

N-Ch 40V Fast Switching MOSFETs

- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent CdV/dt effect decline
- ★ Advanced high cell density Trench technology

Product Summary

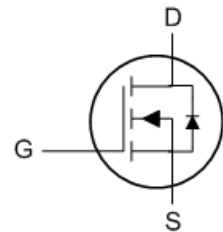
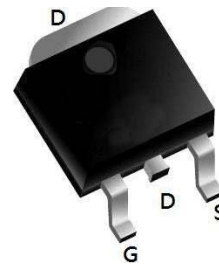


BVDSS	RDSON	ID
40V	2.9mΩ	120A

Description

The UD120N04 is the high cell density trench N-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications. The UD120N04 meet the RoHS and Green Product requirement, 100% EAS guaranteed with full function reliability approved.

TO252-3L Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^{1,6}$	120	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^{1,6}$	82	A
I_{DM}	Pulsed Drain Current ²	508	A
EAS	Single Pulse Avalanche Energy ³	441	mJ
I_{AS}	Avalanche Current	---	A
$P_D@T_C=25^\circ C$	Total Power Dissipation ⁴	115	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	---	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	1.3	$^\circ C/W$

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Electrical Characteristics ($T_J=25\text{ }^{\circ}\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V$, $I_D=250\mu A$	40	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=1\text{mA}$	---	---	---	V/ $^{\circ}\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=10V$, $I_D=20A$	---	2.9	3.6	m Ω
		$V_{GS}=4.5V$, $I_D=20A$	---	3.8	4.8	
		$V_{GS}=2.5V$, $I_D=10A$	---	---	---	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$, $I_D=250\mu A$	1	---	2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	---	---	mV/ $^{\circ}\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=40V$, $V_{GS}=0V$, $T_J=25^{\circ}\text{C}$	---	---	1	μA
		$V_{DS}=40V$, $V_{GS}=0V$, $T_J=125^{\circ}\text{C}$	---	---	100	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V$, $V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=5V$, $I_D=15A$	---	39	---	S
Q_g	Total Gate Charge	$V_{DS}=20V$, $V_{GS}=10V$, $I_D=20A$	---	110	---	nC
Q_{gs}	Gate-Source Charge		---	20	---	
Q_{gd}	Gate-Drain Charge		---	20	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DS}=20V$, $V_{GS}=10V$, $R_G=6\Omega$	---	14	---	ns
T_r	Rise Time		---	26	---	
$T_{d(off)}$	Turn-Off Delay Time		---	77	---	
T_f	Fall Time		---	22	---	
C_{iss}	Input Capacitance	$V_{DS}=20V$, $V_{GS}=0V$, $f=1\text{MHz}$	---	6130	---	pF
C_{oss}	Output Capacitance		---	401	---	
C_{rss}	Reverse Transfer Capacitance		---	348	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,4}	$V_G=V_D=0V$, Force Current	---	---	120	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V$, $I_S=1A$, $T_J=25^{\circ}\text{C}$	---	---	1.2	V
t_{rr}	Reverse Recovery Time	$I_F=20A$, $di/dt=100A/\mu s$, $T_J=25^{\circ}\text{C}$	---	25	---	nS
Q_{rr}	Reverse Recovery Charge		---	16	---	nC

Note :

- 1.Repetitive Rating: Pulse width limited by maximum junction temperature.
- 2.EAS condition: $T_J=25^{\circ}\text{C}$, $V_{DD}=40V$, $V_G=10V$, $R_G=25\Omega$, $L=0.5\text{mH}$.
- 3.Repetitive Rating: Pulse width limited by maximum junction temperature.

Typical Electrical And Thermal Characteristics (Curves)

