



PFC Device Corporation

PRM012N04D

40V Single N-Channel MOSFET

Major ratings and characteristics

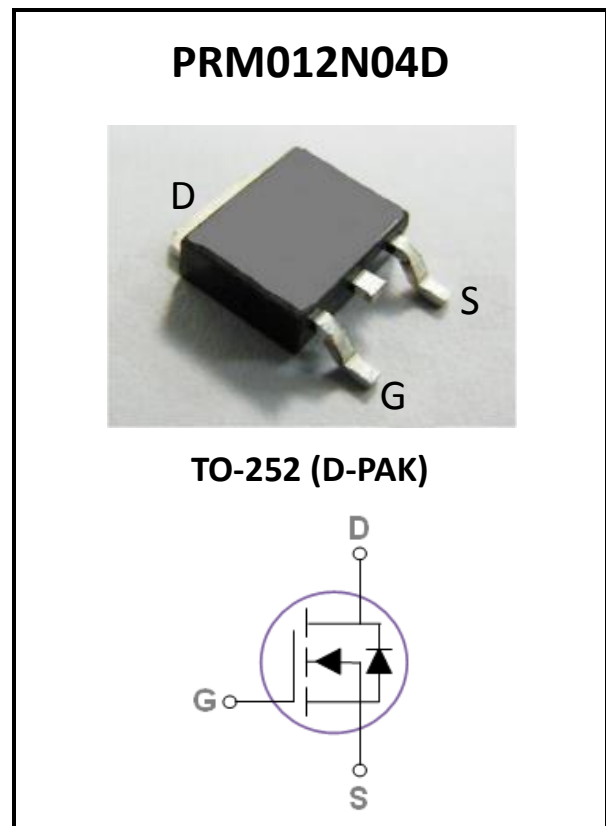
Characteristics	Values	Units
V_{DS}	40	V
I_D^5 ($T_C=25^\circ\text{C}$)	40	A
Max. $R_{DS(ON)}$ @ $V_{GS}=10\text{V}$	12	m Ω
Max. $R_{DS(ON)}$ @ $V_{GS}=4.5\text{V}$	17	m Ω
T_J Operating Junction Temperature	-55 to +150	$^\circ\text{C}$

General Description

The N-Channel enhancement mode power field effect transistor is using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. The device is well suited for high efficiency fast switching applications.

Typical Applications

- Charger Adapter
- Power Tools
- LED Lighting



Features

- Max. $R_{DS(ON)}=12\text{m}\Omega@V_{GS}=10\text{V}$
- Improved dv/dt capability
- Fast switching
- 100% E_{AS} Guaranteed
- Green Device Available

1. Characteristics

Maximum Ratings Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-Source Voltage	± 20	V
I_D^4	Drain Current – Continuous ($T_C=25^\circ\text{C}$)	42	A
	Drain Current – Continuous ($T_C=100^\circ\text{C}$)	26.6	A
I_D^5	Drain Current – Continuous ($T_C=25^\circ\text{C}$)	40	A
I_{DM}	Drain Current – Pulsed ¹	120	A
E_{AS}	Single Pulse Avalanche Energy ²	20	mJ
I_{AS}	Single Pulse Avalanche Current ²	20	A
P_D	Power Dissipation ($T_C=25^\circ\text{C}$)	39	W
	Power Dissipation – Derate above 25°C	0.31	W/ $^\circ\text{C}$
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

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	62	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	3.2	$^\circ\text{C}/\text{W}$



