

500V N-Channel Enhancement Mode MOSFET

Description

The AP13N50F/P/T-B 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

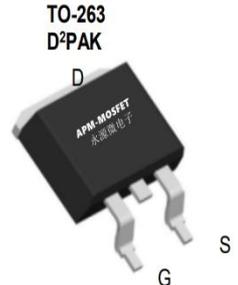
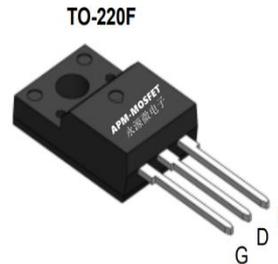
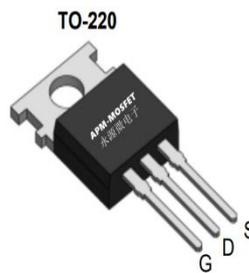
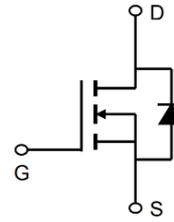
$V_{DS} = 500V$ $I_D = 13A$

$R_{DS(ON)} < 500m\Omega$ @ $V_{GS}=10V$ (Type: 420m Ω)

Application

Uninterruptible Power Supply(UPS)

Power Factor Correction (PFC)



Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
AP13N50F	TO-220F-3L	AP13N50F XXX YYYY	1000
AP13N50P	TO-220-3L	AP13N50P XXX YYYY	1000
AP13N50T	TO-263-3L	AP13N50T XXX YYYY	800

Absolute Maximum Ratings ($T_c=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Value	Unit
V_{DSS}	Drain-Source Voltage ($V_{GS} = 0V$)	500	V
$I_D@T_c=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	13	A
$I_D@T_c=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	9.2	A
I_{DM}	Pulsed Drain Current (note1)	52	A
V_{GS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulse Avalanche Energy (note2)	400	mJ
I_{AS}	Avalanche Current (note1)	13	A
P_D	Power Dissipation ($T_c = 25^\circ C$)	31	W
T_J, T_{stg}	Operating Junction and Storage Temperature Range	-55~+150	$^\circ C$
R_{thJC}	Thermal Resistance, Junction-to-Case	3.92	$^\circ C/W$
R_{thJA}	Thermal Resistance, Junction-to-Ambient	62.5	$^\circ C/W$

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BVDSS	Drain-Source Breakdown Voltage	VGS=0V, ID=250 μ A	500			V
IDSS	Zero Gate Voltage Drain Current	VDS=500V, VGS=0V			1	μ A
		VDS=400V, TC=125 $^{\circ}$ C			10	μ A
IGSSF	Gate-Body Leakage Current, Forward	VGS=30V, VDS=0V			100	nA
IGSSR	Gate-Body Leakage Current, Reverse	VGS=-30V, VDS=0V			-100	nA
VGS(TH)	Gate Threshold voltage	VDS=VGS, ID =250 μ A	2.5	3.5	4.5	V
RDS(On)	Drain-Source on-state resistance	VGS=10V, ID=6.5A, T _J =25 $^{\circ}$ C		420	500	m Ω
gFS	Forward Transconductance	VDS=40V, ID=6.5A (Note 4)		12.0		S
Ciss	Input capacitance	VDS=25V, VGS=0V, f=1.0 MHz		1175		pF
Coss	Output capacitance			176		pF
Crss	Reverse transfer capacitance			6		pF
td(on)	Turn On Delay Time	VDD = 250 V, ID = 13 A, RG = 25 Ω (Note 4, 5)		26		ns
tr	Rising Time			39		ns
td(off)	Turn Off Delay Time			87		ns
tf	Fall Time			42		ns
Qg	Total Gate Charge		VDS = 400 V, ID = 13 A, VGS = 10 V (Note 4, 5)		22	
Qgs	Gate-Source Charge			6.4		nC
Qgd	Gate-Drain Charge			6.8		nC
ISM	Maximum Pulsed Drain-Source Diode Forward Current				52	A
VSD	Diode Forward Voltage	VGS= 0 V, IS = 13 A			1.2	V
trr	Reverse Recovery Time	VGS = 0 V, IS = 13 A, dIF / dt = 100 A/ μ s Note 4)		334		ns
Qrr	Reverse Recovery Charge			2.6		μ C

