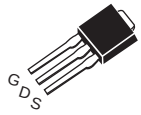
# CED4060A/CEU4060A

## N-Channel Enhancement Mode Field Effect Transistor

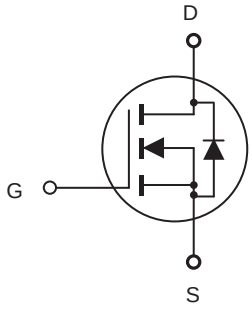
## FEATURES

- 60V, 15A, $R_{DS(ON)}$ = 85mΩ @$V_{GS}$ = 10V.
- Super high dense cell design for extremely low $R_{DS(ON)}$.
- High power and current handing capability.
- Lead free product is acquired.
- TO-251 & TO-252 package.

CEU SERIES
TO-252(D-PAK)



CED SERIES
TO-251(I-PAK)




## ABSOLUTE MAXIMUM RATINGS $T_C$ = 25°C unless otherwise noted

| Parameter | Symbol | Limit | Units |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 60 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous | $I_D$ | 15 | A |
| Drain Current-Pulsed [a] | $I_{DM}$ | 45 | A |
| Maximum Power Dissipation @ $T_C$ = 25°C | $P_D$ | 50 | W |
| - Derate above 25°C | | 0.3 | W/°C |
| Operating and Store Temperature Range | $T_J$,$T_{stg}$ | -55 to 175 | °C |

## Thermal Characteristics

| Parameter | Symbol | Limit | Units |
|---|---|---|---|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 3 | °C/W |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 50 | °C/W |

## Electrical Characteristics $T_C = 25^{\circ}C$ unless otherwise noted

| Parameter | Symbol | Test Condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | 60 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 60V, $V_{GS}$ = 0V | | | 25 | μA |
| Gate Body Leakage Current, Forward | $I_{GSSF}$ | $V_{GS}$ = 20V, $V_{DS}$ = 0V | | | 100 | nA |
| Gate Body Leakage Current, Reverse | $I_{GSSR}$ | $V_{GS}$ = -20V, $V_{DS}$ = 0V | | | -100 | nA |
| **On Characteristics** [b] | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = 250μA | 2 | 2.7 | 4 | V |
| Static Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D$ = 7.5A | | 68 | 85 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ = 10V, $I_D$ = 7.5A | | 6 | | S |
| **Dynamic Characteristics** [c] | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$ = 25V, $V_{GS}$ = 0V, f = 1.0 MHz | | 335 | | pF |
| Output Capacitance | $C_{oss}$ | | | 150 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 40 | | pF |
| **Switching Characteristics** [c] | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD}$ = 30V, $I_D$ = 15A, $V_{GS}$ = 10V, $R_{GEN}$ = 25Ω | | 10 | 20 | ns |
| Turn-On Rise Time | $t_r$ | | | 65 | 100 | ns |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 15 | 30 | ns |
| Turn-Off Fall Time | $t_f$ | | | 30 | 50 | ns |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = 48V, $I_D$ = 15A, $V_{GS}$ = 10V | | 10 | 13 | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 2.4 | | nC |
| Gate-Drain Charge | $Q_{gd}$ | | | 4 | | nC |
| **Drain-Source Diode Characteristics and Maximun Ratings** | | | | | | |
| Drain-Source Diode Forward Current | $I_S$ | | | | 15 | A |
| Drain-Source Diode Forward Voltage [b] | $V_{SD}$ | $V_{GS}$ = 0V, $I_S$ = 7.5A | | 0.8 | 1.2 | V |

**Notes :**
a.Repetitive Rating : Pulse width limited by maximum junction temperature.
b.Pulse Test : Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
c.Guaranteed by design, not subject to production testing.

