UNIKC Semiconductor

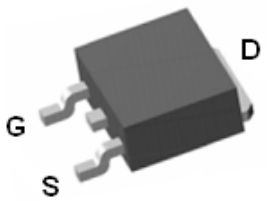
RoHS Compliant

# P3504BD

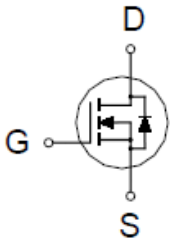
## N-Channel Enhancement Mode MOSFET

### PRODUCT SUMMARY

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ | $I_D$ |
|---|---|---|
| 40V | 40mΩ @$V_{GS}$ = 10V | 20A |




TO-252




**100% Rg tested**

**100% UIS tested**

### ABSOLUTE MAXIMUM RATINGS ($T_A$ = 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 | $I_D$ | 20 | A |
| | $T_C$ = 70 °C | | 16 | |
| Pulsed Drain Current[1] | | $I_{DM}$ | 60 | |
| Avalanche Current | | $I_{AS}$ | 20 | |
| Avalanche Energy | L = 0.1mH | $E_{AS}$ | 20 | mJ |
| 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 |

### 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 | |

[1]Pulse width limited by maximum junction temperature.

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

| PARAMETER | SYMBOL | TEST CONDITIONS | LIMITS | | | UNITS |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| **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 | 2.0 | 2.4 | 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 , $T_C$ = 125 °C | | | 10 | |
| On-State Drain Current[1] | $I_{D(ON)}$ | $V_{DS}$ = 5V, $V_{GS}$ = 10V | 60 | | | A |
| Drain-Source On-State Resistance[1] | $R_{DS(ON)}$ | $V_{GS}$ = 5V, $I_D$ = 8A | | 37 | 60 | mΩ |
| | | $V_{GS}$ = 10V, $I_D$ = 10A | | 28 | 40 | |
| Forward Transconductance[1] | $g_{fs}$ | $V_{DS}$ = 5V, $I_D$ = 10A | | 18 | | S |
| **DYNAMIC** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 20V, f = 1MHz | | 630 | | pF |
| Output Capacitance | $C_{oss}$ | | | 124 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 64 | | |
| Total Gate Charge[2] | $Q_g$ | $V_{DS}$ = 0.5$V_{(BR)DSS}$, $V_{GS}$ = 10V, $I_D$ = 10A | | 11 | | nC |
| Gate-Source Charge[2] | $Q_{gs}$ | | | 2.6 | | |
| Gate-Drain Charge[2] | $Q_{gd}$ | | | 2.2 | | |
| Gate Resistance | $R_g$ | $V_{GS}$ = 0V, $V_{DS}$ = 0V, f = 1MHz | | 1.78 | | Ω |
| Turn-On Delay Time[2] | $t_{d(on)}$ | $V_{DS}$ = 20V, $I_D$≅ 10A, $V_{GS}$ = 10V, $R_{GEN}$ = 6Ω | | 15 | | nS |
| Rise Time[2] | $t_r$ | | | 25 | | |
| Turn-Off Delay Time[2] | $t_{d(off)}$ | | | 45 | | |
| Fall Time[2] | $t_f$ | | | 40 | | |
| **SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_J$ = 25 °C)** | | | | | | |
| Forward Voltage[1] | $V_{SD}$ | $I_F$ = 10A, $V_{GS}$ = 0V | | | 1.3 | V |
| Reverse Recovery Time | $t_{rr}$ | IF = 10A, $dI_F/dt$ = 100A / μS | | 35 | | nS |
| Reverse Recovery Charge | $Q_{rr}$ | | | 41 | | nC |

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

[2]Independent of operating temperature.

