



# CEP38N65SA/CEB38N65SA CEF38N65SA

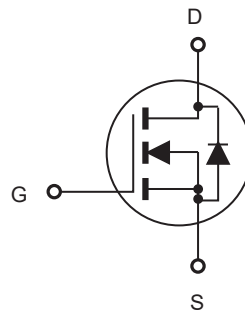
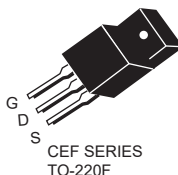
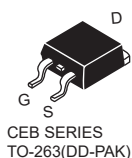
## N-Channel Enhancement Mode Field Effect Transistor

PRELIMINARY

### FEATURES

| Type       | V <sub>DSS</sub> | R <sub>DS(ON)</sub> | I <sub>D</sub>   | @V <sub>GS</sub> |
|------------|------------------|---------------------|------------------|------------------|
| CEP38N65SA | 650V             | 0.095Ω              | 39A              | 10V              |
| CEB38N65SA | 650V             | 0.095Ω              | 39A              | 10V              |
| CEF38N65SA | 650V             | 0.095Ω              | 39A <sup>d</sup> | 10V              |

- Super high dense cell design for extremely low R<sub>DS(ON)</sub>.
- High power and current handling capability.
- RoHS compliant.



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

| Parameter                                                                    | Symbol                            | Limit      |                    | Units |
|------------------------------------------------------------------------------|-----------------------------------|------------|--------------------|-------|
|                                                                              |                                   | TO-220/263 | TO-220F            |       |
| Drain-Source Voltage                                                         | V <sub>DS</sub>                   | 650        |                    | V     |
| Gate-Source Voltage                                                          | V <sub>GS</sub>                   | ±30        |                    | V     |
| Drain Current-Continuous @ T <sub>C</sub> = 25°C<br>@ T <sub>C</sub> = 100°C | I <sub>D</sub>                    | 39         | 39 <sup>d</sup>    | A     |
|                                                                              |                                   | 24.5       | 24.5 <sup>d</sup>  | A     |
| Drain Current-Pulsed <sup>a</sup>                                            | I <sub>DM</sub> <sup>e</sup>      | 155.2      | 155.2 <sup>d</sup> | A     |
| Maximum Power Dissipation @ T <sub>C</sub> = 25°C<br>- Derate above 25°C     | P <sub>D</sub>                    | 357        | 89                 | W     |
|                                                                              |                                   | 2.9        | 0.7                | W/°C  |
| Single Pulsed Avalanche Energy <sup>h</sup>                                  | E <sub>AS</sub>                   | 735        |                    | mJ    |
| Single Pulsed Avalanche Current <sup>h</sup>                                 | I <sub>AS</sub>                   | 7          |                    | A     |
| Operating and Store Temperature Range                                        | T <sub>J</sub> , T <sub>stg</sub> | -55 to 150 |                    | °C    |

### Thermal Characteristics

| Parameter                               | Symbol           | Limit |     | Units |
|-----------------------------------------|------------------|-------|-----|-------|
| Thermal Resistance, Junction-to-Case    | R <sub>θJC</sub> | 0.35  | 1.4 | °C/W  |
| Thermal Resistance, Junction-to-Ambient | R <sub>θJA</sub> | 62.5  | 65  | °C/W  |

This is preliminary information on a new product in development now .  
Details are subject to change without notice .

