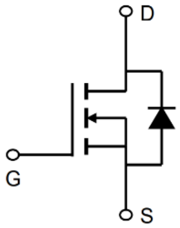
APJ50N65F/P/T (AP65R190)

650V N-Channel Enhancement Mode MOSFET



Description

The APJ50N65F/P/T is CoolFET II MOSFET family that is utilizing charge balance technology for extremely low on-resistance and low gate charge performance.

APJ14N65F/P/T is suitable for applications which require superior power density and outstanding efficiency

General Features

V_{DS} = 650V （Type：740V） IDM =50A

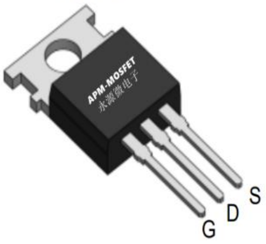
$R_{DS(ON)}$ < 190mΩ @ V_{GS}=10V （Type：150mΩ）

Application

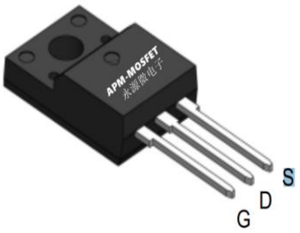
Uninterruptible Power Supply(UPS)

Power Factor Correction (PFC)

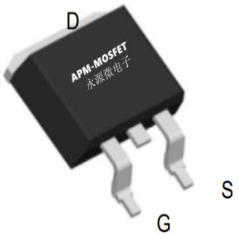
TO-220



TO-220F



TO-263
D^2PAK



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
APJ50N65F	TO-220F-3L	APJ50N65F XXX YYYY	1000
APJ50N65P	TO-220-3L	APJ50N65P XXX YYYY	1000
APJ50N65T	TO-263-3L	APJ50N65T XXX YYYY	1000

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

Symbol	Parameter	Value	Unit
VDSS	Drain-Source Voltage (V_{GS} = 0V)	650	V
ID	Continuous Drain Current	21	A
IDM	Pulsed Drain Current (note1)	50	A
VGS	Gate-Source Voltage	±30	V
E_{AS}	Single Pulse Avalanche Energy (note2)	500	mJ
P_D	Power Dissipation (T_C = 25ºC)	151	W
TJ, Tstg	Operating Junction and Storage Temperature Range	-55~+150	ºC
RthJC	Thermal Resistance, Junction-to-Case	0.82	ºC/W
RthJA	Thermal Resistance, Junction-to-Ambient	62	ºC/W

Electrical Characteristics (T_J=25℃, unless otherwise noted)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
BVDSS	Drain to source breakdown voltage	V_{GS}=0V, I_D=250uA	650	740	--	V
ΔBV_{DSS} / ΔTJ	Breakdown voltage temperature coefficient	I_D=250uA, referenced to 25°C	--	0.7	--	V/°C
IDSS	Drain to source leakage current	V_{DS}=650V, V_{GS}=0V	--	--	1	uA
		V_{DS}=520V, T_C=125°C	--	--	50	uA
IGSS	Gate to source leakage current, forward	V_{GS}=30V, V_{DS}=0V	--	--	100	nA
	Gate to source leakage current, reverse	V_{GS}=-30V, V_{DS}=0V	--	--	-100	nA
VGS(TH)	Gate threshold voltage	V_{DS}=V_{GS}, I_D=250uA	2.5	3.3	4.5	V
RDS(ON)	Drain to source on state resistance	V_{GS}=10V, I_D =3.2A	--	150	190	mΩ
Ciss	Input capacitance	V_{GS}=0V, V_{DS}=100V, f=1MHz	--	1510	--	pF
Coss	Output capacitance		--	65	--	
Crss	Reverse transfer capacitance		--	2.4	--	
td(on)	Turn on delay time	V_{DS}=400V, I_D=13A， R_G=4.7Ω , V_{GS}=13V	--	10	--	ns
tr	Rising time		--	19.8	--	
td(off)	Turn off delay time		--	45.4	--	
t_f	Fall time		--	41.4	--	
Q_g	Total gate charge	V_{DS}=480V, V_{GS}=10V, I_D=11A	--	7.27		nC
Q_{gs}	Gate-source charge		--	17.4	--	
Q_{gd}	Gate-drain charge		--	43.9	--	
IS	Continuous source current	Integral reverse p-n Junction diode in the MOSFET	--	--	21	A
ISM	Pulsed source current		--	--	63	A
VSD	Diode forward voltage drop.	I_S=7.3A, V_{GS}=0V	--	0.812	1.5	V
T_{rr}	Reverse recovery time	I_S=11A, V_{GS}=0V, Vdd=400V, dI_F/dt=100A/us,	--	288	--	ns
Qrr	Reverse recovery Charge		--	3.66	--	uC

