



PFC Device Corporation

## PRM020N06E

### 60V Single N-Channel MOSFET

#### Major ratings and characteristics

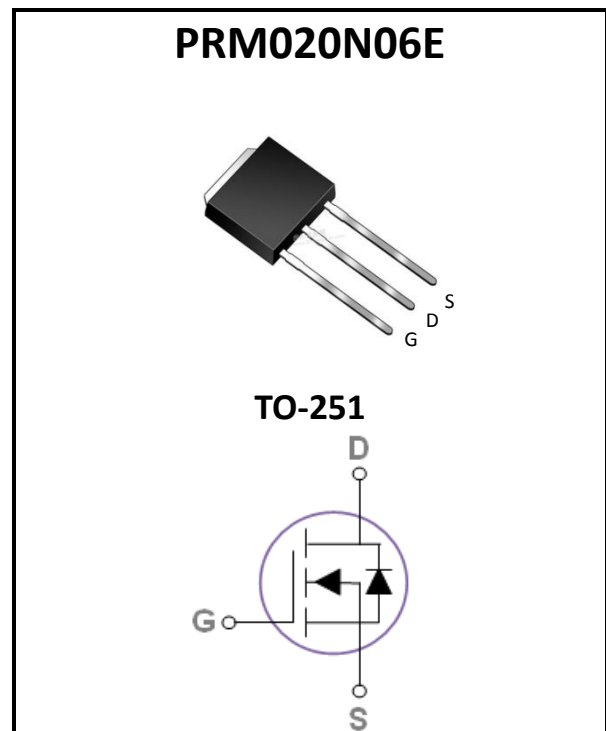
Characteristics	Values	Units
$V_{DS}$	60	V
$I_D$ ( $T_C=25^\circ\text{C}$ )	31.7	A
Max. $R_{DS(ON)}$ @ $V_{GS}=10\text{V}$	20	m $\Omega$
Max. $R_{DS(ON)}$ @ $V_{GS}=4.5\text{V}$	24	m $\Omega$
$T_J$ Operating Junction Temperature	-55 to +150	$^\circ\text{C}$

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

## 1. Characteristics

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

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	60	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current – Continuous ( $T_C=25\text{ }^\circ\text{C}$ )	31.7	A
	Drain Current – Continuous ( $T_C=100\text{ }^\circ\text{C}$ )	20	A
$I_{DM}$	Drain Current – Pulsed <sup>1</sup>	100	A
$E_{AS}$	Single Pulse Avalanche Energy <sup>2</sup>	20	mJ
$I_{AS}$	Single Pulse Avalanche Current <sup>2</sup>	20	A
$P_D$	Power Dissipation ( $T_C=25\text{ }^\circ\text{C}$ )	43.1	W
	Power Dissipation – Derate above $25\text{ }^\circ\text{C}$	0.34	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	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	2.9	$^\circ\text{C/W}$



## 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	$V_{GS}=0V, I_D=250\mu A$	60	---	---	V
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=60V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	1	$\mu A$
		$V_{DS}=60V, V_{GS}=0V, T_J=125^\circ\text{C}$	---	---	250	$\mu A$
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA

### On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	$V_{GS}=10V, I_D=20A$	---	---	20	m $\Omega$
		$V_{GS}=4.5V, I_D=10A$	---	---	24	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	$V_{DS}=5V, I_D=20A$	---	40	---	S

### Dynamic and switching Characteristics

$Q_g$	Total Gate Charge <sup>3,4</sup>	$V_{DS}=30V, V_{GS}=10V, I_D=20A$	---	28.5	---	nC
$Q_{GS}$	Gate-Source Charge <sup>3,4</sup>		---	6	---	
$Q_{GD}$	Gate-Drain Charge <sup>3,4</sup>		---	6.5	---	
$T_{d(on)}$	Turn-On Delay Time <sup>3,4</sup>	$V_{DD}=30V, V_{GS}=10V, R_G=6\Omega, I_D=20A$	---	14	---	ns
$T_r$	Turn-On Rise Time <sup>3,4</sup>		---	95	---	
$T_{d(off)}$	Turn-Off Delay Time <sup>3,4</sup>		---	34	---	
$T_f$	Turn-Off Fall Time <sup>3,4</sup>		---	116	---	
$C_{iss}$	Input Capacitance	$V_{DS}=25V, V_{GS}=0V, f=1\text{MHz}$	---	1600	---	pF
$C_{oss}$	Output Capacitance		---	110	---	
$C_{rss}$	Reverse Transfer Capacitance		---	80	---	
$R_g$	Gate resistance	$V_{GS}=0V, V_{DS}=0V, f=1\text{MHz}$	---	1.1	---	$\Omega$

