# CEP21A3/CEB21A3

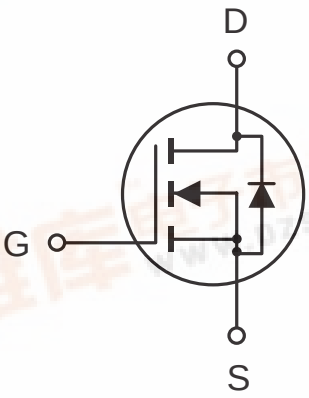
Nov. 2002

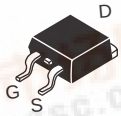
## N-Channel Logic Level Enhancement Mode Field Effect Transistor



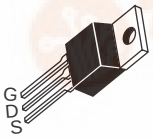
## FEATURES

- 30V , 20A , $R_{DS(ON)}$=45mΩ @$V_{GS}$=10V.
  $R_{DS(ON)}$=70mΩ @$V_{GS}$=4.5V.
- Super high dense cell design for extremely low $R_{DS(ON)}$.
- High power and current handling capability.
- TO-220 & TO-263 package.




CEB SERIES
TO-263(DD-PAK)




CEP SERIES
TO-220

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

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 30 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous | $I_D$ | 20 | A |
| -Pulsed | $I_{DM}$ | 60 | A |
| Drain-Source Diode Forward Current | $I_S$ | 20 | A |
| Maximum Power Dissipation @$T_C$=25°C | $P_D$ | 43 | W |
| Derate above 25°C | | 0.29 | W/°C |
| Operating and Storage Temperature Range | $T_J$, $T_{STG}$ | -65 to 175 | °C |

## THERMAL CHARACTERISTICS

| | | | |
|---|---|---|---|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 3.5 | °C/W |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 62.5 | °C/W |

# CEP21A3/CEB21A3

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## ELECTRICAL CHARACTERISTICS (TC=25°C unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ[c] | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$ = 0V, $I_D$=250μA | 30 | | | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 30V, $V_{GS}$ = 0V | | | 1 | μA |
| Gate-Body Leakage | $I_{GSS}$ | $V_{GS}$ = ± 20V, $V_{DS}$ = 0V | | | ±100 | nA |
| **ON CHARACTERISTICS[a]** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 0.8 | | 2.5 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$ = 10V, $I_D$ = 12A | | 36 | 45 | mΩ |
| | | $V_{GS}$ = 4.5V, $I_D$ =15A | | 55 | 70 | mΩ |
| On-State Drain Current | $I_{D(ON)}$ | $V_{DS}$ = 10V, $V_{GS}$ = 10V | 20 | | | A |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ = 10V, $I_D$ = 12A | | 20 | | S |
| **DYNAMIC CHARACTERISTICS[b]** | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{DS}$ =15V, $V_{GS}$ = 0V<br>f =1.0MHz | | 364 | | pF |
| Output Capacitance | $C_{OSS}$ | | | 197 | | pF |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | 62 | | pF |
| **SWITCHING CHARACTERISTICS[b]** | | | | | | |
| Turn-On Delay Time | $t_{D(ON)}$ | $V_{DD}$ = 15V,<br>$I_D$ = 12A<br>$V_{GS}$ = 10V,<br>$R_{GEN}$ =2.5Ω | | 12 | 25 | ns |
| Rise Time | $t_r$ | | | 5 | 15 | ns |
| Turn-Off Delay Time | $t_{D(OFF)}$ | | | 14 | 30 | ns |
| Fall Time | $t_f$ | | | 14 | 30 | ns |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = 15V,$I_D$ = 6A<br>$V_{GS}$ = 10V | | 10 | 15 | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 2 | | nC |
| Gate-Drain Charge | $Q_{gd}$ | | | 3 | | nC |

## ELECTRICAL CHARACTERISTICS ($T_C$=25°C unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **DRAIN-SOURCE DIODE CHARACTERISTICS** [a] | | | | | | |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$ = 0V, Is = 12A | | 0.9 | 1.3 | V |

Notes

a.Pulse Test:Pulse Width ≤300 μs, Duty Cycle ≤ 2%.

b.Guaranteed by design, not subject to production testing.

