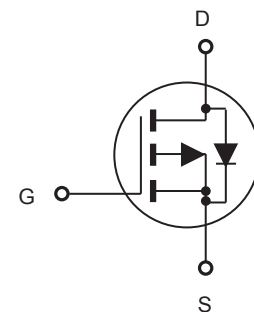
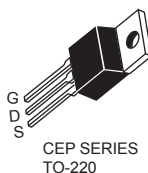


## P-Channel Enhancement Mode Field Effect Transistor

### FEATURES

- -40V, -25A,  $R_{DS(ON)} = 42m\Omega$  @  $V_{GS} = -10V$ .  
 $R_{DS(ON)} = 65m\Omega$  @  $V_{GS} = -4.5V$ .
- Super high dense cell design for extremely low  $R_{DS(ON)}$ .
- High power and current handling capability.
- Lead-free plating ; RoHS compliant.
- TO-220 & TO-263 package.



### ABSOLUTE MAXIMUM RATINGS $T_C = 25^\circ\text{C}$ 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 @ $T_C = 25^\circ\text{C}$  | $I_D$          | -25        | A                   |
| @ $T_C = 100^\circ\text{C}$                          |                | -17        | A                   |
| Drain Current-Pulsed <sup>a</sup>                    | $I_{DM}$       | -100       | A                   |
| Maximum Power Dissipation @ $T_C = 25^\circ\text{C}$ | $P_D$          | 39         | W                   |
| - Derate above $25^\circ\text{C}$                    |                | 0.31       | W/ $^\circ\text{C}$ |
| Operating and Store Temperature Range                | $T_J, T_{stg}$ | -55 to 150 | $^\circ\text{C}$    |

### Thermal Characteristics

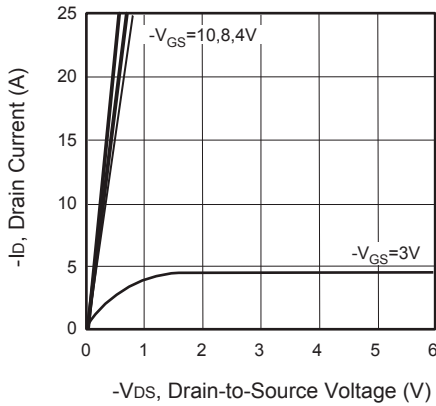
| Parameter                               | Symbol          | Limit | Units              |
|-----------------------------------------|-----------------|-------|--------------------|
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 3.2   | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 62.5  | $^\circ\text{C/W}$ |