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Voltage	$V_{GS}=0V, I_S=20A$	---	---	1.5	V
$t_{rr}$	Reverse Recovery Time	$I_S=10A, di/dt=100A/\mu s$	---	15	---	ns
$Q_{rr}$	Reverse Recovery Charge		---	4	---	nC

Note :

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2.  $V_{DD}=50V, V_{GS}=10V, L=0.1\text{mH}, I_{AS}=20A, R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$
3. The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$ .
4. Essentially independent of operating temperature.



2. Characteristics Curves

Ratings and Characteristics Curves

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

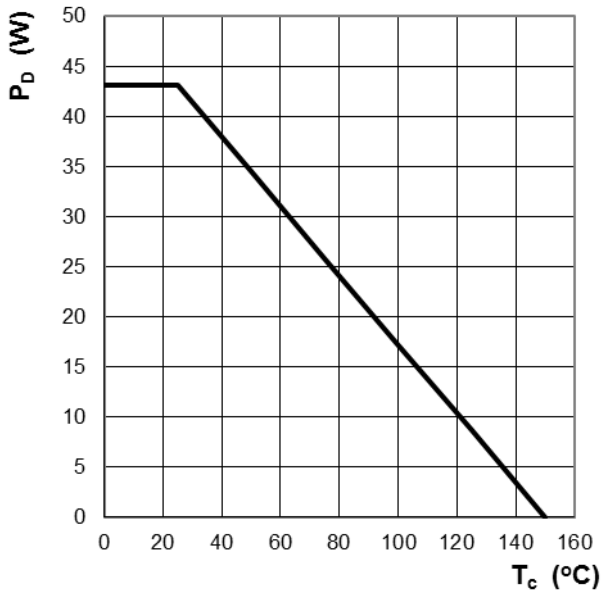


Figure 1: Power Dissipation

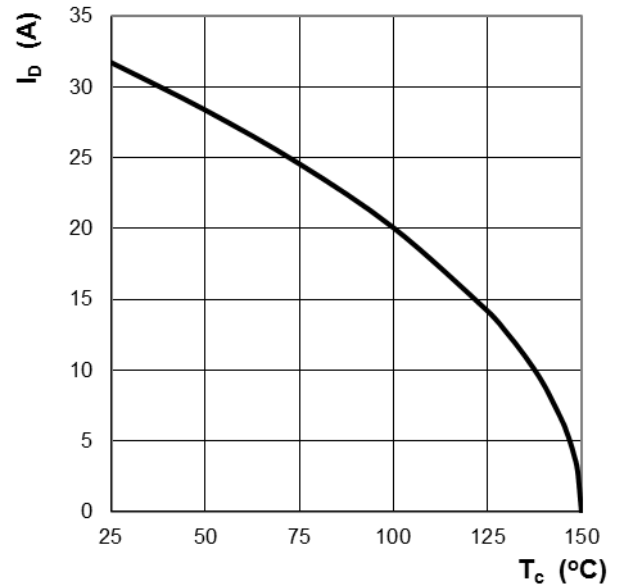


Figure 2: Continuous Drain Current vs.  $T_c$

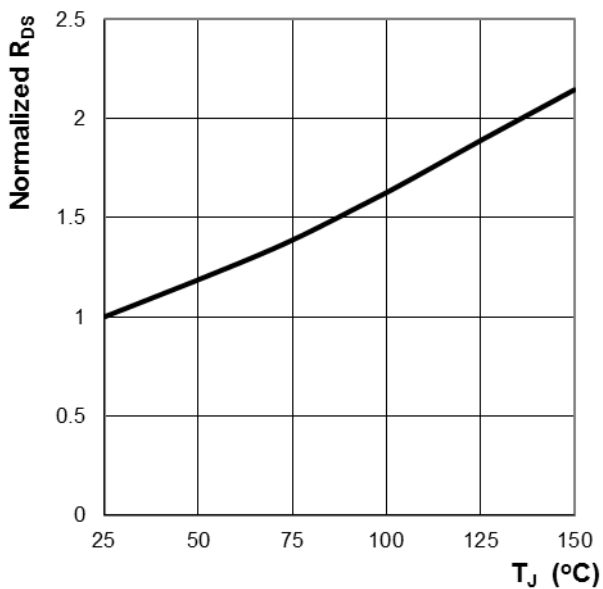


Figure 3: Normalized  $R_{DS(on)}$  vs.  $T_j$

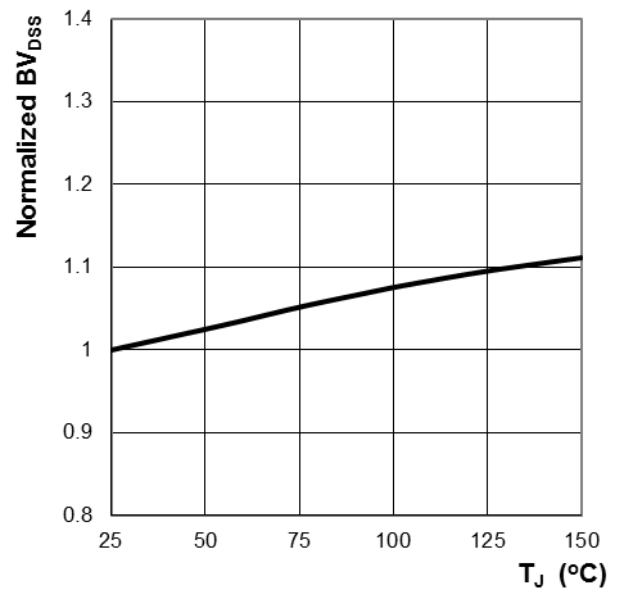


Figure 4: Normalized  $BV_{DSS}$  vs.  $T_j$



Ratings and Characteristics Curves

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

