

## General Description

The CMSC25NP02 is the highest performance trench N-ch and P-ch MOSFETs with high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

## Features

- N Channel+P Channel
- Low On-Resistance
- Surface Mount Package
- RoHS Compliant

## Absolute Maximum Ratings

| Symbol                      | Parameter                                  | Max N-channel | Max P-channel | Units            |
|-----------------------------|--------------------------------------------|---------------|---------------|------------------|
| $V_{DS}$                    | Drain-Source Voltage                       | 20            | -20           | V                |
| $V_{GS}$                    | Gate-Source Voltage                        | $\pm 12$      | $\pm 12$      | V                |
| $I_D@T_C=25^\circ\text{C}$  | Continuous Drain Current                   | 25            | -20           | A                |
| $I_D@T_C=100^\circ\text{C}$ | Continuous Drain Current                   | 17            | -14           | A                |
| $I_{DM}$                    | Pulsed Drain Current                       | 75            | -60           | A                |
| EAS                         | Single Pulse Avalanche Energy <sup>1</sup> | 56            | 68            | mJ               |
| $P_D@T_C=25^\circ\text{C}$  | Power Dissipation                          | 20            |               | W                |
| $T_{STG}$                   | Storage Temperature Range                  | -55 to 150    |               | $^\circ\text{C}$ |
| $T_J$                       | Operating Junction Temperature Range       | -55 to 150    |               | $^\circ\text{C}$ |

## Thermal Characteristics: N-channel

| Symbol          | Parameter                   | Typ. | Max. | Unit                      |
|-----------------|-----------------------------|------|------|---------------------------|
| $R_{\theta JA}$ | Maximum Junction-to-Ambient | ---  | 40   | $^\circ\text{C}/\text{W}$ |
| $R_{\theta JC}$ | Maximum Junction-to-Case    | ---  | 3.1  | $^\circ\text{C}/\text{W}$ |

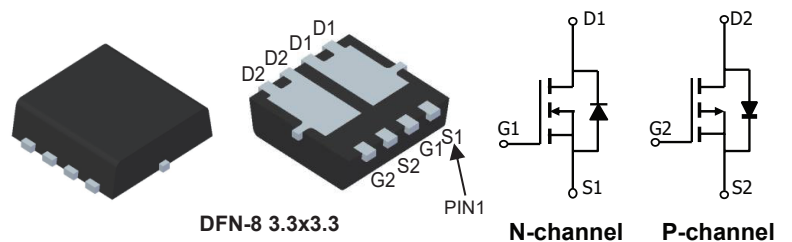
## Product Summary

|           | BVDSS | RDSON        | ID   |
|-----------|-------|--------------|------|
| N-Channel | 20V   | 11m $\Omega$ | 25A  |
| P-Channel | -20V  | 21m $\Omega$ | -20A |

## Applications

- Synchronous Rectification.
- High Current, High Speed Switching.
- Portable equipment application

## DFN-8 3.3x3.3 Pin Configuration



| Type       | Package       | Marking |
|------------|---------------|---------|
| CMSC25NP02 | DFN-8 3.3*3.3 | 25NP02  |

## Thermal Characteristics: P-channel

| Symbol          | Parameter                   | Typ. | Max. | Unit                 |
|-----------------|-----------------------------|------|------|----------------------|
| $R_{\theta JA}$ | Maximum Junction-to-Ambient | ---  | 50   | $^{\circ}\text{C/W}$ |
| $R_{\theta JC}$ | Maximum Junction-to-Case    | ---  | 6    | $^{\circ}\text{C/W}$ |

N-channel Electrical Characteristics ( $T_J=25^{\circ}\text{C}$  , unless otherwise noted)

| Symbol       | Parameter                         | Conditions                                                      | Min. | Typ. | Max.      | Unit      |
|--------------|-----------------------------------|-----------------------------------------------------------------|------|------|-----------|-----------|
| $BV_{DSS}$   | Drain-Source Breakdown Voltage    | $V_{GS}=0V$ , $I_D=250\mu A$                                    | 20   | ---  | ---       | V         |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance | $V_{GS}=4.5V$ , $I_D=15A$                                       | ---  | 9.5  | 11        | $m\Omega$ |
|              |                                   | $V_{GS}=2.5V$ , $I_D=10A$                                       | ---  | 11.5 | 14        |           |
| $V_{GS(th)}$ | Gate Threshold Voltage            | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                                | 0.5  | ---  | 1.5       | V         |
| $I_{DSS}$    | Drain-Source Leakage Current      | $V_{DS}=16V$ , $V_{GS}=0V$                                      | ---  | ---  | 1         | $\mu A$   |
|              |                                   | $V_{DS}=16V$ , $V_{GS}=0V$ , $T_J=125^{\circ}\text{C}$          | ---  | ---  | 10        |           |
| $I_{GSS}$    | Gate-Source Leakage Current       | $V_{GS}=\pm 12V$                                                | ---  | ---  | $\pm 100$ | nA        |
| $g_{fs}$     | Forward Transconductance          | $V_{DS}=5V$ , $I_D=15A$                                         | ---  | 23   | ---       | S         |
| $Q_g$        | Total Gate Charge(4.5V)           | $V_{DS}=10V$ , $I_D=20A$<br>$V_{GS}=10V$                        | ---  | 38   | ---       | nC        |
| $Q_{gs}$     | Gate-Source Charge                |                                                                 | ---  | 8.5  | ---       |           |
| $Q_{gd}$     | Gate-Drain Charge                 |                                                                 | ---  | 13   | ---       |           |
| $T_{d(on)}$  | Turn-On Delay Time                | $V_{DS}=10V$ , $V_{GS}=10V$ , $R_G=3\Omega$<br>$R_L=0.56\Omega$ | ---  | 7    | ---       | ns        |
| $T_r$        | Rise Time                         |                                                                 | ---  | 9    | ---       |           |
| $T_{d(off)}$ | Turn-Off Delay Time               |                                                                 | ---  | 70   | ---       |           |
| $T_f$        | Fall Time                         |                                                                 | ---  | 20   | ---       |           |
| $C_{iss}$    | Input Capacitance                 | $V_{DS}=10V$ , $V_{GS}=0V$ , $f=1\text{MHz}$                    | ---  | 1400 | ---       | pF        |
| $C_{oss}$    | Output Capacitance                |                                                                 | ---  | 280  | ---       |           |
| $C_{rss}$    | Reverse Transfer Capacitance      |                                                                 | ---  | 220  | ---       |           |

