APM

A Power Microelectronics

650V N-Channel Enhancement Mode MOSFET

Description

The AP7N65F/P is silicon N-channel Enhanced

VDMOSFETs, is obtained by the self-aligned planar Technology

which reduce the conduction loss, improve switching

performance and enhance the avalanche energy. The transistor

can be used in various power switching circuit for system

miniaturization and higher efficiency.
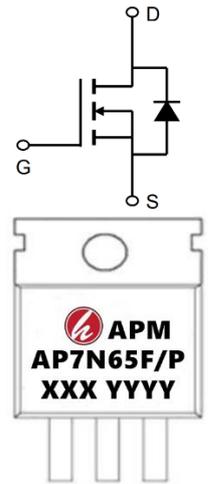
General Features

V_{DS} = 650V I_D =7A

$R_{DS(ON)}$ < 1.2Ω @ V_{GS}=10V （Type：1.0Ω）

Application

Uninterruptible Power Supply(UPS)

Power Factor Correction (PFC)

Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP7N65F	TO-220F-3L	AP7N65F XXX YYYY	1000
AP7N65P	TO-220-3L	AP7N65P XXX YYY	1000

Absolute Maximum Ratings (T$_C$=25℃unless otherwise noted)

Symbol	Parameter	Value TO-220F TO-220	Unit
VDSS	Drain-Source Voltage (V_{GS} = 0V)	650	V
ID	Continuous Drain Current	7	A
IDM	Pulsed Drain Current (note1)	28	A
VGS	Gate-Source Voltage	±30	V
E$_{AS}$	Single Pulse Avalanche Energy (note2)	247	mJ
IAR	Avalanche Current (note1)	7	A
E$_{AR}$	Repetitive Avalanche Energy note1)	18	mJ
P$_D$	Power Dissipation (T$_C$ = 25ºC)	32.9	W
TJ, Tstg	Operating Junction and Storage Temperature Range	-55~+150	ºC
RthJC	Thermal Resistance, Junction-to-Case	3.8	ºC/W
RthJA	Thermal Resistance, Junction-to-Ambient	13.3	ºC/W

Electrical Characteristics (T$_J$=25℃, unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V(BR)DSS	Drain-Source Breakdown Voltage	V$_{GS}$ = 0V, I$_D$ = 250µA	650	685	--	V
IDSS	Zero Gate Voltage Drain Current	V$_{DS}$= 650V, V$_{GS}$= 0V, T$_J$=25ºC	--	--	1	µA
IGSS	Gate-Source Leakage	V$_{GS}$ = ±30V	--	--	±100	nA
VGS(th)	Gate-Source Threshold Voltage	V$_{DS}$ = V$_{GS}$, I$_D$ = 250µA	2.0	--	4.0	V
RDS(on)	Drain-Source On-Resistance (Note3)	V$_{GS}$ = 10V, I$_D$ = 3.5A	--	1.0	1.2	Ω
C$_{iss}$	Input Capacitance	V$_{GS}$ = 0V, V$_{DS}$ = 25V, f = 1.0MHz	--	1000	--	pF
C$_{oss}$	Output Capacitance		--	101	--	
C$_{rss}$	Reverse Transfer Capacitance		--	1.5	--	
Q$_g$	Total Gate Charge	V$_{DD}$=520V, I$_D$ = 7A, V$_{GS}$ = 10V	--	22	--	nC
Q$_{gs}$	Gate-Source Charge		--	4.3	--	
Q$_{gd}$	Gate-Drain Charge		--	13	--	
td(on)	Turn-on Delay Time	V$_{DD}$=325V, I$_D$ = 7A, R$_G$ = 25Ω	--	12	--	ns
t$_r$	Turn-on Rise Time		--	26	--	
td(off)	Turn-off Delay Time		--	29	--	
t$_f$	Turn-off Fall Time		--	27	--	
IS	Continuous Body Diode Current	T$_C$ = 25 ºC	--	--	7.0	A
ISM	Pulsed Diode Forward Current		--	--	28	A
V$_{SD}$	Body Diode Voltage	T$_J$ = 25ºC, I$_{SD}$ = 7A, V$_{GS}$ = 0V	--	--	1.4	V
trr	Reverse Recovery Time	V$_{GS}$ = 0V,I$_S$ = 7A, di$_F$/dt =100A /µs	--	389	--	ns
Q$_{rr}$	Reverse Recovery Charge		--	2.04	--	µC

Note :

1、The data tested by surface mounted on a 1 inch2 FR-4 board with 2OZ copper.

