

150V N-Channel Enhancement Mode MOSFET

Description

The AP40N15D uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 10V. This device is suitable for use as a Battery protection or in other Switching application.

General Features

$V_{DS} = 150V$ $I_D = 40A$

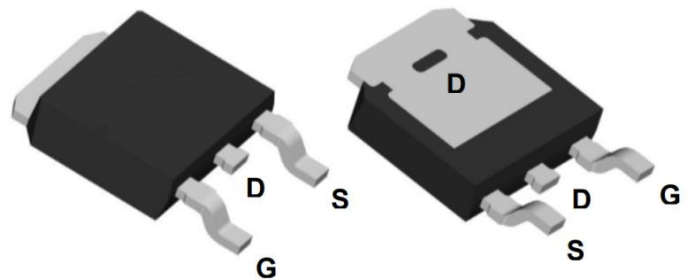
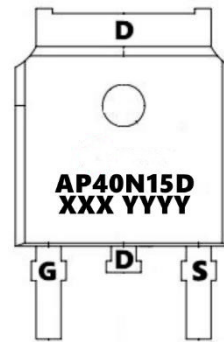
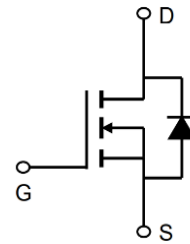
$R_{DS(ON)} < 46m\Omega$ @ $V_{GS}=10V$ (Type: **35mΩ**)

Application

DC/DC Converter

LED Backlighting

Power Management Switches



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP40N15D	TO-252-3L	AP40N15D XXX YYYY	1000

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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	150	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_C=25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	40	A
$I_D@T_C=100^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V	28	A
IDM	Pulsed Drain Current	120	A
EAS	Single Pulse Avalanche Energy	216	mJ
IAS	Avalanche Current	38	A
$P_D@T_C=25^\circ\text{C}$	Total Power Dissipation ⁴	115	W
TSTG	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	1.3	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case	62.5	$^\circ\text{C/W}$

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Electrical Characteristics (T_c=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	150	---	---	V
RDS(ON)	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =20A	---	35	46	mΩ
	Static Drain-Source On-Resistance ²	V _{GS} =4.5V, I _D =20A	---	37	50	mΩ
VGS(th)	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	1.2	2.0	2.5	V
IDSS	Drain-Source Leakage Current	V _{DS} =120V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =120V, V _{GS} =0V, T _J =55°C	---	---	5	
IGSS	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
gfs	Forward Transconductance	V _{DS} =5V, I _D =20A	---	55	---	S
Q _g	Total Gate Charge (4.5V)	V _{DS} =75V, V _{GS} =4.5V, I _D =10A	---	40	---	nC
Q _{gs}	Gate-Source Charge		---	10	---	
Q _{gd}	Gate-Drain Charge		---	21	---	
Td(on)	Turn-On Delay Time	V _{DD} =50V, V _{GS} =4.5V, R _G =3.3Ω, I _D =10A	---	18	---	ns
T _r	Rise Time		---	20	---	
Td(off)	Turn-Off Delay Time		---	65	---	
T _f	Fall Time		---	15	---	
Ciss	Input Capacitance	V _{DS} =25V, V _{GS} =0V, f=1MHz	---	3755	---	pF
Coss	Output Capacitance		---	207	---	
Crss	Reverse Transfer Capacitance		---	160	---	
IS	Continuous Source Current ^{1,5}	V _G =V _D =0V, Force Current	---	---	30	A
VSD	Diode Forward Voltage ²	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1.2	V
trr	Reverse Recovery Time	IF=10A, dI/dt=100A/μs, T _J =25°C	---	35	---	nS
Q _{rr}	Reverse Recovery Charge		---	120	---	nC

Notes:

- 1、 The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
- 2、 The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3、 The EAS data shows Max. rating . The test condition is V_{DD}=50V, V_{GS}=10V, L=0.5mH, I_{AS}=38A
- 4、 The power dissipation is limited by 150°C junction temperature
- 5、 The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