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

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	---	---	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=40V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	μA
		$V_{DS}=40V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	250	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=20A$	---	---	12	$m\Omega$
		$V_{GS}=4.5V, I_D=10A$	---	---	17	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=250\mu A$	1.0	---	3.0	V
g_{fs}	Forward Transconductance	$V_{DS}=5V, I_D=20A$	---	37	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge	$V_{DS}=20V, V_{GS}=10V, I_D=20A$	---	23.5	---	nC
Q_{gs}	Gate-Source Charge		---	5	---	
Q_{gd}	Gate-Drain Charge		---	3.5	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=20V, V_{GS}=10V, R_G=6\Omega, I_D=20A$	---	11	---	ns
T_r	Turn-On Rise Time		---	89	---	
$T_{d(off)}$	Turn-Off Delay Time		---	27	---	
T_f	Turn-Off Fall Time		---	110	---	
C_{iss}	Input Capacitance	$V_{DS}=25V, V_{GS}=0V, f=1\text{MHz}$	---	1390	---	pF
C_{oss}	Output Capacitance		---	100	---	
C_{riss}	Reverse Transfer Capacitance		---	75	---	
R_g	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1\text{MHz}$	---	2	---	Ω

Drain-Source Diode Characteristics

V_{SD}^3	Source to Drain Diode Voltage	$V_{GS}=0V, I_S=20A$	---	---	1.5	V
t_{rr}	Reverse Recovery Time	$I_S=10A, di/dt=100A/\mu s$	---	7	---	ns
Q_{rr}	Reverse Recovery Charge		---	1	---	nC

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. $L=0.1\text{mH}, R_G=25\Omega$, Starting $T_J=25^\circ\text{C}$
3. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.
4. Silicon limited.
5. Package limited.



2. Characteristics Curves

Ratings and Characteristics Curves

($T_A = 25^\circ\text{C}$ unless otherwise specified)