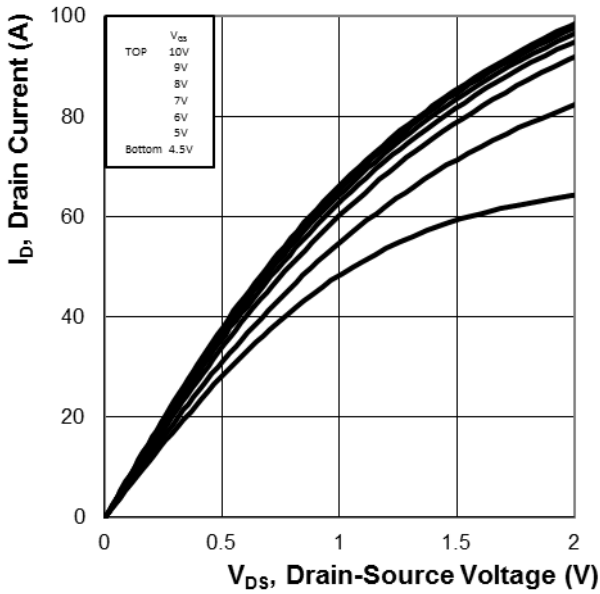


Figure 5: On-Region Characteristics

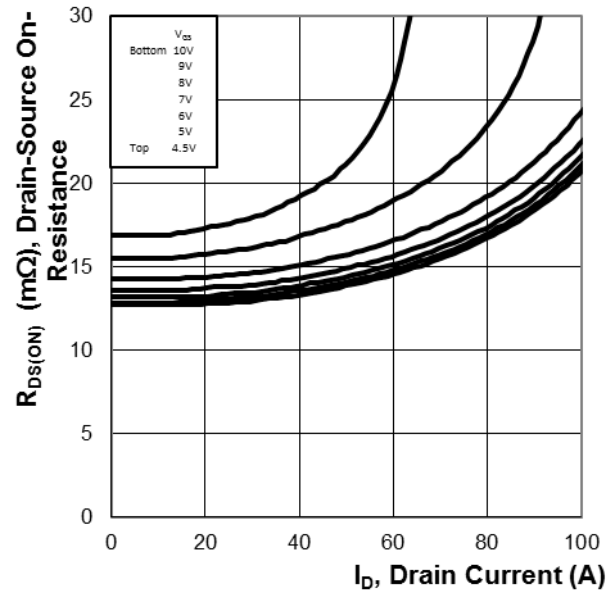


Figure 6: Typ.  $R_{DS}$  Variation vs.  $I_D$  and  $V_{GS}$

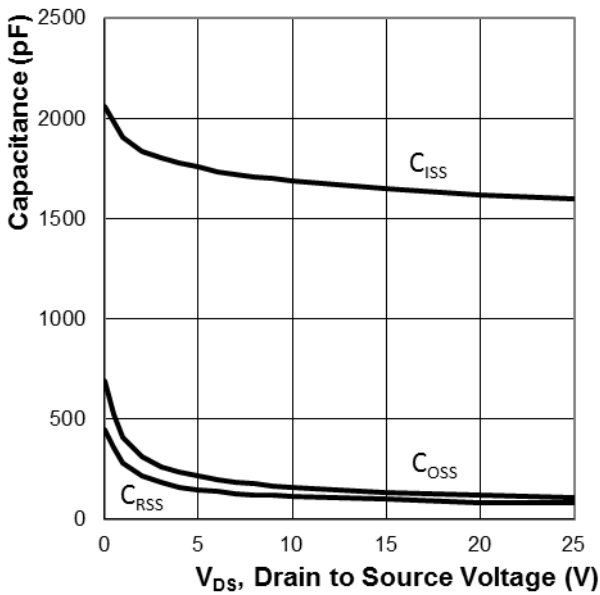


Figure 7: Typ. Capacitance Characteristics

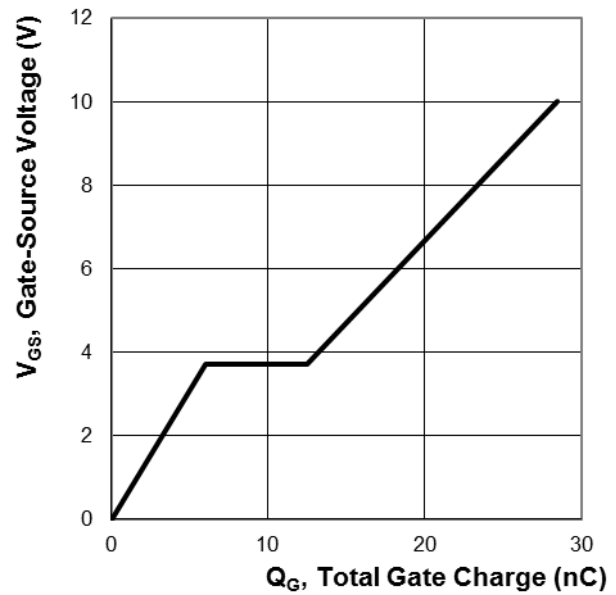


Figure 8: Typ. Gate Charge Characteristics



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

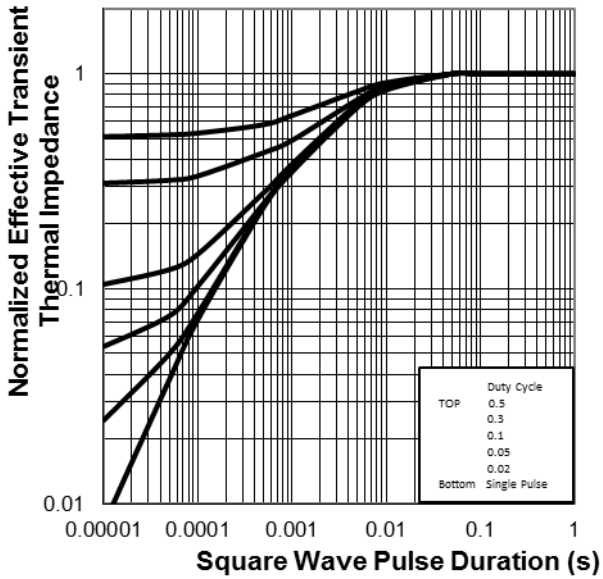


Figure 9: Normalized Thermal Transient Impedance, Junction-to-Case

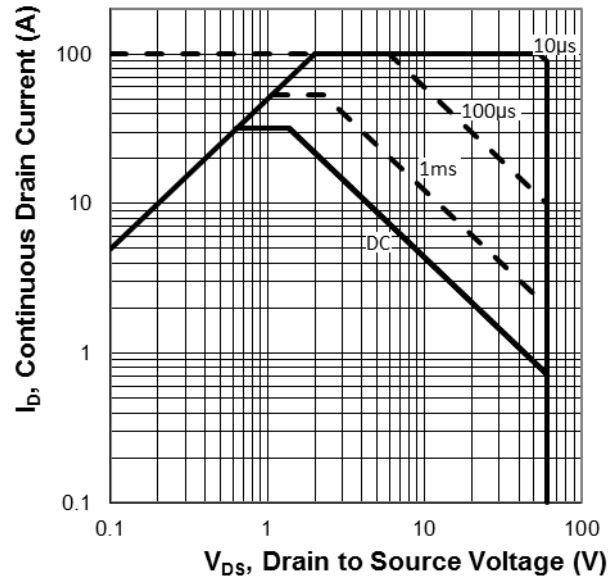