2、The EAS data shows Max. rating . IAS = 4.5A, VDD = 50V, RG = 25 Ω, Starting TJ = 25 ºC

3、The test condition is Pulse Test: Pulse width ≤ 300µs, Duty Cycle ≤ 1%

4、The power dissipation is limited by 150℃ junction temperature

5、The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

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Typical Characteristics
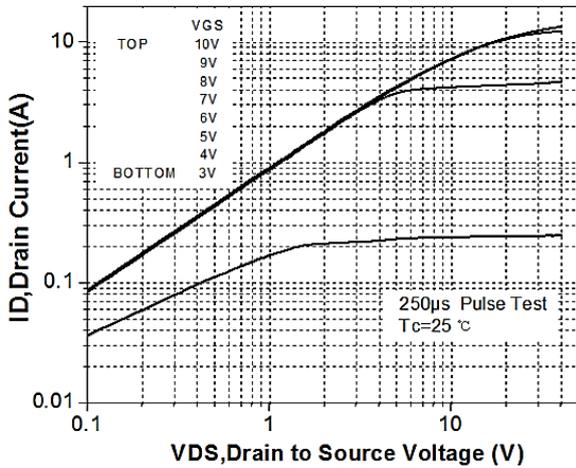
Figure 1. On-Region Characteristics
