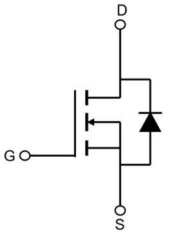
AP90N04K

N-Channel Enhancement Mosfet

DATA SHEET

Features

- 40V,80A
  $R_{DS(ON)}$ < 4.5mΩ @V_{GS}=10V TYP: 3.8mΩ
  $R_{DS(ON)}$ < 6.0mΩ @V_{GS}=4.5V TYP: 5.0mΩ
- Lead free and Green Device Available
- Excellent $R_{DS(ON)}$ and Low Gate Charge
- Lead free product Fast switching speed



Schematic Diagram

Applications

- Load Switch
- PWM Application
- Power management



Marking and pin assignment

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
90N04K	AP90N04K	TO-252	-	-	2500

ABSOLUTE MAXIMUM RATINGS (T_J=25℃ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	±20	V
Continuous Drain Current (Tc=25℃) (1)	I_D	80	A
Continuous Drain Current (Tc=100℃)	I_D	50	A
Pulsed Drain Current (1)	I_{DM}	320	A
Drain Power Dissipation	P_D	35	W
Single Pulsed Avalanche Energy (2)	E_{AS}	324	mJ
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	52	℃/W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	3.5	℃/W
Junction Temperature	T_J	-55~ +150	℃
Storage Temperature	T_{STG}	-55~ +150	℃

Notes:

1) Repetitive Rating: pulse width limited by maximum junction temperature
2) EAS condition : T_J=25℃, V_{DD}=30V, V_G=10V, L=0.5mH, R_g=25Ω, I_{AS}=36A

MOSFET ELECTRICAL CHARACTERISTICS(T_J=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D =250μA	40	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} =40V, V_{GS} = 0V,T_J=25℃	-	-	1	μA
Gate-body leakage current	I_{GSS}	V_{GS} =±20V, V_{DS} = 0V	-	-	±100	nA
Gate threshold voltage	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =250μA	1.0	1.5	2.2	V
Drain-source on-resistance	$R_{DS(on)}$	V_{GS} =10V, I_D =20A	-	3.8	4.5	mΩ
		V_{GS} =4.5V, I_D =10A		5.0	6.0	
Gate resistance	R_g	V_{GS}= 0V, V_{DS}= 0V, f=1.0MHz	-	1.6	-	Ω
Dynamic characteristics						
Input Capacitance	C_{iss}	V_{DS} =20V, V_{GS} =0V, f =1.0MHz	-	3042	-	pF
Output Capacitance	C_{oss}		-	386	-	
Reverse Transfer Capacitance	C_{rss}		-	232	-	
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	V_{DD}=20V, I_D=30A, R_L=1Ω ,R_G=3Ω V_{GS}=10V	-	8	-	ns
Turn-on rise time	t_r		-	18	-	
Turn-off delay time	$t_{d(off)}$		-	24	-	
Turn-off fall time	t_f		-	14	-	
Total Gate Charge	Qg	V_{DS}=20V, I_D=30A, V_{GS}=10V	-	57	-	nC
Gate-Source Charge	Qgs		-	9	-	
Gate-Drain Charge	Qgd		-	11	-	
Source-Drain Diode characteristics						
Diode Forward voltage	V_{SD}	T_J=25℃, V_{GS} =0V, I_S=30A	-	-	1.2	V
Diode Forward current	I_S	T_C=25℃	-	-	80	A
Body Diode Reverse Recovery Time	trr	T_J=25℃， IF=5A,di/dt=100A/us		22		ns
Body Diode Reverse Recovery Charge	Qrr	T_J=25℃， IF=5A,di/dt=100A/us		11		uc