Figure 1. Output Characteristics

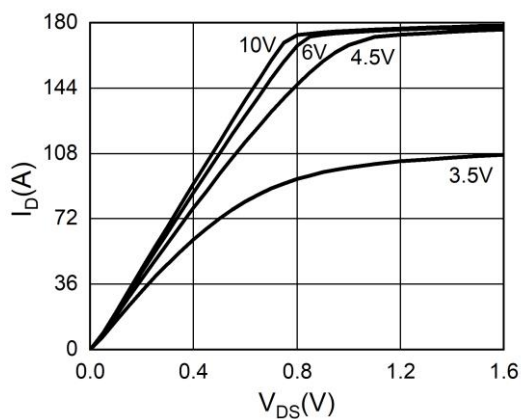


Figure 2. Transfer Characteristics

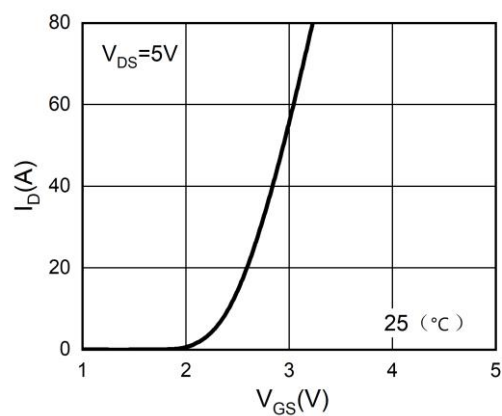


Figure 3. Power Dissipation

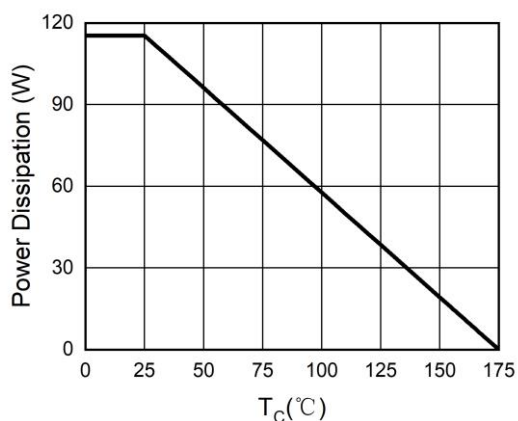


Figure 4. Drain Current

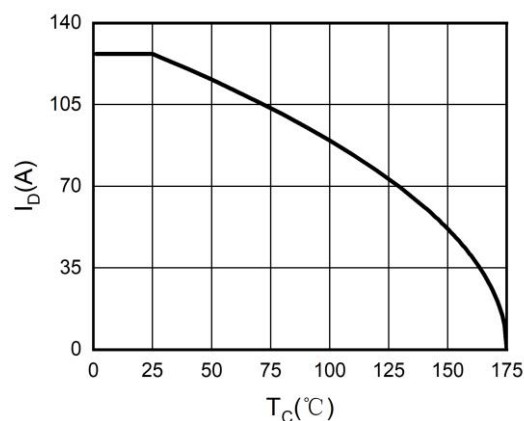


Figure 5. BV_{DSS} vs Junction Temperature

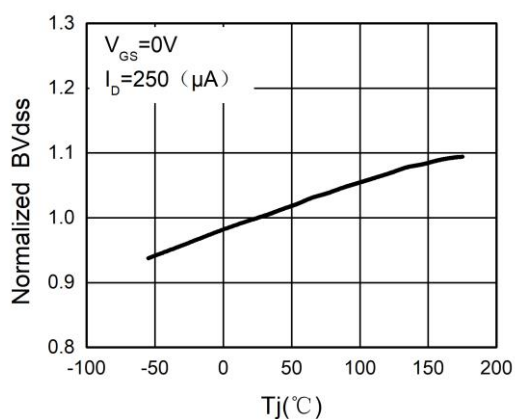
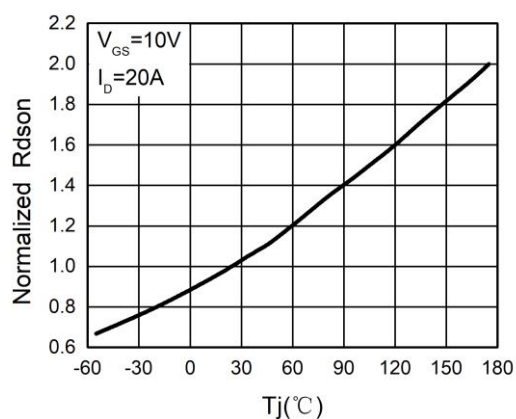


Figure 6. $R_{DS(ON)}$ vs Junction Temperature



Typical Electrical And Thermal Characteristics (Curves)

