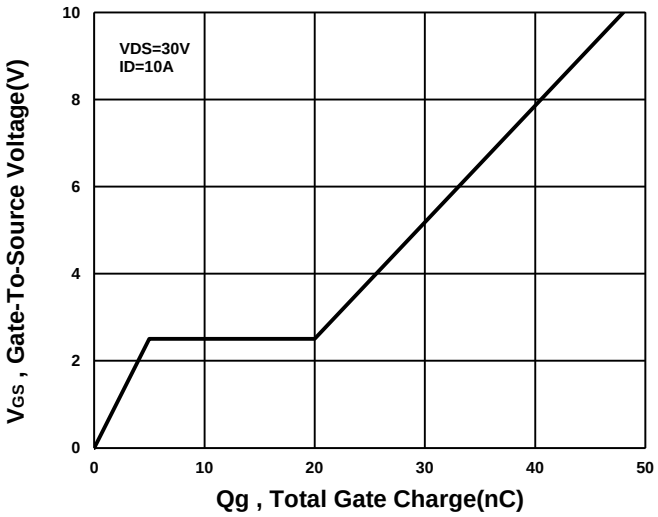
## Output Characteristics



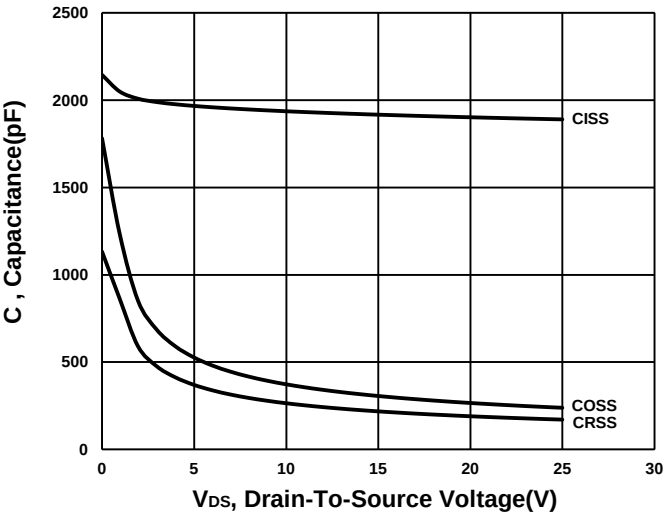

## Transfer Characteristics



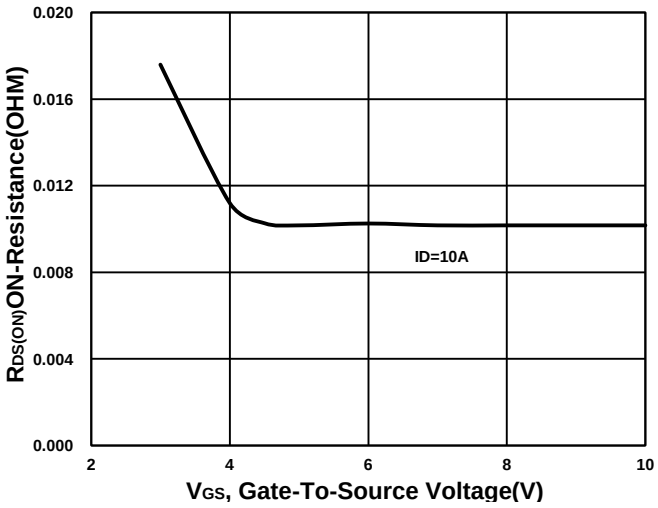

## Gate charge Characteristics



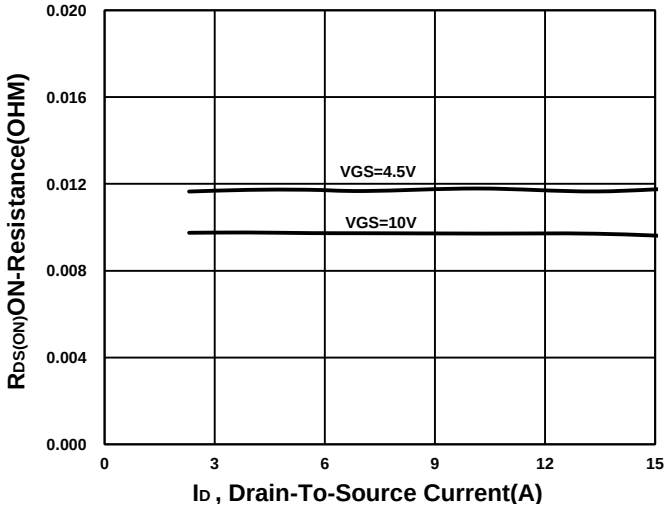

## Capacitance Characteristic



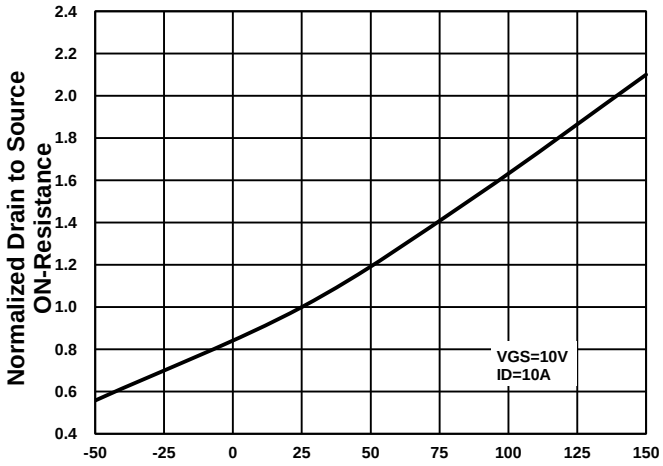

