

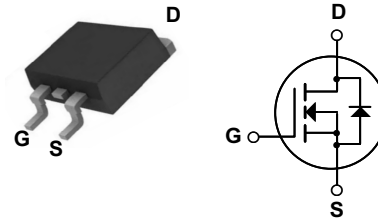
HD12N20L

200V Logic Level N-Channel MOSFET

Features

- 9.0A, 200V, $R_{DS(on)} = 0.28\Omega$ @ $V_{GS} = 10\text{ V}$
- Low gate charge (typical 16 nC)
- Low C_{rss} (typical 17 pF)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability
- Low level gate drive requirement allowing direct operation from logic drivers

DPAK/TO-252



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	HD12N20L	Units
V_{DSS}	Drain-Source Voltage	200	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	9.0	A
	- Continuous ($T_C = 100^\circ\text{C}$)	5.7	A
I_{DM}	Drain Current - Pulsed (Note 1)	36	A
V_{GSS}	Gate-Source Voltage	± 20	V
I_{AR}	Avalanche Current (Note 1)	9.0	A
dv/dt	Peak Diode Recovery dv/dt (Note 2)	5.5	V/ns
P_D	Power Dissipation ($T_A = 25^\circ\text{C}$) *	2.5	W
	Power Dissipation ($T_C = 25^\circ\text{C}$)	55	W
	- Derate above 25°C	0.44	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	--	2.27	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	50	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	--	110	$^\circ\text{C/W}$

Electrical Characteristics

$T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	200	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C	--	0.14	--	V/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	μA
		$V_{DS} = 160\text{ V}, T_C = 125^\circ\text{C}$	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -20\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.0	--	2.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 4.5\text{ A}$	--	0.22	0.28	Ω
		$V_{GS} = 5\text{ V}, I_D = 4.5\text{ A}$	--	0.25	0.32	Ω
g_{FS}	Forward Transconductance	$V_{DS} = 30\text{ V}, I_D = 4.5\text{ A}$ (Note 3)	--	11.6	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	830	1080	pF
C_{oss}	Output Capacitance		--	120	155	pF
C_{rss}	Reverse Transfer Capacitance		--	17	22	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 100\text{ V}, I_D = 11.6\text{ A},$ $R_G = 25\text{ }\Omega$ (Note 3, 4)	--	15	40	ns
t_r	Turn-On Rise Time		--	190	390	ns
$t_{d(off)}$	Turn-Off Delay Time		--	60	130	ns
t_f	Turn-Off Fall Time		--	120	250	ns
Q_g	Total Gate Charge	$V_{DS} = 160\text{ V}, I_D = 11.6\text{ A},$ $V_{GS} = 5\text{ V}$ (Note 3, 4)	--	16	21	nC
Q_{gs}	Gate-Source Charge		--	2.8	--	nC
Q_{gd}	Gate-Drain Charge		--	7.6	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	9.0	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	36	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 9.0 A	--	--	1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 11.6 A, dI _F / dt = 100 A/μs (Note 3)	--	128	--	ns
Q _{rr}	Reverse Recovery Charge		--	0.56	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $I_{SD} \leq 11.6\text{ A}$, $di/dt \leq 300\text{ A}/\mu\text{s}$, $V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
3. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
4. Essentially independent of operating temperature