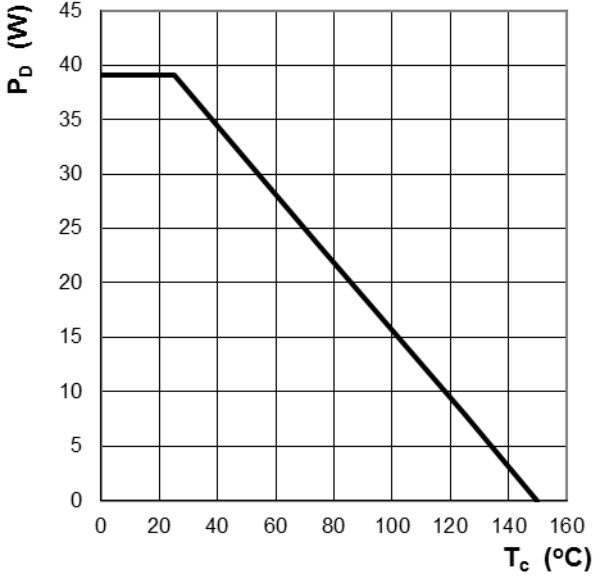


Figure 1: Power Dissipation

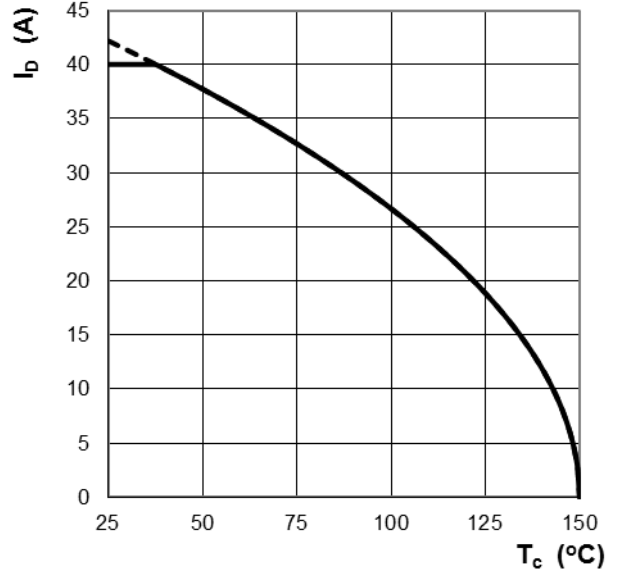


Figure 2: Continuous Drain Current vs. T_c

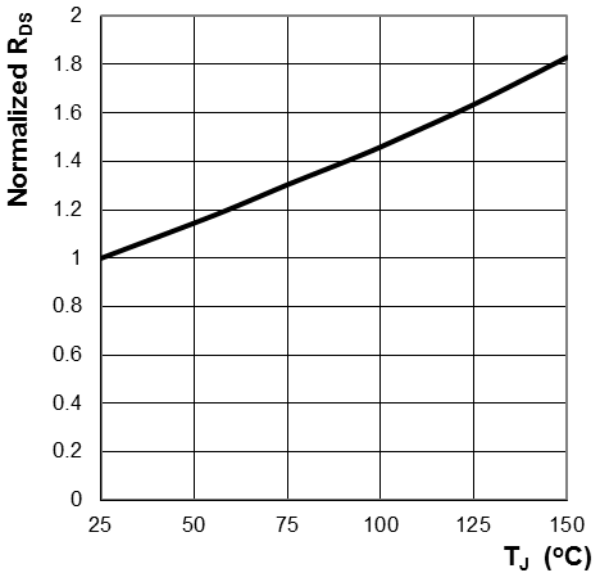


Figure 3: Normalized $R_{DS(ON)}$ vs. T_J

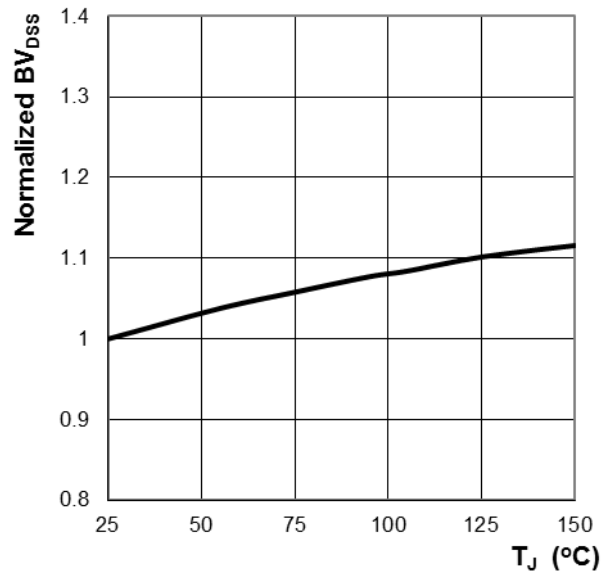


Figure 4: Normalized BV_{DSS} vs. T_J



Ratings and Characteristics Curves

($T_A = 25^\circ\text{C}$ unless otherwise specified)