## Diode Characteristics

| Symbol        | Parameter                        | Conditions                                         | Min. | Typ. | Max. | Unit |
|---------------|----------------------------------|----------------------------------------------------|------|------|------|------|
| $I_S$         | Diode continuous forward current | $V_G=V_D=0V$ , Force Current                       | ---  | ---  | 25   | A    |
| $I_{S,pulse}$ | Diode pulse current              |                                                    | ---  | ---  | 75   | A    |
| $V_{SD}$      | Diode Forward Voltage            | $V_{GS}=0V$ , $I_F=10A$ , $T_J=25^{\circ}\text{C}$ | ---  | ---  | 1.2  | V    |

P Channel Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)

| Symbol              | Parameter                         | Conditions                                                                                                    | Min. | Typ. | Max. | Unit |
|---------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------|------|------|------|------|
| BV <sub>DSS</sub>   | Drain-Source Breakdown Voltage    | V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA                                                                   | -20  | ---  | ---  | V    |
| R <sub>DS(ON)</sub> | Static Drain-Source On-Resistance | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-15A                                                                  | ---  | 18   | 21   | mΩ   |
|                     |                                   | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-10A                                                                  | ---  | 23   | 28   |      |
| V <sub>GS(th)</sub> | Gate Threshold Voltage            | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250μA                                                     | -0.5 | ---  | -1.5 | V    |
| I <sub>DSS</sub>    | Drain-Source Leakage Current      | V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V                                                                    | ---  | ---  | -1   | μA   |
|                     |                                   | V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                                              | ---  | ---  | -10  |      |
| I <sub>GSS</sub>    | Gate-Source Leakage Current       | V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V                                                                    | ---  | ---  | ±100 | nA   |
| g <sub>fs</sub>     | Forward Transconductance          | V <sub>DS</sub> =-5V, I <sub>D</sub> =-15A                                                                    | ---  | 21   | ---  | S    |
| Q <sub>g</sub>      | Total Gate Charge                 | V <sub>DS</sub> =-10V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-20A                                           | ---  | 30   | ---  | nC   |
| Q <sub>gs</sub>     | Gate-Source Charge                |                                                                                                               | ---  | 4    | ---  |      |
| Q <sub>gd</sub>     | Gate-Drain Charge                 |                                                                                                               | ---  | 6    | ---  |      |
| T <sub>d(on)</sub>  | Turn-On Delay Time                | V <sub>DS</sub> =-10V, V <sub>GS</sub> =-10V, I <sub>D</sub> =-20A<br>R <sub>G</sub> =6Ω, R <sub>L</sub> =15Ω | ---  | 15   | ---  | ns   |
| T <sub>r</sub>      | Rise Time                         |                                                                                                               | ---  | 12   | ---  |      |
| T <sub>d(off)</sub> | Turn-Off Delay Time               |                                                                                                               | ---  | 62   | ---  |      |
| T <sub>f</sub>      | Fall Time                         |                                                                                                               | ---  | 46   | ---  |      |
| C <sub>iss</sub>    | Input Capacitance                 | V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, f=1MHz                                                            | ---  | 2100 | ---  | pF   |
| C <sub>oss</sub>    | Output Capacitance                |                                                                                                               | ---  | 300  | ---  |      |
| C <sub>rss</sub>    | Reverse Transfer Capacitance      |                                                                                                               | ---  | 180  | ---  |      |

## Diode Characteristics

| Symbol          | Parameter                 | Conditions                                                       | Min. | Typ. | Max. | Unit |
|-----------------|---------------------------|------------------------------------------------------------------|------|------|------|------|
| I <sub>S</sub>  | Continuous Source Current | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current                | ---  | ---  | -20  | A    |
| I <sub>SM</sub> | Pulsed Source Current     |                                                                  | ---  | ---  | -60  | A    |
| V <sub>SD</sub> | Diode Forward Voltage     | V <sub>GS</sub> =0V, I <sub>F</sub> =-10 A, T <sub>J</sub> =25°C | ---  | ---  | -1.2 | V    |

Note:

1.The EAS data shows Max. rating . The N-Channel test condition is V<sub>DD</sub>=20V, V<sub>GS</sub>=10V, L=0.5mH, I<sub>AS</sub>=15A.The P-Channel test condition is V<sub>DD</sub>=-20V, V<sub>GS</sub>=-10V, L=0.5mH, I<sub>AS</sub>=-16.5A.

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