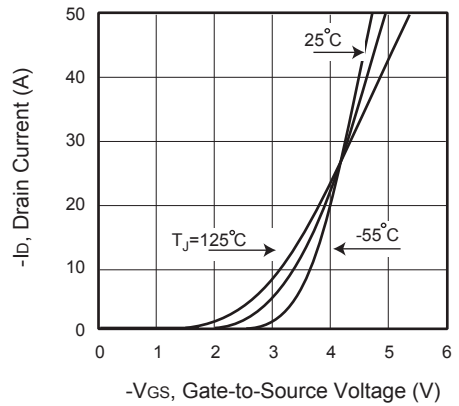
# CEP4301/CEB4301

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

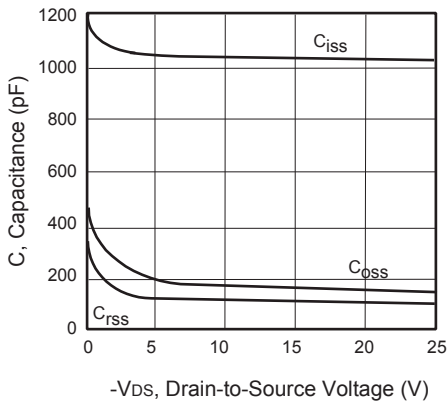
| Parameter                                                                                                                                                                                                                                                                                                                            | Symbol       | Test Condition                                                    | Min | Typ  | Max  | Units      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------------------------------------------------|-----|------|------|------------|
| Off Characteristics                                                                                                                                                                                                                                                                                                                  |              |                                                                   |     |      |      |            |
| Drain-Source Breakdown Voltage                                                                                                                                                                                                                                                                                                       | $BV_{DSS}$   | $V_{GS} = 0V, I_D = -250\mu A$                                    | -40 |      |      | V          |
| Zero Gate Voltage Drain Current                                                                                                                                                                                                                                                                                                      | $I_{DSS}$    | $V_{DS} = -40V, V_{GS} = 0V$                                      |     |      | -1   | $\mu A$    |
| Gate Body Leakage Current, Forward                                                                                                                                                                                                                                                                                                   | $I_{GSSF}$   | $V_{GS} = 20V, V_{DS} = 0V$                                       |     |      | 100  | nA         |
| Gate Body Leakage Current, Reverse                                                                                                                                                                                                                                                                                                   | $I_{GSSR}$   | $V_{GS} = -20V, V_{DS} = 0V$                                      |     |      | -100 | nA         |
| On Characteristics <sup>c</sup>                                                                                                                                                                                                                                                                                                      |              |                                                                   |     |      |      |            |
| Gate Threshold Voltage                                                                                                                                                                                                                                                                                                               | $V_{GS(th)}$ | $V_{GS} = V_{DS}, I_D = -250\mu A$                                | -1  |      | -3   | V          |
| Static Drain-Source                                                                                                                                                                                                                                                                                                                  | $R_{DS(on)}$ | $V_{GS} = -10V, I_D = -12A$                                       |     | 30   | 42   | m $\Omega$ |
| On-Resistance                                                                                                                                                                                                                                                                                                                        |              | $V_{GS} = -4.5V, I_D = -6A$                                       |     | 48   | 65   | m $\Omega$ |
| Dynamic Characteristics <sup>d</sup>                                                                                                                                                                                                                                                                                                 |              |                                                                   |     |      |      |            |
| Input Capacitance                                                                                                                                                                                                                                                                                                                    | $C_{iss}$    | $V_{DS} = -20V, V_{GS} = 0V,$<br>$f = 1.0\text{ MHz}$             |     | 1125 |      | pF         |
| Output Capacitance                                                                                                                                                                                                                                                                                                                   | $C_{oss}$    |                                                                   |     | 150  |      | pF         |
| Reverse Transfer Capacitance                                                                                                                                                                                                                                                                                                         | $C_{rss}$    |                                                                   |     | 100  |      | pF         |
| Switching Characteristics <sup>d</sup>                                                                                                                                                                                                                                                                                               |              |                                                                   |     |      |      |            |
| Turn-On Delay Time                                                                                                                                                                                                                                                                                                                   | $t_{d(on)}$  | $V_{DD} = -20V, I_D = -5A,$<br>$V_{GS} = -10V, R_{GEN} = 3\Omega$ |     | 12   | 24   | ns         |
| Turn-On Rise Time                                                                                                                                                                                                                                                                                                                    | $t_r$        |                                                                   |     | 5    | 10   | ns         |
| Turn-Off Delay Time                                                                                                                                                                                                                                                                                                                  | $t_{d(off)}$ |                                                                   |     | 33   | 66   | ns         |
| Turn-Off Fall Time                                                                                                                                                                                                                                                                                                                   | $t_f$        |                                                                   |     | 4    | 8    | ns         |
| Total Gate Charge                                                                                                                                                                                                                                                                                                                    | $Q_g$        | $V_{DS} = -20V, I_D = -5A,$<br>$V_{GS} = -10V$                    |     | 20   | 26   | nC         |
| Gate-Source Charge                                                                                                                                                                                                                                                                                                                   | $Q_{gs}$     |                                                                   |     | 2.5  |      | nC         |
| Gate-Drain Charge                                                                                                                                                                                                                                                                                                                    | $Q_{gd}$     |                                                                   |     | 3.5  |      | nC         |
| Drain-Source Diode Characteristics and Maximun Ratings                                                                                                                                                                                                                                                                               |              |                                                                   |     |      |      |            |
| Drain-Source Diode Forward Current <sup>b</sup>                                                                                                                                                                                                                                                                                      | $I_S$        |                                                                   |     |      | -25  | A          |
| Drain-Source Diode Forward Voltage <sup>c</sup>                                                                                                                                                                                                                                                                                      | $V_{SD}$     | $V_{GS} = 0V, I_S = -25A$                                         |     |      | -1.3 | V          |
| <div>Notes :<br/>a.Repetitive Rating : Pulse width limited by maximum junction temperature.<br/>b.Surface Mounted on FR4 Board, <math>t \leq 10\text{ sec.}</math><br/>c.Pulse Test : Pulse Width <math>\leq 300\mu s</math>, Duty Cycle <math>\leq 2\%</math>.<br/>d.Guaranteed by design, not subject to production testing.</div> |              |                                                                   |     |      |      |            |