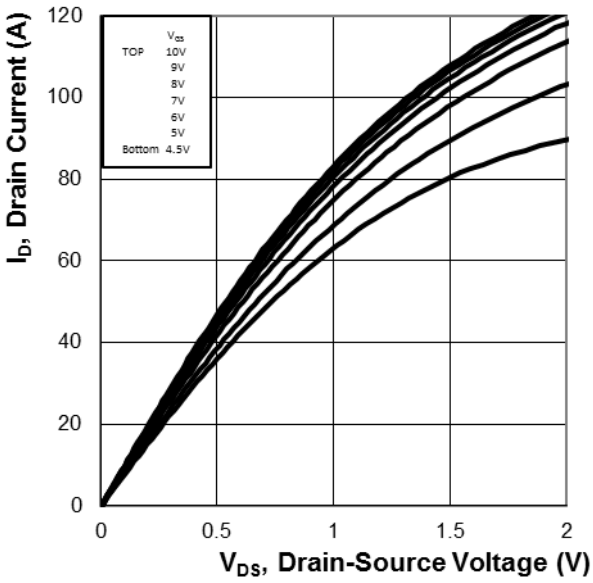


Figure 5: On-Region Characteristics

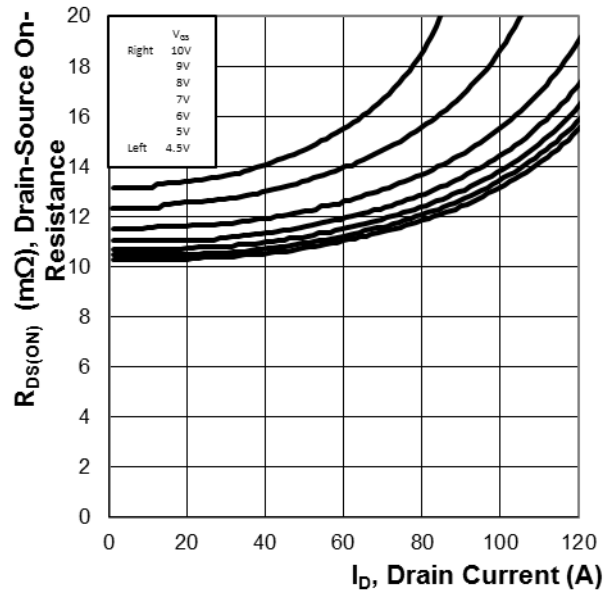


Figure 6: Typ. R_{DS} Variation vs. I_D and V_{GS}

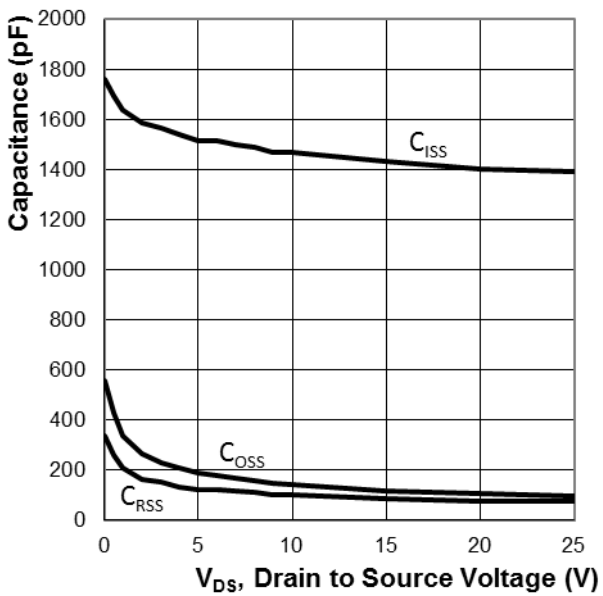


Figure 7: Typ. Capacitance Characteristics

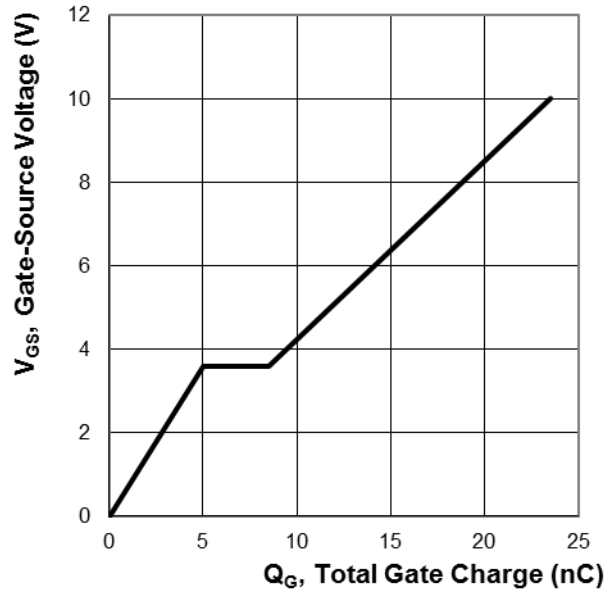


Figure 8: Typ. Gate Charge Characteristics



Ratings and Characteristics Curves ($T_A = 25^\circ\text{C}$ unless otherwise specified)