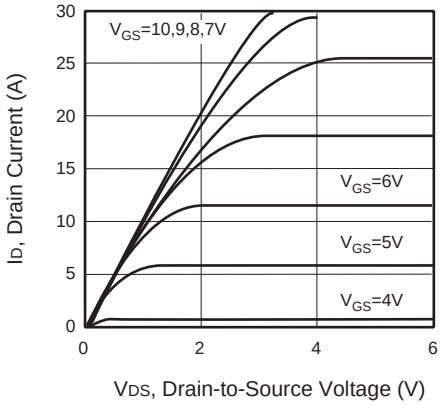



**Figure 1. Output Characteristics**

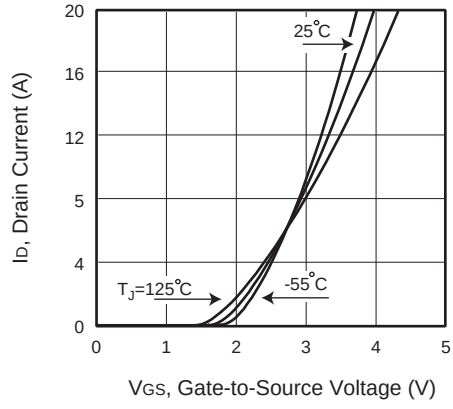



**Figure 2. Transfer Characteristics**

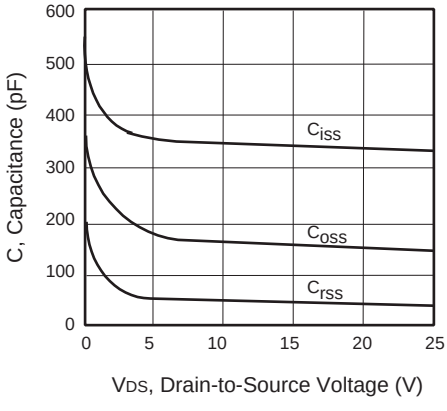



**Figure 3. Capacitance**

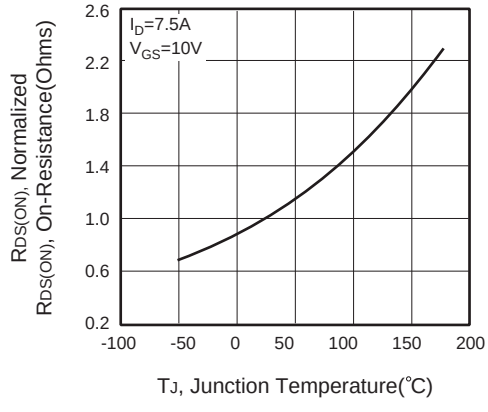



**Figure 4. On-Resistance Variation with Temperature**

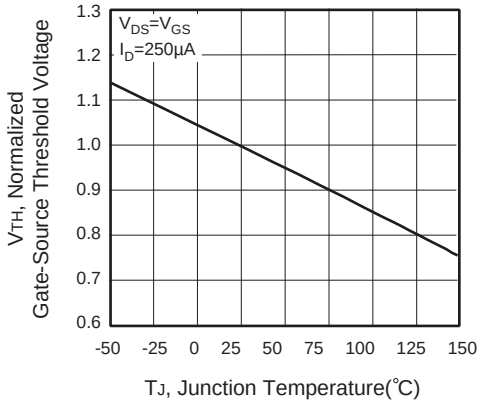



**Figure 5. Gate Threshold Variation with Temperature**

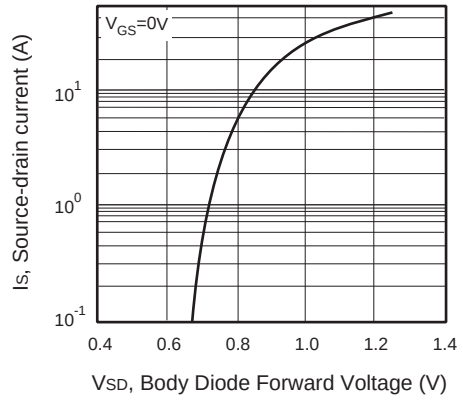



