60V N-Channel Enhancement Mode Power MOSFET

General Description

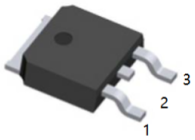
The 20N06 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

Features

- V_{DS} = 60V,ID =20A
  $R_{DS(ON)}$,23m Ω (Typ) @ VGS =10V
  $R_{DS(ON)}$,29m Ω (Typ) @ VGS =4.5V
- Advanced Trench Technology
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Lead free product is acquired

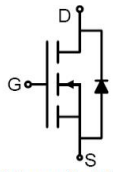
Application

- Load Switch
- PWM Application
- Power management



1.Date 2.Drain 3.Sourse

TO-252(DPAK) top view



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
20N06	20N06	TO-252	330mm	12mm	2500

Absolute Maximum Ratings(TA=25℃ unless otherwise noted)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	±20	V
Drain Current-Continuous[Note3]	TC=25℃	I_D	20	A
	TC=100℃		14	A
Drain Current-Pulsed[Note1]		I_{DM}	120	A
Avalanche Energy[Note4]		E_{AS}	72	mJ
Maximum Power Dissipation	TC=25℃	P_D	55	W
Storage Temperature Range		T_{STG}	-55 to +150	℃
Operating Junction Temperature Range		T_J	-55 to +150	℃

Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max	Unit
Thermal Resistance,Junction-to-Case	$R_{\theta JC}$	-	-	2.7	℃/W

Electrical Characteristics(TJ=25℃ unless otherwise noted)

OFF CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V,I_{DS}=250uA	60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=60V,V_{GS}=0V	-	-	1	uA
Gate-Body Leakage	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA

ON CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	VGS(TH)	V_{DS}=V_{GS},I_{DS}=250uA	1.0	1.6	2.5	V
Drain-Source On-State Resistance	RDS(ON)	V_{GS}=10V,I_{DS}=15A	-	23	29	mΩ
		V_{GS}=4.5V,I_{DS}=10A	-	29	40	mΩ

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C_{iss}	VDS =25V, VGS = 0V, f=1MHz	-	1562	-	pF
Output Capacitance	C_{oss}		-	75.4	-	
Reverse Transfer Capacitance	C_{rss}		-	66.8	-	

SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	$T_{d(on)}$	V_{GS}=10V,V_{Ds}=30V, R_{GEN}=1.8Ω I_D=15A	-	7.5	-	ns
Rise Time	t_r		-	21	-	
Turn-Off Delay Time	$T_{d(off)}$		-	16	-	
Fall Time	t_f		-	23.5	-	
Total Gate Charge at 10V	Q_g	V_{DS}=30V,I_{DS}=15A, V_{GS}=10V	-	25	-	nC
Gate to Source Gate Charge	Q_{gs}		-	4.5	-	
Gate to Drain“Miller”Charge	Q_{gd}		-	6.5	-	

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_{DS}=15A	-	-	1.2	V
Reverse Recovery Time	t_{rr}	TJ=25℃,IF=15A di/dt=100A/us	-	29	-	nS
Reverse Recovery Charge	Q_{rr}		-	45	-	nC

Notes:

1: Repetitive rating, pulse width limited by maximum junction temperature.

2: Surface mounted on FR4 Board, t≤10sec.

3: Pulse width ≤ 300μs, duty cycle ≤ 2%.

4: EAS condition: L=0.5mH,VDD=30V,VG=10V,V_{GATE}=60V,Start T_J=25℃.