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=4.1Mh IAS=16A, VDD=50V, RG=25 Ω , Starting T_J = 25 $^{\circ}$ C
- 3、 The test condition is Pulse Test: Pulse width \leq 300 μ s, Duty Cycle \leq 1%
- 4、 The power dissipation is limited by 150 $^{\circ}$ C 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

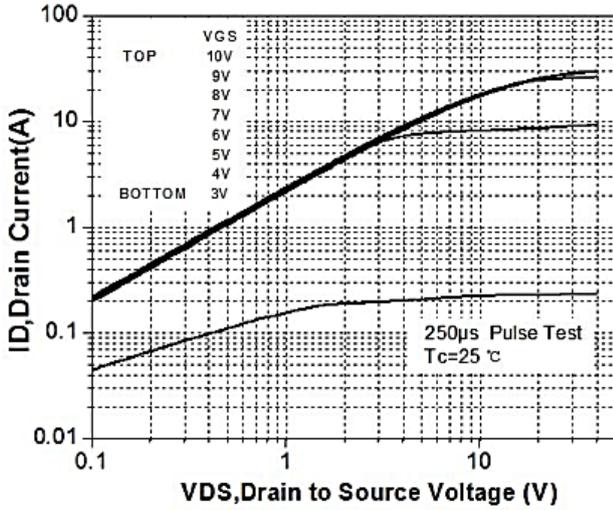


Figure 1. On-Region Characteristics

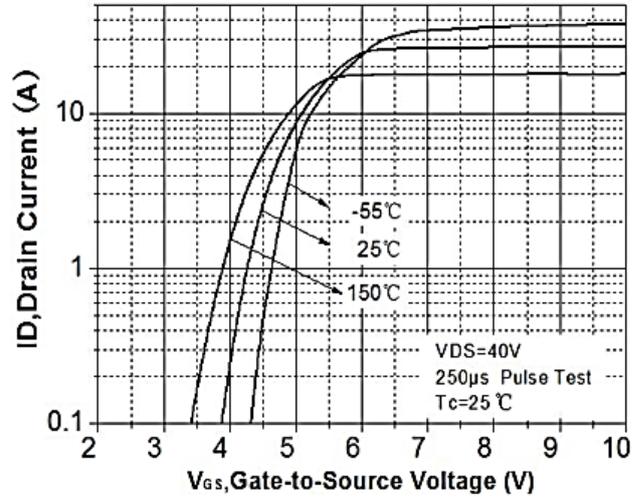


Figure 2. Transfer Characteristics