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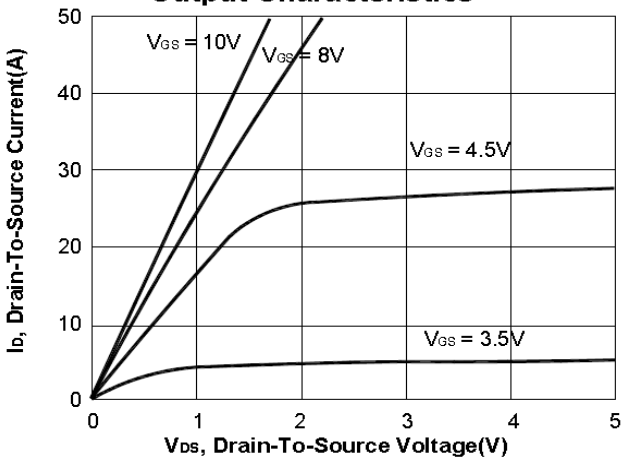
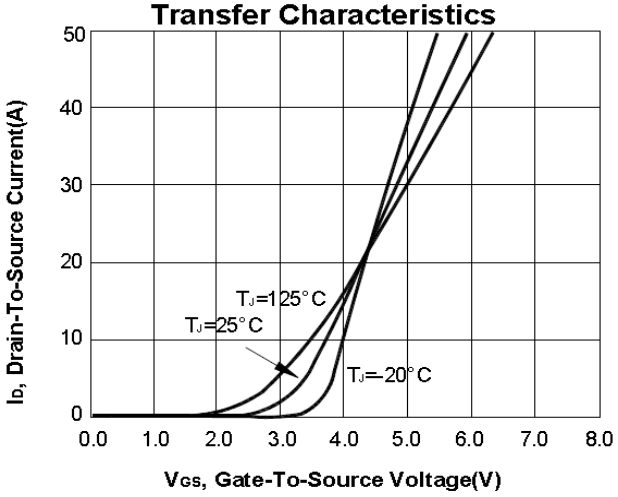
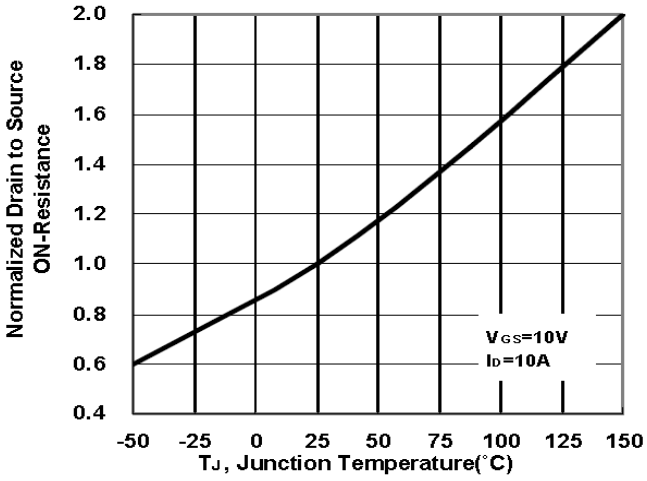
### Output Characteristics



