

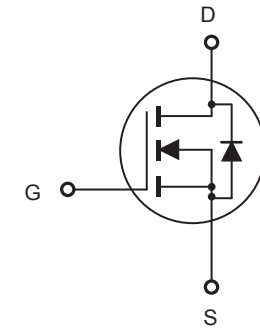


# CEP84A4/CEB84A4

## N-Channel Enhancement Mode Field Effect Transistor

### FEATURES

- 40V, 90A,  $R_{DS(ON)} = 5.1m\Omega$  @  $V_{GS} = 10V$ .  
 $R_{DS(ON)} = 7.8m\Omega$  @  $V_{GS} = 4.5V$ .
- Super high dense cell design for extremely low  $R_{DS(ON)}$ .
- High power and current handling capability.
- Lead free product is acquired.
- TO-220 & TO-263 package.



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

| Parameter                                                                     | Symbol         | Limit      | Units         |
|-------------------------------------------------------------------------------|----------------|------------|---------------|
| Drain-Source Voltage                                                          | $V_{DS}$       | 40         | V             |
| Gate-Source Voltage                                                           | $V_{GS}$       | $\pm 20$   | V             |
| Drain Current-Continuous @ $T_C = 25^\circ C$<br>@ $T_C = 100^\circ C$        | $I_D$          | 90         | A             |
|                                                                               |                | 62         | A             |
| Drain Current-Pulsed <sup>a</sup>                                             | $I_{DM}$       | 360        | A             |
| Maximum Power Dissipation @ $T_C = 25^\circ C$<br>- Derate above $25^\circ C$ | $P_D$          | 71         | W             |
|                                                                               |                | 0.47       | W/ $^\circ C$ |
| Operating and Store Temperature Range                                         | $T_J, T_{stg}$ | -55 to 175 | $^\circ C$    |

### Thermal Characteristics

| Parameter                               | Symbol          | Limit | Units        |
|-----------------------------------------|-----------------|-------|--------------|
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 2.1   | $^\circ C/W$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 62.5  | $^\circ C/W$ |



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

| Parameter                                                                                                                                                                                                                             | Symbol       | Test Condition                                                         | Min | Typ  | Max | Units     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------------------------------------------------------|-----|------|-----|-----------|
| <b>Off Characteristics</b>                                                                                                                                                                                                            |              |                                                                        |     |      |     |           |
| Drain-Source Breakdown Voltage                                                                                                                                                                                                        | $BV_{DSS}$   | $V_{GS} = 0V, I_D = 250\mu A$                                          | 40  |      |     | V         |
| Zero Gate Voltage Drain Current                                                                                                                                                                                                       | $I_{DSS}$    | $V_{DS} = 40V, V_{GS} = 0V$                                            |     |      | 1   | $\mu A$   |
| Gate Body Leakage Current, Forward                                                                                                                                                                                                    | $I_{GSSF}$   | $V_{GS} = 20V, V_{DS} = 0V$                                            |     |      | 80  | nA        |
| Gate Body Leakage Current, Reverse                                                                                                                                                                                                    | $I_{GSSR}$   | $V_{GS} = -20V, V_{DS} = 0V$                                           |     |      | -80 | nA        |
| <b>On Characteristics<sup>b</sup></b>                                                                                                                                                                                                 |              |                                                                        |     |      |     |           |
| Gate Threshold Voltage                                                                                                                                                                                                                | $V_{GS(th)}$ | $V_{GS} = V_{DS}, I_D = 250\mu A$                                      | 1   |      | 3   | V         |
| Static Drain-Source On-Resistance                                                                                                                                                                                                     | $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 30A$                                              |     | 3.9  | 5.1 | $m\Omega$ |
|                                                                                                                                                                                                                                       |              | $V_{GS} = 4.5V, I_D = 20A$                                             |     | 5.6  | 7.8 | $m\Omega$ |
| <b>Dynamic Characteristics<sup>c</sup></b>                                                                                                                                                                                            |              |                                                                        |     |      |     |           |
| Input Capacitance                                                                                                                                                                                                                     | $C_{iss}$    | $V_{DS} = 15V, V_{GS} = 0V, f = 1.0\text{ MHz}$                        |     | 3070 |     | pF        |
| Output Capacitance                                                                                                                                                                                                                    | $C_{oss}$    |                                                                        |     | 385  |     | pF        |
| Reverse Transfer Capacitance                                                                                                                                                                                                          | $C_{rss}$    |                                                                        |     | 285  |     | pF        |
| <b>Switching Characteristics<sup>c</sup></b>                                                                                                                                                                                          |              |                                                                        |     |      |     |           |
| Turn-On Delay Time                                                                                                                                                                                                                    | $t_{d(on)}$  | $V_{DD} = 15V, I_D = 1A, \square$<br>$V_{GS} = 10V, R_{GEN} = 6\Omega$ |     | 19   | 38  | ns        |
| Turn-On Rise Time                                                                                                                                                                                                                     | $t_r$        |                                                                        |     | 10   | 20  | ns        |
| Turn-Off Delay Time                                                                                                                                                                                                                   | $t_{d(off)}$ |                                                                        |     | 84   | 168 | ns        |
| Turn-Off Fall Time                                                                                                                                                                                                                    | $t_f$        |                                                                        |     | 22   | 44  | ns        |
| Total Gate Charge                                                                                                                                                                                                                     | $Q_g$        | $V_{DS} = 15V, I_D = 16A, V_{GS} = 10V$                                |     | 67   | 81  | nC        |
| Gate-Source Charge                                                                                                                                                                                                                    | $Q_{gs}$     |                                                                        |     | 10   |     | nC        |
| Gate-Drain Charge                                                                                                                                                                                                                     | $Q_{gd}$     |                                                                        |     | 12   |     | nC        |
| <b>Drain-Source Diode Characteristics and Maximum Ratings</b>                                                                                                                                                                         |              |                                                                        |     |      |     |           |
| Drain-Source Diode Forward Current                                                                                                                                                                                                    | $I_S$        |                                                                        |     |      | 90  | A         |
| Drain-Source Diode Forward Voltage <sup>b</sup>                                                                                                                                                                                       | $V_{SD}$     | $V_{GS} = 0V, I_S = 20A$                                               |     |      | 1.5 | V         |
| <b>Notes :</b> □<br>a.Repetitive Rating : Pulse width limited by maximum junction temperature<br>b.Pulse Test : Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 2\%$ . □<br>c.Guaranteed by design, not subject to production testing. |              |                                                                        |     |      |     |           |