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<http://www.cet-mos.com>



# CEP38N65SA/CEB38N65SA

## CEF38N65SA

### 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                         | $BV_{DSS}$   | $V_{GS} = 0V, I_D = 250\mu A$                                    | 650 |      |       | V        |
| Zero Gate Voltage Drain Current                        | $I_{DSS}$    | $V_{DS} = 650V, V_{GS} = 0V$                                     |     |      | 1     | $\mu A$  |
| Gate Body Leakage Current, Forward                     | $I_{GSSF}$   | $V_{GS} = 30V, V_{DS} = 0V$                                      |     |      | 100   | nA       |
| Gate Body Leakage Current, Reverse                     | $I_{GSSR}$   | $V_{GS} = -30V, V_{DS} = 0V$                                     |     |      | -100  | nA       |
| On Characteristics <sup>b</sup>                        |              |                                                                  |     |      |       |          |
| Gate Threshold Voltage                                 | $V_{GS(th)}$ | $V_{GS} = V_{DS}, I_D = 250\mu A$                                | 2.5 |      | 4.5   | V        |
| Static Drain-Source On-Resistance                      | $R_{DS(on)}$ | $V_{GS} = 10V, I_D = 20A$                                        |     | 0.08 | 0.095 | $\Omega$ |
| Dynamic Characteristics <sup>c</sup>                   |              |                                                                  |     |      |       |          |
| Input Capacitance                                      | $C_{iss}$    | $V_{DS} = 150V, V_{GS} = 0V,$<br>$f = 1.0\text{ MHz}$            |     | 1915 |       | pF       |
| Output Capacitance                                     | $C_{oss}$    |                                                                  |     | 110  |       | pF       |
| Reverse Transfer Capacitance                           | $C_{rss}$    |                                                                  |     | 5    |       | pF       |
| Switching Characteristics <sup>c</sup>                 |              |                                                                  |     |      |       |          |
| Turn-On Delay Time                                     | $t_{d(on)}$  | $V_{DD} = 520V, I_D = 20A,$<br>$V_{GS} = 10V, R_{GEN} = 6\Omega$ |     | 37   |       | ns       |
| Turn-On Rise Time                                      | $t_r$        |                                                                  |     | 17   |       | ns       |
| Turn-Off Delay Time                                    | $t_{d(off)}$ |                                                                  |     | 95   |       | ns       |
| Turn-Off Fall Time                                     | $t_f$        |                                                                  |     | 9    |       | ns       |
| Total Gate Charge                                      | $Q_g$        | $V_{DS} = 520V, I_D = 20A,$<br>$V_{GS} = 10V$                    |     | 69   |       | nC       |
| Gate-Source Charge                                     | $Q_{gs}$     |                                                                  |     | 12   |       | nC       |
| Gate-Drain Charge                                      | $Q_{gd}$     |                                                                  |     | 30   |       | nC       |
| Drain-Source Diode Characteristics and Maximun Ratings |              |                                                                  |     |      |       |          |
| Drain-Source Diode Forward Current                     | $I_S^f$      |                                                                  |     |      | 39    | A        |
| Drain-Source Diode Forward Voltage <sup>b</sup>        | $V_{SD}$     | $V_{GS} = 0V, I_S = 20A^g$                                       |     |      | 1.5   | V        |

**Notes :**

a. Repetitive Rating : Pulse width limited by maximum junction temperature .

b. Pulse Test : Pulse Width  $\leq 300\mu s$ , 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  $I_{S(max)} = 19A$  .

g. Full package  $V_{SD}$  test condition  $I_S = 19A$  .

h.  $L = 30mH, I_{AS} = 7A, V_{DD} = 60V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ C$ .