Typical Performance Characteristics

Figure1: Output Characteristics

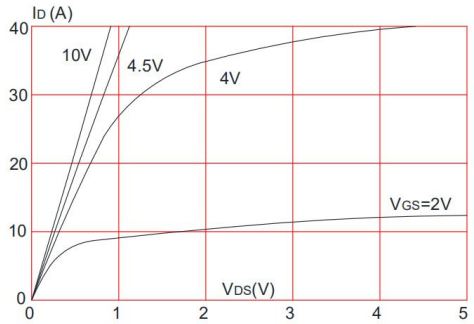


Figure 2: Typical Transfer Characteristics

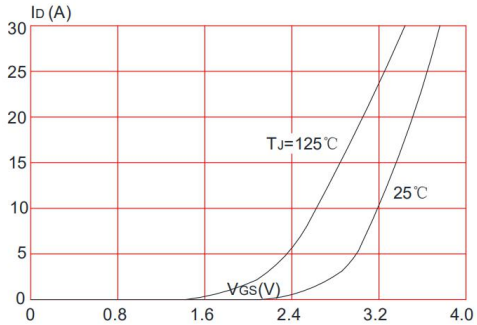


Figure 3: On-resistance vs. Drain Current

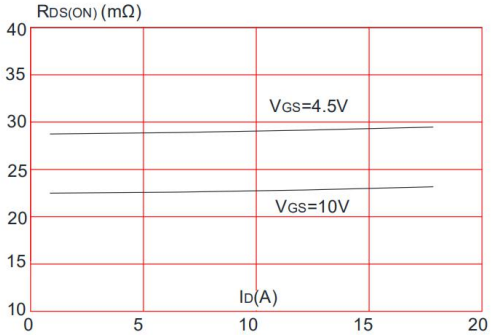


Figure 4: Body Diode Characteristics

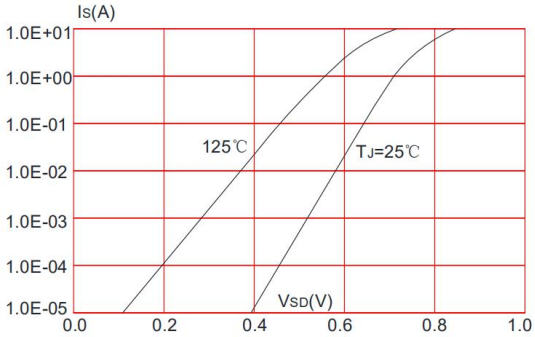


Figure 5: Gate Charge Characteristics

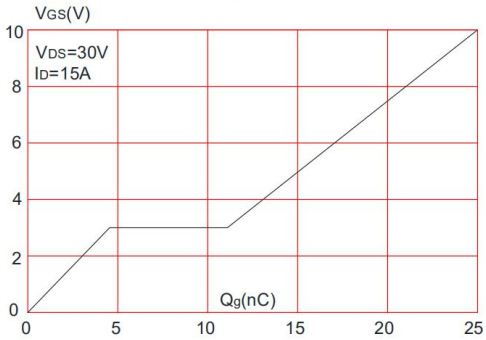


Figure 6: Capacitance Characteristics

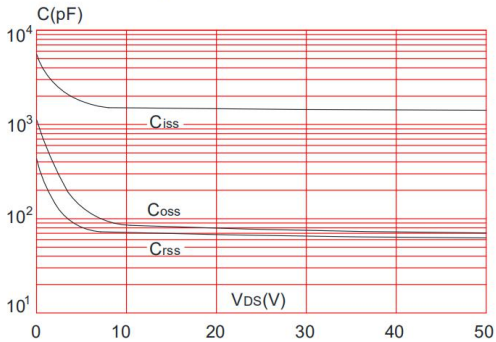


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

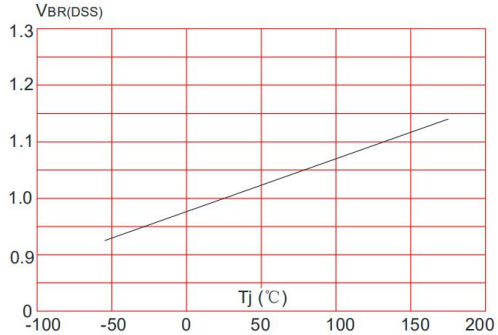


Figure 8: Normalized on Resistance vs. Junction Temperature

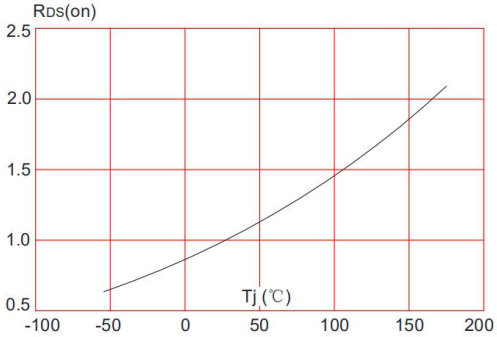


Figure 9: Maximum Safe Operating Area

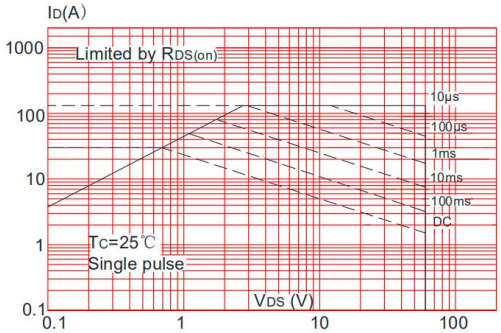


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

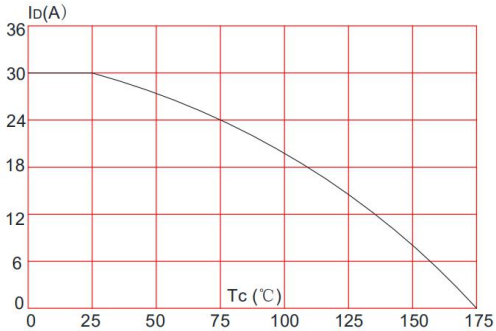
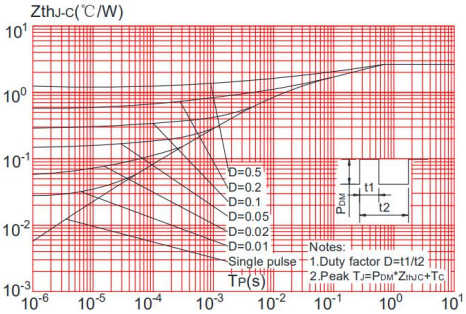