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 . L=0.5mH, IAS =7A, VDD =50V, RG=25Ω
3、The test condition is Pulse Test: ISD ≤ ID, di/dt = 100A/us, VDD≤ BVDSS, Starting at TJ =25℃
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.

Typical Characteristics

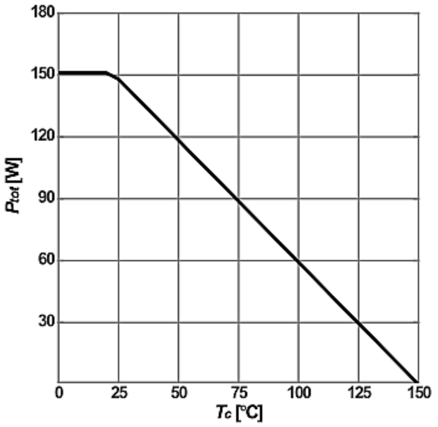


Figure1: Power dissipation (Non FullPAK)

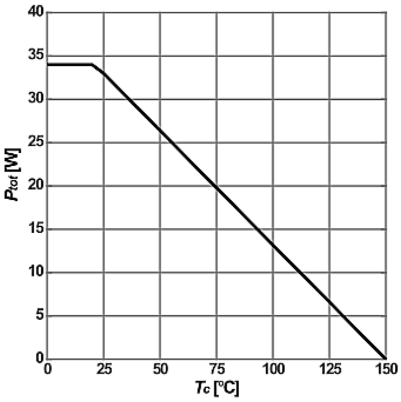


Figure2: Power dissipation (FullPAK)

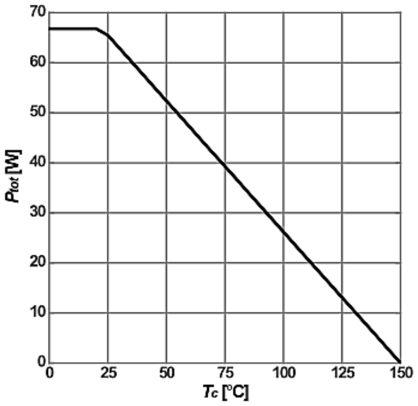


Figure3: Power dissipation

P_{tot}=f(T_C)

