



QNHCHIP

QN20ND06

# Product Specification

**QN20ND06**

---

60V Dual N-Channel MOSFET



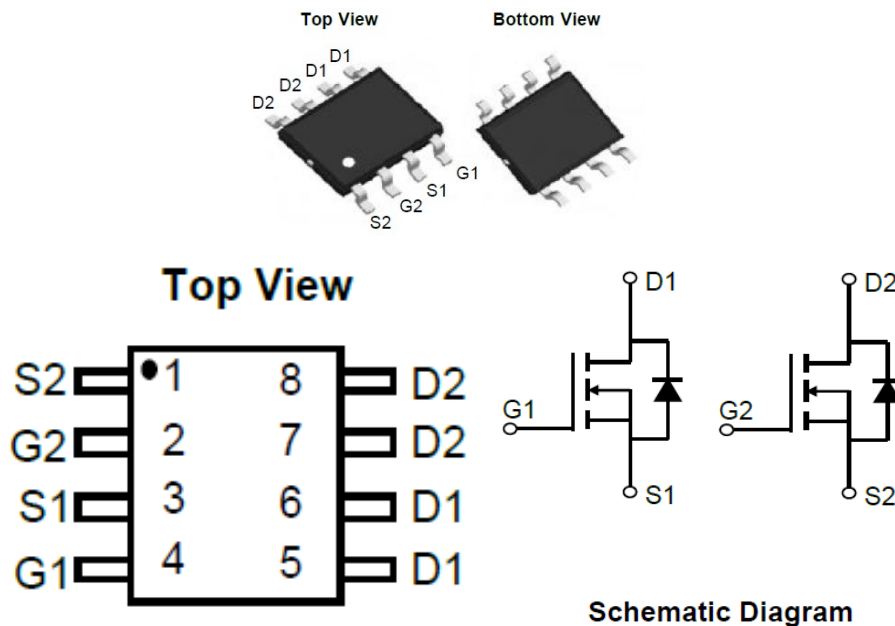
## FEATURES

- 60V, 12A
- $R_{DS(ON)}$  Typ= 9m $\Omega$  @  $V_{GS} = 10V$
- $R_{DS(ON)}$  Typ= 10m $\Omega$  @  $V_{GS} = 4.5V$
- Advanced Trench Technology
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- Lead Free

## Applications

- Load Switch
- PWM Application
- Power Management

## Pin Description



NO.	Symbol	Description
1	S2	SOURCE 2
2	G2	GATE 2
3	S1	SOURCE 1
4	G1	GATE 1
5	D1	DRAIN 1
6	D1	DRAIN 1
7	D2	DRAIN 2
8	D2	DRAIN 2



## Absolute Maximum Ratings

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

Symbol	Parameter	Value	Units	
$V_{DS}$	Drain-to-Source Voltage	60	V	
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V	
$I_D$	Continuous Drain Current	$T_A = 25^\circ\text{C}$	12	A
		$T_A = 100^\circ\text{C}$	8	
$I_{DM}$	Pulsed Drain Current <sup>(1)</sup>	48	A	
$E_{AS}$	Single Pulsed Avalanche Energy <sup>(2)</sup>	36	mJ	
$P_D$	Power Dissipation	$T_A = 25^\circ\text{C}$	1.9	W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient <sup>(3)</sup>	66	$^\circ\text{C}/\text{W}$	
$T_J, T_{STG}$	Junction & Storage Temperature Range	-55 to 150	$^\circ\text{C}$	