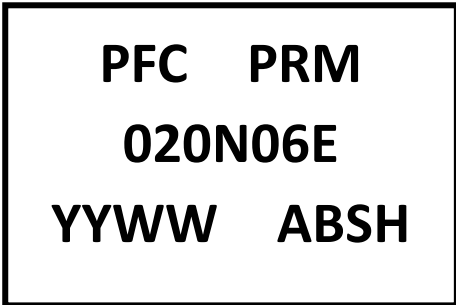


Figure 10: Maximum Safe Operation Area



**3. Marking information**

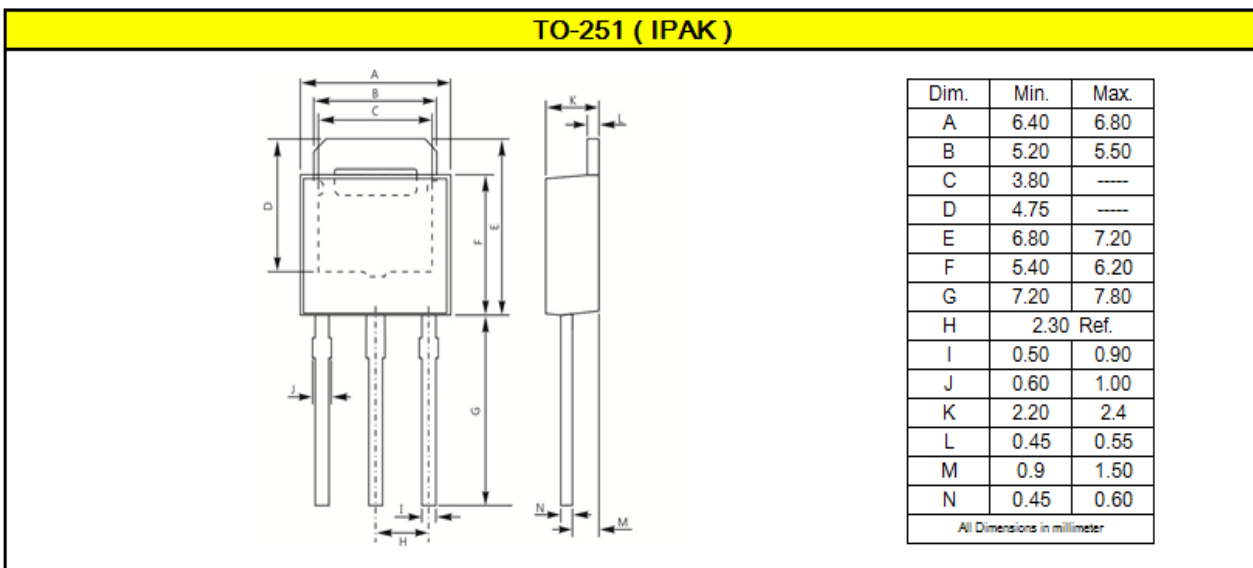
Top Marking Rule



PRM020N06E = 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



**5. Ordering information**

Part Number	Package	Delivery mode
PRM020N06E	TO-251 (I-PAK)	75 pcs / Tube

Mechanical

- Molder Plastic: UL Flammability Classification Rating 94V-0
- Device Weight : 0.01 ounces (0.3grams) - TO-251 (I-PAK)

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