

# **PRM020N10D**

# PFC Device Corporation

# 100V Single N-Channel MOSFET

## Major ratings and characteristics

Characteristics	Values	Units
$V_{DS}$	100	٧
I <sub>D</sub> (T <sub>C</sub> =25°C)	40	Α
Max. R <sub>DS(ON)</sub> @V <sub>GS</sub> =10V	20	mΩ
Max. R <sub>DS(ON)</sub> @V <sub>GS</sub> =4.5V	25	mΩ
T <sub>J</sub> Operating Junction Temperature	-55 to +150	°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.

# PRM020N10D TO-252 (D-PAK)

# **Typical Applications**

- Charger Adapter
- Power Tools
- LED Lighting

#### **Features**

- Max.  $R_{DS(ON)}=20m\Omega@V_{GS}=10V$
- Improved dv/dt capability
- Fast switching
- 100% E<sub>AS</sub> Guaranteed
- Green Device Available

# 1. Characteristics

# **Maximum Ratings Characteristics** ( $T_A = 25$ °C unless otherwise specified)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	100	V
$V_{GS}$	Gate-Source Voltage	±20	V
	Drain Current – Continuous (T <sub>C</sub> =25°C)	40	А
I <sub>D</sub>	Drain Current – Continuous (T <sub>C</sub> =100°C)	25.3	А
I <sub>DM</sub>	Drain Current – Pulsed <sup>1</sup>	160	А
E <sub>AS</sub>	Single Pulse Avalanche Energy <sup>2</sup>	45	mJ
I <sub>AS</sub>	Single Pulse Avalanche Current <sup>2</sup>	30	А
D	Power Dissipation (T <sub>C</sub> =25°C)	69.4	W
P <sub>D</sub>	Power Dissipation – Derate above 25°C	0.55	W/°C
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
TJ	Operating Junction Temperature Range	-55 to 150	°C

#### **Thermal Characteristics**

Symbol	Parameter		Max.	Unit	
$R_{\theta JA}$	Thermal Resistance Junction to ambient		62	°C/W	
Raic	Thermal Resistance Junction to Case		1.8	°C/W	



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#### **Electrical Characteristics**

( $T_J = 25$  °C unless otherwise specified)

#### **Off Characteristics**

Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250uA	100			V
	Drain Source Leekage Current	V <sub>DS</sub> =100V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C			1	uA
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =100V, V <sub>GS</sub> =0V, T <sub>J</sub> =125°C			250	uA
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V			±100	nA

#### **On Characteristics**

R <sub>DS(ON)</sub> Static Drain-Source On-Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =20A			20	mΩ	
$R_{DS(ON)}$	Static Dialif-Source Off-Resistance	V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A			25	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.0		3.0	V
<b>g</b> fs	Forward Transconductance	$V_{DS}$ =5V, $I_D$ =20A		40		S

#### **Dynamic and switching Characteristics**

$Q_{g}$	Total Gate Charge <sup>3,4</sup>		 37.5	
$Q_{qs}$	Gate-Source Charge <sup>3, 4</sup>	V <sub>DS</sub> =50V, V <sub>GS</sub> =10V, I <sub>D</sub> =20A	 7.5	 nC
$Q_{gd}$	Gate-Drain Charge <sup>3, 4</sup>		 10	
$T_{d(on)}$	Turn-On Delay Time <sup>3, 4</sup>		 17	
T <sub>r</sub>	Turn-On Rise Time <sup>3, 4</sup>	$V_{DD}$ =50V, $V_{GS}$ =10V, $R_{G}$ =6 $\Omega$	 92	 ns
$T_{d(off)}$	Turn-Off Delay Time <sup>3, 4</sup>		 34	 115
$T_f$	Turn-Off Fall Time <sup>3, 4</sup>		 110	
$C_{iss}$	Input Capacitance		 2100	
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	 230	 pF
$C_{rss}$	Reverse Transfer Capacitance		 100	
$R_{g}$	Gate resistance	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, f=1MHz	 1	 Ω

#### **Drain-Source Diode Characteristics**

$V_{SD}$	Source to Drain Diode Voltage	$V_{GS}$ =0V, $I_{S}$ =20A	 	1.5	V
t <sub>rr</sub>	Reverse Recovery Time	1 20 4 4:/4+ 400 4/	 28		ns
$Q_{rr}$	Reverse Recovery Charge	I <sub>S</sub> =20A, di/dt=100A/us	 23		nC

#### Note:

- Repetitive Rating: Pulsed width limited by maximum junction temperature.
   V<sub>DD</sub>=50V, V<sub>GS</sub>=10V, L=0.1mH, I<sub>AS</sub>=30A, R<sub>G</sub>=25Ω, Starting T<sub>J</sub>=25°C
   The data tested by pulsed, pulse width ≤300us, duty cycle ≤2%.
   Essentially independent of operating temperature.