Test Circuit

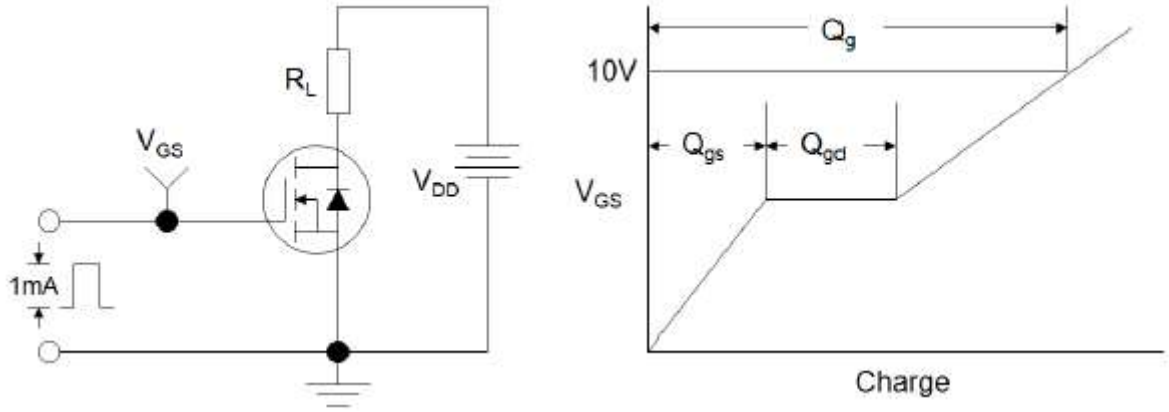


Figure1:Gate Charge Test Circuit & Waveform

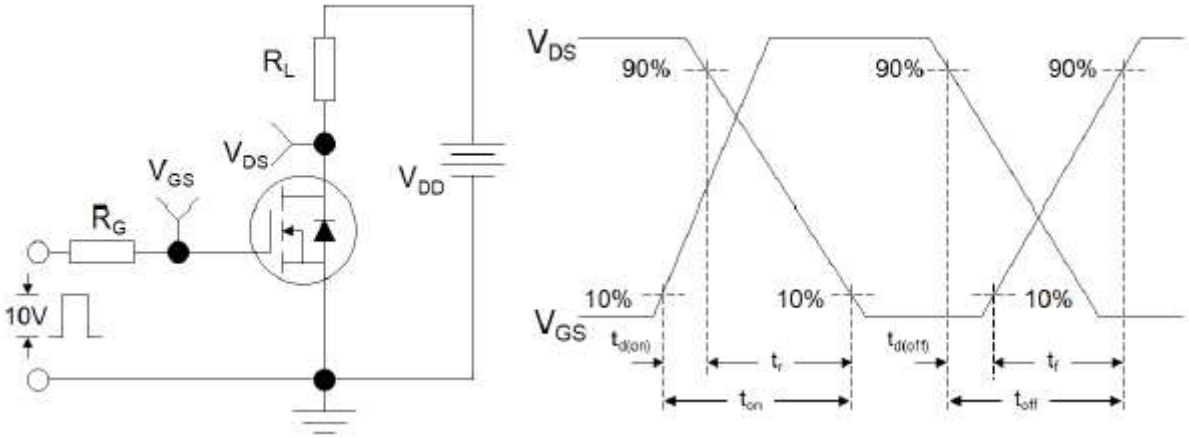


Figure 2: Resistive Switching Test Circuit & Waveforms

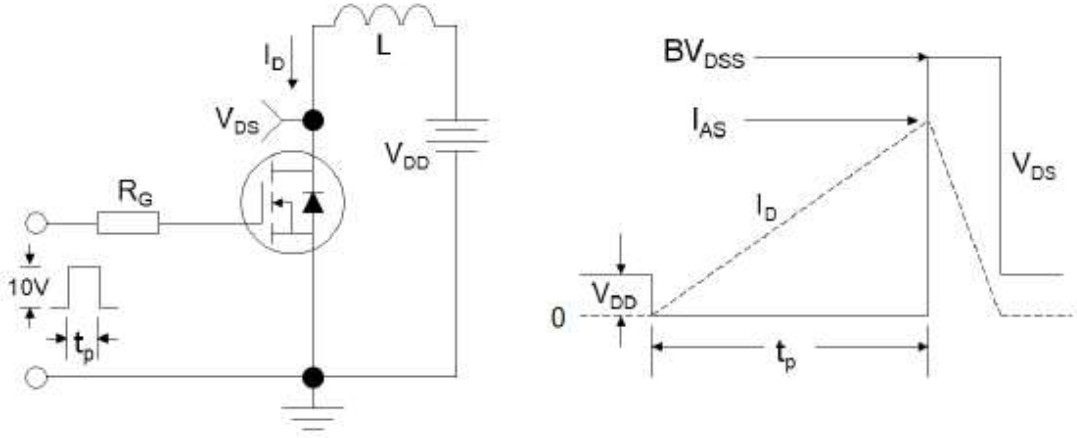


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

Typical Performance Characteristics

Figure1: Output Characteristics

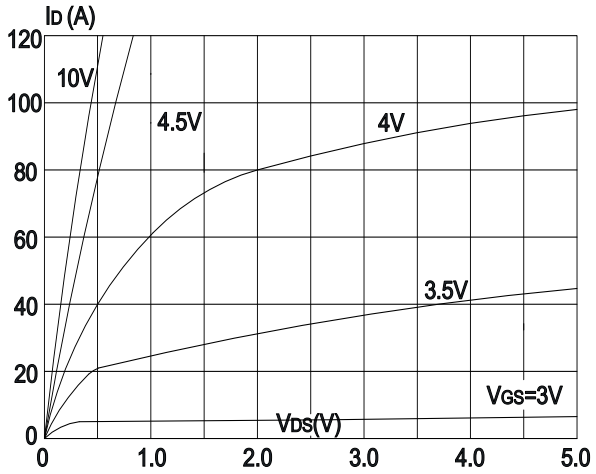