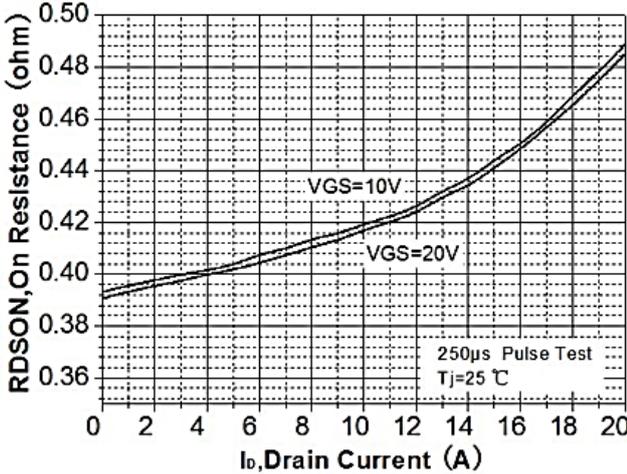


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

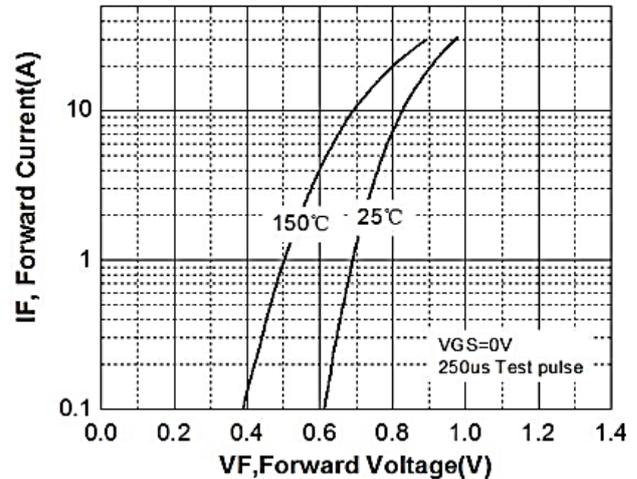


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

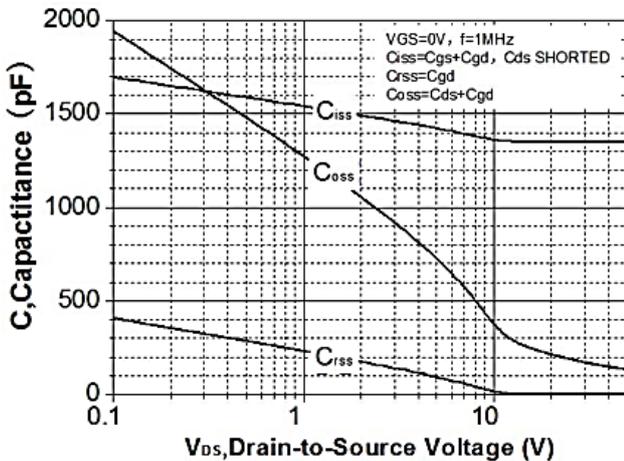


Figure 5. Capacitance Characteristics

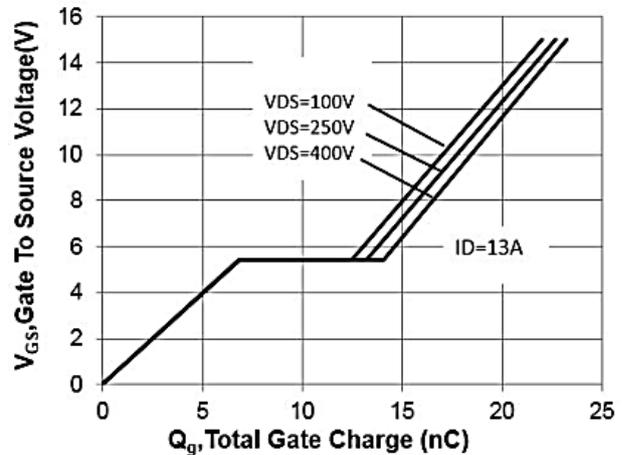


Figure 6. Gate Charge Characteristics

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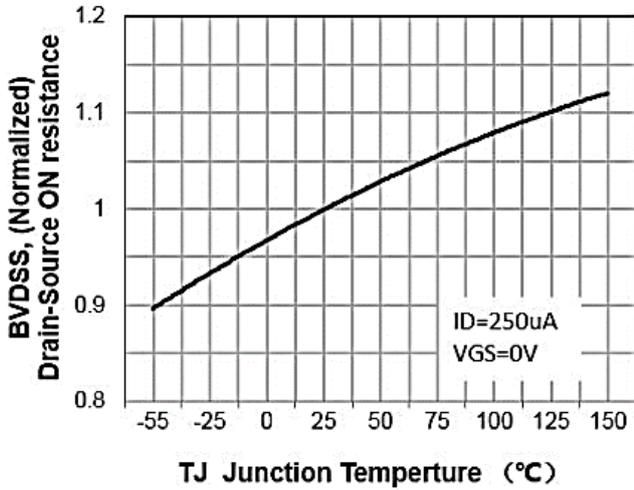


