**NIKO-SEM**

# P-Channel Logic Level Enhancement Mode Field Effect Transistor ( Preliminary )

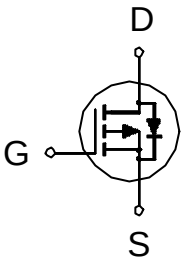
**P4404EDG**

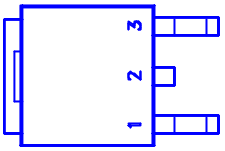
**TO-252(DPAK)**

Lead-Free

**PRODUCT SUMMARY**

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ | $I_D$ |
|---|---|---|
| -40V | 44mΩ | -10A |




1. GATE
2. DRAIN
3. SOURCE

**ABSOLUTE MAXIMUM RATINGS ($T_C$ = 25 °C Unless Otherwise Noted)**

| PARAMETERS/TEST CONDITIONS | | SYMBOL | LIMITS | UNITS |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | -40 | V |
| Gate-Source Voltage | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current | $T_C$ = 25 °C | $I_D$ | -10 | A |
| | $T_C$ = 70 °C | | -8 | |
| Pulsed Drain Current[1] | | $I_{DM}$ | -32 | |
| Power Dissipation | $T_C$ = 25 °C | $P_D$ | 30 | W |
| | $T_C$ = 70 °C | | 20 | |
| Operating Junction & Storage Temperature Range | | $T_j$, $T_{stg}$ | -55 to 150 | °C |
| Lead Temperature ($^1/_{16}$" from case for 10 sec.) | | $T_L$ | 275 | |

**THERMAL RESISTANCE RATINGS**

| THERMAL RESISTANCE | SYMBOL | TYPICAL | MAXIMUM | UNITS |
|---|---|---|---|---|
| Junction-to-Case | $R_{\theta JC}$ | | 4.1 | °C / W |
| Junction-to-Ambient | $R_{\theta JA}$ | | 80 | °C / W |

[1]Pulse width limited by maximum junction temperature.
[2]Duty cycle ≤ 1%

**ELECTRICAL CHARACTERISTICS ($T_C$ = 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 | -40 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = -250µA | -1 | -1.8 | -3.0 | |
| Gate-Body Leakage | $I_{GSS}$ | $V_{DS}$ = 0V, $V_{GS}$ = ±20V | | | ±250 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = -32V, $V_{GS}$ = 0V | | | 1 | µA |
| | | $V_{DS}$ = -30V, $V_{GS}$ = 0V, $T_J$ = 125 °C | | | 10 | |
| On-State Drain Current[1] | $I_{D(ON)}$ | $V_{DS}$ = -5V, $V_{GS}$ = -10V | -32 | | | A |
| Drain-Source On-State Resistance[1] | $R_{DS(ON)}$ | $V_{GS}$ = -4.5V, $I_D$ = -8A | | 57 | 68 | mΩ |
| | | $V_{GS}$ = -10V, $I_D$ = -10A | | 38 | 44 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Forward Transconductance[1] | $g_{fs}$ | $V_{DS}$ = -10V, $I_D$ = -10A | | 11 | | S |
| **DYNAMIC** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = -10V, f = 1MHz | | 660 | | pF |
| Output Capacitance | $C_{oss}$ | | | 300 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 70 | | |
| Total Gate Charge[2] | $Q_g$ | $V_{DS}$ = 0.5$V_{(BR)DSS}$, $V_{GS}$ = -10V, $I_D$ = -10A | | 14 | | nC |
| Gate-Source Charge[2] | $Q_{gs}$ | | | 2.2 | | |
| Gate-Drain Charge[2] | $Q_{gd}$ | | | 1.9 | | |
| Turn-On Delay Time[2] | $t_{d(on)}$ | $V_{DS}$ = -20V, $R_L$ = 1Ω, $I_D \cong$ -1A, $V_{GS}$ = -10V, $R_{GS}$ = 6Ω | | 6.0 | 12.8 | nS |
| Rise Time[2] | $t_r$ | | | 9.2 | 18.6 | |
| Turn-Off Delay Time[2] | $t_{d(off)}$ | | | 19.2 | 34.8 | |
| Fall Time[2] | $t_f$ | | | 11.8 | 21.6 | |
| **SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_C$ = 25 °C)** | | | | | | |
| Continuous Current | $I_S$ | | | | -10 | A |
| Pulsed Current[3] | $I_{SM}$ | | | | -30 | |
| Forward Voltage[1] | $V_{SD}$ | $I_F$ = $I_S$, $V_{GS}$ = 0V | | | -1 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_F$ = -5 A, $dI_F/dt$ = 100A / µS | | 15.5 | | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | | 7.9 | | nC |