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Typical Characteristics

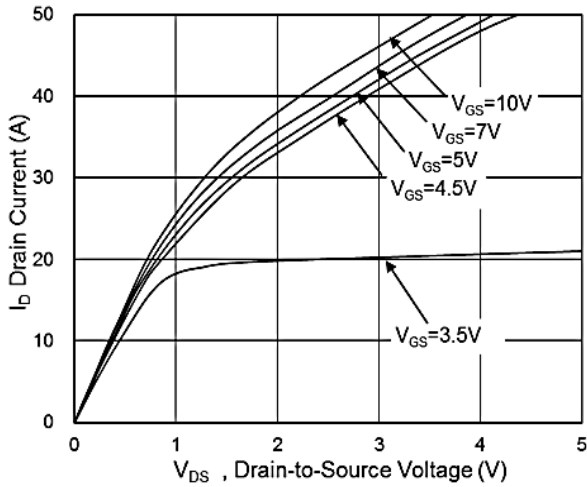


Fig.1 Typical Output Characteristics

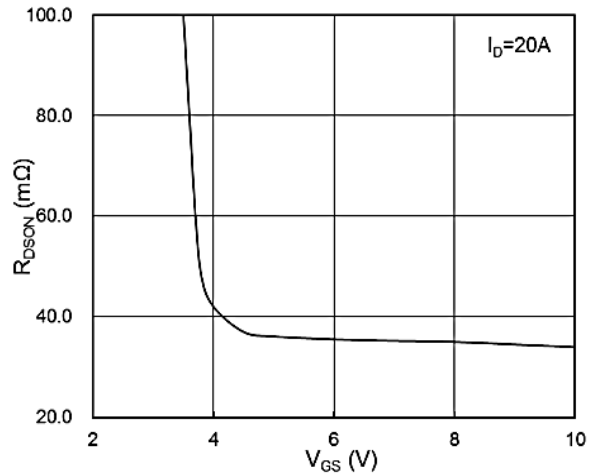


Fig.2 On-Resistance vs. Gate-Source

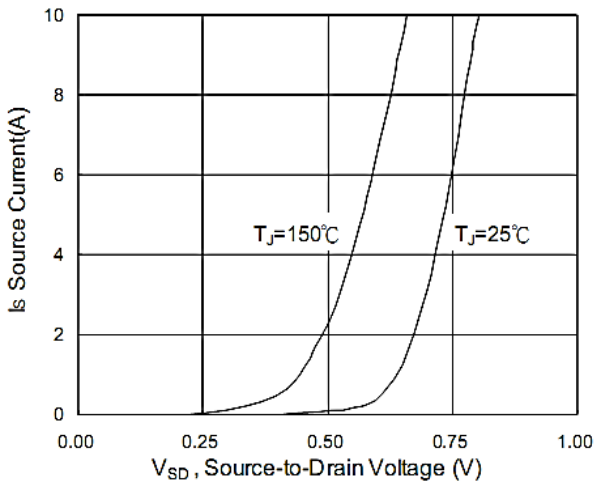


Fig.3 Forward Characteristics Of Reverse

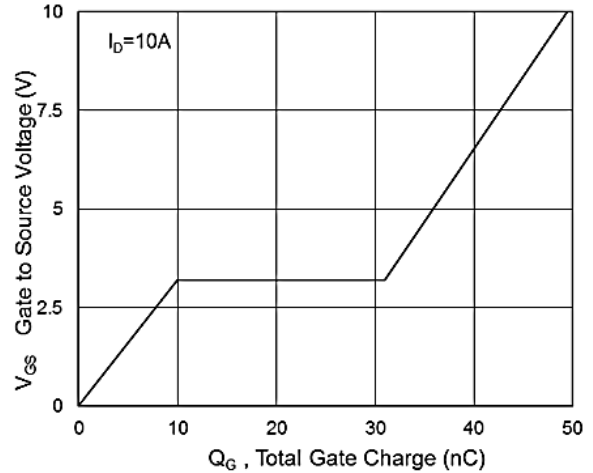


Fig.4 Gate-Charge Characteristics

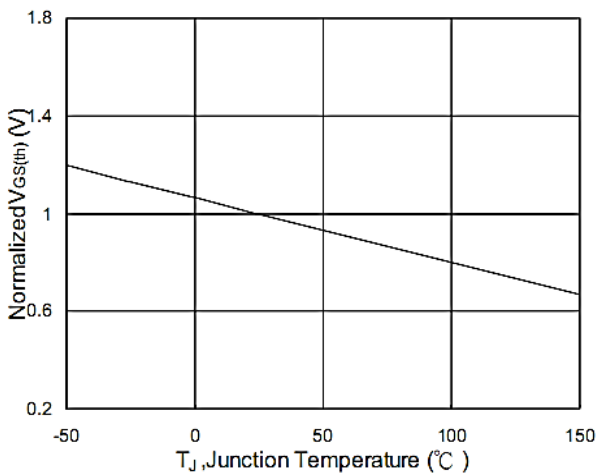


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

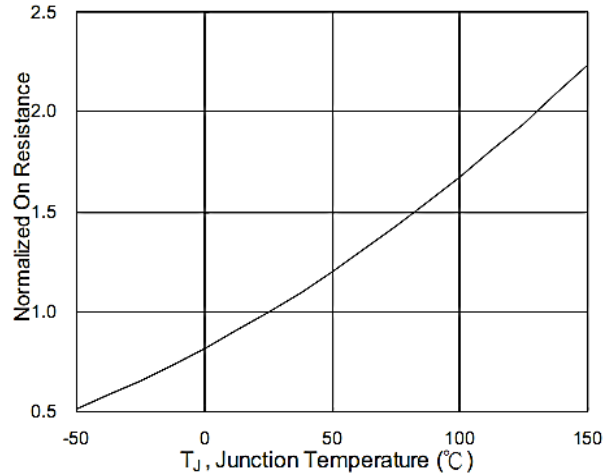


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

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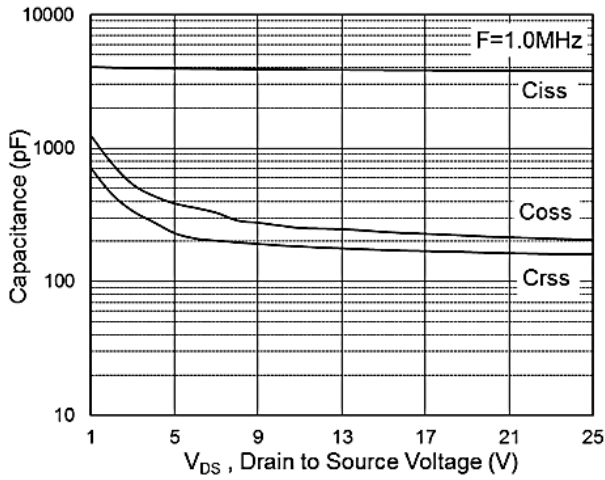