Figure 7. Breakdown Voltage Variation vs Temperature

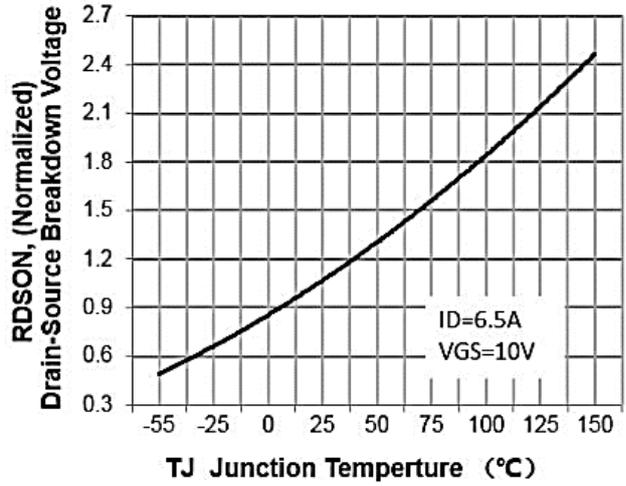


Figure 8. On-Resistance Variation vs Temperature

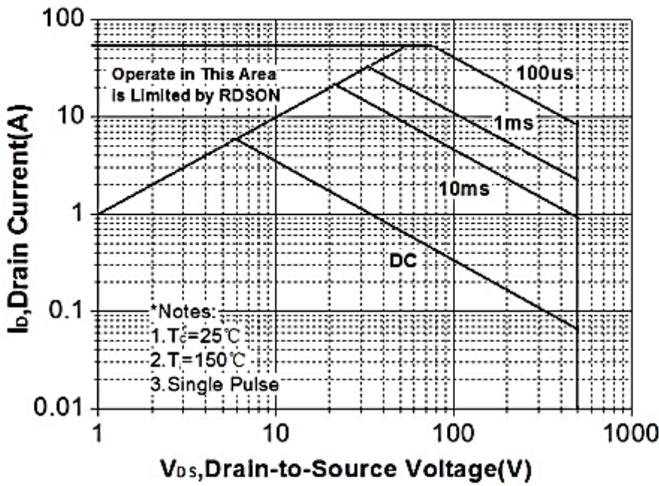


Figure 9. Maximum Safe Operating Area