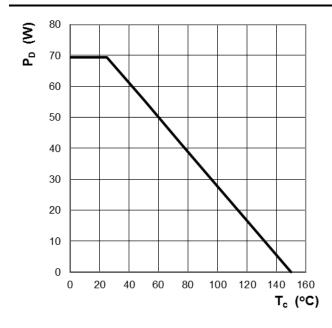


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# 2. Characteristics Curves

### **Ratings and Characteristics Curves**

## (T<sub>A</sub> = 25°C unless otherwise specified)



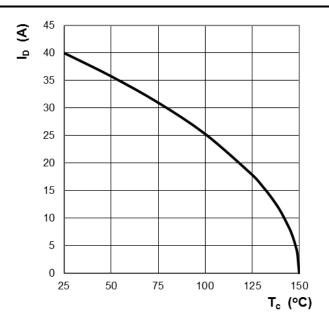


Figure 1: Power Dissipation

Figure 2: Continuous Drain Current vs. T<sub>C</sub>

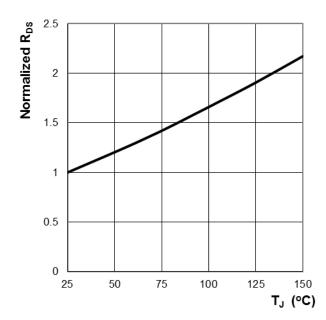


Figure 3: Normalized R<sub>DS(ON)</sub> vs. T<sub>J</sub>

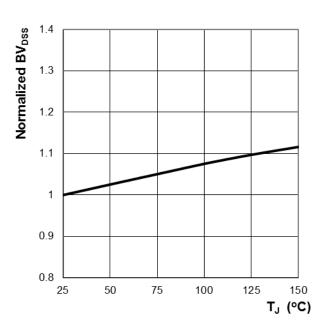


Figure 4: Normalized BV<sub>DSS</sub> vs. T<sub>J</sub>



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#### **Ratings and Characteristics Curves**

# ( T<sub>A</sub> = 25° unless otherwise specified )

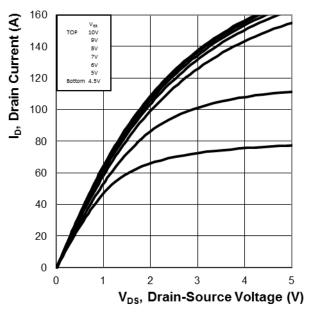


Figure 5: On-Region Characteristics

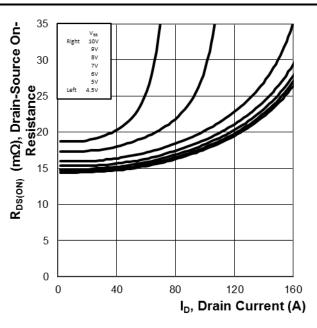


Figure 6: Typ.  $R_{DS}$  Variation vs.  $I_D$  and  $V_{GS}$ 

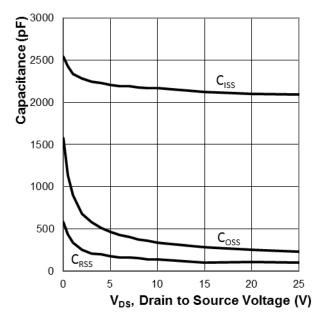


Figure 7: Typ. Capacitance Characteristics

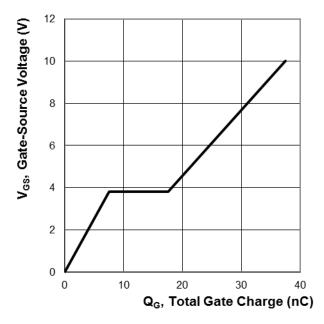


Figure 8: Typ. Gate Charge Characteristics



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#### **Ratings and Characteristics Curves**

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

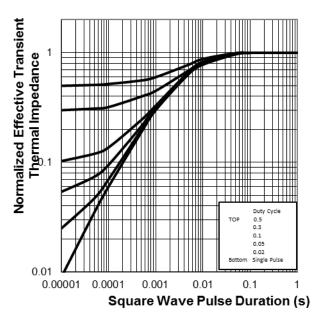


Figure 9: Normalized Thermal Transient Impedance, Junction-to-Case

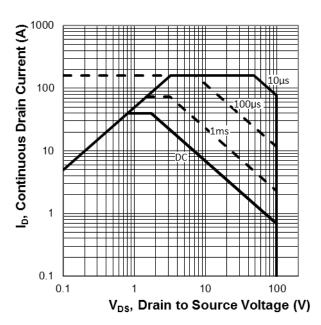


Figure 10: Maximum Safe Operation Area



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# 3. Marking information

**Top Marking Rule** 

PFC PRM
020N10D
YYWW ABSH

PRM020N10D = Product Type Marking Code

YYWW = Date Code

YY = Last two digits of year

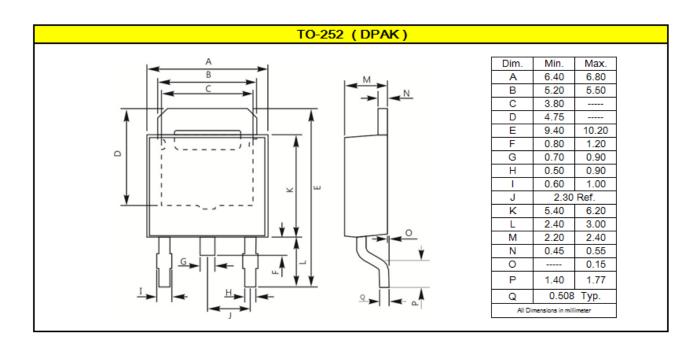
WW = Week code

ABS = Assembly code

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

# 4. Package information

Package Outline Dimensions millimeters





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# 5. Ordering information

Part Number	Package	Delivery mode
PRM020N10D	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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