# CED6060N/CEU6060N

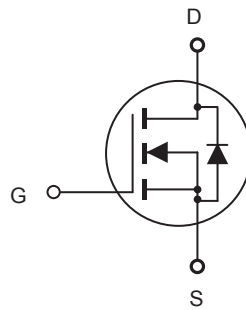**N-Channel Enhancement Mode Field Effect Transistor**

## FEATURES

■ 60V, 34A, $R_{DS(ON)}$ = 25mΩ  @$V_{GS}$ = 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$^\circ$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 | $I_D$ | 34 | A |
| Drain Current-Pulsed [a] | $I_{DM}$ | 136 | A |
| Maximum Power Dissipation @ $T_C$ = 25$^\circ$C | $P_D$ | 62.5 | W |
| - Derate above 25$^\circ$C | | 0.42 | W/$^\circ$C |
| Operating and Store Temperature Range | $T_J,T_{stg}$ | -65 to 175 | $^\circ$C |

## Thermal Characteristics

| Parameter | Symbol | Limit | Units |
|-----------|--------|-------|-------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 2.4 | $^\circ$C/W |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 50 | $^\circ$C/W |

# CED6060N/CEU6060N

**Electrical Characteristics** $T_C = 25^\circ C$ unless otherwise noted

| Parameter | Symbol | Test Condition | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS} = 0V$, $I_D = 250\mu A$ | 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 | $V_{GS(th)}$ | $V_{GS} = V_{DS}$, $I_D = 250\mu A$ | 2 | | 4 | V |
| Static Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS} = 10V$, $I_D = 15A$ | | 19 | 25 | mΩ |
| **Dynamic Characteristics** [c] | | | | | | |
| Forward Transconductance | $g_{FS}$ | $V_{DS} = 10V$, $I_D = 15A$ | | 40 | | S |
| Input Capacitance | $C_{iss}$ | $V_{DS} = 25V$, $V_{GS} = 0V$, f = 1.0 MHz | | 1320 | | pF |
| Output Capacitance | $C_{oss}$ | | | 310 | | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 40 | | pF |
| **Switching Characteristics** [c] | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DD} = 30V$, $I_D = 19A$, $V_{GS} = 10V$, $R_{GEN} = 4.7\Omega$ | | 16 | 32 | ns |
| Turn-On Rise Time | $t_r$ | | | 3 | 6 | ns |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 36 | 72 | ns |
| Turn-Off Fall Time | $t_f$ | | | 4 | 8 | ns |
| Total Gate Charge | $Q_g$ | $V_{DS} = 48V$, $I_D = 34A$, $V_{GS} = 10V$ | | 28.7 | 38.1 | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 6.3 | | nC |
| Gate-Drain Charge | $Q_{gd}$ | | | 9.7 | | nC |
| **Drain-Source Diode Characteristics and Maximun Ratings** | | | | | | |
| Drain-Source Diode Forward Current | $I_S$ | | | | 34 | A |
| Drain-Source Diode Forward Voltage [b] | $V_{SD}$ | $V_{GS} = 0V$, $I_S = 15A$ | | | 1.3 | V |

**Notes :**
a.Repetitive Rating : Pulse width limited by maximum junction temperature .
b.Pulse Test : Pulse Width $\leq$ 300μs, Duty Cycle $\leq$ 2% .
c.Guaranteed by design, not subject to production testing.
d.Limited only by maximum temperature allowed .
e.Pulse width limited by safe operating area .
f.Full package $I_{S(max)} = 34A$ .
g.Full package $V_{SD}$ test condition $I_S = 34A$ .
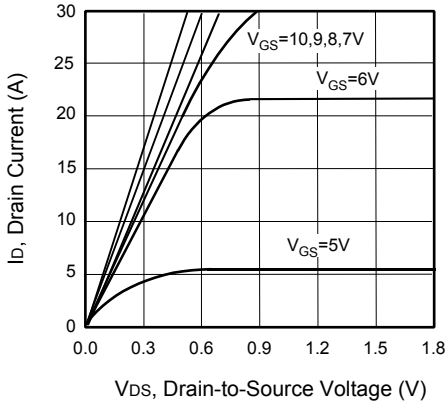h.L = 0.19mH, $I_{AS} = 42A$, $V_{DD} = 50V$, $R_G = 25\Omega$, Starting $T_J = 25 C$

