

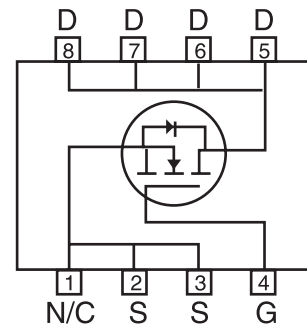
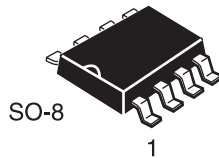
# CEM9410

March 1998

## N-Channel Enhancement Mode Field Effect Transistor

### FEATURES

- 30V , 7A ,  $R_{DS(ON)}=30m\Omega$  @  $V_{GS}=10V$ .  
 $R_{DS(ON)}=50m\Omega$  @  $V_{GS}=4.5V$ .
- Super high dense cell design for extremely low  $R_{DS(ON)}$ .
- High power and current handling capability.
- Surface mount Package.



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### ABSOLUTE MAXIMUM RATINGS ( $T_A=25^{\circ}C$ unless otherwise noted)

| Parameter  | Symbol         | Limit      | Unit        |
|--|----------------|------------|-------------|
| Drain-Source Voltage   | $V_{DS}$       | 30         | V           |
| Gate-Source Voltage  | $V_{GS}$       | $\pm 20$   | V           |
| Drain Current-Continuous <sup>a</sup> @ $T_J=125^{\circ}C$<br>-Pulsed <sup>b</sup> | $I_D$          | $\pm 7$    | A           |
|  | $I_{DM}$       | $\pm 20$   | A           |
| Drain-Source Diode Forward Current <sup>a</sup>                                    | $I_S$          | 2.8        | A           |
| Maximum Power Dissipation <sup>a</sup>   | $P_D$          | 2.5        | W           |
| Operating Junction and Storage Temperature Range                                   | $T_J, T_{STG}$ | -55 to 150 | $^{\circ}C$ |

### THERMAL CHARACTERISTICS

|  |                 |    |               |
|--|-----------------|----|---------------|
| Thermal Resistance, Junction-to-Ambient <sup>a</sup> | $R_{\theta JA}$ | 50 | $^{\circ}C/W$ |
|--|-----------------|----|---------------|

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

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| Parameter                                    | Symbol              | Condition  | Min | Typ <sup>c</sup> | Max  | Unit |
|--|---------------------|--|-----|------------------|------|------|
| <b>OFF CHARACTERISTICS</b>                   |                     |  |     |                  |      |      |
| Drain-Source Breakdown Voltage               | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA   | 30  |                  |      | V    |
| Zero Gate Voltage Drain Current              | I <sub>DSS</sub>    | V <sub>DS</sub> =24V, V <sub>GS</sub> =0V  |     |                  | 1    | μA   |
| Gate-Body Leakage                            | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V   |     |                  | ±100 | nA   |
| <b>ON CHARACTERISTICS<sup>b</sup></b>        |                     |  |     |                  |      |      |
| Gate Threshold Voltage                       | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                       | 1   | 1.5              | 3    | V    |
| Drain-Source On-State Resistance             | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =7A   |     | 25               | 30   | mΩ   |
|  |                     | V <sub>GS</sub> =4.5V, I <sub>D</sub> =3.5A  |     | 38               | 50   | mΩ   |
| On-State Drain Current                       | I <sub>D(ON)</sub>  | V <sub>GS</sub> =10V, V <sub>DS</sub> =5V  | 20  |                  |      | A    |
| Forward Transconductance                     | g <sub>FS</sub>     | V <sub>DS</sub> =15V, I <sub>D</sub> =7A   |     | 14               |      | S    |
| <b>DYNAMIC CHARACTERISTICS<sup>c</sup></b>   |                     |  |     |                  |      |      |
| Input Capacitance                            | C <sub>ISS</sub>    | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V<br>f=1.0MHz  |     | 464              | 600  | pF   |
| Output Capacitance                           | C <sub>OSS</sub>    |  |     | 215              | 280  | pF   |
| Reverse Transfer Capacitance                 | C <sub>RSS</sub>    |  |     | 66               | 85   | pF   |
| <b>SWITCHING CHARACTERISTICS<sup>c</sup></b> |                     |  |     |                  |      |      |
| Turn-On Delay Time                           | t <sub>D(ON)</sub>  | V <sub>DD</sub> =25V,<br>I <sub>D</sub> =1A,<br>V <sub>GEN</sub> =10V,<br>R <sub>GEN</sub> =6Ω |     | 20               | 30   | ns   |
| Rise Time                                    | t <sub>r</sub>      |  |     | 40               | 60   | ns   |
| Turn-Off Delay Time                          | t <sub>D(OFF)</sub> |  |     | 80               | 150  | ns   |
| Fall Time                                    | t <sub>f</sub>      |  |     | 100              | 140  | ns   |
| Total Gate Charge                            | Q <sub>g</sub>      | V <sub>DS</sub> =15V, I <sub>D</sub> =2A,<br>V <sub>GS</sub> =10V                              |     | 17               | 50   | nC   |
| Gate-Source Charge                           | Q <sub>gs</sub>     |  |     | 3                |      | nC   |
| Gate-Drain Charge                            | Q <sub>gd</sub>     |  |     | 3                |      | nC   |