Typical Characteristics

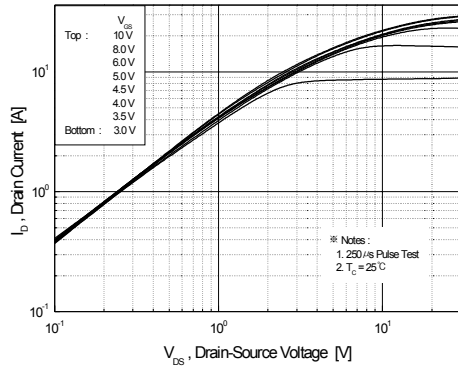


Figure 1. On-Region Characteristics

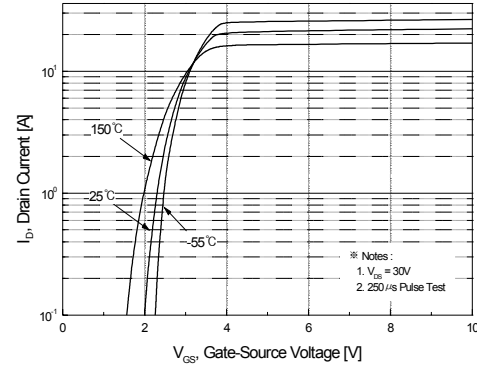


Figure 2. Transfer Characteristics

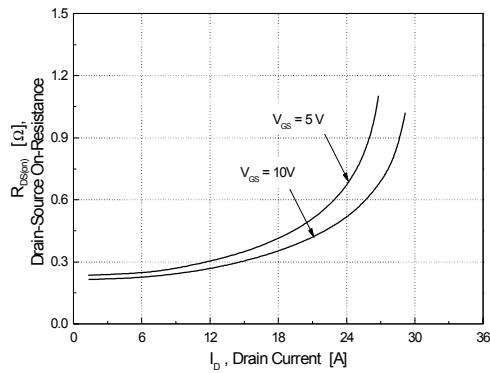


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

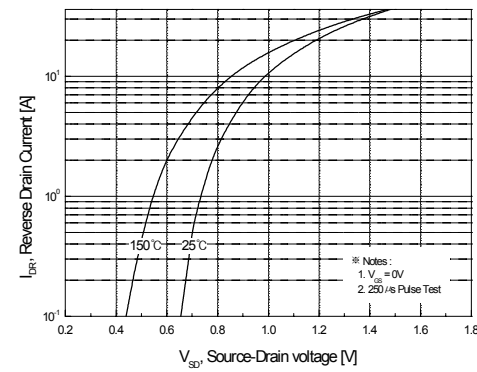


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

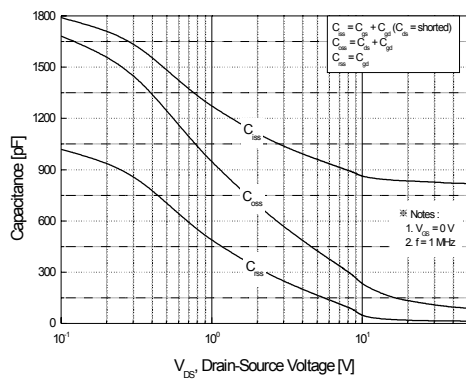


Figure 5. Capacitance Characteristics

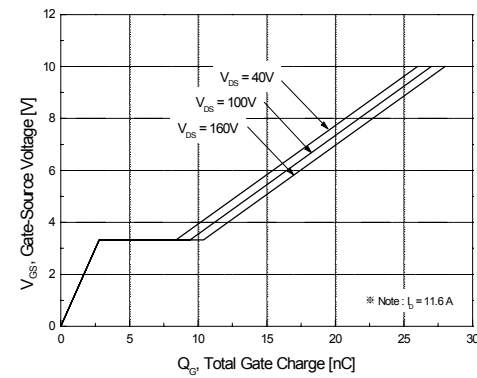


Figure 6. Gate Charge Characteristics

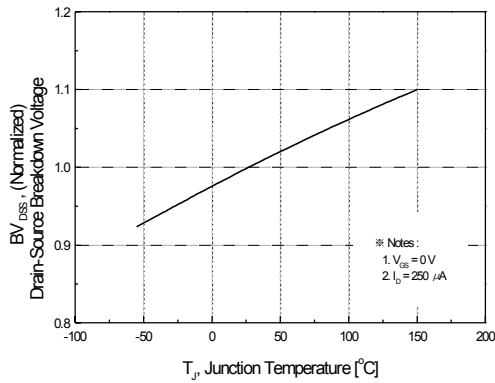