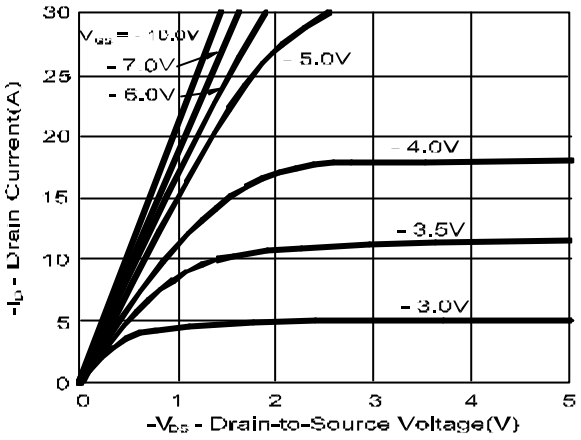
[1]Pulse test : Pulse Width ≤ 300 µsec, Duty Cycle ≤ 2%.
[2]Independent of operating temperature.
[3]Pulse width limited by maximum junction temperature.

**REMARK: THE PRODUCT MARKED WITH "P4404EDG", DATE CODE or LOT #**

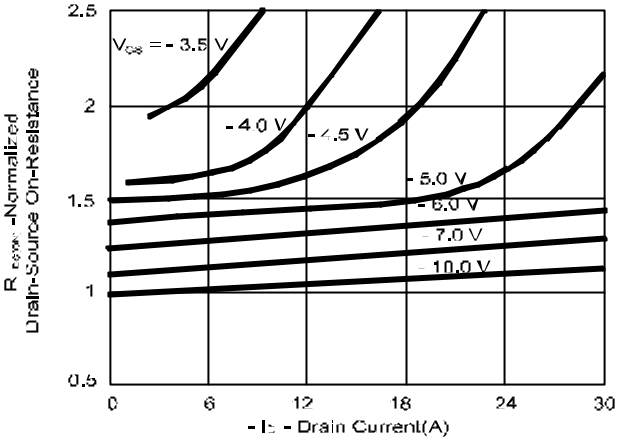
**Orders for parts with Lead-Free plating can be placed using the PXXXXXXG parts name.**