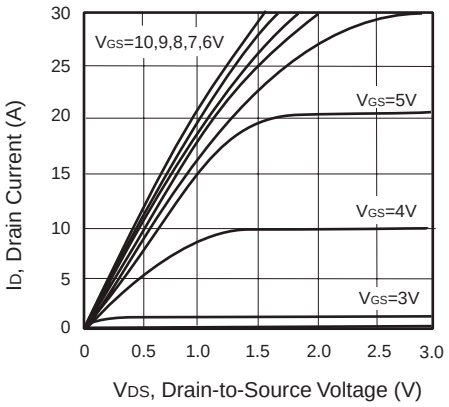


**Figure 1. Output Characteristics**

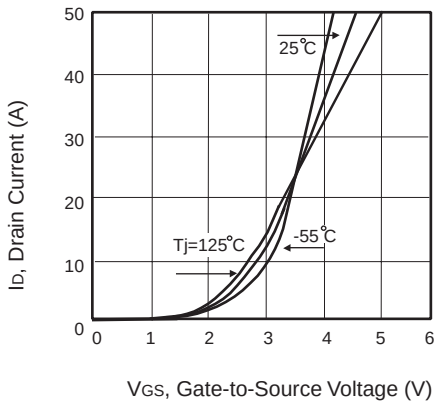


**Figure 2. Transfer Characteristics**

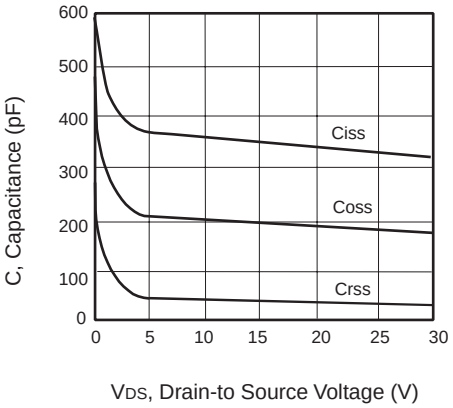


**Figure 3. Capacitance**

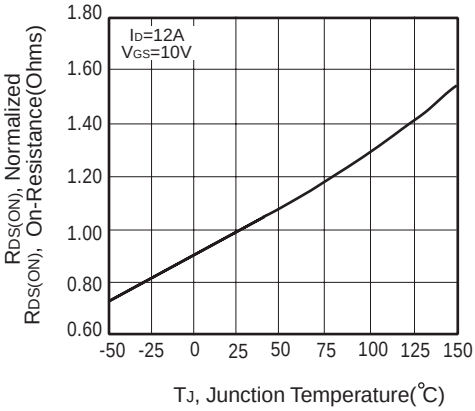


**Figure 4. On-Resistance Variation with Temperature**

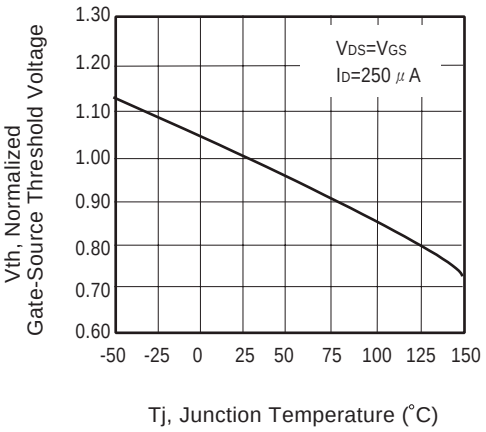


**Figure 5. Gate Threshold Variation with Temperature**

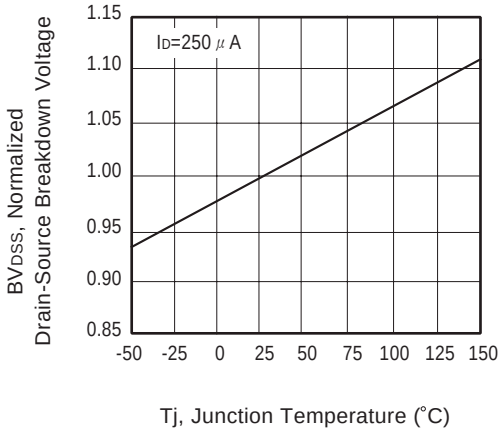


**Figure 6. Breakdown Voltage Variation with Temperature**

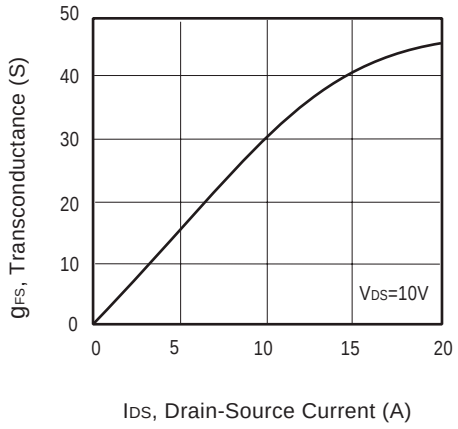