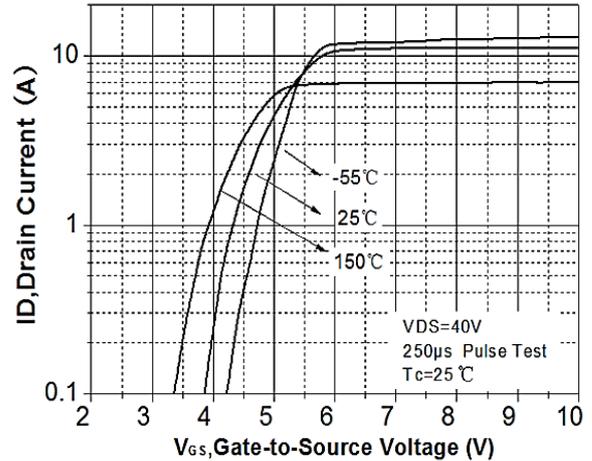
Figure 2. Transfer Characteristics
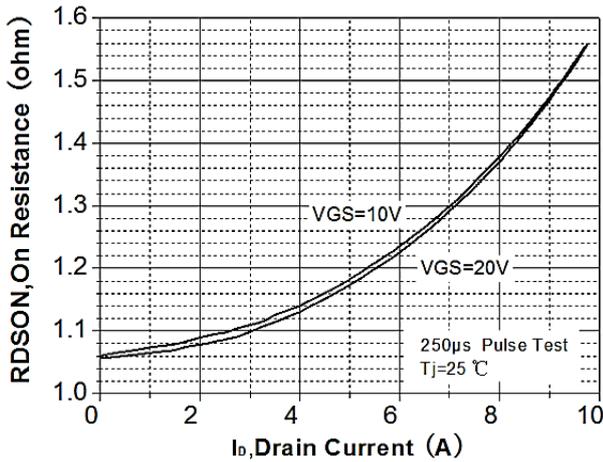
Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage
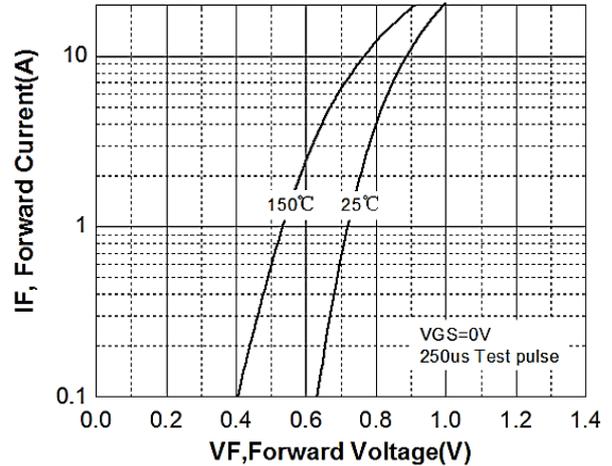
Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature
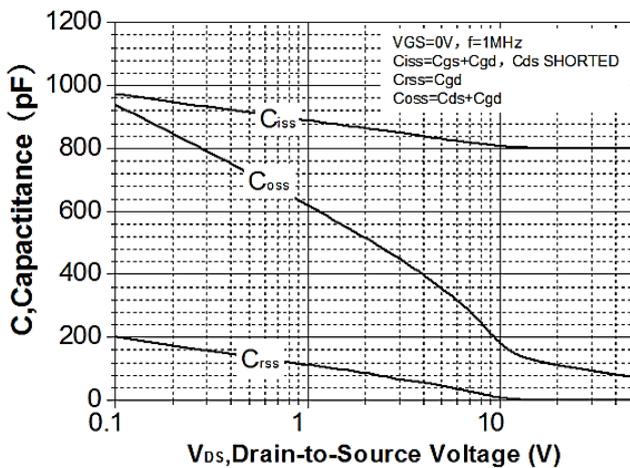
Figure 5. Capacitance Characteristics
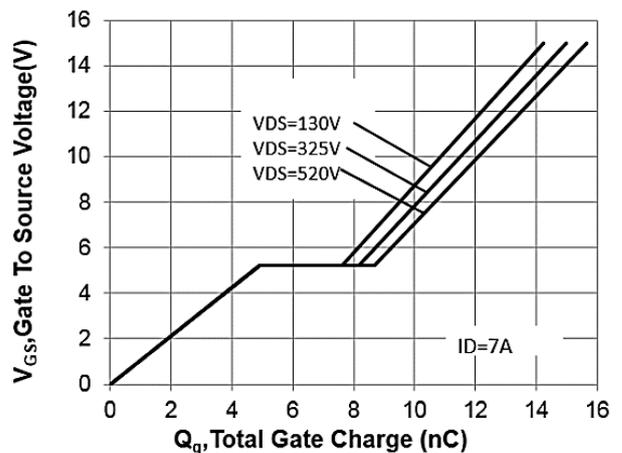
Figure 6. Gate Charge Characteristics