Figure 7. Gate Charge Waveforms

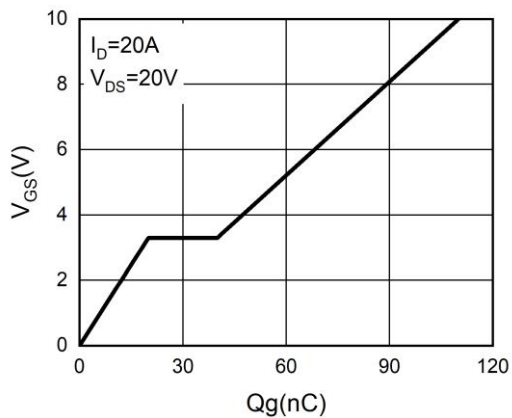


Figure 8. Capacitance

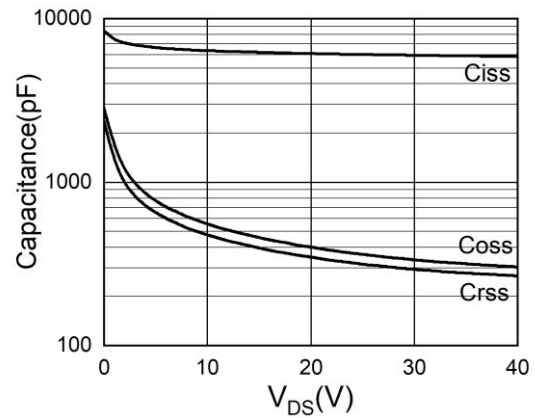


Figure 9. Body-Diode Characteristics

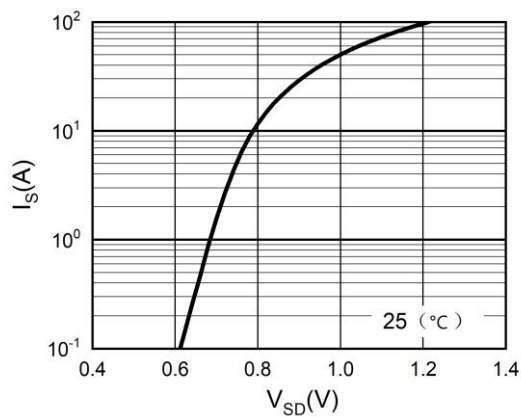
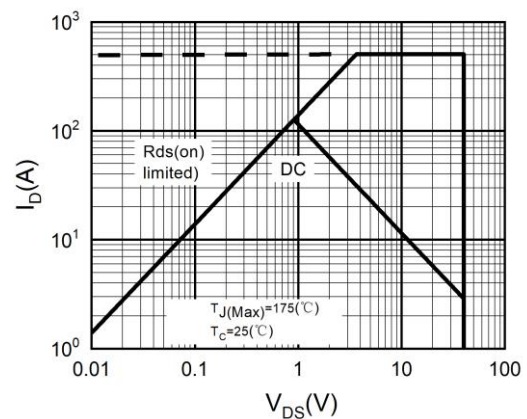


Figure 10. Maximum Safe Operating Area



Test Circuit

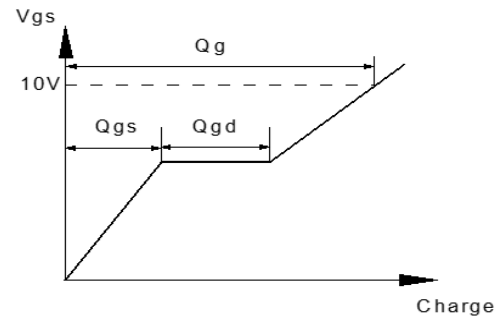
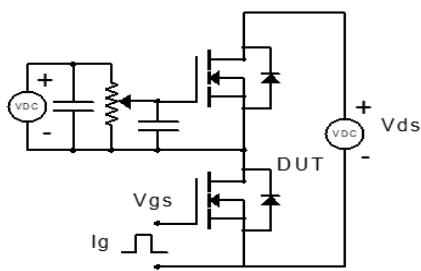


Figure 1: Gate Charge Test Circuit & Waveform

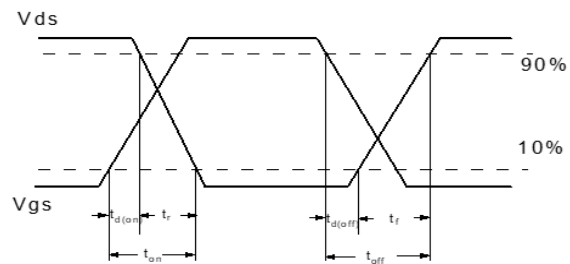
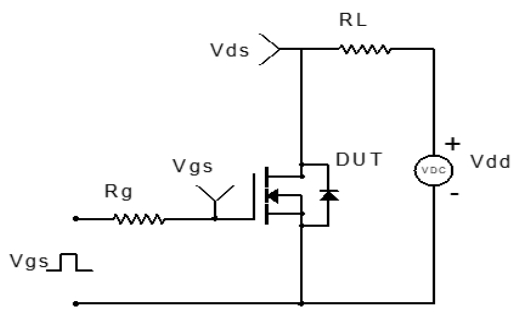