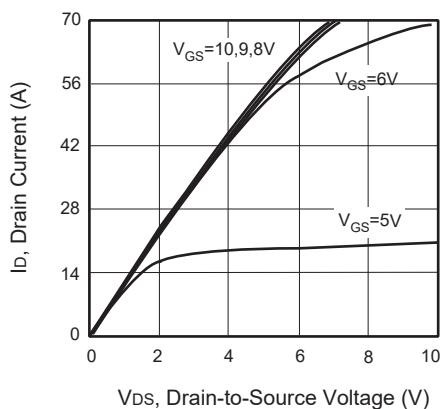


Figure 1. Output Characteristics

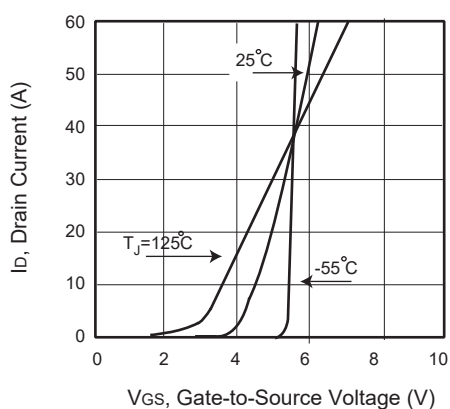


Figure 2. Transfer Characteristics

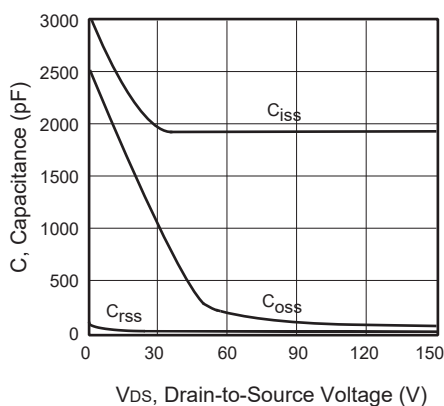


Figure 3. Capacitance

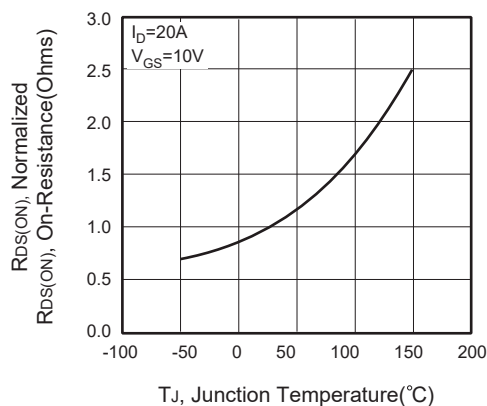


Figure 4. On-Resistance Variation with Temperature

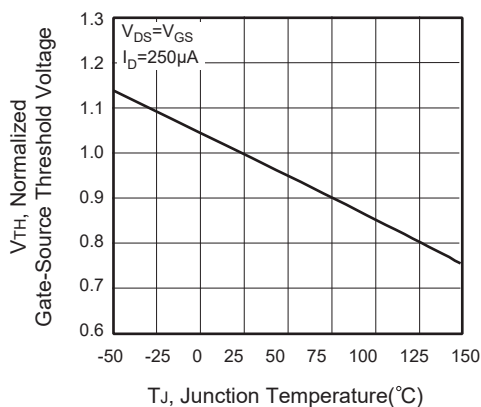


Figure 5. Gate Threshold Variation with Temperature

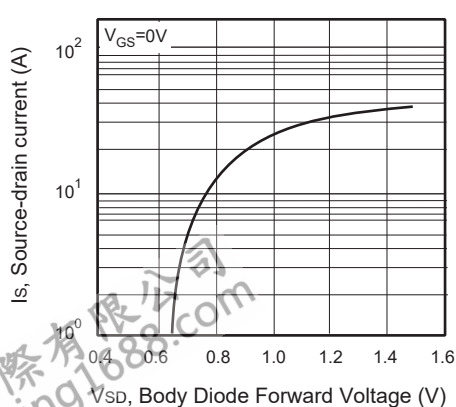


Figure 6. Body Diode Forward Voltage Variation with Source Current

