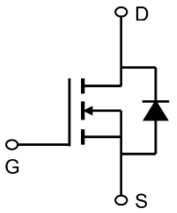
AP40N02D

20V N-Channel Enhancement Mode MOSFET

Description

The AP40N02D uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.



General Features

V_{DS} = 20V I_D =40 A

$R_{DS(ON)}$ < 10mΩ @ V_{GS}=10V

Application

Battery protection

Load switch

Uninterruptible power supply

Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP40N02D	TO-252-3L	AP40N02D XXXX YYYY	2500

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Symbol	Parameter	Limit	Unit
V_{DS}	Drain-Source Voltage	20	V
V_{GS}	Gate-Source Voltage	±12	V
I_D	Drain Current-Continuous	40	A
I_D (100℃)	Drain Current-Continuous(T_C=100℃)	28	A
I_{DM}	Pulsed Drain Current	80	A
P_D	Maximum Power Dissipation	40	W
E_{AS}	Single pulse avalanche energy (Note 5)	150	mJ
T_J,T_{STG}	Operating Junction and Storage Temperature Range	-55 To 150	℃
$R_{\theta JC}$	Thermal Resistance,Junction-to-Case(Note 2)	3.8	℃/W

20V N-Channel Enhancement Mode MOSFET

Electrical Characteristics (T_A=25℃unless otherwise noted)

Symbol	Parameter	Condition	Min	Typ	Max	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V I_D=250μA	20	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=20V,V_{GS}=0V	-	-	1	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±12V,V_{DS}=0V	-	-	±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=250μA	0.5	0.7	1.2	V
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=4.5V, I_D=25A	-	6.2	10	mΩ
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=2.5V, I_D=10A	-	9.1	12	mΩ
g_{FS}	Forward Transconductance	V_{DS}=5V,I_D=20A	10	-	-	S
C_{lss}	Input Capacitance	V_{DS}=10V,V_{GS}=0V, F=1.0MHz		1100		PF
C_{oss}	Output Capacitance			162		PF
C_{rss}	Reverse Transfer Capacitance			105		PF
$t_{d(on)}$	Turn-on Delay Time	VGS=10V,VDS=10V RL=0. 5Ω,RGEN=3Ω	-	4.5	-	nS
t_r	Turn-on Rise Time		-	9.2	-	nS
$t_{d(off)}$	Turn-Off Delay Time		-	18.7	-	nS
t_f	Turn-Off Fall Time		-	3.3	-	nS
Q_g	Total Gate Charge	VGS=10V,VDS=10V,ID=20A		15		nC
Q_{gs}	Gate-Source Charge			1.8		nC
Q_{gd}	Gate-Drain Charge			2.8		nC
V_{SD}	Diode Forward Voltage (Note 3)	V_{GS}=0V,I_S=20A	-	-	1.2	V
I_S	Diode Forward Current (Note 2)	-	-	-	30	A
t_{rr}	Reverse Recovery Time	TJ = 25°C, IF = 20A di/dt = 100A/μs(Note3)	-	18	-	nS
Qrr	Reverse Recovery Charge		-	9.5	-	nC
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

1、Repetitive Rating: Pulse width limited by maximum junction temperature.
2、Surface Mounted on FR4 Board, t ≤ 10 sec.
3、Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4、Guaranteed by design, not subject to production
5、EAS condition：Tj=25℃,V_{DD}=10V,V_G=10V,L=0.5mH,Rg=25Ω