Figure 2: Resistive Switching Test Circuit & Waveform

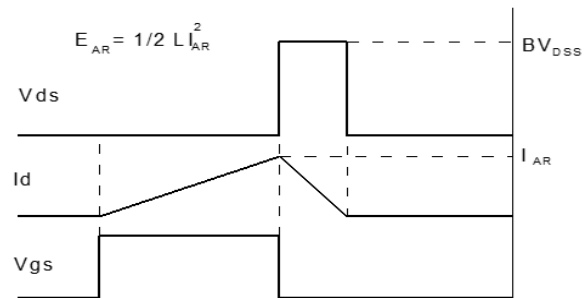
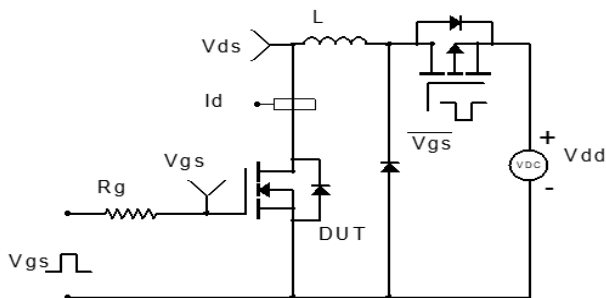


Figure 3: Unclamped Inductive Switching Test Circuit & Waveform

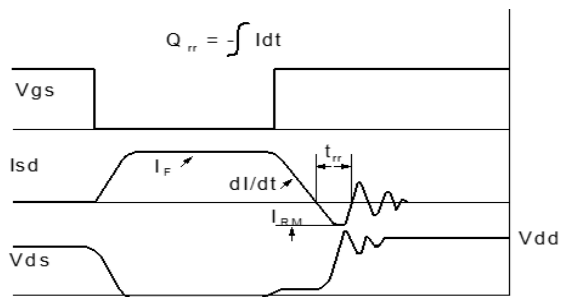
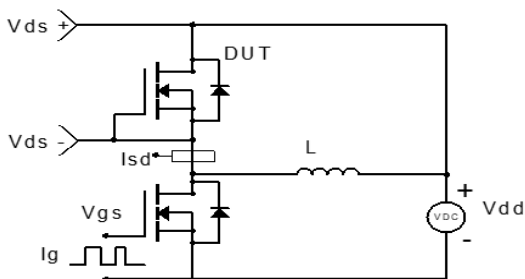
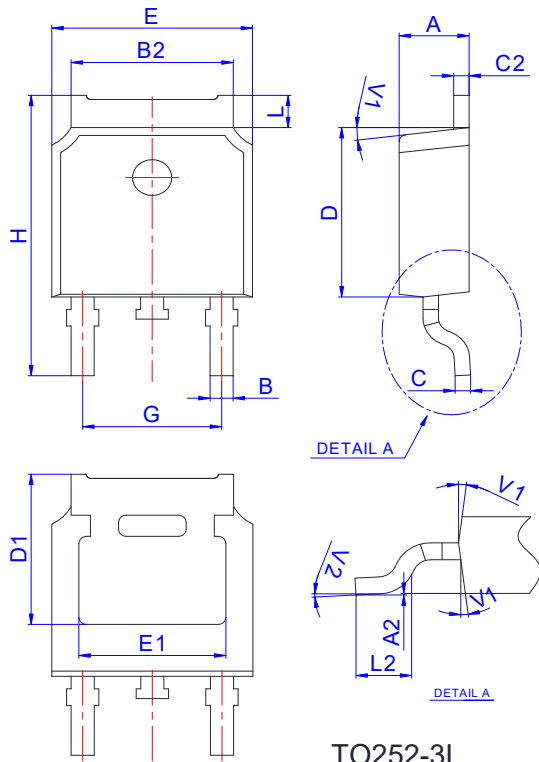


Figure 4: Diode Recovery Test Circuit & Waveform

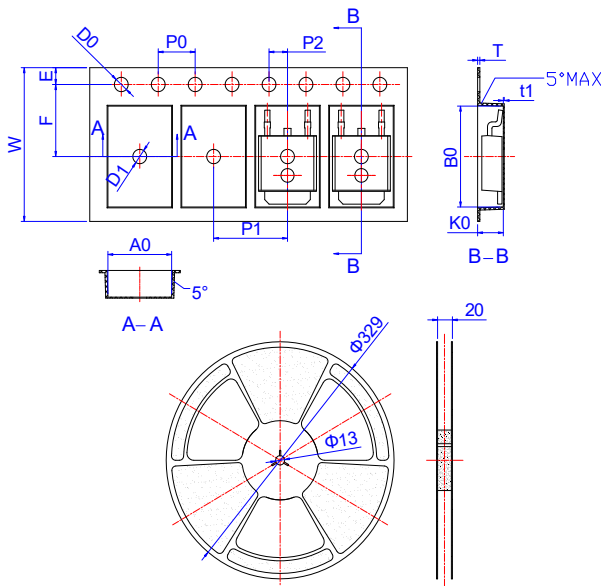
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Package Mechanical Data-TO252-3L



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 Specification-TO252-3L



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