# CEP84A4/CEB84A4

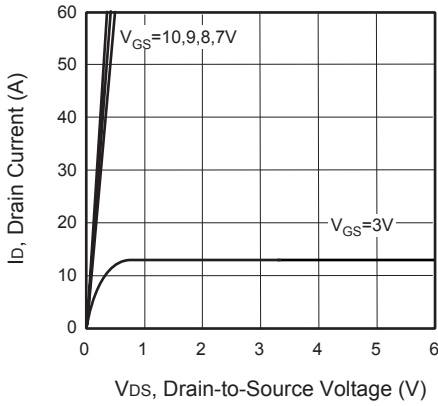


Figure 1. Output Characteristics

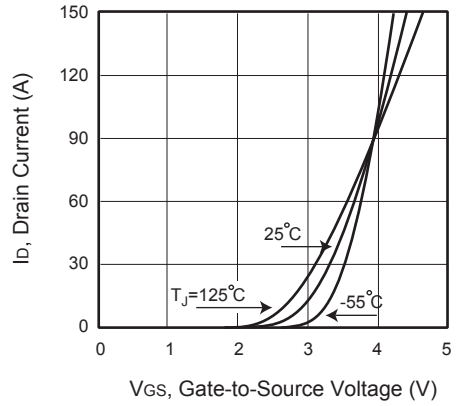


Figure 2. Transfer Characteristics

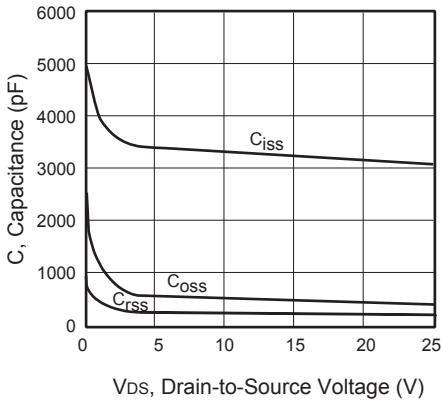


Figure 3. Capacitance

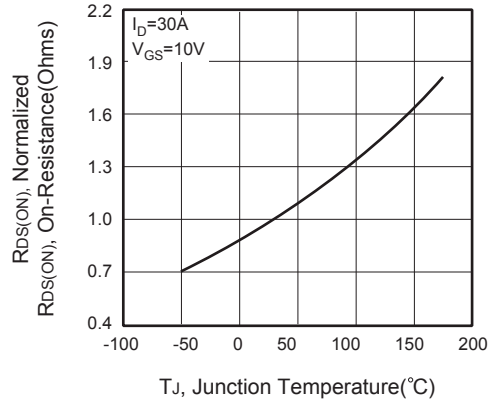


Figure 4. On-Resistance Variation with Temperature

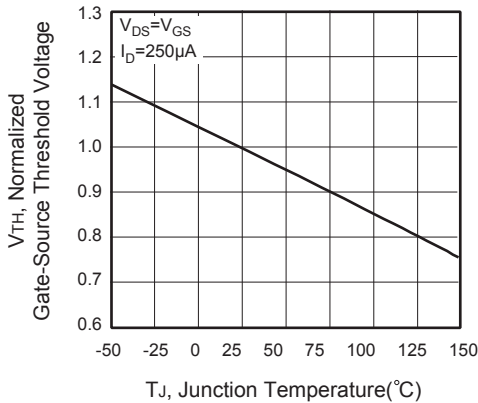


Figure 5. Gate Threshold Variation with Temperature

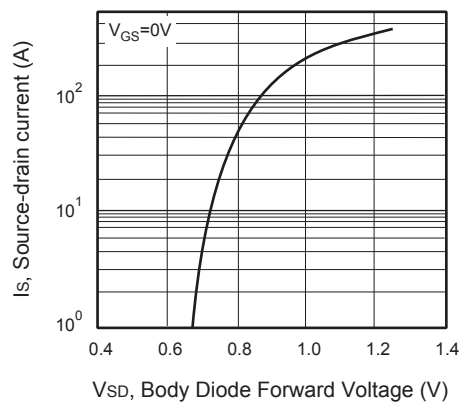


