

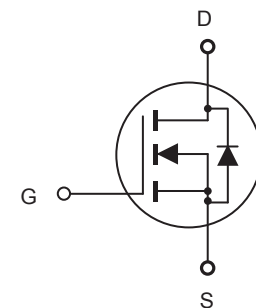


# CED21A3/CEU21A3

## N-Channel Enhancement Mode Field Effect Transistor

### FEATURES

- 30V, 20A,  $R_{DS(ON)} = 45m\Omega$  @  $V_{GS} = 10V$ .  
 $R_{DS(ON)} = 70m\Omega$  @  $V_{GS} = 4.5V$ .
- Super high dense cell design for extremely low  $R_{DS(ON)}$ .
- High power and current handling capability.
- Lead free product is acquired.
- TO-251 & TO-252 package.



### ABSOLUTE MAXIMUM RATINGS $T_C = 25^\circ\text{C}$ unless otherwise noted

| Parameter                                                                                 | Symbol         | Limit      | Units               |
|-------------------------------------------------------------------------------------------|----------------|------------|---------------------|
| Drain-Source Voltage                                                                      | $V_{DS}$       | 30         | V                   |
| Gate-Source Voltage                                                                       | $V_{GS}$       | $\pm 20$   | V                   |
| Drain Current-Continuous                                                                  | $I_D$          | 20         | A                   |
| Drain Current-Pulsed <sup>a</sup>                                                         | $I_{DM}$       | 45         | A                   |
| Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$<br>- Derate above $25^\circ\text{C}$ | $P_D$          | 38         | W                   |
|                                                                                           |                | 0.25       | W/ $^\circ\text{C}$ |
| Operating and Store Temperature Range                                                     | $T_J, T_{stg}$ | -55 to 175 | $^\circ\text{C}$    |

### Thermal Characteristics

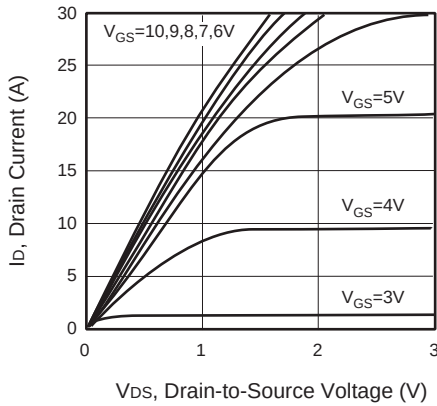
| Parameter                               | Symbol          | Limit | Units              |
|-----------------------------------------|-----------------|-------|--------------------|
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 4.0   | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 50    | $^\circ\text{C/W}$ |