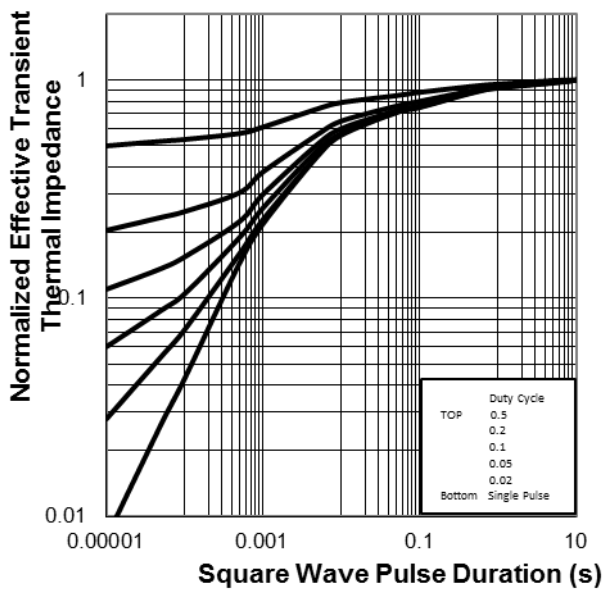


Figure 9: Normalized Thermal Transient Impedance, Junction-to-Case

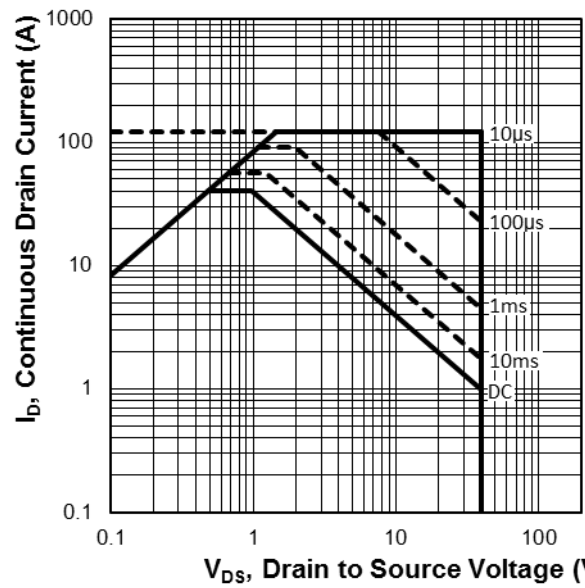
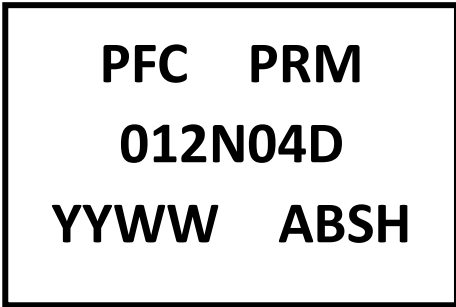


Figure 10: Maximum Safe Operation Area



3. Marking information

Top Marking Rule



PRM012N04D = Product Type Marking Code

YYWW = Date Code

YY = Last two digits of year

WW = Week code

ABS = Assembly code

H = Halogen Free (N/A = common molding compound)

4. Package information

Package Outline Dimensions millimeters

TO-252 (DPAK)

Dim.	Min.	Max.
A	6.30	6.90
B	5.10	5.60
C	3.50	-----
D	4.60	-----
E	9.40	10.60
F	0.50	1.20
G	0.70	0.90
H	0.50	0.90
I	0.50	0.90
J	2.30 Ref.	
K	5.40	6.30
L	2.40	3.40
M	2.10	2.50
N	0.35	0.65
O	-----	0.20
P	1.40	1.90

All Dimensions in millimeter



5. Ordering information

Part Number	Package	Delivery mode
PRM012N04D	TO-252 (D-PAK)	2500 pcs / 13" diameter reel

Mechanical

- Molder Plastic: UL Flammability Classification Rating 94V-0
- Device Weight : 0.01 ounces (0.3grams) - TO-252 (D-PAK)

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