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



Test Circuit

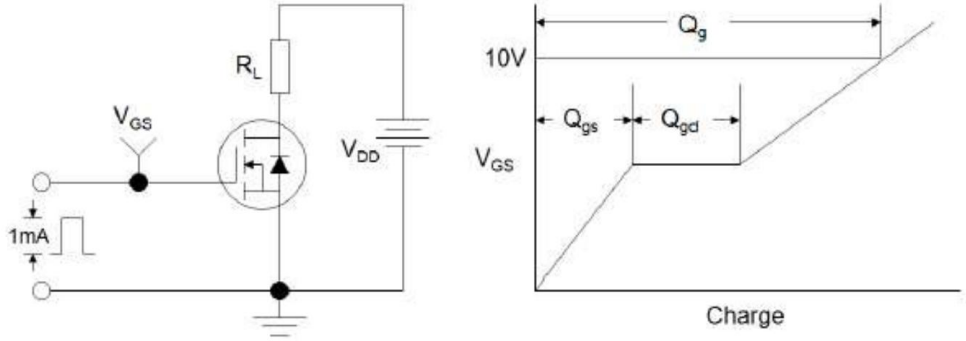


Figure1:Gate Charge Test Circuit & Waveform

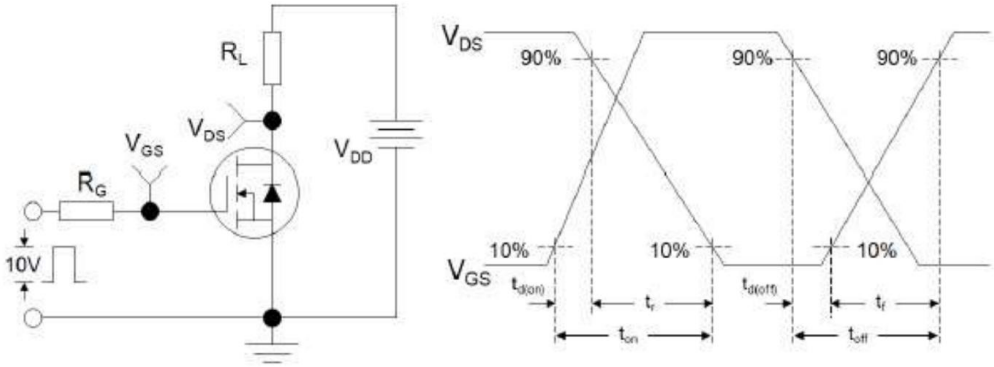


Figure 2: Resistive Switching Test Circuit & Waveforms

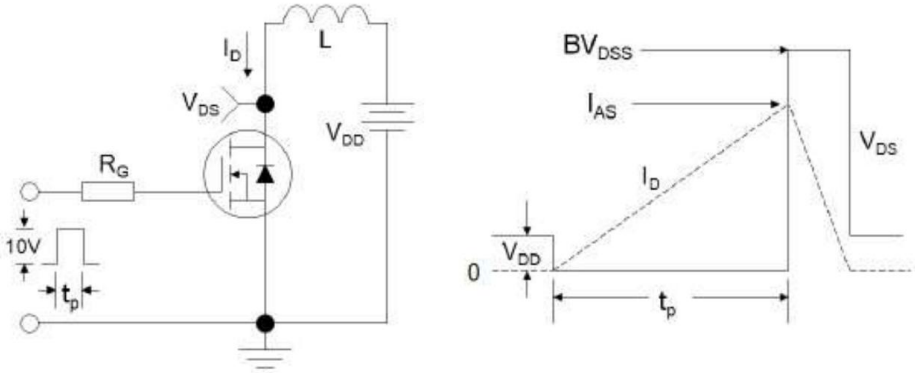
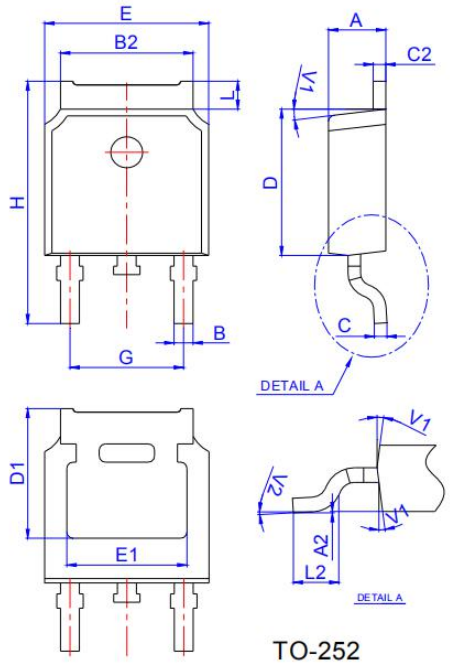


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

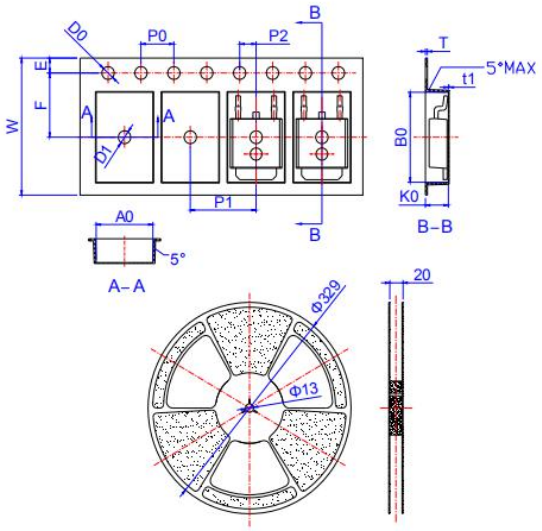
Package Mechanical Data



TO-252

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°

Reel Spectification-TO-252



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
W	15.90	16.00	16.10	0.626	0.630	0.634
E	1.65	1.75	1.85	0.065	0.069	0.073
F	7.40	7.50	7.60	0.291	0.295	0.299
D0	1.40	1.50	1.60	0.055	0.059	0.063
D1	1.40	1.50	1.60	0.055	0.059	0.063
P0	3.90	4.00	4.10	0.154	0.157	0.161
P1	7.90	8.00	8.10	0.311	0.315	0.319
P2	1.90	2.00	2.10	0.075	0.079	0.083
A0	6.85	6.90	7.00	0.270	0.271	0.276
B0	10.45	10.50	10.60	0.411	0.413	0.417
K0	2.68	2.78	2.88	0.105	0.109	0.113
T	0.24		0.27	0.009		0.011
t1	0.10			0.004		
10P0	39.80	40.00	40.20	1.567	1.575	1.583