Fig.7 Capacitance

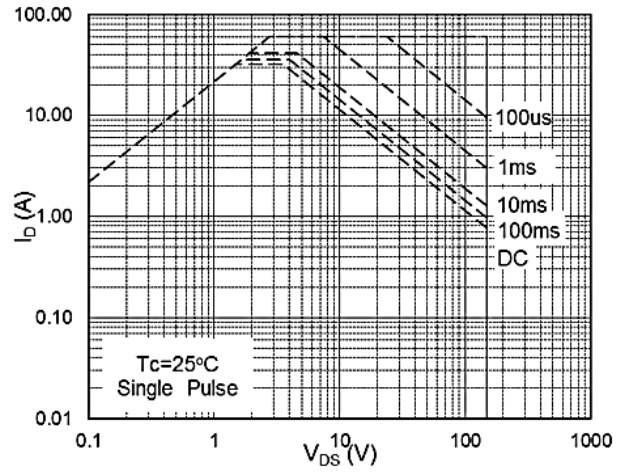


Fig.8 Safe Operating Area

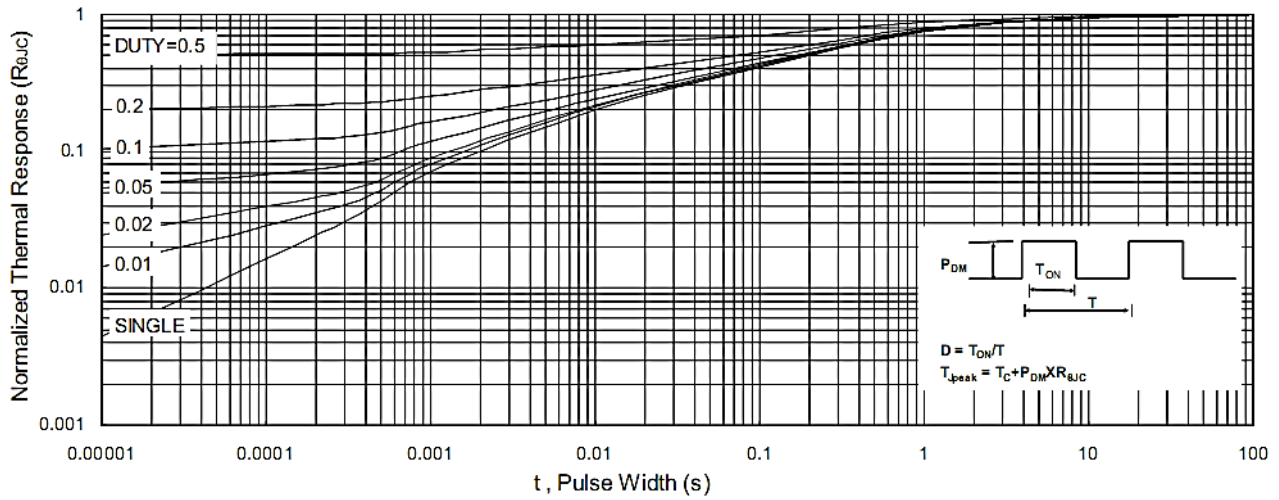


Fig.9 Normalized Maximum Transient Thermal Impedance

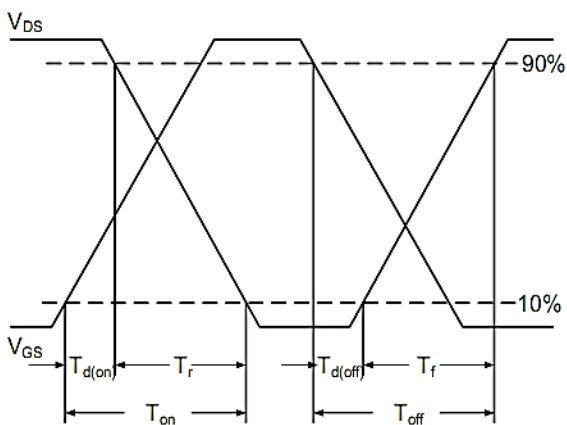


Fig.10 Switching Time Waveform

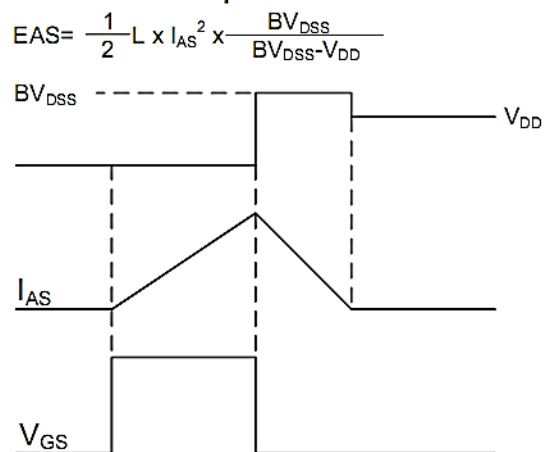