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## ELECTRICAL CHARACTERISTICS ( $T_A=25^\circ\text{C}$ unless otherwise noted)

| Parameter   | Symbol   | Condition                 | Min | Typ <sup>c</sup> | Max | Unit |
|---|----------|---------------------------|-----|------------------|-----|------|
| <b>DRAIN-SOURCE DIODE CHARACTERISTICS<sup>b</sup></b> |          |                           |     |                  |     |      |
| Diode Forward Voltage                                 | $V_{SD}$ | $V_{GS} = 0V, I_s = 2.0A$ |     | 0.76             | 1.1 | V    |

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### Notes

- a. Surface Mounted on FR4 Board,  $t \leq 10\text{sec}$ .
- b. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
- c. Guaranteed by design, not subject to production testing.

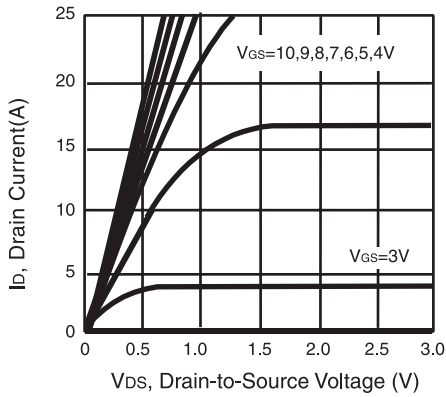


Figure 1. Output Characteristics

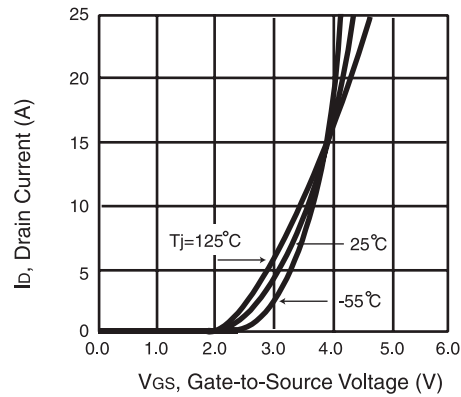


Figure 2. Transfer Characteristics

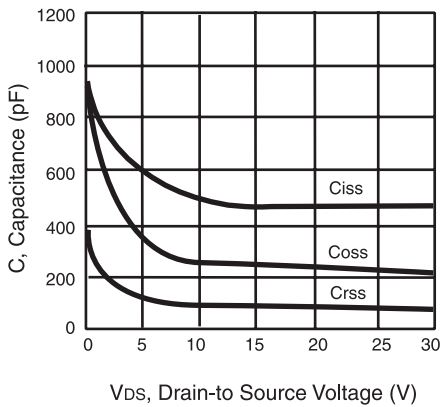


Figure 3. Capacitance

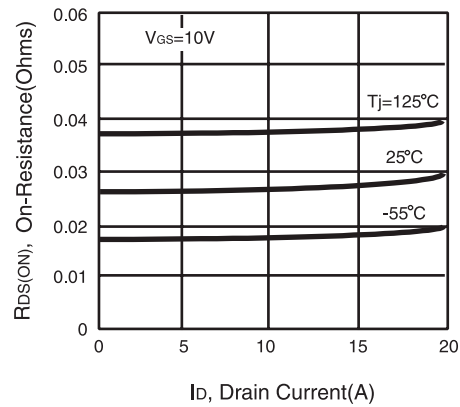
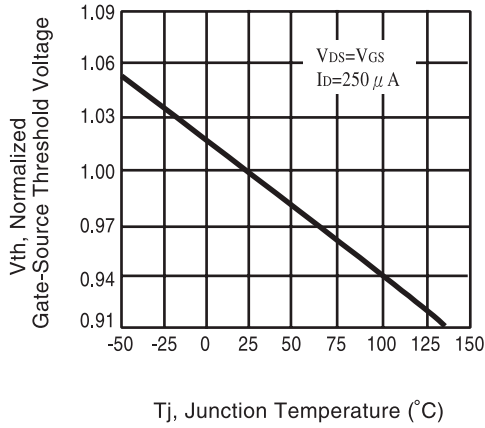


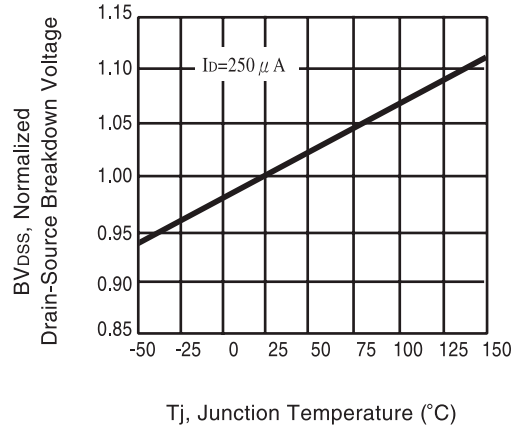
Figure 4. On-Resistance Variation with Drain Current and Temperature

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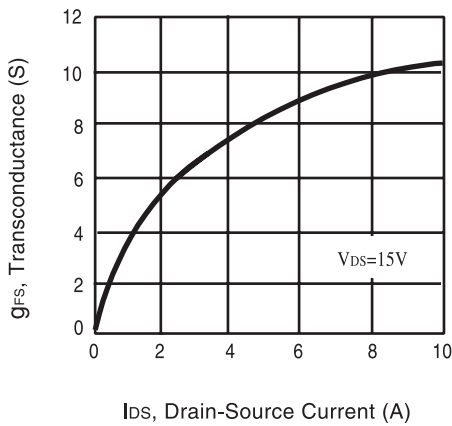
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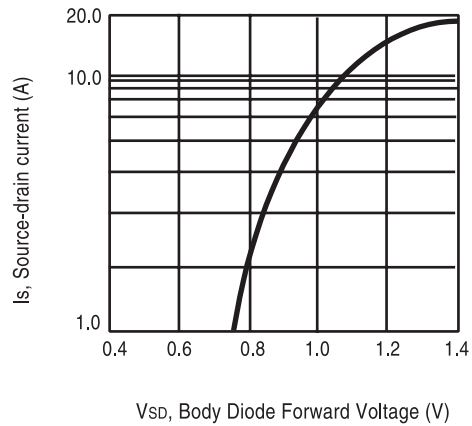
**Figure 5. Gate Threshold Variation with Temperature**



