

### General Description

These N-channel enhancement mode power mosfets used advanced trench technology design, provided excellent R<sub>ds(on)</sub> and low gate charge. Which accords with the RoHS standard.

Product Summary			
V <sub>DS</sub>	R <sub>DS(on)</sub> (mΩ) Typ	I <sub>D</sub> (A)	Q <sub>g</sub> (Typ)
20V	4.5@4.5V	60	65nc

### Features

- Fast switching
- Low on-resistance
- Low gate charge
- 100% Single Pulse Avalanche Energy Test

### Mechanical Data

- Case:TO-252 Package

**TO-252**  
**JHD60N02A**



### Ordering Information

Part No.	Package Type	Package	Quality(box)
JHD60N02A	TO-252	Tape & Reel	2500

### Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

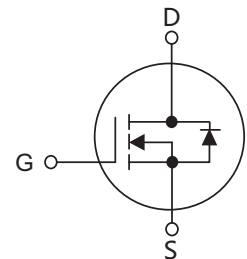


Table1 Absolute Maximum Ratings (T<sub>C</sub>=25°C, unless otherwise specified)

Parameter	Symbol	TO-252	Unit
Drain-Source Voltage	V <sub>DS</sub>	20	V
Gate-Source Voltage	V <sub>GS</sub>	±10	V
Continuous Drain Current	I <sub>D</sub>	T <sub>C</sub> =25°C	60
		T <sub>C</sub> =100°C	42
Pulsed Drain Current (Note 1)	I <sub>DM</sub>	210	A
Single Pulse Avalanche Energy(Note 2)	E <sub>AS</sub>	195	mJ
Power Dissipation T <sub>C</sub> =25°C	P <sub>D</sub>	35	W
Isolation Voltage	V <sub>ISO</sub>	/	V
Operating Junction and Storage Temperature	T <sub>J</sub> /T <sub>STG</sub>	-55 ~ +175	°C
Maximum Temperature for soldering	T <sub>L</sub>	300	°C

Table 2. Thermal Characteristics

Parameter	Symbol	TO-252	Unit
Thermal resistance Junction to Case	$R_{\theta JC}$	2.8	$^{\circ}\text{C}/\text{W}$

Table 3. Electrical Characteristics ( $T_J=25^{\circ}\text{C}$ , unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Off Characteristics							
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu\text{A}$	20	--	--	V	
Drain-Source Leakage Current	$I_{DSS}$	$V_{DS}=20V, V_{GS}=0V$	--	--	1	$\mu\text{A}$	
Gate- Source Leakage Current	Forward	$I_{GSS}$	$V_{GS}=10V, V_{DS}=0V$	--	--	100	nA
	Reverse		$V_{GS}=-10V, V_{DS}=0V$	--	--	-100	nA
On Characteristics(Note 4)							
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	0.4	0.62	1.0	V	
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=4.5V, I_D=20A$	--	4.5	6.0	m $\Omega$	
Dynamic Characteristics(Note 5)							
Input Capacitance	$C_{ISS}$	$V_{DS}=10V, V_{GS}=0V, f=1\text{MHz}$	--	2450	--	pF	
Output Capacitance	$C_{OSS}$		--	430	--	pF	
Reverse Transfer Capacitance	$C_{RSS}$		--	205	--	pF	
Switching Characteristics (Note 5)							
Turn-On Delay Time	$t_d(\text{on})$	$V_{DS}=10V, I_D=10A,$ $V_{GS}=4.5V, R_{GEN}=3\Omega$	--	12	--	ns	
Turn-On Rise Time	$t_r$		--	26	--	ns	
Turn-Off Delay Time	$t_d(\text{off})$		--	35	--	ns	
Turn-Off Fall Time	$t_f$		--	10	--	ns	
Total Gate Charge	$Q_G$	$V_{DS}=10V, I_D=15A,$ $V_{GS}=4.5V$	--	65	--	nC	
Gate-Source Charge	$Q_{GS}$		--	15	--	nC	
Gate-Drain Charge	$Q_{GD}$		--	13	--	nC	
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_S=20A$	--	--	1.2	V	
Maximum Continuous Drain-Source Diode Forward Current	$I_S$		--	--	60	A	
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_F=15A$ $di_F/dt=100A/\mu\text{s}$ (Note 1)	--	35	--	ns	
Reverse Recovery Charge	$Q_{RR}$		--	39	--	nC	