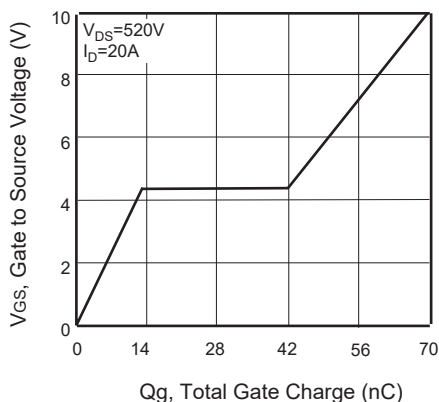


Figure 7. Gate Charge

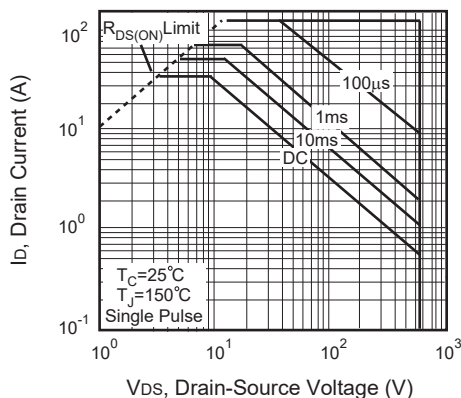


Figure 8. Maximum Safe Operating Area

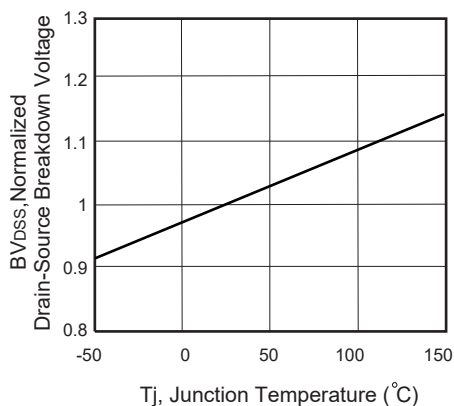


Figure 9. Breakdown Voltage Variation VS Temperature

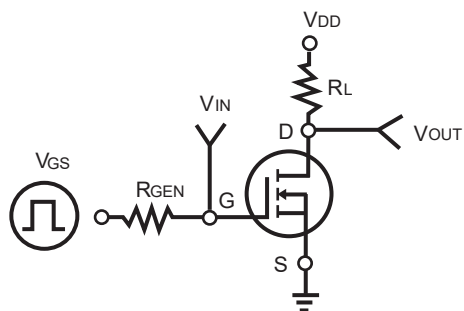


Figure 10. Switching Test Circuit

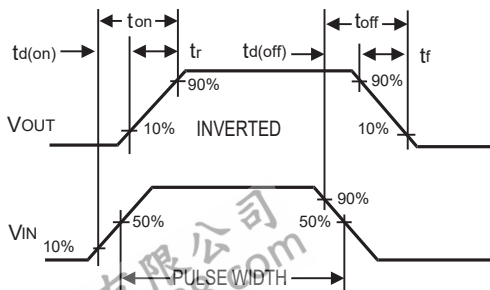


Figure 11. Switching Waveforms



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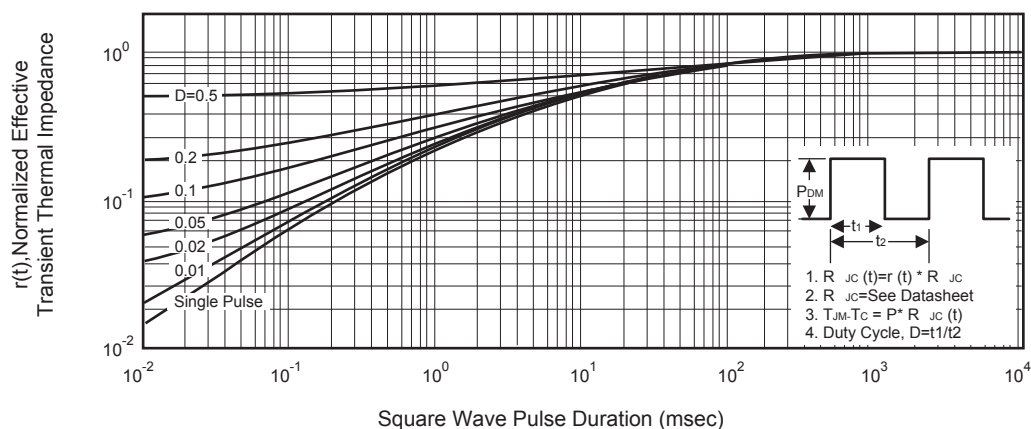


Figure 12. Normalized Thermal Transient Impedance Curve