## TYPICAL PERFORMANCE CHARACTERISTICS

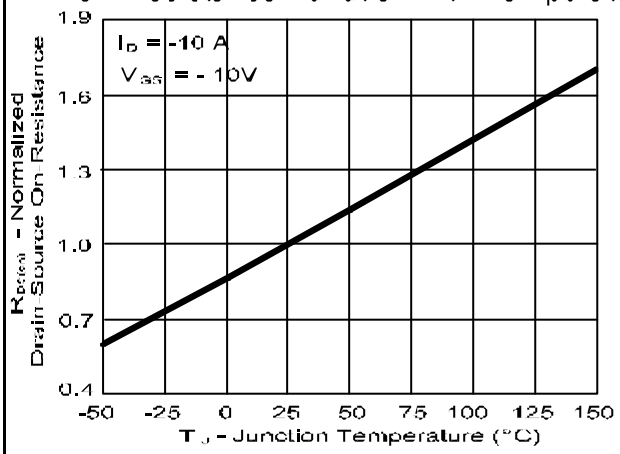
On-Region Characteristics



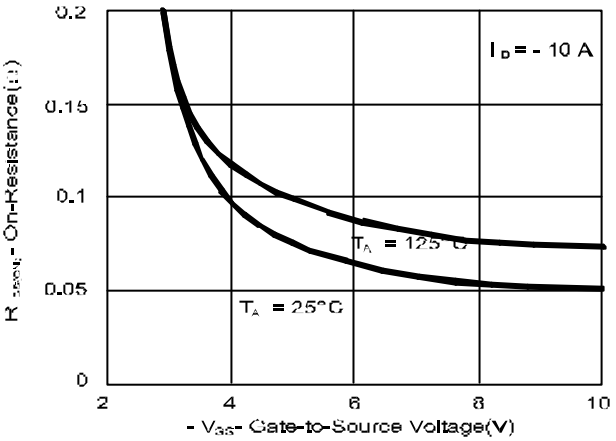

On-Resistance Variation with Drain Current and Gate Voltage



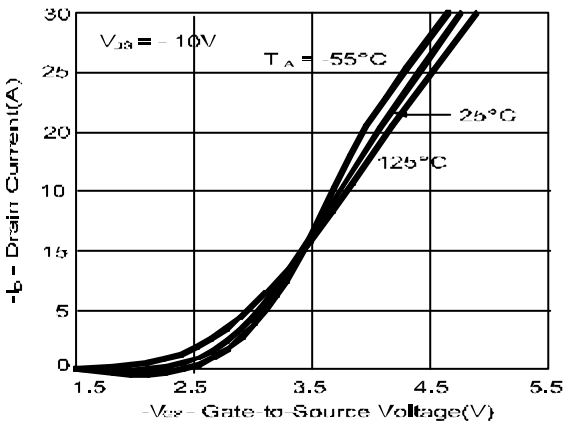

On-Resistance Variation with Temperature



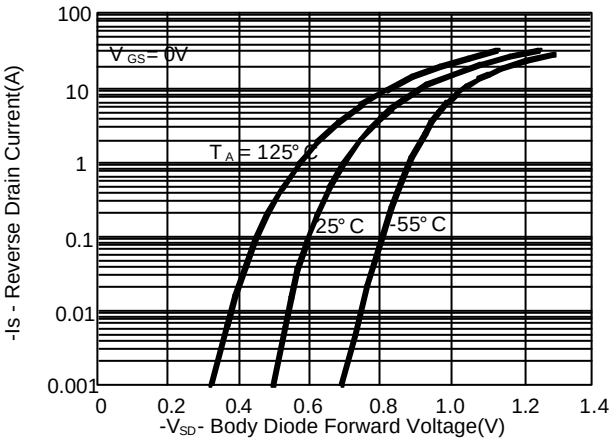

On-Resistance Variation with Gate-to-Source Voltage



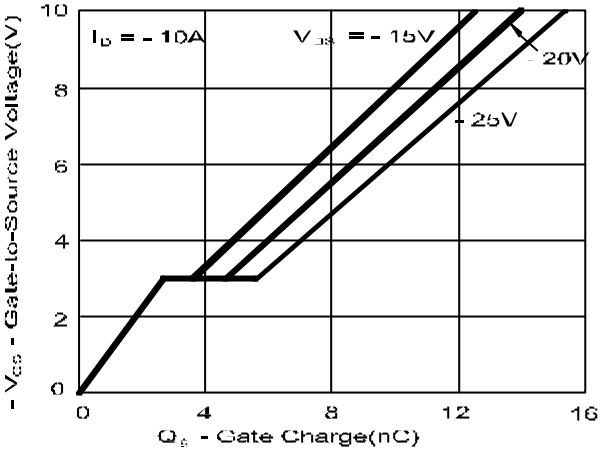

Transfer Characteristics



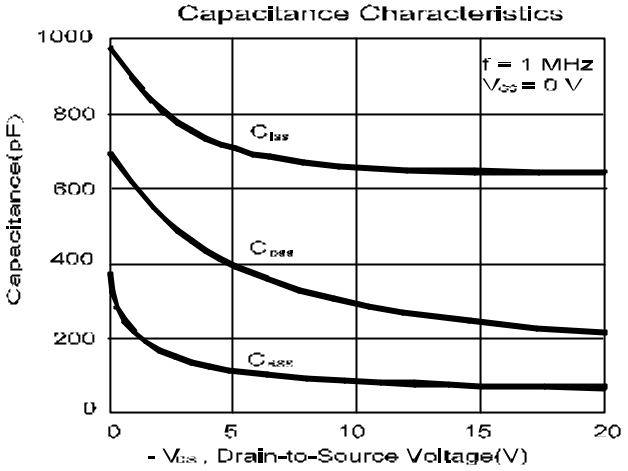

Body Diode Forward Voltage Variation with Source Current and Temperature



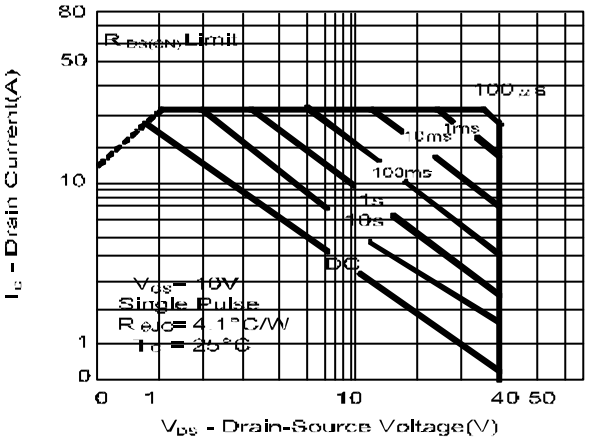
Gate Charge Characteristics