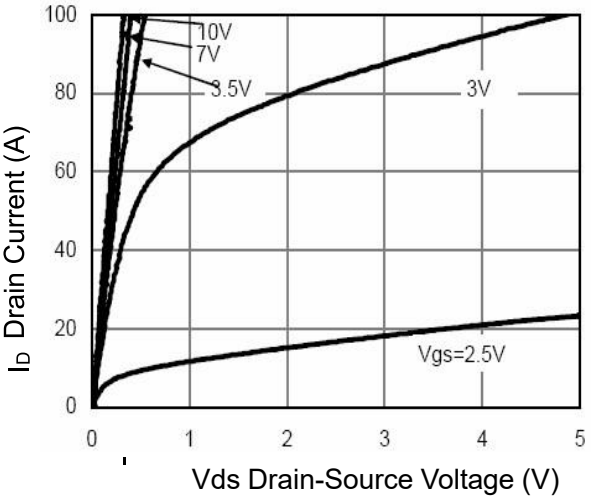


Figure 1 Output Characteristics

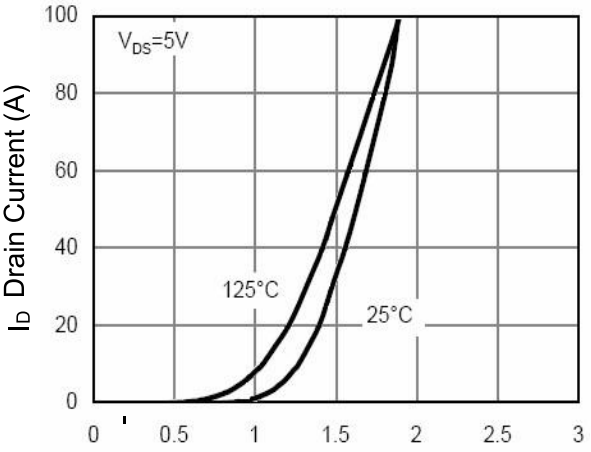


Figure 2 Transfer Characteristics

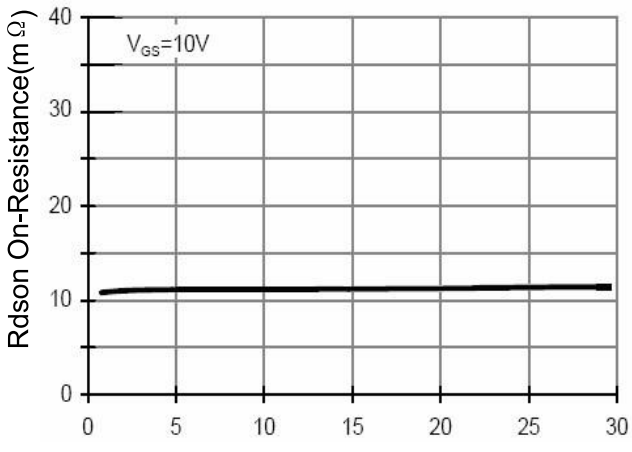


Figure 3 Rdson-Drain Current

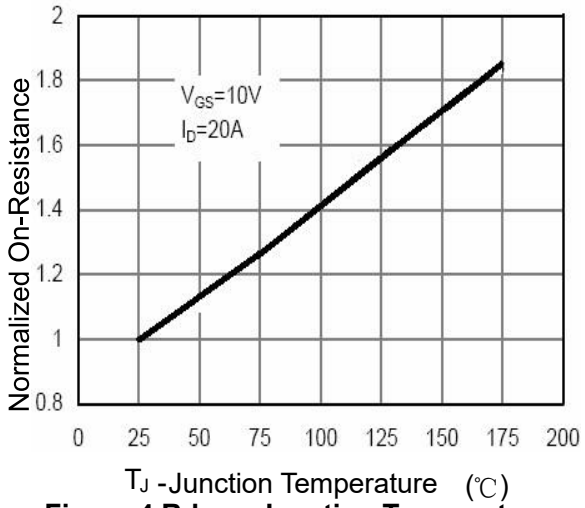


Figure 4 Rdson-Junction Temperature

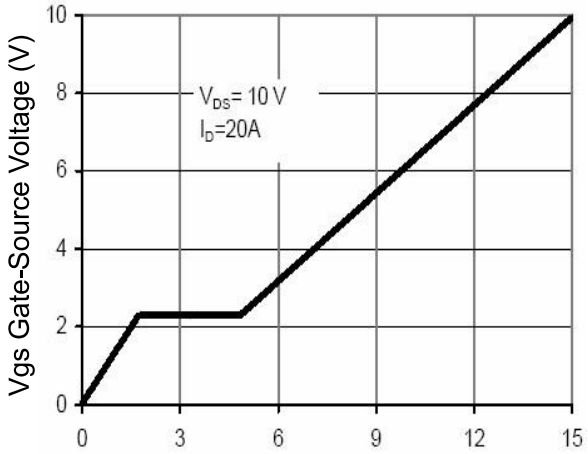


Figure 5 Gate Charge