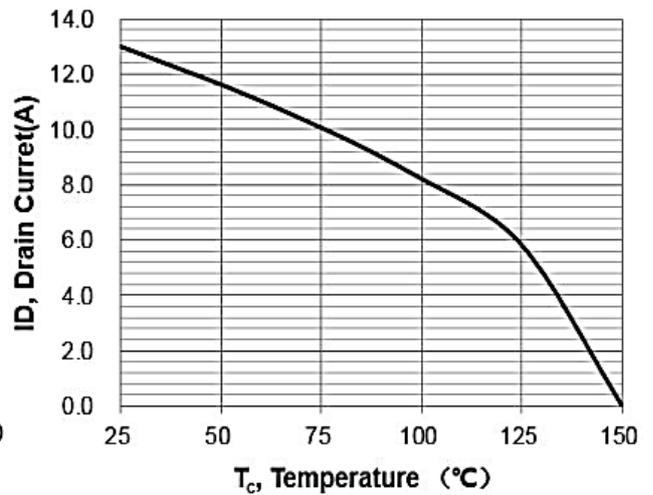


Figure 10. Maximum Drain Current vs Case Temperature

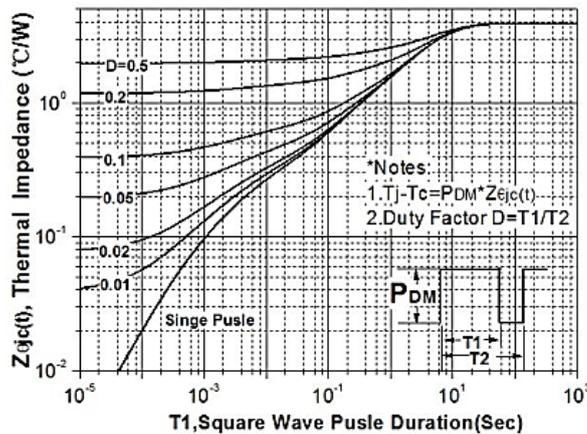
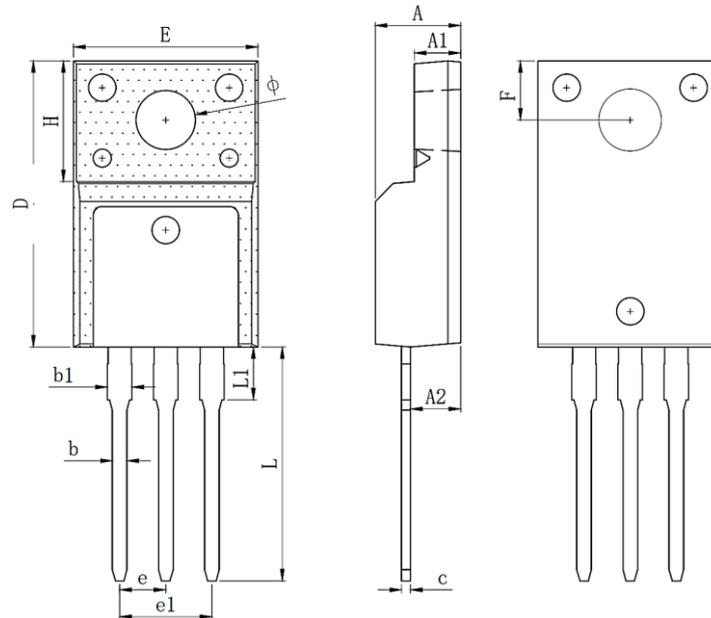


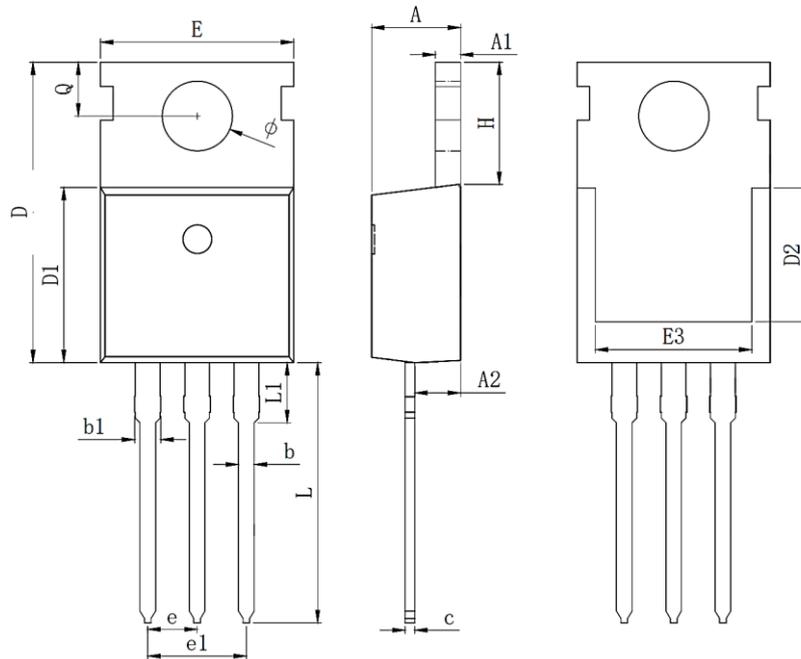
Figure 11. Transient Thermal Response Curve