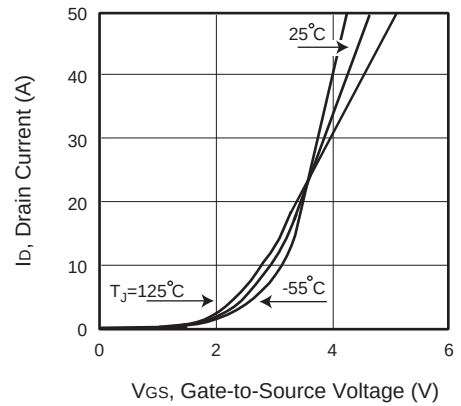
# CED21A3/CEU21A3

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

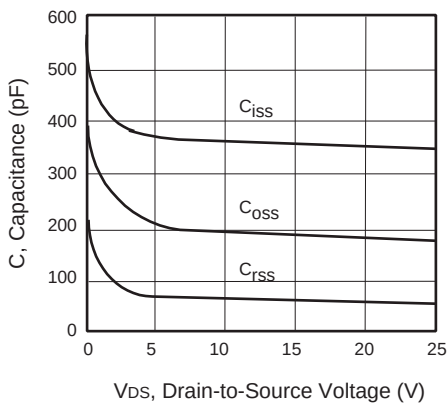
| Parameter                                                                                                                                                                                                                                                    | Symbol       | Test Condition                                                            | Min | Typ  | Max  | Units      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------------------------------------------------------------------------|-----|------|------|------------|
| Off Characteristics                                                                                                                                                                                                                                          |              |                                                                           |     |      |      |            |
| Drain-Source Breakdown Voltage                                                                                                                                                                                                                               | $BV_{DSS}$   | $V_{GS} = 0V, I_D = 250\mu A$                                             | 30  |      |      | V          |
| Zero Gate Voltage Drain Current                                                                                                                                                                                                                              | $I_{DSS}$    | $V_{DS} = 30V, V_{GS} = 0V$                                               |     |      | 1    | $\mu A$    |
| 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 <sup>b</sup>                                                                                                                                                                                                                              |              |                                                                           |     |      |      |            |
| Gate Threshold Voltage                                                                                                                                                                                                                                       | $V_{GS(th)}$ | $V_{GS} = V_{DS}, I_D = 250\mu A$                                         | 0.8 |      | 2.5  | V          |
| Static Drain-Source On-Resistance                                                                                                                                                                                                                            | $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 12A$                                                 |     | 36   | 45   | m $\Omega$ |
| On-Resistance                                                                                                                                                                                                                                                |              | $V_{GS} = 4.5V, I_D = 12A$                                                |     | 55   | 70   | m $\Omega$ |
| Forward Transconductance                                                                                                                                                                                                                                     | $g_{FS}$     | $V_{DS} = 10V, I_D = 12A$                                                 |     | 20   |      | S          |
| Dynamic Characteristics <sup>c</sup>                                                                                                                                                                                                                         |              |                                                                           |     |      |      |            |
| Input Capacitance                                                                                                                                                                                                                                            | $C_{iss}$    | $V_{DS} = 15V, V_{GS} = 0V,$<br>$f = 1.0\text{ MHz}$                      |     | 960  |      | pF         |
| Output Capacitance                                                                                                                                                                                                                                           | $C_{oss}$    |                                                                           |     | 160  |      | pF         |
| Reverse Transfer Capacitance                                                                                                                                                                                                                                 | $C_{rss}$    |                                                                           |     | 80   |      | pF         |
| Switching Characteristics <sup>c</sup>                                                                                                                                                                                                                       |              |                                                                           |     |      |      |            |
| Turn-On Delay Time                                                                                                                                                                                                                                           | $t_{d(on)}$  | $V_{DD} = 15V, I_D = 10A, \square$<br>$V_{GS} = 10V, R_{GEN} = 0.3\Omega$ |     | 14   | 28   | ns         |
| Turn-On Rise Time                                                                                                                                                                                                                                            | $t_r$        |                                                                           |     | 3.3  | 6.6  | ns         |
| Turn-Off Delay Time                                                                                                                                                                                                                                          | $t_{d(off)}$ |                                                                           |     | 31   | 62   | ns         |
| Turn-Off Fall Time                                                                                                                                                                                                                                           | $t_f$        | $V_{DS} = 15V, I_D = 36A,$<br>$V_{GS} = 10V$                              |     | 7    | 14   | ns         |
| Total Gate Charge                                                                                                                                                                                                                                            | $Q_g$        |                                                                           |     | 13.3 | 17.7 | nC         |
| Gate-Source Charge                                                                                                                                                                                                                                           | $Q_{gs}$     |                                                                           |     | 2.7  |      | nC         |
| Gate-Drain Charge                                                                                                                                                                                                                                            | $Q_{gd}$     |                                                                           |     | 1.1  |      | nC         |
| Drain-Source Diode Characteristics and Maximum Ratings                                                                                                                                                                                                       |              |                                                                           |     |      |      |            |
| Drain-Source Diode Forward Current                                                                                                                                                                                                                           | $I_S$        |                                                                           |     |      | 20   | A          |
| Drain-Source Diode Forward Voltage <sup>b</sup>                                                                                                                                                                                                              | $V_{SD}$     | $V_{GS} = 0V, I_S = 12A$                                                  |     | 0.9  | 1.3  | V          |
| Notes :<br><sup>a</sup> Repetitive Rating : Pulse width limited by maximum junction temperature.<br><sup>b</sup> Pulse Test : Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$ .<br><sup>c</sup> Guaranteed by design, not subject to production testing. |              |                                                                           |     |      |      |            |