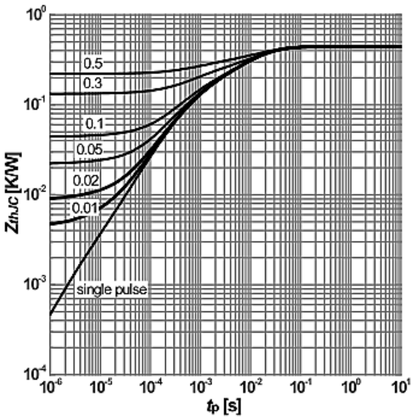


Figure4:Max. transient thermal impedance

Z_{thJC}=f(t_p); parameter: D= t_p/T

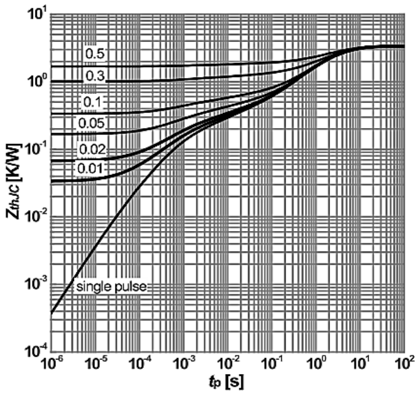


Figure5: Max. transient thermal impedance

Z_{thJC}=f(t_p); parameter: D= t_p/T

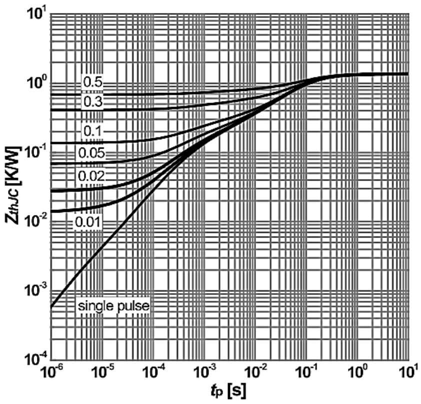


Figure6: Max. transient thermal impedance

Z_{thJC}=f(t_p); parameter: D= t_p/T

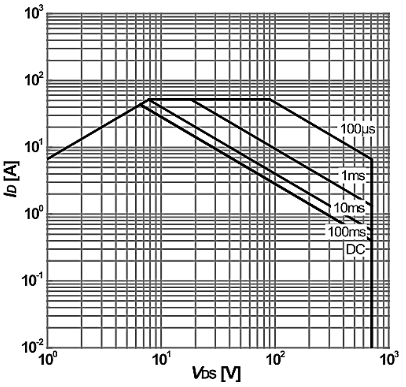


Figure 7: Safe operating area (Non FullPAK)
I_D=f(V_{DS}); T_j=25°C; D=0; parameter: t_p

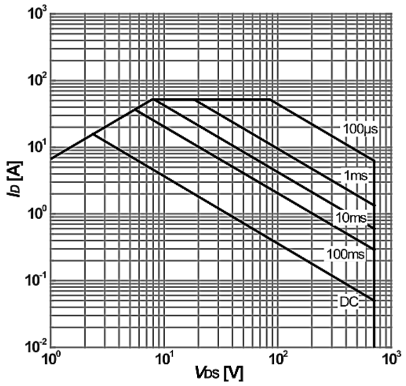


Figure8 : Safe operating area (Non FullPAK)
I_D=f(V_{DS}); T_j=25°C; D=0; parameter: t_p

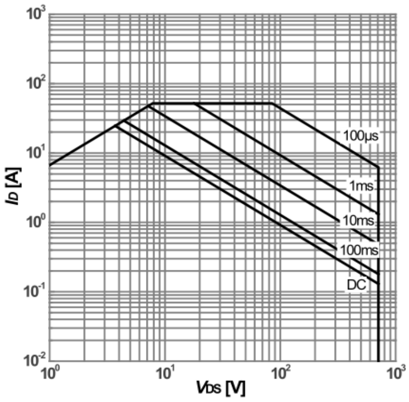


Figure9 : TSafe operating area (FullPAK-TO220A)
R_{DS}(on)=f(I_D); T_j=25°C; parameter: V_{GS}