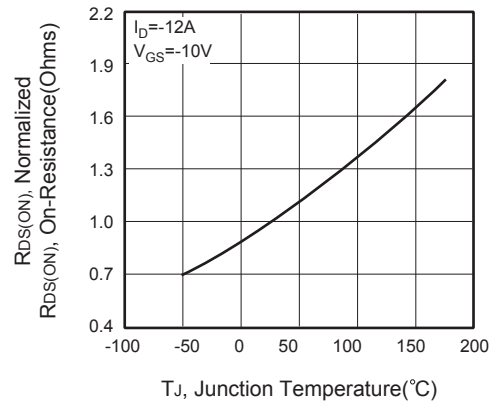
**Figure 1. Output Characteristics**



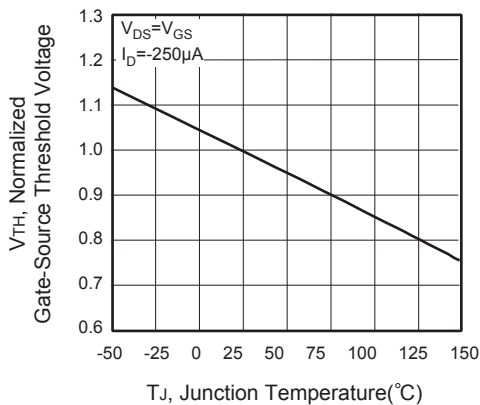
**Figure 2. Transfer Characteristics**



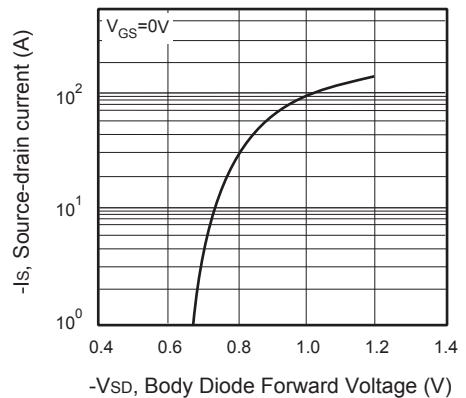
**Figure 3. Capacitance**



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



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



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

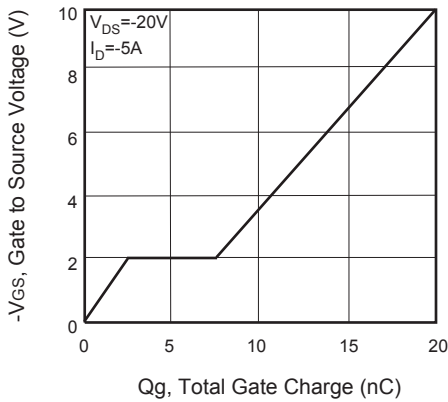


Figure 7. Gate Charge

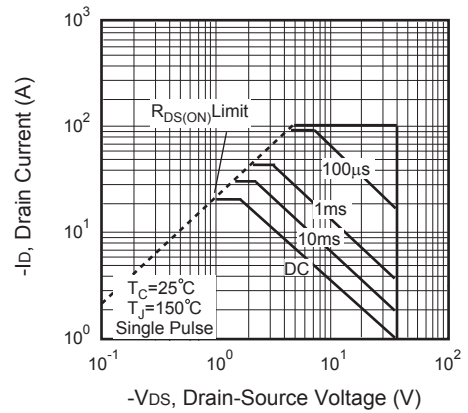


Figure 8. Maximum Safe Operating Area

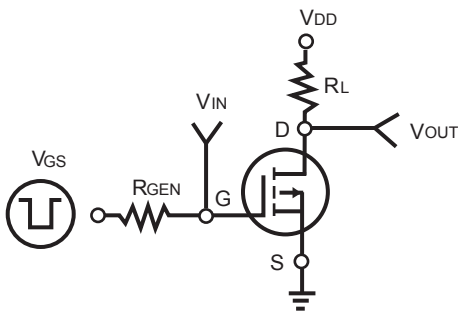


Figure 9. Switching Test Circuit

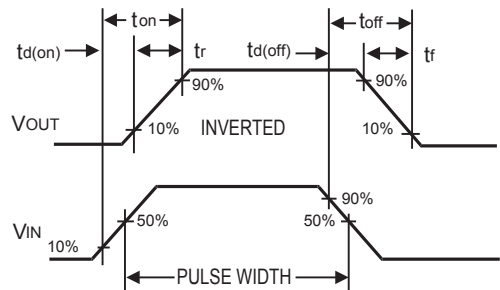


Figure 10. Switching Waveforms

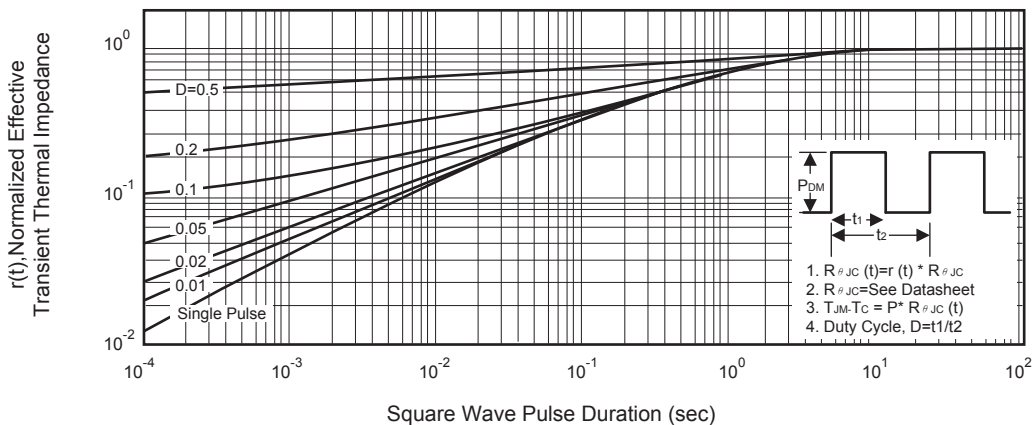


Figure 11. Normalized Thermal Transient Impedance Curve