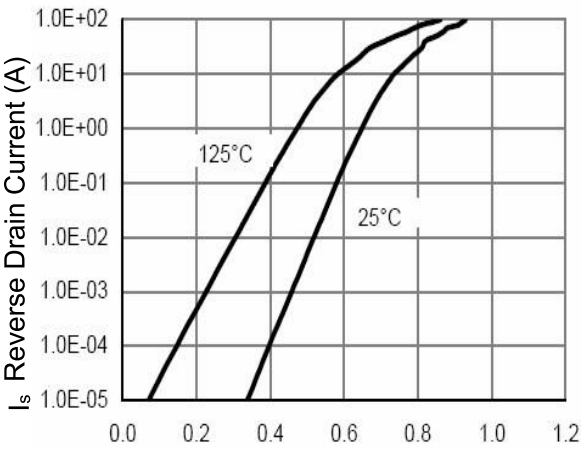


Figure 6 Source- Drain Diode Forward

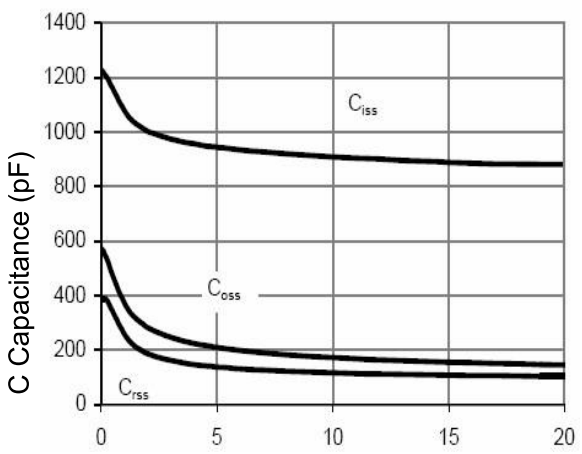


Figure 7 Capacitance vs Vds

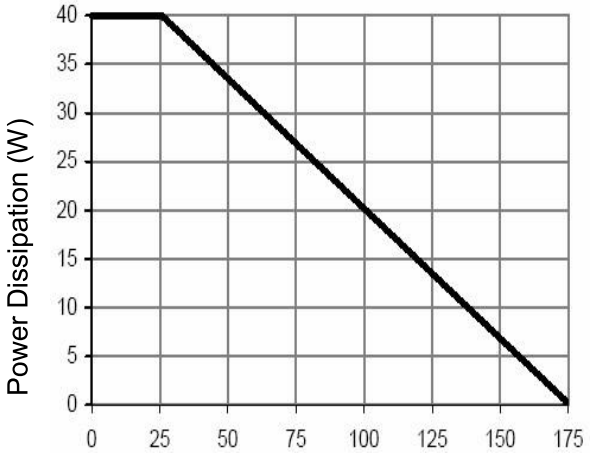


Figure 9 Power De-rating

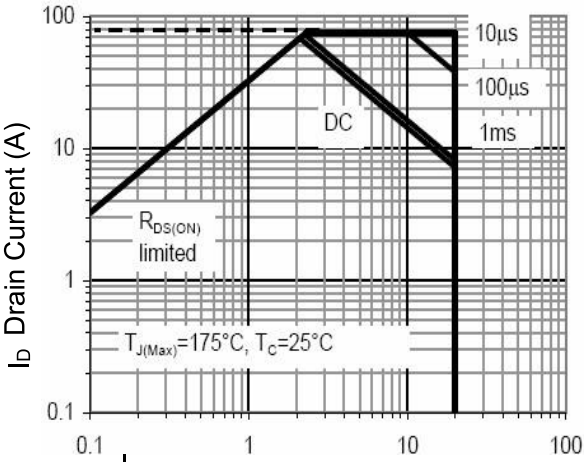


Figure 8 Safe Operation Area

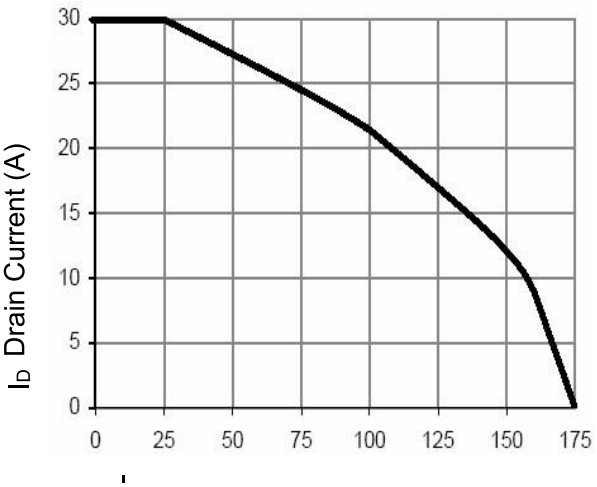


Figure 10 Current De-rating