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ID=250uA
VGS=0V
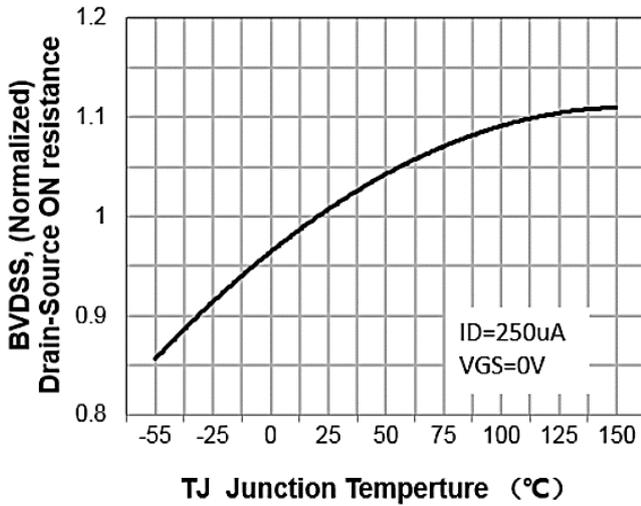
Figure 7. Breakdown Voltage Variation vs Temperature

ID=3.5A
VGS=0V
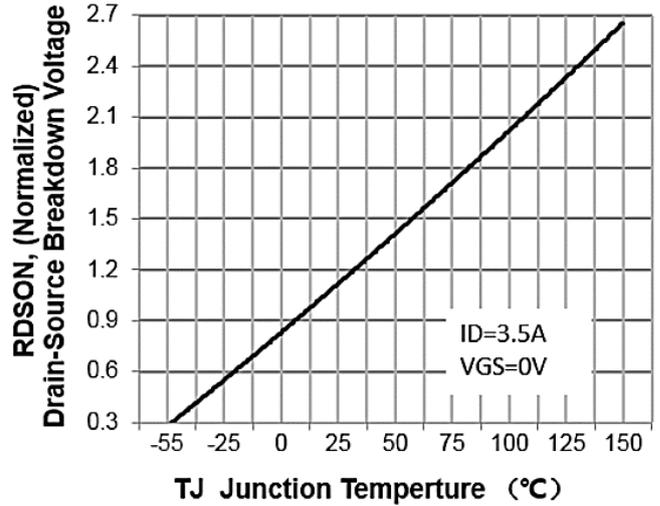
Figure 8. On-Resistance Variation vs Temperature

Operate in This Area is Limited by RDSON

100us
1ms
10ms
100ms
DC

*Notes:
1.Tc=25℃
2.Tj=150℃
3.Single Pulse
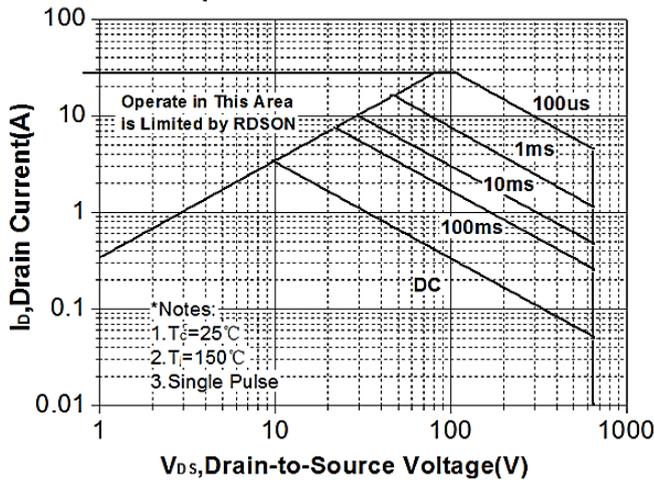
Figure 9. Maximum Safe Operating Area
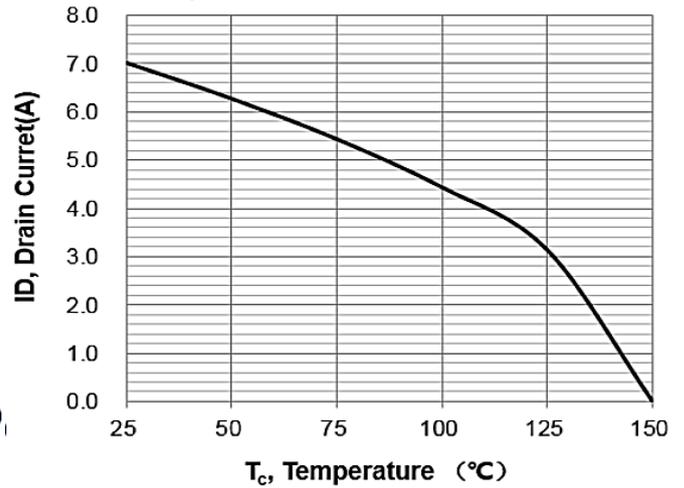
Figure 10. Maximum Drain Current vs Case Temperature