Notes: 1 Repetitive Rating:Pulse width limited by maximum junction temperature

2  $L=0.5\text{mH}$ ,  $R_g=25\Omega$ ,  $V_{DD}=15V$ ,  $V_{GATE}=10V$ , Starting  $T_J=25^{\circ}\text{C}$

4 Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty cycle  $\leq 2\%$

5 Guaranteed by design, not subject to production



Typical characteristics diagrams

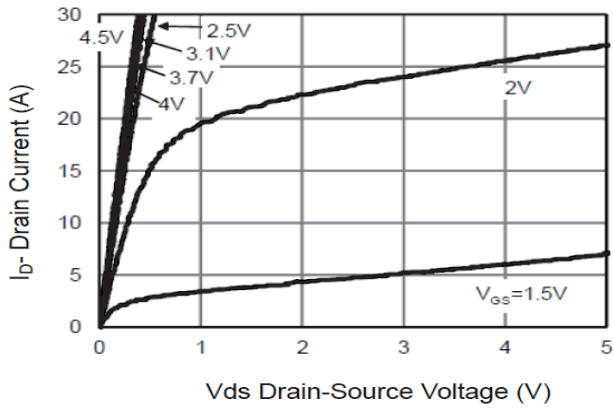


Figure1. Output Characteristics

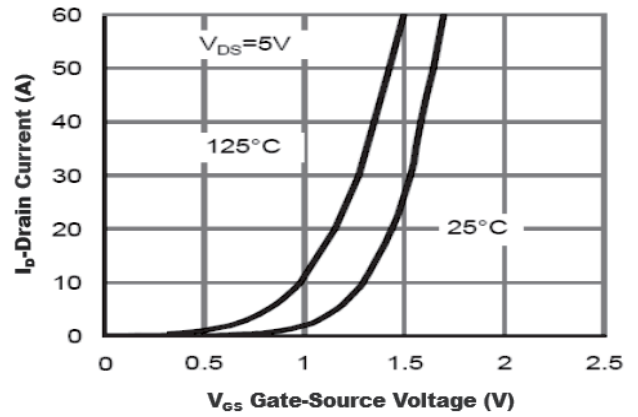


Figure2. Transfer Characteristics

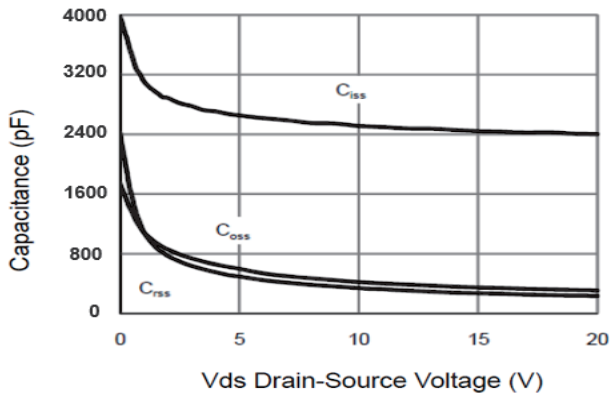


Figure3. Capacitance Characteristics

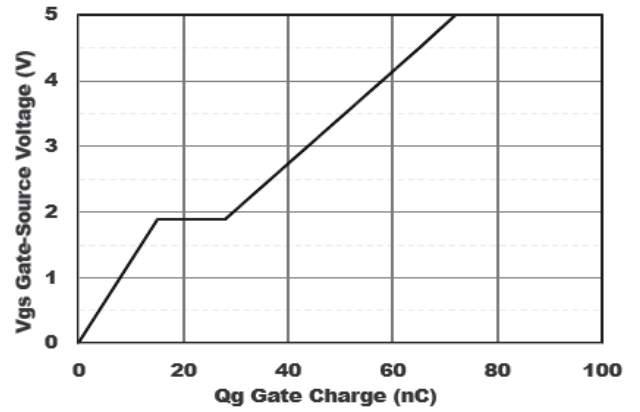


Figure4. Gate Charge

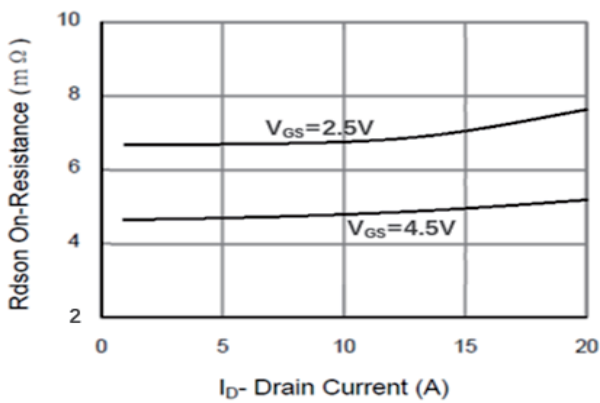


Figure5. Drain -Source on Resistance