# CED6060N/CEU6060N
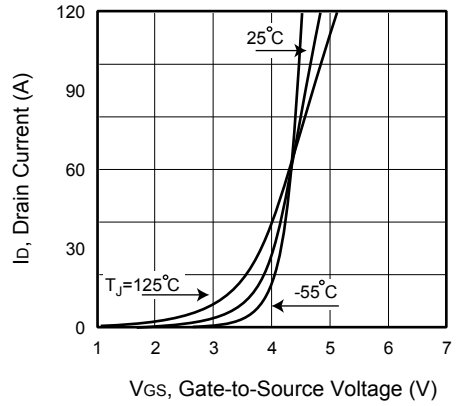
**Figure 1. Output Characteristics**
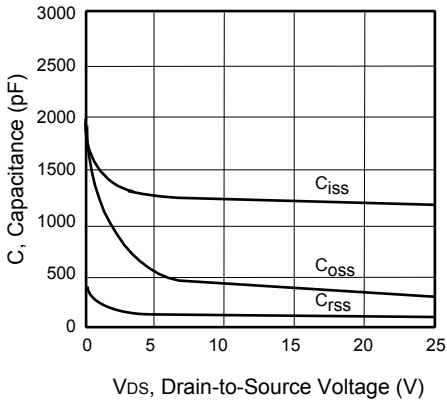
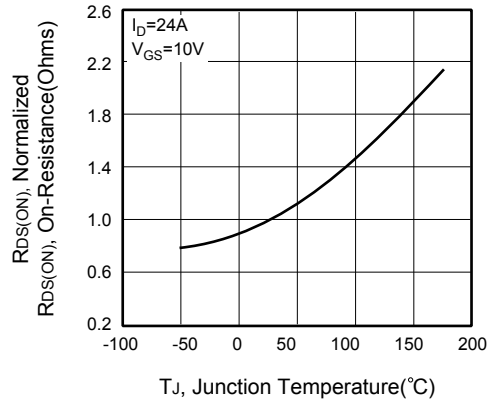**Figure 2. Transfer Characteristics**

**Figure 3. Capacitance**

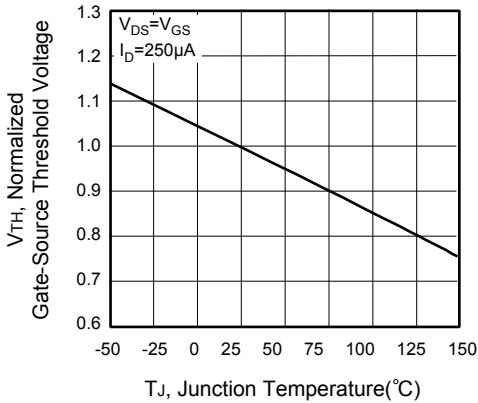**Figure 4. On-Resistance Variation with Temperature**

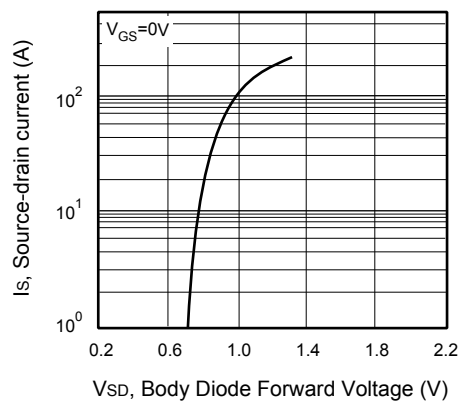**Figure 5. Gate Threshold Variation with Temperature**