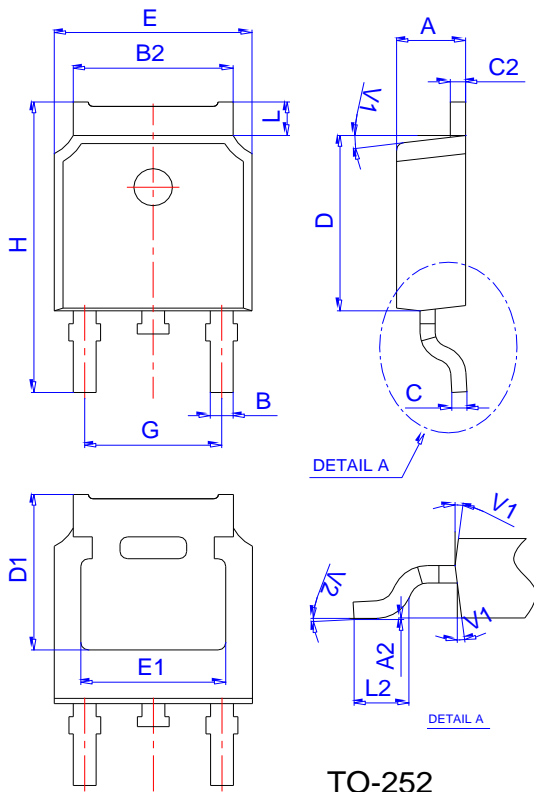


Fig.11 Unclamped Inductive Switching Waveform

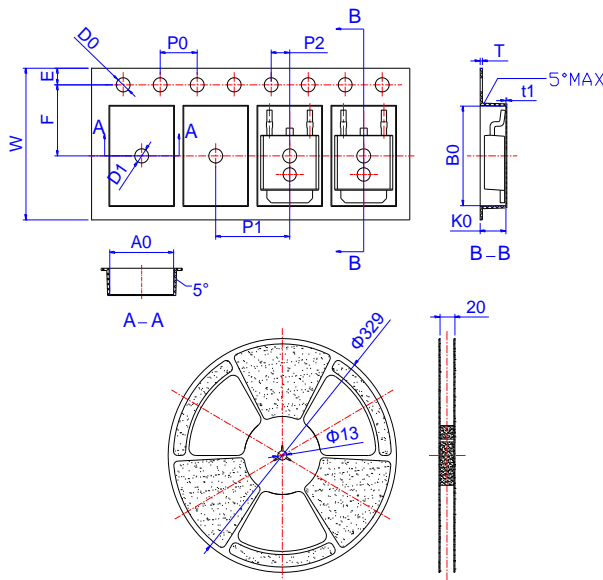
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Package Mechanical Data: TO-252-3L



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-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