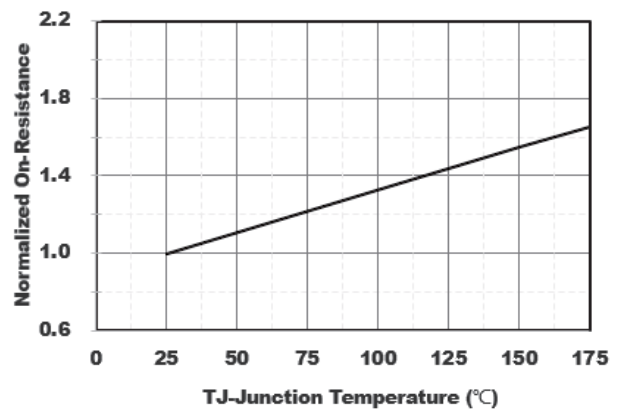


Figure6. Drain-Source on Resistance

Typical characteristics diagrams

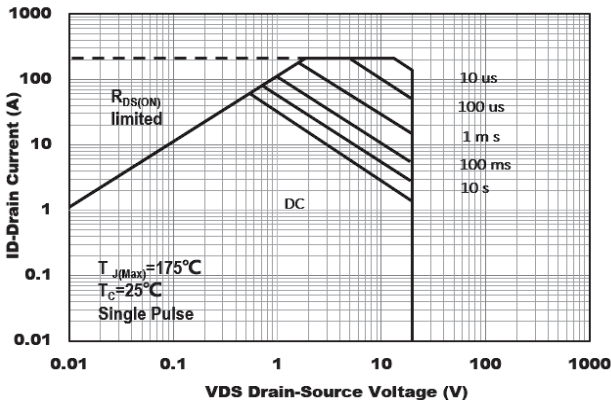


Figure7. Safe Operation Area

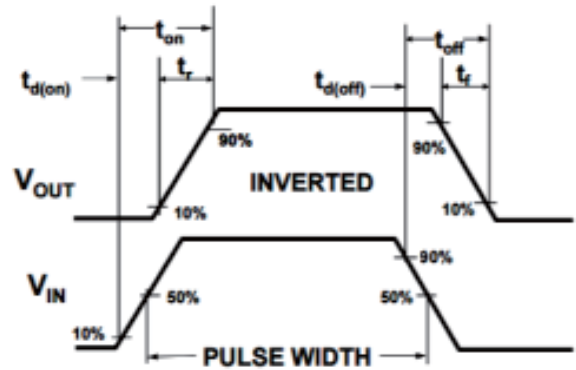
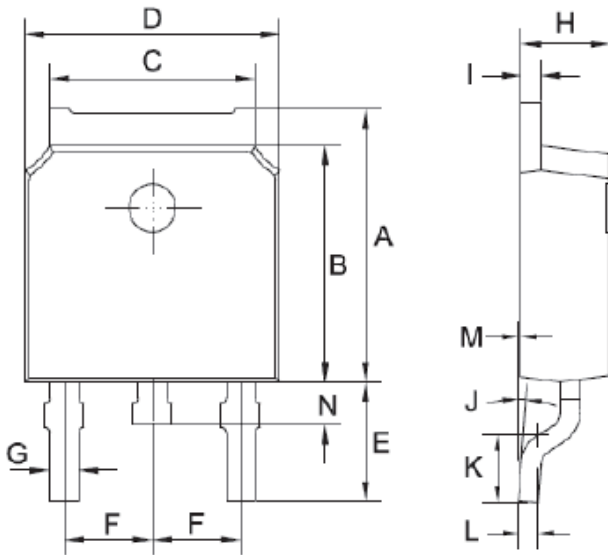


Figure8. Switching wave

Dimensions

TO-252 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	6.85	7.25	0.270	0.285
B	5.8	6.3	0.228	0.248
C	5	5.53	0.197	0.218
D	6.3	6.8	0.248	0.268
E	2.6	3.3	0.102	0.130
F	2.19	2.39	0.086	0.094
G	0.45	0.85	0.018	0.033
H	2.2	2.4	0.087	0.094
I	0.41	0.61	0.016	0.024
J	0°	8°	0°	8°
K	1.45	1.85	0.057	0.073
L	0.41	0.61	0.016	0.024
M	0	0.12	0.000	0.005
N	0.6	1	0.024	0.039

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