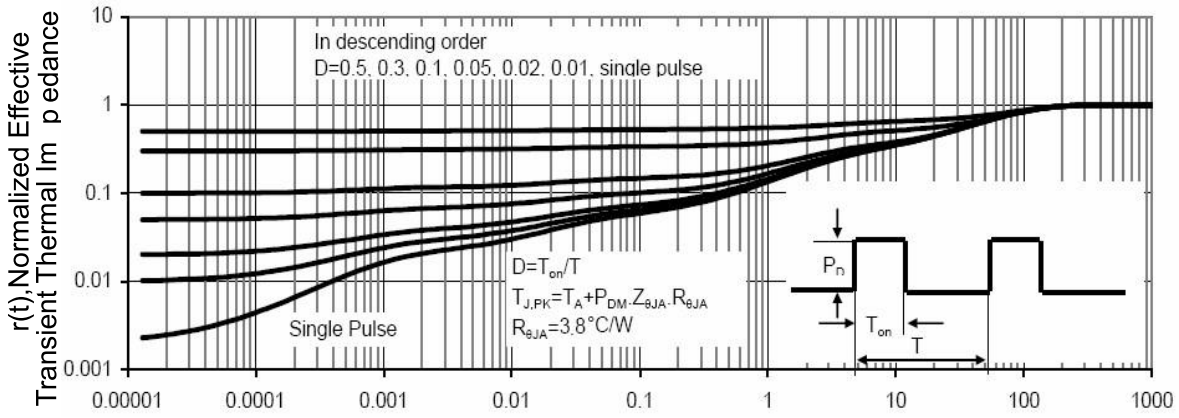
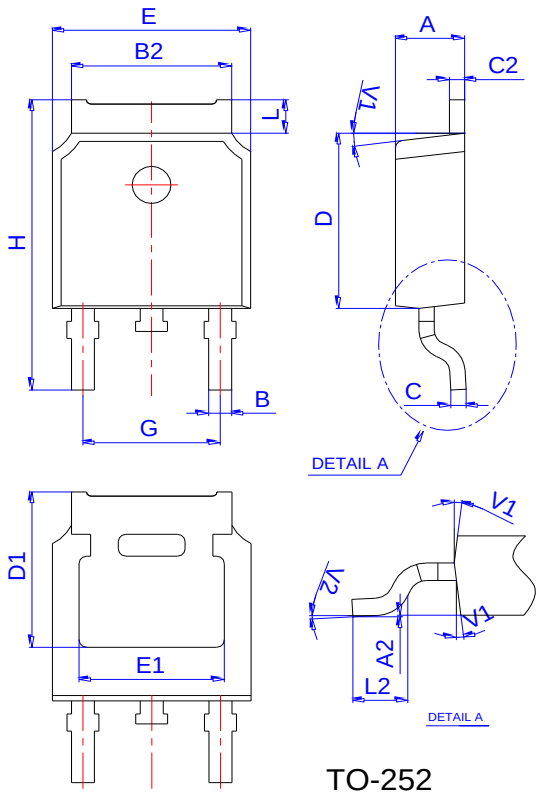


Figure 11 Normalized Maximum Transient Thermal Impedance

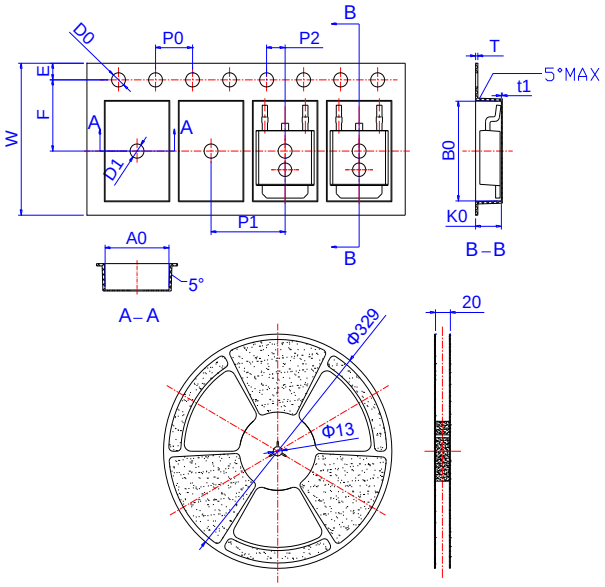
Package Mechanical Data:TO-252-3L



TO-252

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 Spectification-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