Package Mechanical Data: TO-220F-3L



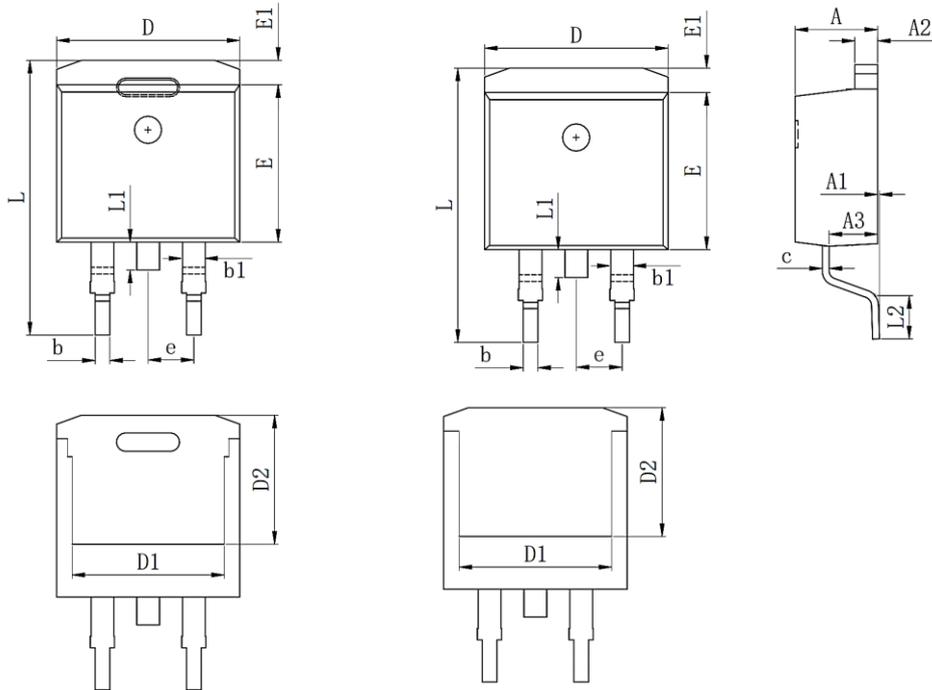
Symbol	Dim in mm		
	Min	Typ	Max
A	4.5	4.7	5.0
A1	2.34	2.54	2.84
A2	2.4	2.9	3.4
b	0.7	0.8	0.95
b1	1.05	1.35	1.55
c	0.4	0.5	0.65
D	15.57	15.87	16.17
H	6.7REF		
E	9.86	10.16	10.46
e	2.54BSC		
e1	5.08BSC		
L	12.65	12.98	13.3
L1	2.78	3.08	3.38
F	3.15	3.3	3.55
φ	3	3.3	3.65

Package Mechanical Data: TO-220C-3L



Symbol	Dim in mm		
	Min	Typ	Max
A	4.25	4.5	4.7
A1	1.15	1.3	1.45
A2	2.15	2.35	2.55
b	0.65	0.8	0.95
b1	1.15	1.35	1.55
c	0.35	0.5	0.65
D	14.3	15.3	16.3
D1	8.8	9.1	9.4
D2	6.3REF		
E	9.7	10	10.3
E3	7	8	9
e	2.54BSC		
e1	5.08BSC		
L	12.7	13.5	13.9
L1		3.1	3.4
H	6	6.5	6.95
Q	2.6	2.8	3
ϕ	3.4	3.6	3.8

Package Mechanical Data: TO-263C-3L



Symbol	Dim in mm		
	Min	Typ	Max
A	4.37	4.57	4.77
A1	0		0.25
A2	1.22	1.27	1.42
A3	2.49	2.69	2.89
b	0.7	0.81	0.96
b1	1.17	1.27	1.47
c	0.3	0.38	0.53
D	9.86	10.16	10.36
D1	8.4REF		
D2	7.073REF		
E	8.5	8.7	8.9
E1	1.07	1.27	1.47
e	2.54BSC		
L	17.7	15.1	15.5
L1	1.4	1.55	1.7
L2	2	2.3	2.6
H	6	6.5	6.95
Q	2.6	2.8	3
φ	3.4	3.6	3.8



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Edition	Date	Change
REV1.0	2024/1/31	Initial release

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