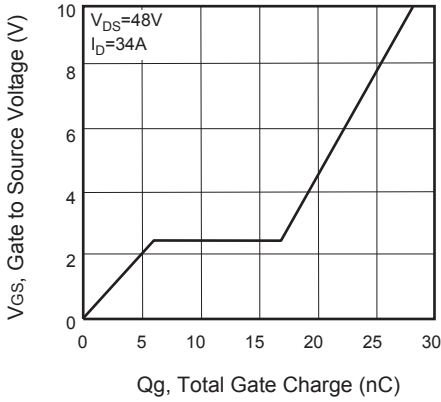**Figure 6. Body Diode Forward Voltage Variation with Source Current**
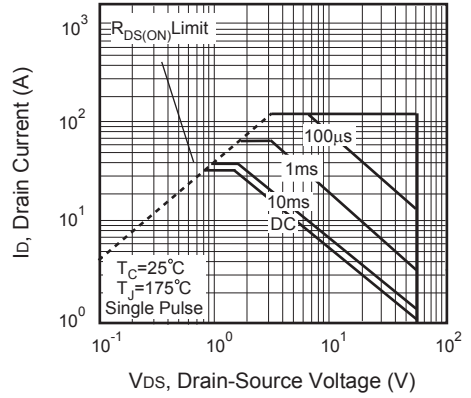
**Figure 7. Gate Charge**



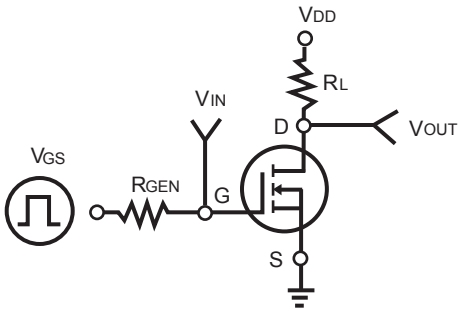**Figure 8. Maximum Safe Operating Area**
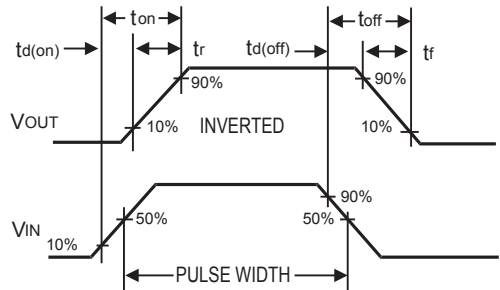


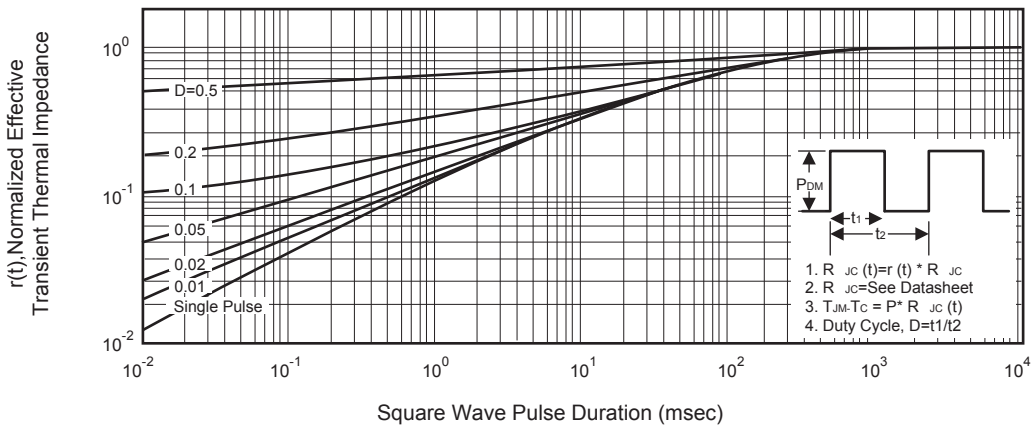**Figure 9. Switching Test Circuit**



**Figure 10. Switching Waveforms**



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