D=0.5
0.3
0.1
0.05
0.02
0.01

*Notes:
1.Tj-Tc=P_{DM}*$Z_{\theta jc(t)}$
2.Duty Factor D=T1/T2

P_{DM}
T1
T2

Singe Pusle
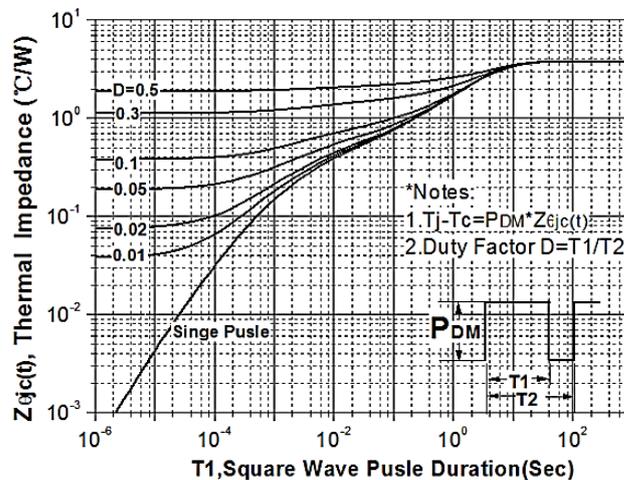
Figure 11. Transient Thermal Response Curve
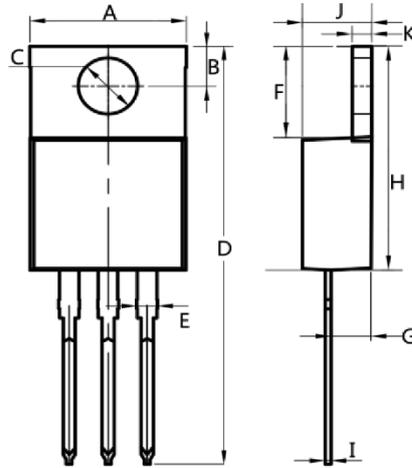
TO-220AB

Dim.	Min.	Max.
A	10.0	10.4
B	2.5	3.0
C	3.5	4.0
D	28.0	30.0
E	1.1	1.5
F	6.2	6.6
G	2.9	3.3
H	15.0	16.0
I	0.35	0.45
J	4.3	4.7
K	1.2	1.4
All Dimensions in millimeter		

ITO-220AB
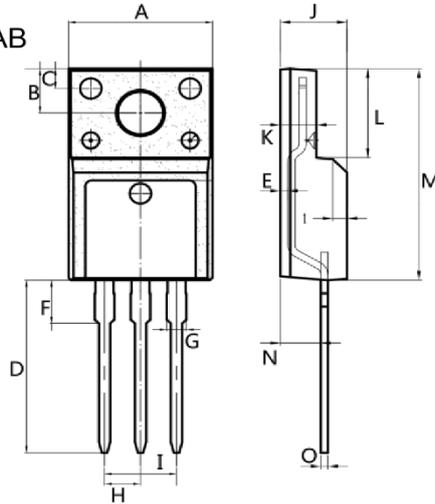
Dim.	Min.	Max.
A	9.9	10.3
B	2.9	3.5
C	1.15	1.45
D	12.75	13.25
E	0.55	0.75
F	3.1	3.5
G	1.25	1.45
H	Typ	2.54
I	Typ	5.08
J	4.55	4.75
K	2.4	2. 7
L	6.35	6.75
M	15.0	16.0
N	2.75	3.15
O	0.45	0.60
All Dimensions in millimeter		

TO-263
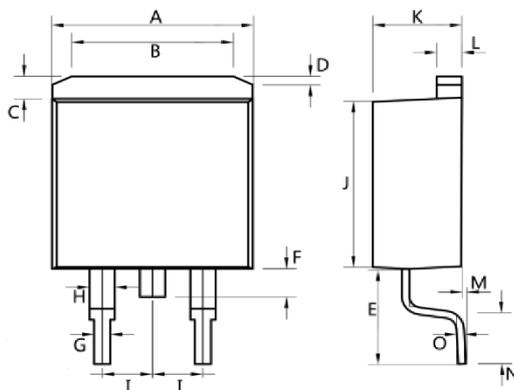
Dim.	Min.	Max.
A	10.0	10. 5
B	7.25	7.75
C	1.3	1.5
D	0.55	0.75
E	5.0	6.0
F	1.4	1.6
G	0.75	0.95
H	1.15	1.35
I	Typ	2.54
J	8.4	8.6
K	4.4	4.6
L	1.25	1.45
M	0.02	0.1
N	2.4	2.8
O	0.35	0.45
All Dimensions in millimeter		

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Edition	Date	Change
Rve1.0	2018/1/31	Initial release
Rve1.1	2021/1/05	Reduce RDS(on)

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