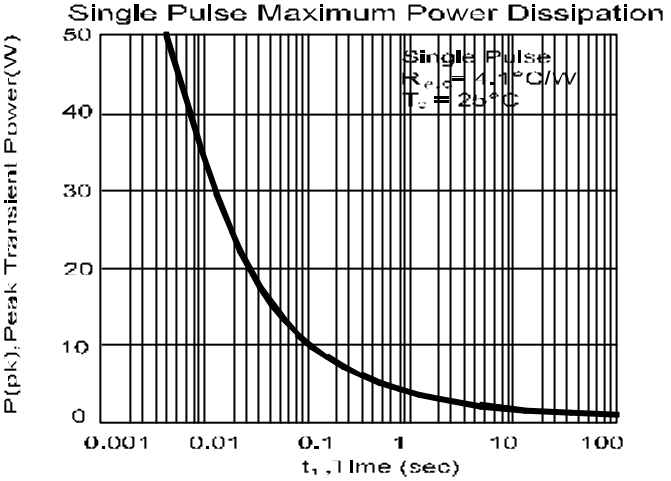

Capacitance Characteristics



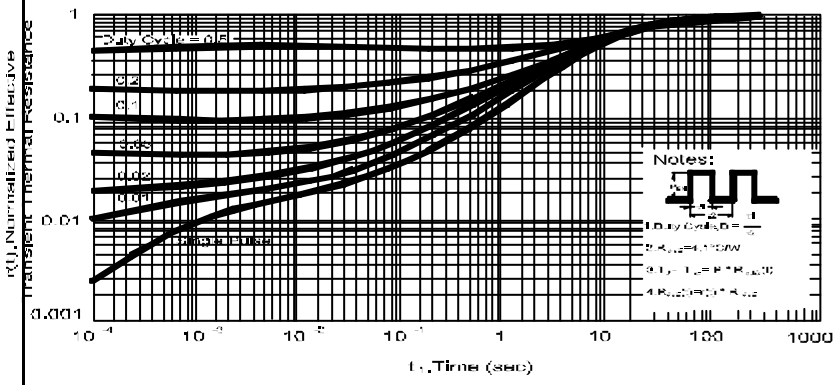

Maximum Safe Operating Area




Single Pulse Maximum Power Dissipation




Transient Thermal Response Curve



# TO-252 (DPAK) MECHANICAL DATA

| Dimension | mm | | | Dimension | mm | | |
|---|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | Min. | Typ. | Max. |
| A | 9.35 | | 10.1 | H | | 0.8 | |
| B | 2.2 | | 2.4 | I | 6.4 | | 6.6 |
| C | 0.48 | | 0.6 | J | 5.2 | | 5.4 |
| D | 0.89 | | 1.5 | K | 0.6 | | 1 |
| E | 0.45 | | 0.6 | L | 0.64 | | 0.9 |
| F | 0.03 | | 0.23 | M | 4.4 | | 4.6 |
| G | 6 | | 6.2 | N | | | |