**Figure 6. Body Diode Forward Voltage Variation with Source Current**

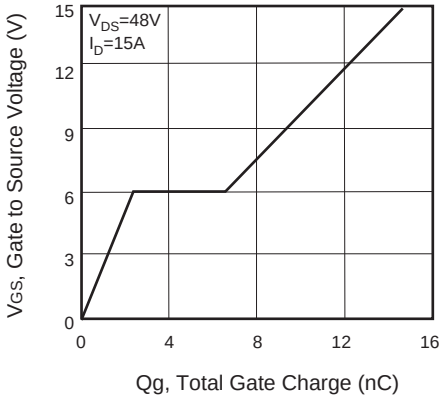



**Figure 7. Gate Charge**

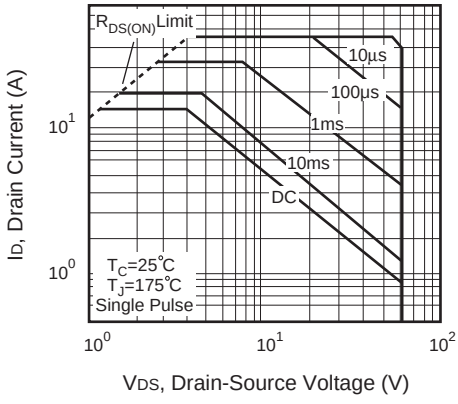



**Figure 8. Maximum Safe Operating Area**

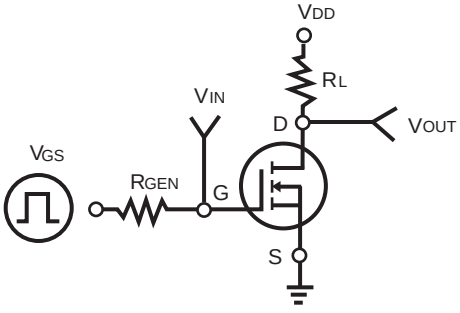



**Figure 9. Switching Test Circuit**

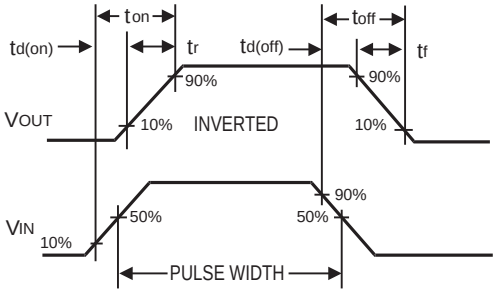



**Figure 10. Switching Waveforms**

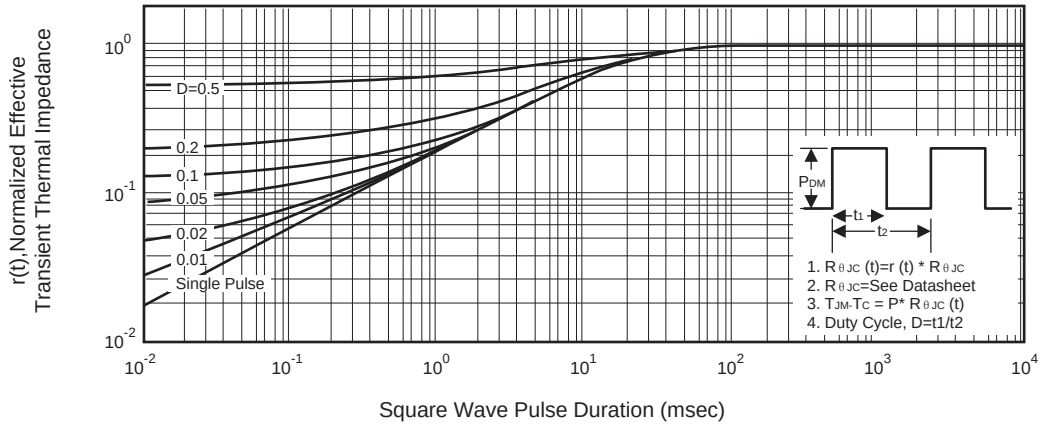



**Figure 11. Normalized Thermal Transient Impedance Curve**