Figure 6. Body Diode Forward Voltage Variation with Source Current



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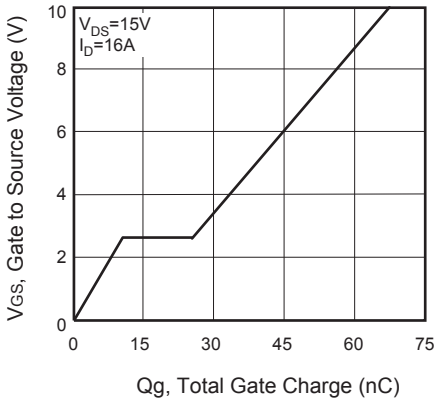


Figure 7. Gate Charge

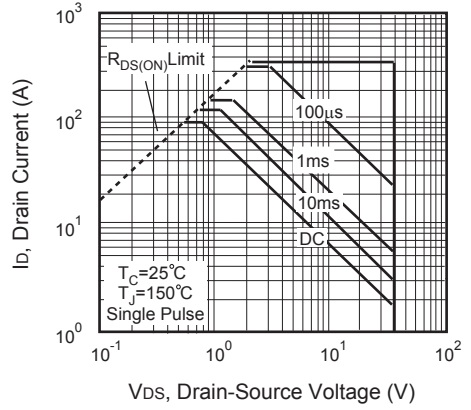


Figure 8. Maximum Safe Operating Area

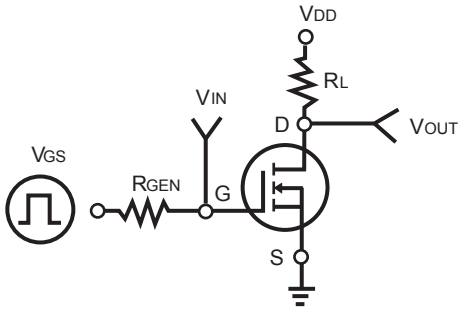


Figure 9. Switching Test Circuit

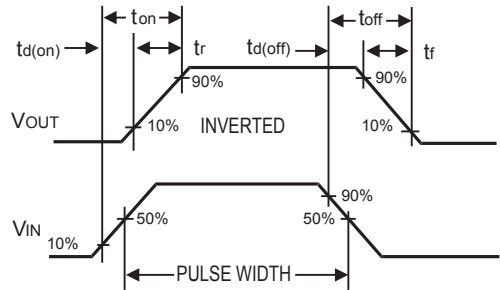


Figure 10. Switching Waveforms

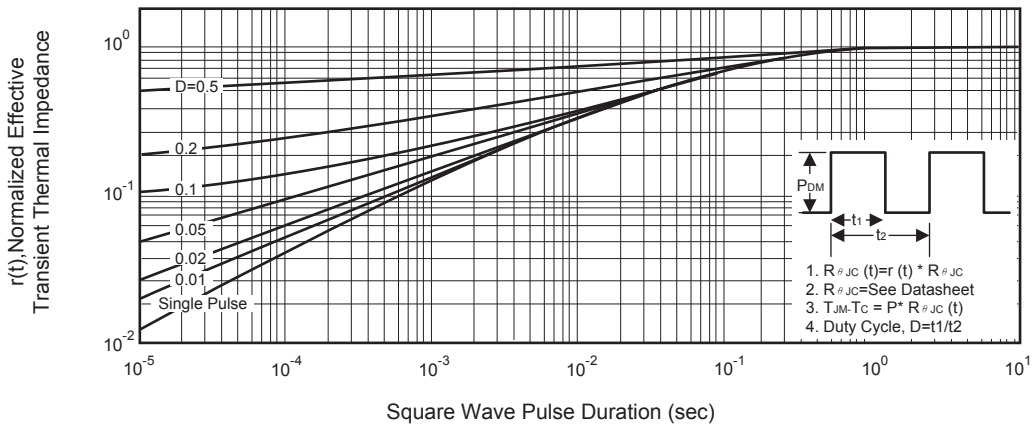


Figure 11. Normalized Thermal Transient Impedance Curve