Figure 7. Breakdown Voltage Variation vs. Temperature

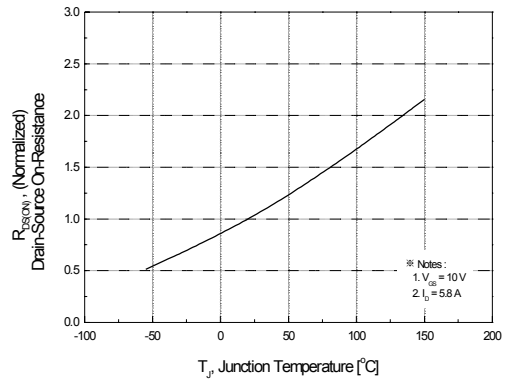


Figure 8. On-Resistance Variation vs. Temperature

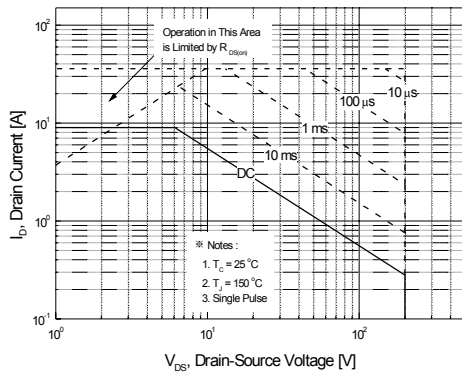


Figure 9. Maximum Safe Operating Area

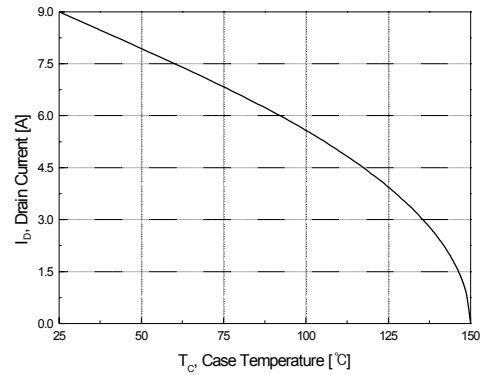


Figure 10. Maximum Drain Current vs. Case Temperature

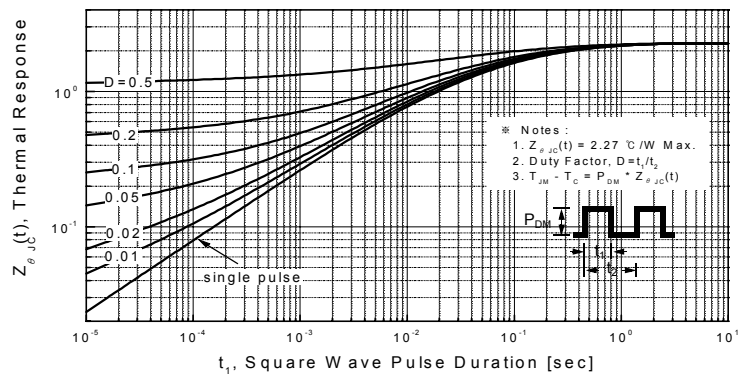


Figure 11. Transient Thermal Response Curve

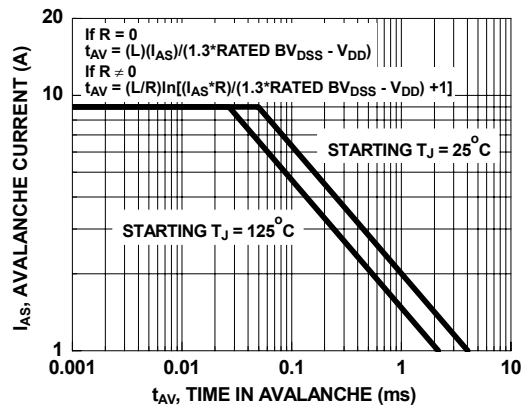


Figure 12. Unclamped Inductive Switching Capability

Test Circuits and Waveforms

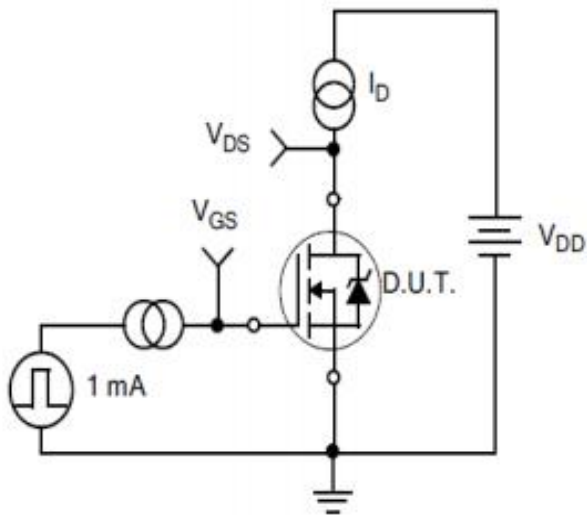