## On-Resistance VS Gate-To-Source



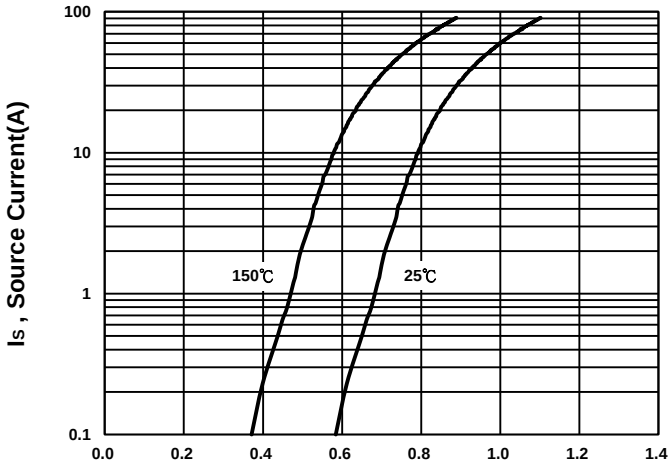

## On-Resistance VS Drain Current



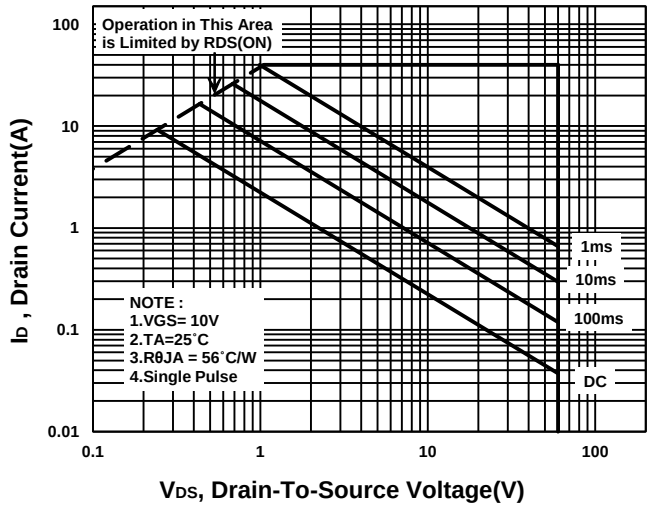
## On-Resistance VS Temperature



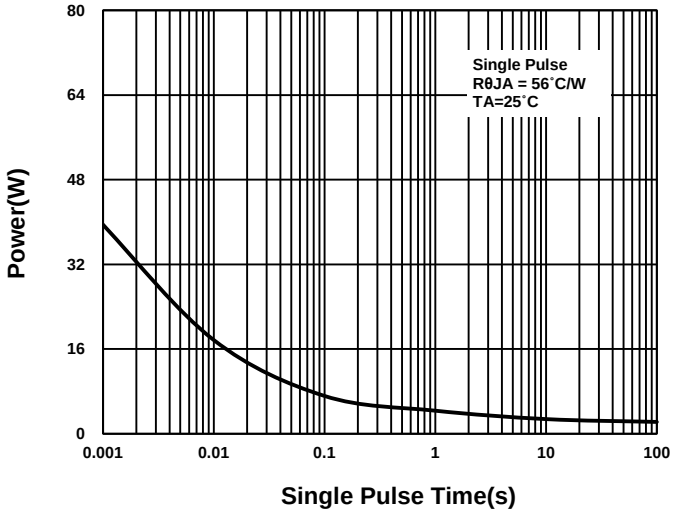

## Source-Drain Diode Forward Voltage




## Safe Operating Area




## Single Pulse Maximum Power Dissipation




## Transient Thermal Response Curve