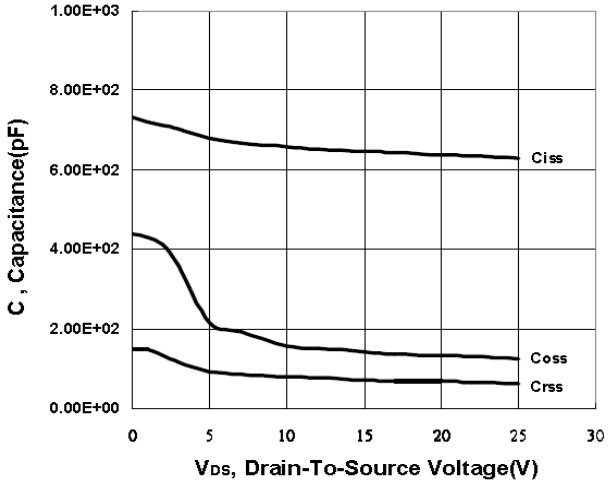

### Transfer Characteristics



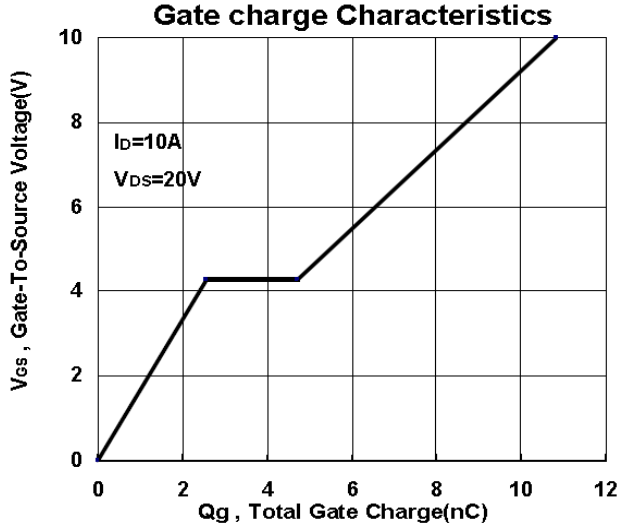

### On-Resistance VS Temperature



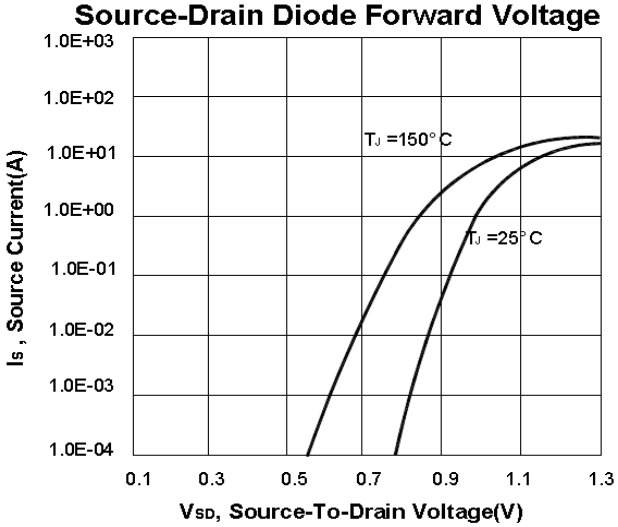

### Capacitance Characteristic




### Gate charge Characteristics




### Source-Drain Diode Forward Voltage



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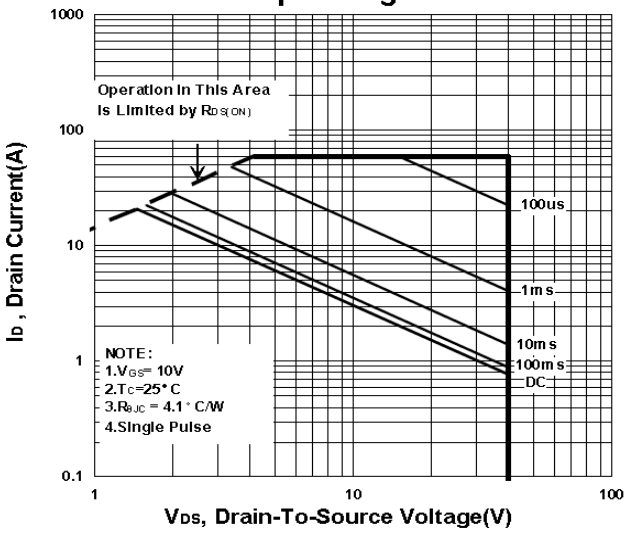
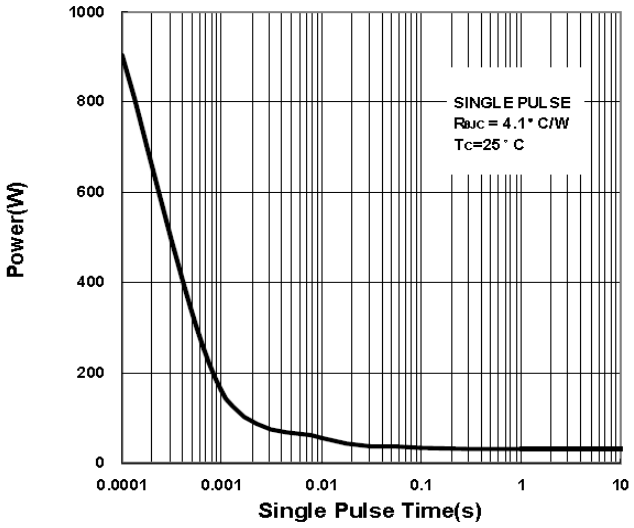
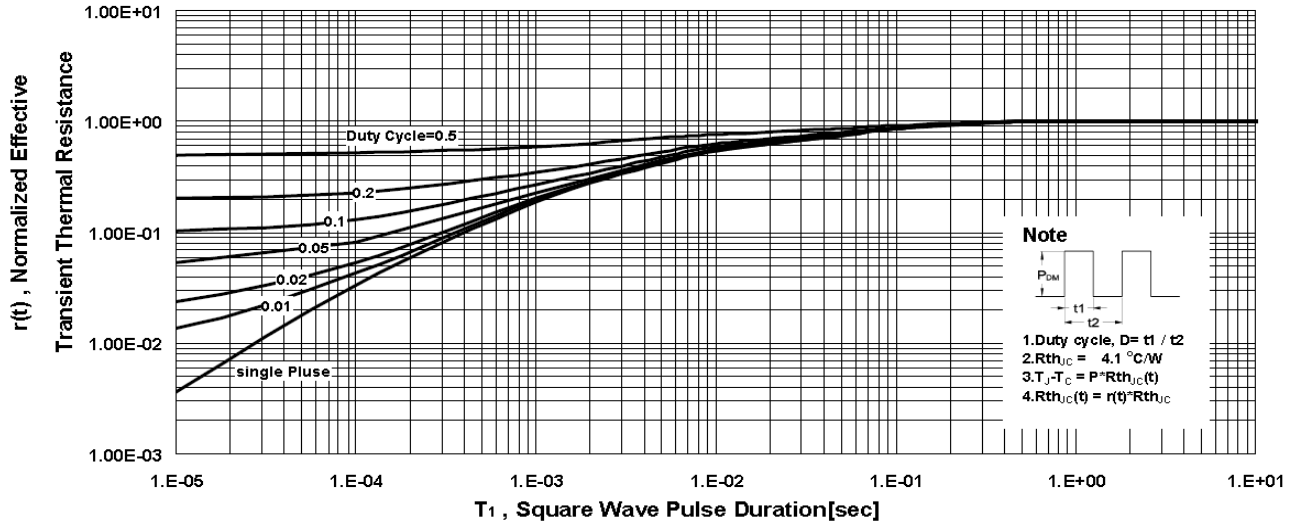
### Safe Operating Area




### Single Pulse Maximum Power Dissipation




### Transient Thermal Response Curve



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## N-Channel Enhancement Mode MOSFET

**Package Dimension**

### TO-252 (DPAK) MECHANICAL DATA

| Dimension | mm | | | Dimension | mm | | |
|---|---|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | Min. | Typ. | Max. |
| A | 8.9 | 10 | 10.41 | J | 4.8 | | 5.64 |
| B | 2.1 | 2.2 | 2.5 | K | 0.15 | | 1.49 |
| C | 0.4 | 0.5 | 0.61 | L | 0.4 | 0.76 | 0.91 |
| D | 0.82 | 1.2 | 1.5 | M | 4.2 | 4.58 | 5 |
| E | 0.35 | 0.5 | 0.65 | S | 4.57 | 5.1 | 5.52 |
| F | 0 | | 0.2 | T | 3.81 | 4.75 | 5.24 |
| G | 5.3 | 6.1 | 6.3 | U | 1.4 | | 1.78 |
| H | 0.5 | | 1.7 | V | 0.55 | 1.25 | 1.7 |
| I | 6.3 | 6.5 | 6.8 | | | | |