## Electrical Characteristics

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
<b>Off Characteristics</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	60	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain	$V_{DS} = 48\text{V}, V_{GS} = 0\text{V}$	-	-	1.0	$\mu\text{A}$
$I_{GSS}$	Gate-Body Leakage Current	$V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu\text{A}$	1.2	1.7	2.3	V
$R_{DS(ON)}$	Static Drain-Source ON-Resistance <sup>(4)</sup>	$V_{GS} = 10\text{V}, I_D = 12\text{A}$	-	9	10.0	m $\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 10\text{A}$	-	10	14.0	m $\Omega$
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=30\text{V},$ $f = 1\text{MHz}$	-	3226	-	pF
$C_{oss}$	Output Capacitance		-	187	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	158	-	pF
$Q_g$	Total Gate Charge	$V_{GS} = 0\sim 10\text{V}$ $V_{DD}=30\text{V}, I_D=12\text{A}$	-	77	-	nC
$Q_{gs}$	Gate Source Charge		-	14	-	nC
$Q_{gd}$	Gate Drain ("Miller") Charge		-	15	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On DelayTime	$V_{GS} = 10\text{V}, V_{DD} = 30\text{V}$ $I_D = 12\text{A}, R_{GEN} = 3\Omega$	-	13	-	ns
$t_r$	Turn-On Rise Time		-	77	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	50	-	ns
$t_f$	Turn-Off Fall Time		-	106	-	ns
<b>Drain-Source Diode Characteristics and Max Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward		-	-	12	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward		-	-	48	A
$V_{SD}$	Drain to Source Diode	$V_{GS} = 0\text{V}, I_S = 12\text{A}$	-	-	1.2	V
$t_{rr}$	Body Diode Reverse Recovery	$I_F=12\text{A}, di/dt=100\text{A}/\mu\text{s}$	-	25	-	ns
$Q_{rr}$	Body Diode Reverse Recovery		-	30	-	nC

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature.
2.  $E_{AS}$  condition: Starting  $T_J=25^\circ\text{C}$ ,  $V_{DD}=30\text{V}$ ,  $V_G=10\text{V}$ ,  $R_G=25\Omega$ ,  $L=0.5\text{mH}$ ,  $I_{AS}=12\text{A}$
3.  $R_{\theta JA}$  is measured with the device mounted on a 1 inch<sup>2</sup> pad of 2oz copper FR4 PCB
4. Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 0.5\%$ .



## Test Circuit

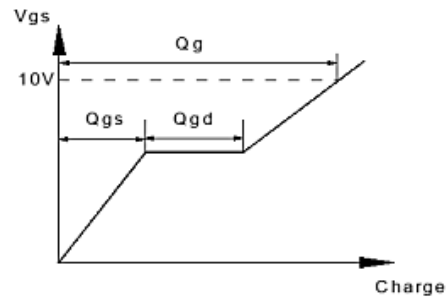
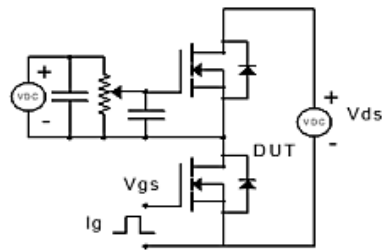


Figure 1: Gate Charge Test Circuit & Waveform

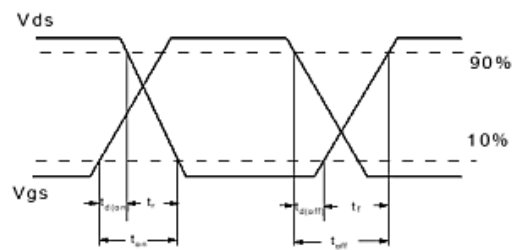
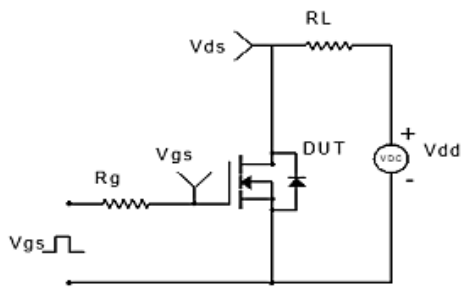


Figure 2: Resistive Switching Test Circuit & Waveform

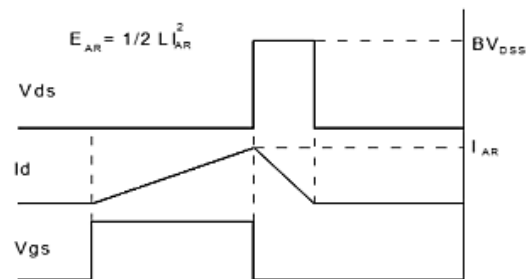
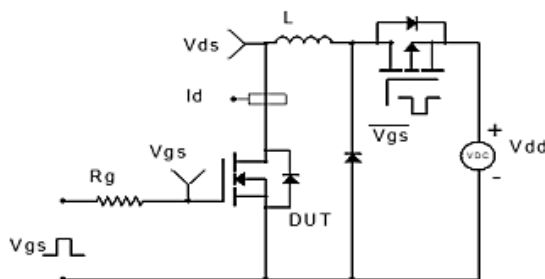