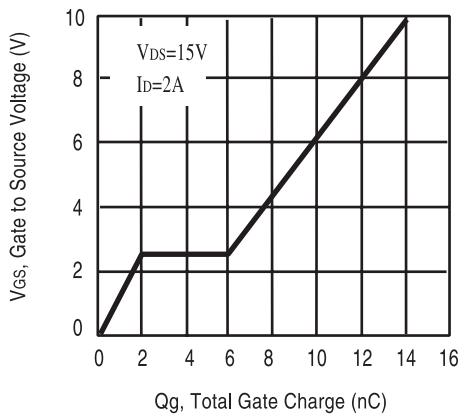
**Figure 6. Breakdown Voltage Variation with Temperature**



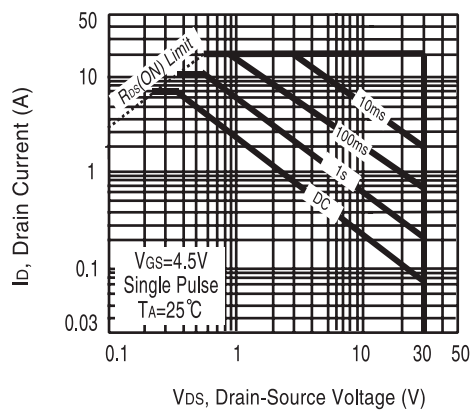
**Figure 7. Transconductance Variation with Drain Current**



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



**Figure 9. Gate Charge**



**Figure 10. Maximum Safe Operating Area**

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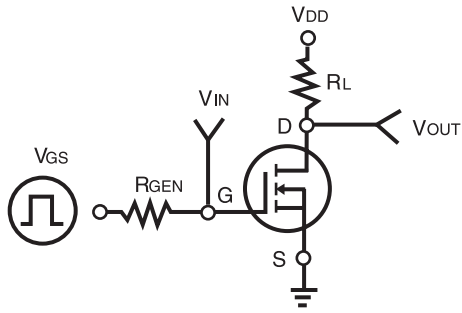


Figure 11. Switching Test Circuit

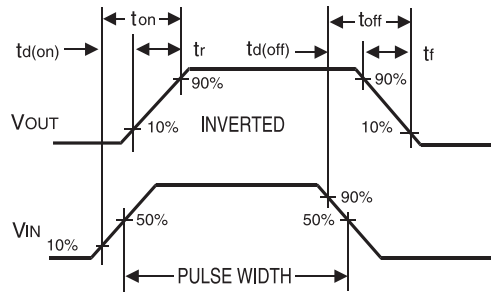


Figure 12. Switching Waveforms

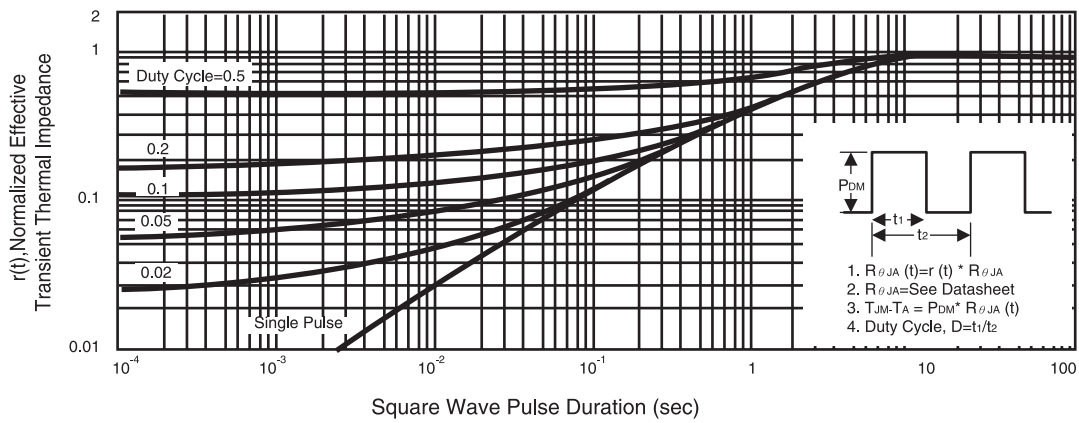


Figure 13. Normalized Thermal Transient Impedance Curve