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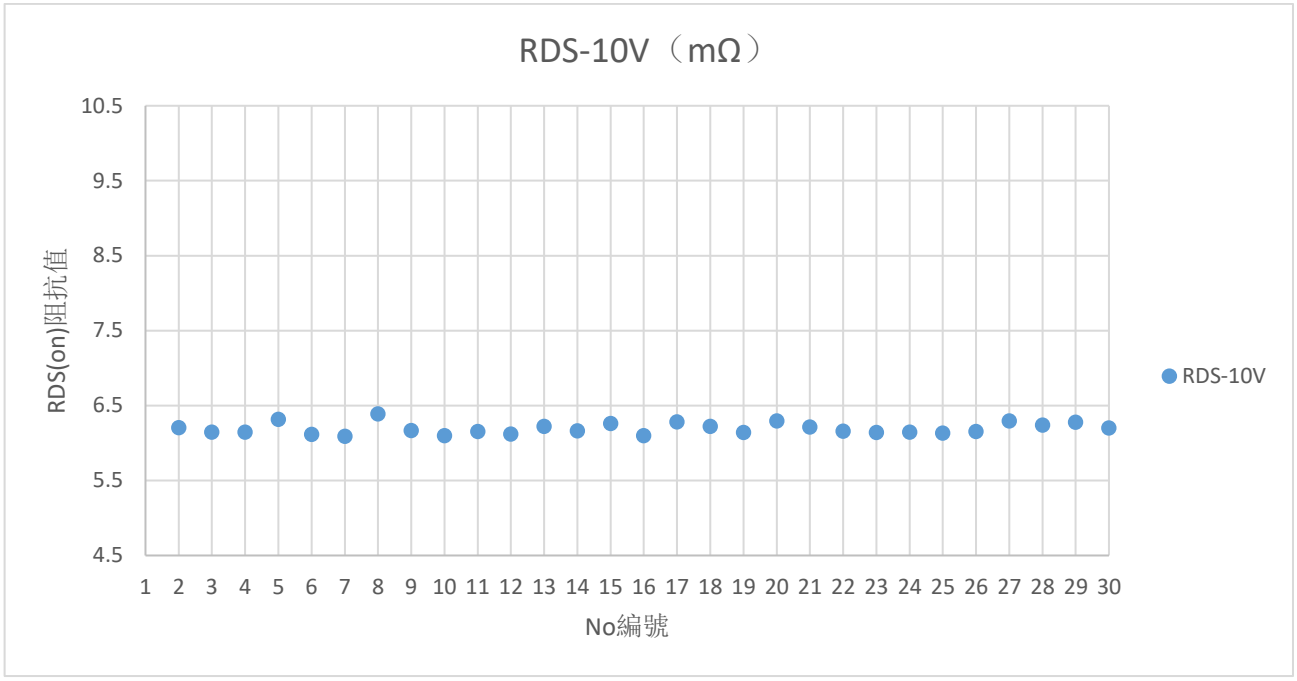
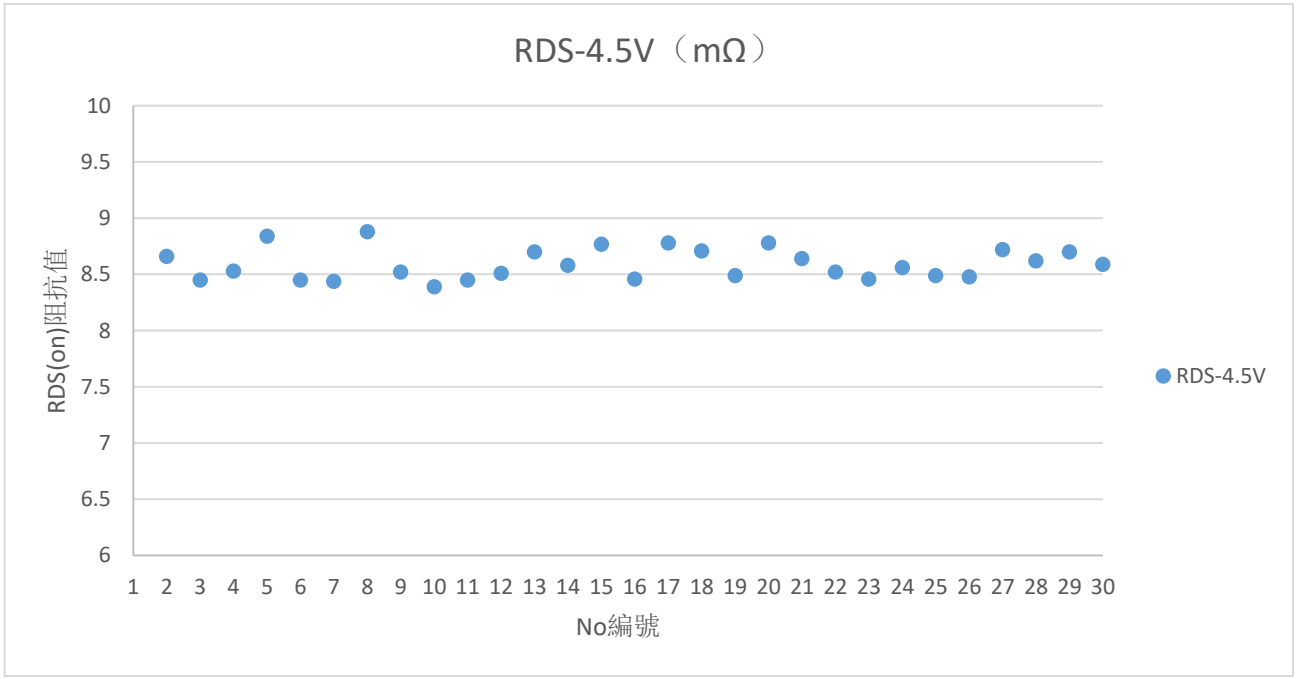
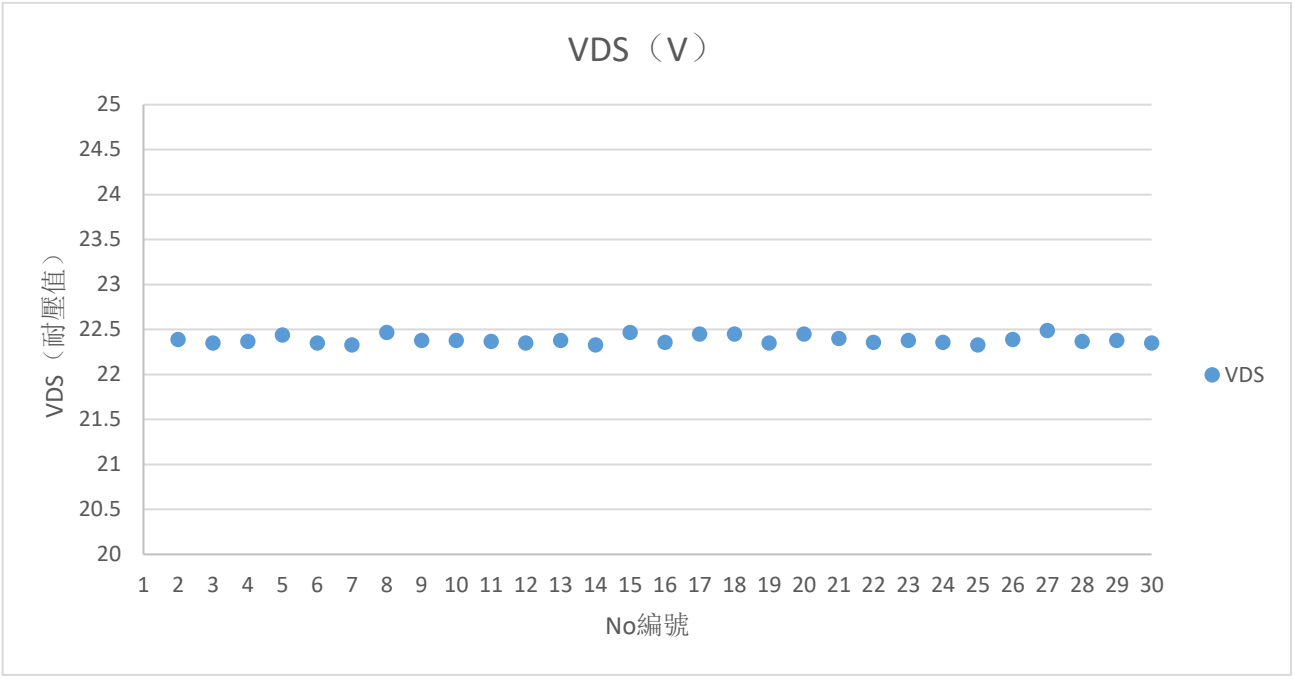