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

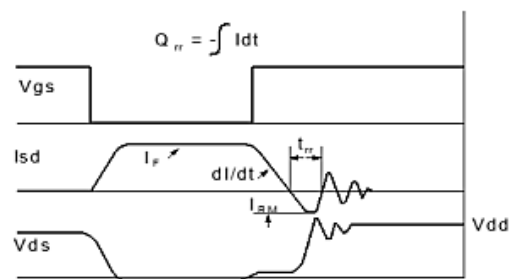
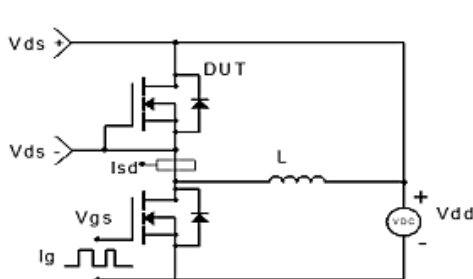
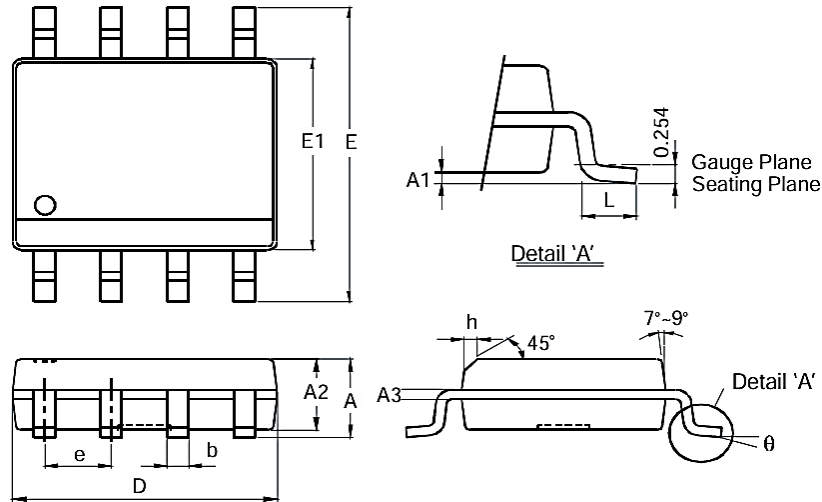


Figure 4: Diode Recovery Test Circuit & Waveform



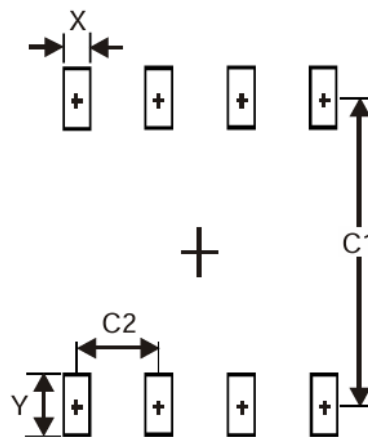
## Package Mechanical Data

### SOP-8



Dim	Min(mm)	Max(mm)
A	-	1.75
A1	0.10	0.20
A2	1.30	1.50
A3	0.15	0.25
b	0.3	0.5
D	4.85	4.95
E	5.90	6.10
E1	3.85	3.95
e	1.27 Typ	
h	-	0.35
L	0.62	0.82
θ	0°	8°

### suggested Pad Layout



Dimensions	Value(mm)
X	0.60
Y	1.55
C1	5.4
C2	1.27



## Ordering information

Order Code	Package	V <sub>DS</sub> (V)	I <sub>D</sub> (A)	R <sub>DS(ON)</sub> ( m Ω )	
QN20ND06	SOP-8	60	12	V <sub>GS</sub> =10V	9
				V <sub>GS</sub> =4.5V	10