Figure 2: Typical Transfer Characteristics

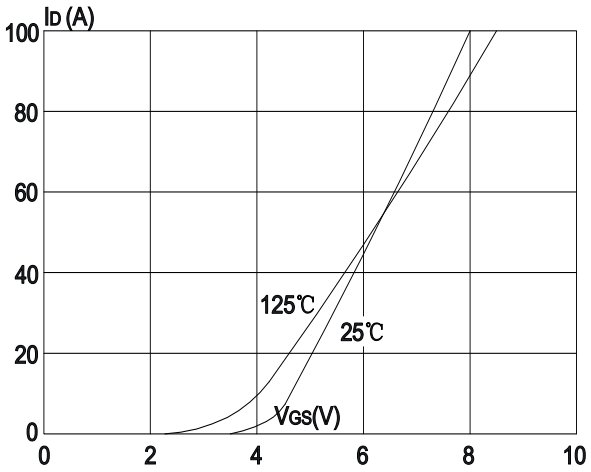


Figure 3: On-resistance vs. Drain Current

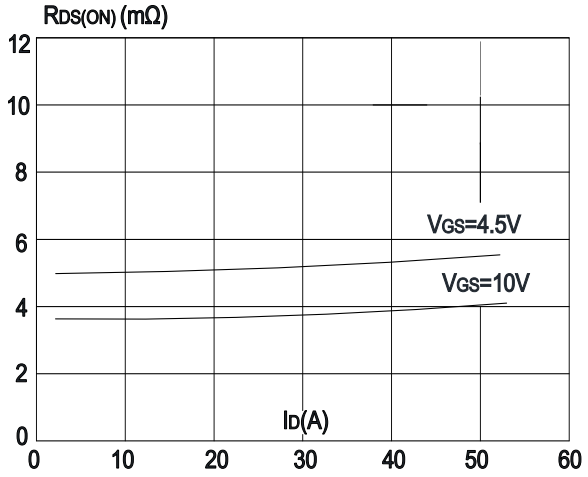


Figure 4: Body Diode Characteristics

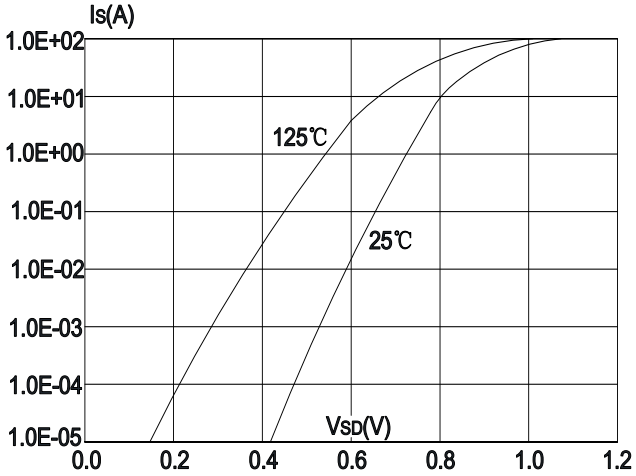


Figure 5: Gate Charge Characteristics

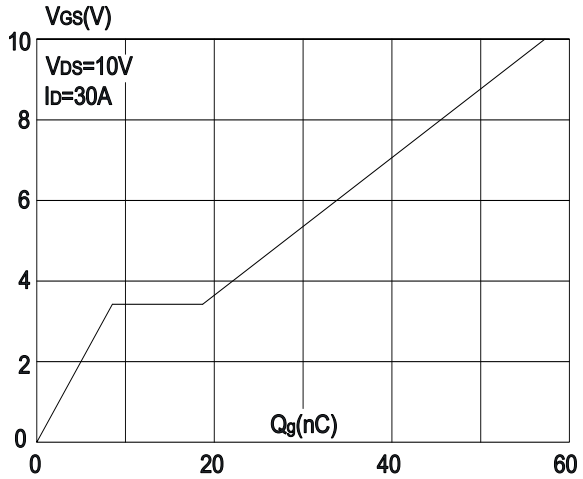
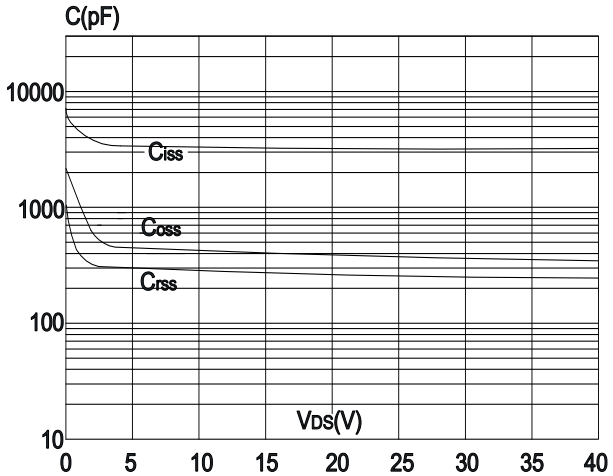