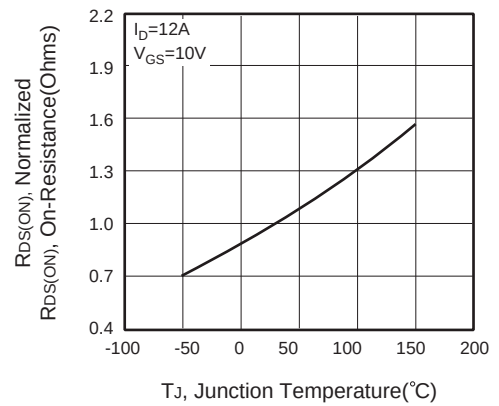
**Figure 1. Output Characteristics**



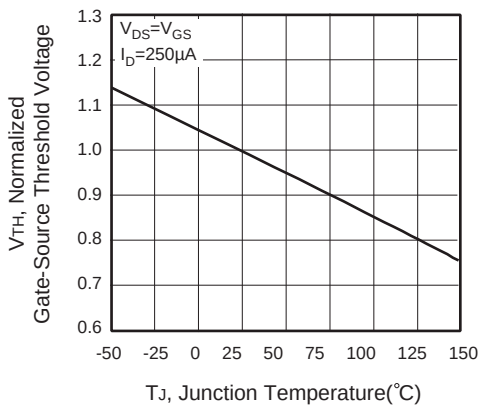
**Figure 2. Transfer Characteristics**



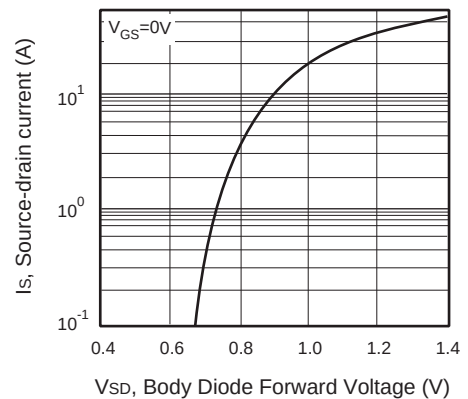
**Figure 3. Capacitance**



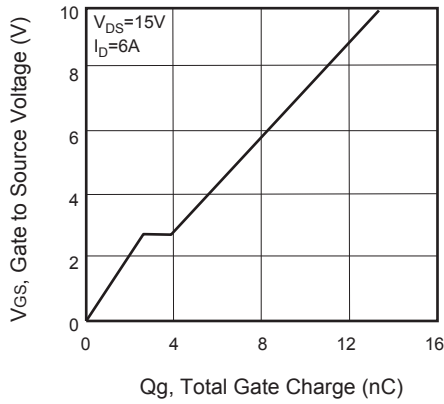
**Figure 4. On-Resistance Variation with Temperature**



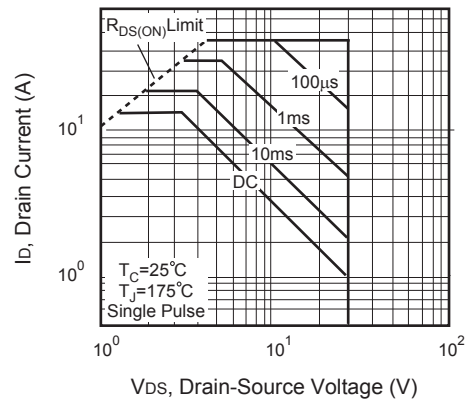
**Figure 5. Gate Threshold Variation with Temperature**



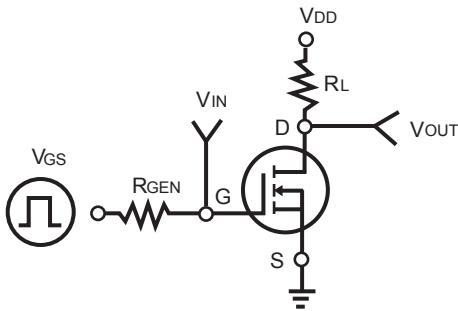
**Figure 6. Body Diode Forward Voltage Variation with Source Current**



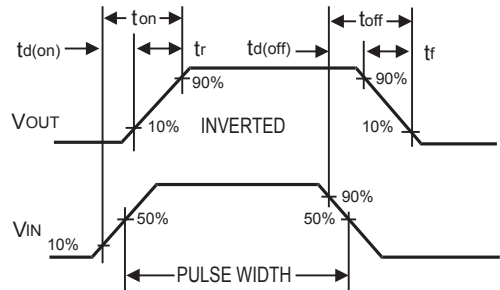
**Figure 7. Gate Charge**



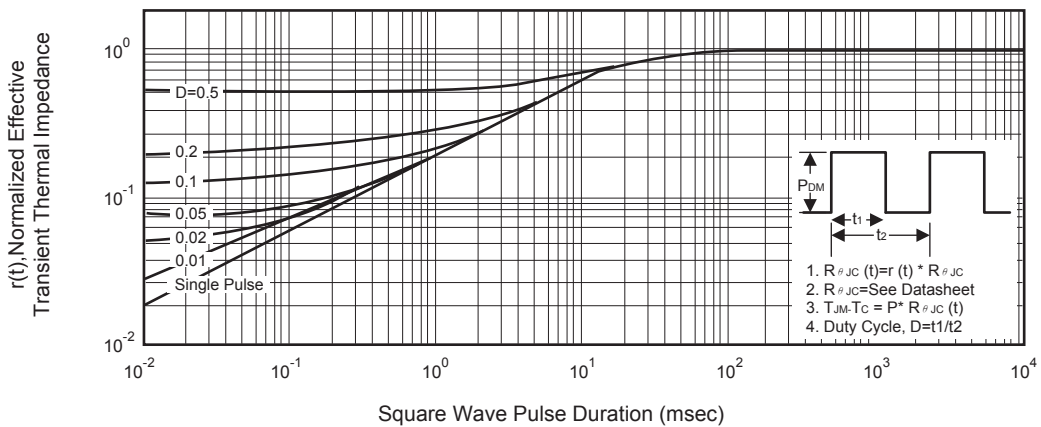
**Figure 8. Maximum Safe Operating Area**



**Figure 9. Switching Test Circuit**



**Figure 10. Switching Waveforms**



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