**Figure 7. Transconductance Variation with Drain Current**

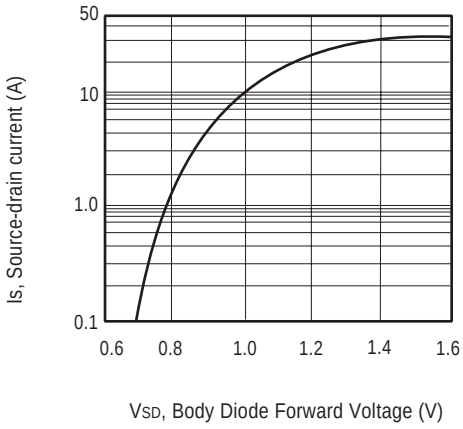


**Figure 8. Body Diode Forward Voltage Variation with Source Current**

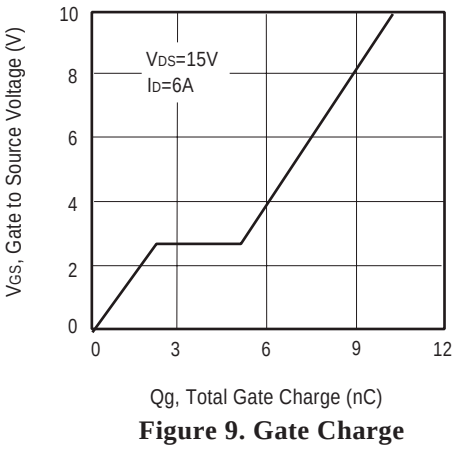


**Figure 9. Gate Charge**

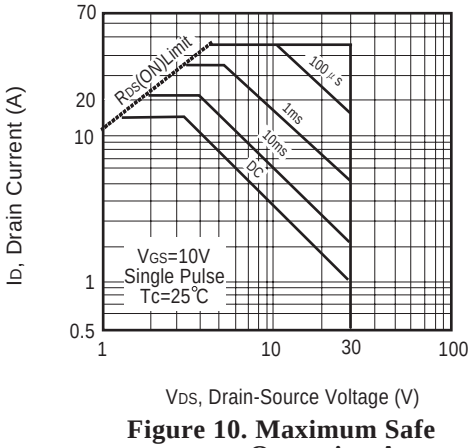


**Figure 10. Maximum Safe Operating Area**

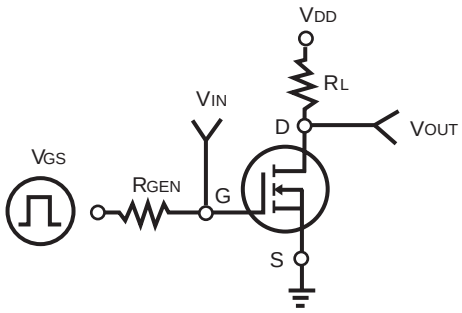


**Figure 11. Switching Test Circuit**

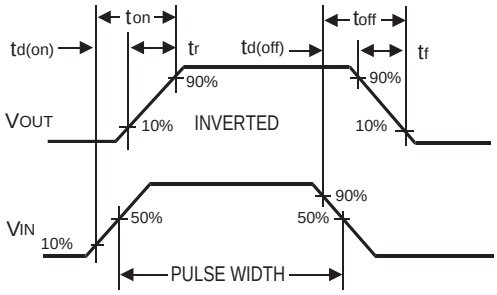


**Figure 12. Switching Waveforms**

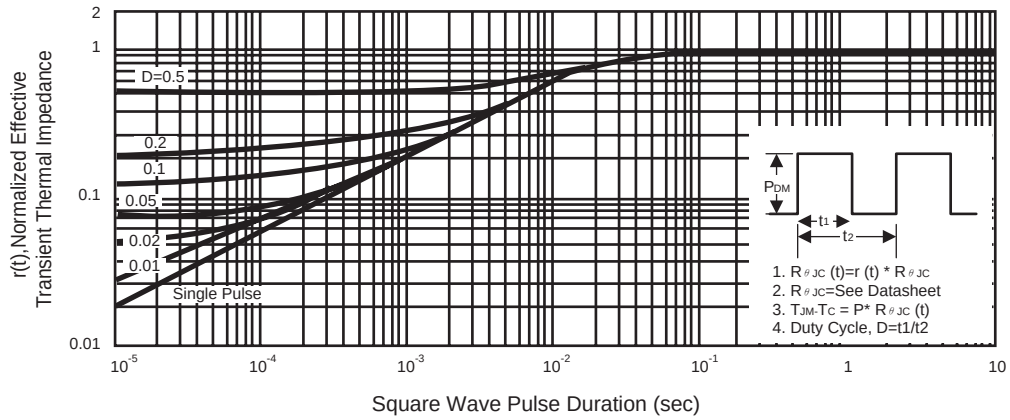


**Figure 13. Normalized Thermal Transient Impedance Curve**