

General Description

The CMSC12NP04 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	40	-40	V
V_{GS}	Gate-Source Voltage	± 20	± 20	V
$I_D@T_C=25^\circ\text{C}$	Continuous Drain Current	20	-12	A
$I_D@T_C=100^\circ\text{C}$	Continuous Drain Current	13	-8.4	A
I_{DM}	Pulsed Drain Current	60	-36	A
EAS	Single Pulse Avalanche Energy ¹	56	56	mJ
$P_D@T_C=25^\circ\text{C}$	Power Dissipation	24	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	---	53	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Maximum Junction-to-Case	---	5.1	$^\circ\text{C}/\text{W}$

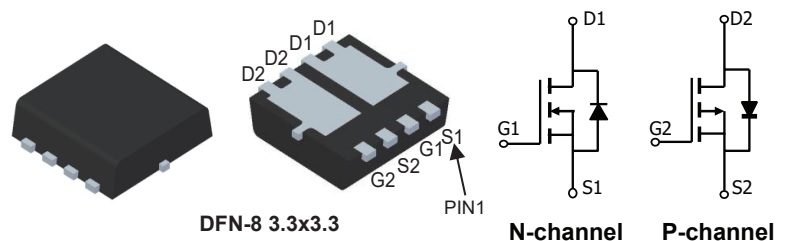
Product Summary

	BVDSS	RDSON	ID
N-Channel	40V	25m Ω	20A
P-Channel	-40V	48m Ω	-12A

Applications

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

DFN-8 3.3x3.3 Pin Configuration



Type	Package	Marking
CMSC12NP04	DFN-8 3.3x3.3	12NP04

Thermal Characteristics: P-channel

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Maximum Junction-to-Ambient ($t \leq 10s$)	---	50	$^{\circ}C/W$
$R_{\theta JC}$	Maximum Junction-to-Case	---	6.2	$^{\circ}C/W$

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=6A$	---	20	25	m Ω
		$V_{GS}=4.5V, I_D=6A$	---	25	35	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D = 250\mu A$	1	---	3	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=32V, V_{GS}=0V$	---	---	1	μA
		$V_{DS}=32V, V_{GS}=0V, T_J=55^{\circ}C$	---	---	5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = \pm 20V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=5V, I_D=6A$	---	10	---	S
Q_g	Total Gate Charge	$V_{DS}=20V, I_D=7A$ $V_{GS}=0$ to 10V	---	14	---	nC
Q_{gs}	Gate-Source Charge		---	2	---	
Q_{gd}	Gate-Drain Charge		---	2.5	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=20V, V_{GS}=10V, R_G=6\Omega$ $I_D=7A$	---	7	---	ns
T_r	Rise Time		---	3	---	
$T_{d(off)}$	Turn-Off Delay Time		---	20	---	
T_f	Fall Time		---	2	---	
C_{iss}	Input Capacitance	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	---	850	---	pF
C_{oss}	Output Capacitance		---	85	---	
C_{rss}	Reverse Transfer Capacitance		---	50	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Diode continuous forward current	$V_G=V_D=0V$, Force Current	---	---	20	A
$I_{S,pulse}$	Diode pulse current		---	---	60	A
V_{SD}	Diode Forward Voltage	$V_{GS}=0V, I_F=12A, T_J=25^{\circ}C$	---	0.9	1.2	V

P Channel Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250μA	-40	---	---	V
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =-10V, I _D =-6A	---	40	48	mΩ
		V _{GS} =-4.5V, I _D =-6A	---	51	61	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250μA	-1	---	-3	V
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-40V, V _{GS} =0V	---	---	-1	uA
		V _{DS} =-40V, V _{GS} =0V, T _J =55°C	---	---	-10	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V, I _D =-6A	---	11	---	S
Q _g	Total Gate Charge	V _{DS} =-20V, V _{GS} =-4.5V, I _D =-5A	---	11	---	nC
Q _{gs}	Gate-Source Charge		---	3	---	
Q _{gd}	Gate-Drain Charge		---	5	---	
T _{d(on)}	Turn-On Delay Time	V _{DS} =-20V, V _{GS} =-10V, I _D =-4A R _G =1Ω, R _L =5Ω	---	6	---	ns
T _r	Rise Time		---	13	---	
T _{d(off)}	Turn-Off Delay Time		---	26	---	
T _f	Fall Time		---	10	---	
C _{iss}	Input Capacitance	V _{DS} =-25V, V _{GS} =0V, f=1MHz	---	1050	---	pF
C _{oss}	Output Capacitance		---	90	---	
C _{rss}	Reverse Transfer Capacitance		---	55	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current	V _G =V _D =0V, Force Current	---	---	-12	A
I _{SM}	Pulsed Source Current		---	---	-36	A
V _{SD}	Diode Forward Voltage	V _{GS} =0V, I _F =-12 A, T _J =25°C	---	-0.97	-1.2	V

Note:

1. The EAS data shows Max. rating. The N-Channel test condition is V_{DD}=30V, V_{GS}=10V, L=0.5mH, I_{AS}=15A.

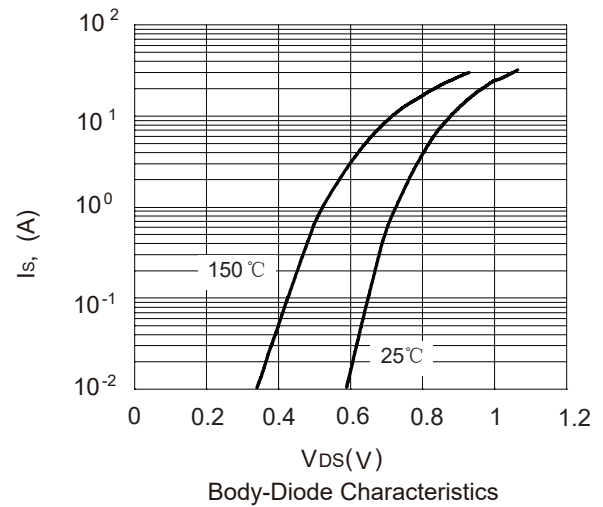
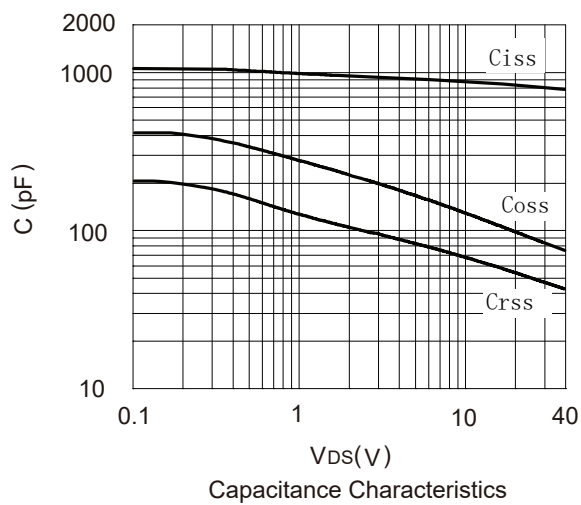
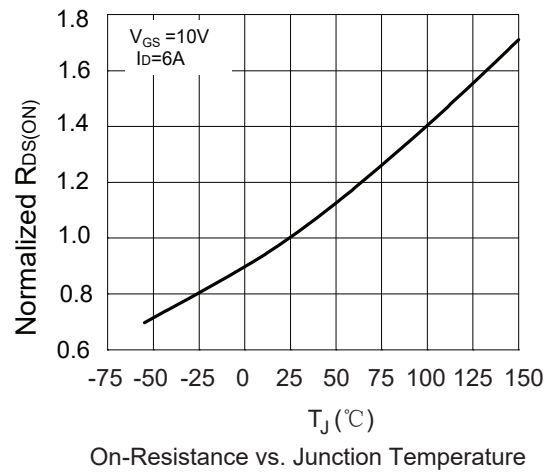
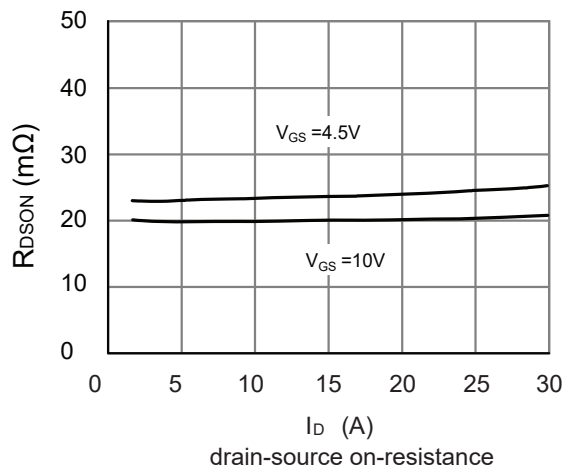
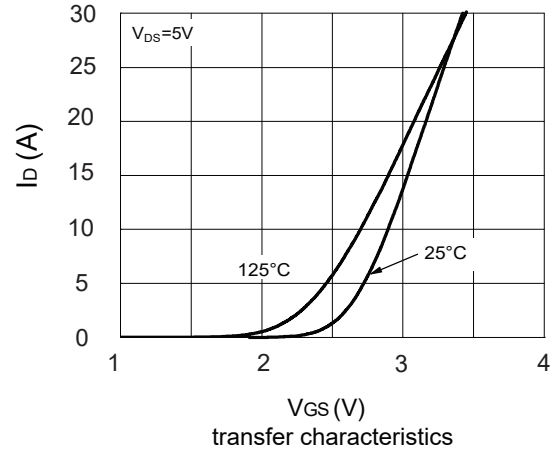
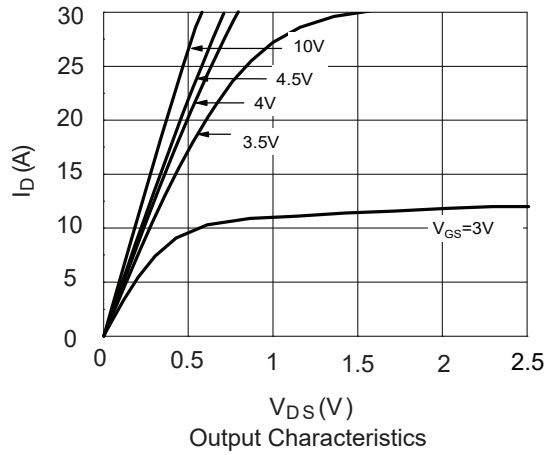
The P-Channel test condition is V_{DD}=-30V, V_{GS}=-10V, L=0.5mH, I_{AS}=-15A.

This product has been designed and qualified for the consumer market.

Cmos assumes no liability for customers' product design or applications.

Cmos reserves the right to improve product design, functions and reliability without notice.

Typical Characteristics:N-Channel



N&P-Channel Enhancement Mode MOSFET

Typical Characteristics:P-Channel