Figure A.
Gate Charge Test Circuit

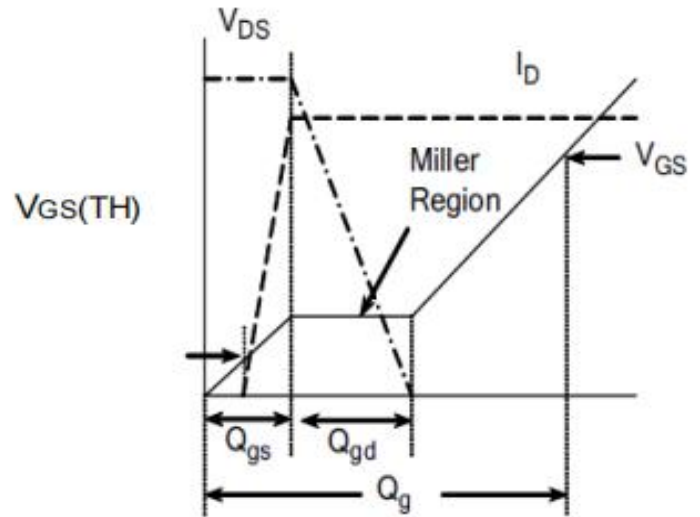


Figure B.
Gate Charge Waveform

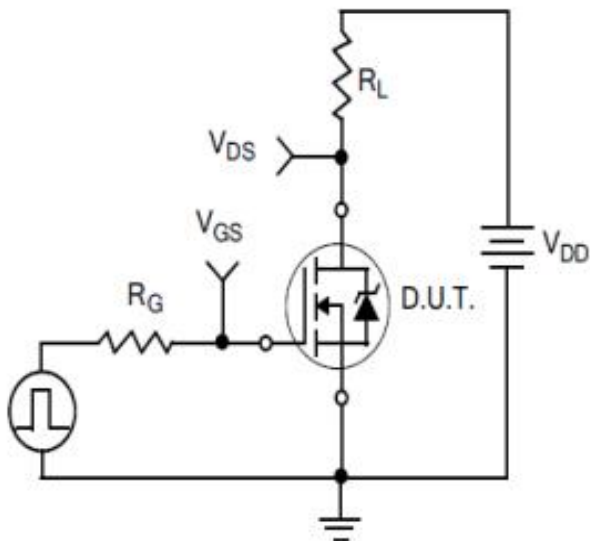


Figure C.
Resistive Switching Test Circuit

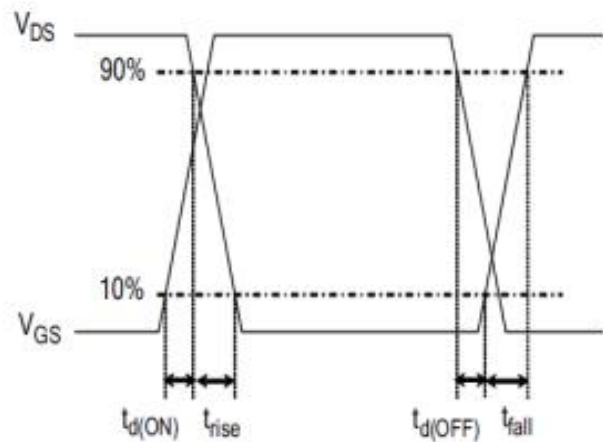
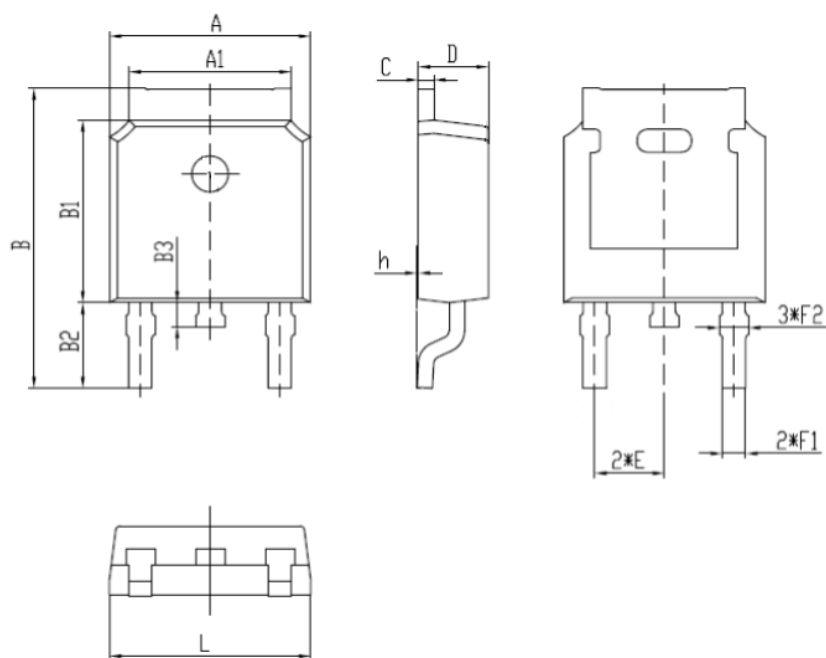


Figure D.
Resistive Switching Waveforms

Package Dimensions



TO-252

Symbol	Dimensions in Millimeters	
	MIN	MAX
A	6.35	6.80
A1	4.953	5.50
B	9.398	10.50
B1	5.969	6.223
B2	2.60	3.00
B3	0.60	1.016
C	0.45	0.63
D	2.184	2.40
E	2.186	2.386
F1	0.635	0.889
F2	0.68	1.143
h	0.00	0.200
L	6.35	6.80