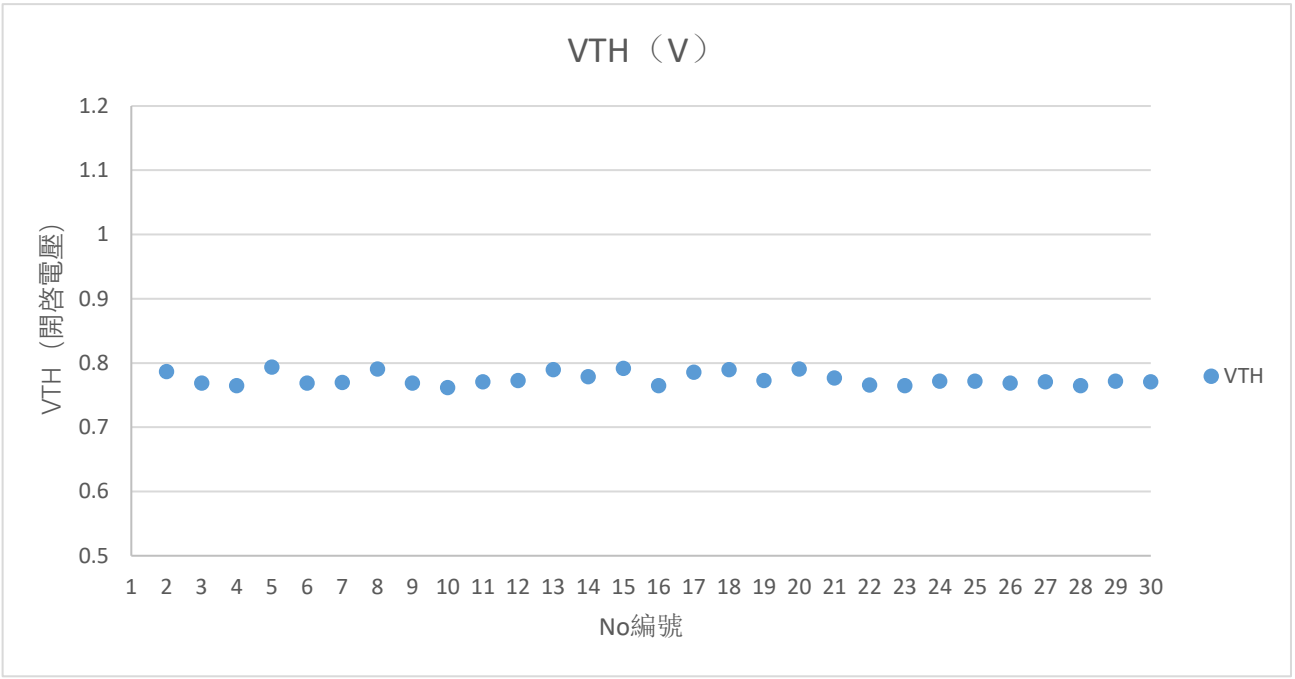
Edition	Date	Change
Rve3.2	2018/8/31	Initial release
Rve3.3	2019/11/31	Reduce RDS

Test Report For 30PCS（30pcs 典型測試報告）






VDS（V）
VDS（耐壓值）
25
24.5
24
23.5
23
22.5
22
21.5
21
20.5
20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
No編號
VDS


VTH（V）
VTH（開啓電壓）
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
No編號
VTH