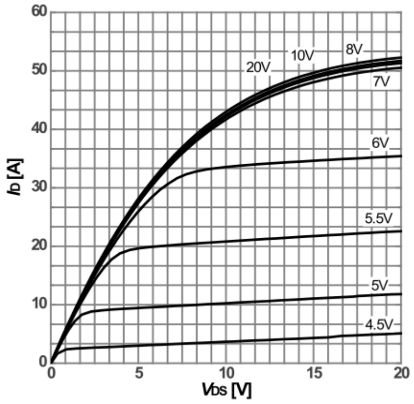


Figure 10: Typ. output characteristics
R_{DS}(on)=f(T_j); I_D=3.2A; V_{GS}=10V

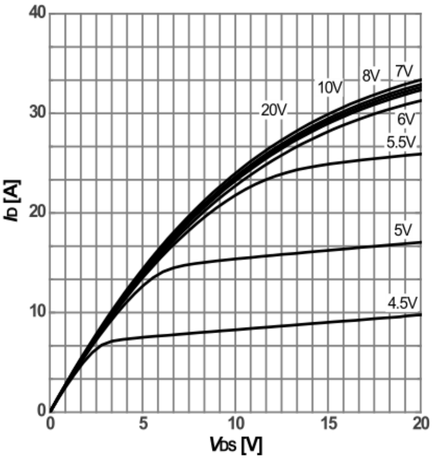


Figure 11: Typ. output characteristics
I_D=f(V_{DS}); T_j=125°C; parameter: V_{GS}

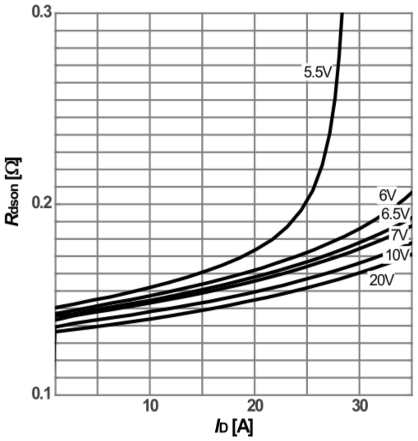
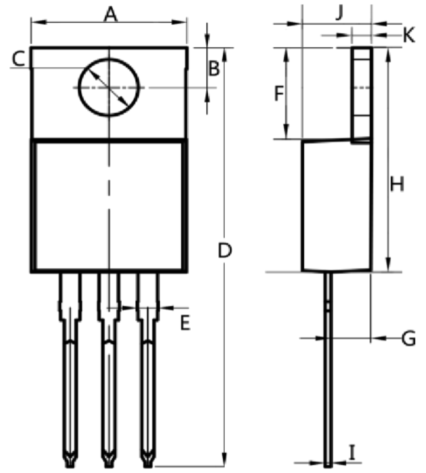


Figure 12: Type. gate charge
R_{DS}(on)=f(I_D); T_j=25°C; parameter: V_{GS}

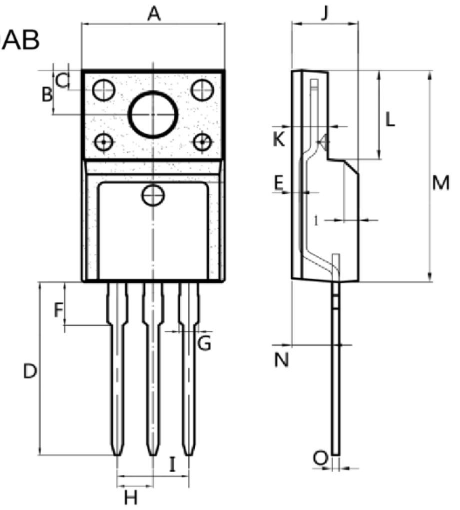
Package Mechanical Data-TO-X

TO-220AB



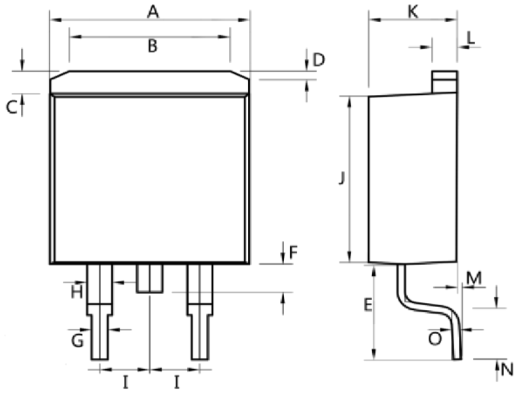
Dim.	Min.	Max.
A	10.0	10.4
B	2.5	3.0
C	3.5	4.0
D	28.0	30.0
E	1.1	1.5
F	6.2	6.6
G	2.9	3.3
H	15.0	16.0
I	0.35	0.45
J	4.3	4.7
K	1.2	1.4
All Dimensions in millimeter		

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