Figure 6: Capacitance Characteristics



Typical Performance Characteristics

Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

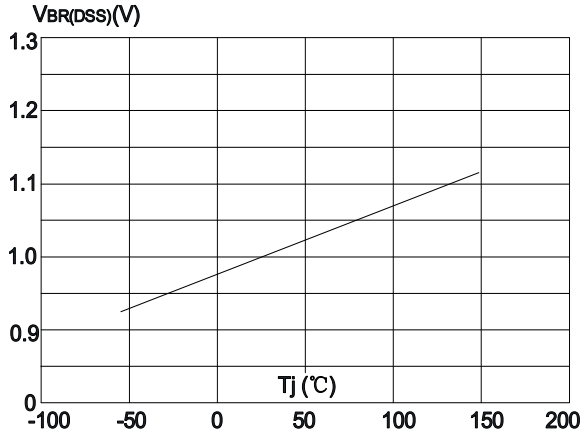


Figure 8: Normalized on Resistance vs. Junction Temperature

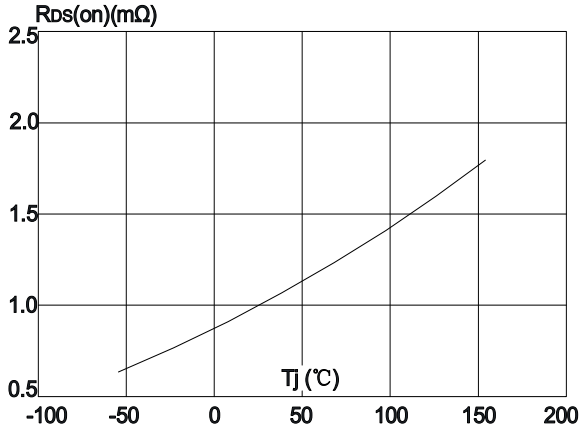


Figure 9: Maximum Safe Operating Area

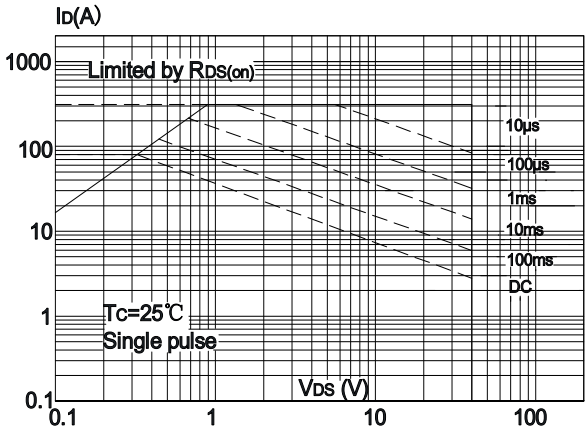


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

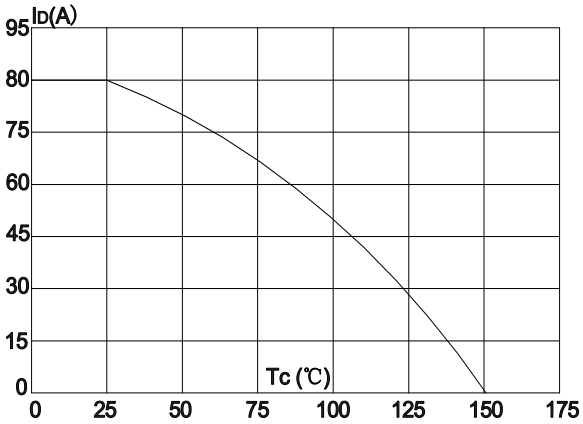
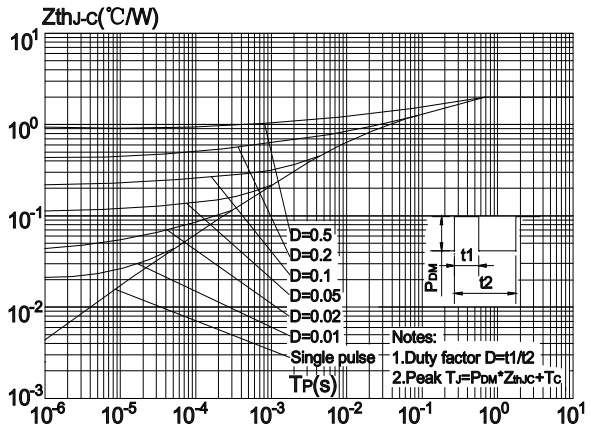
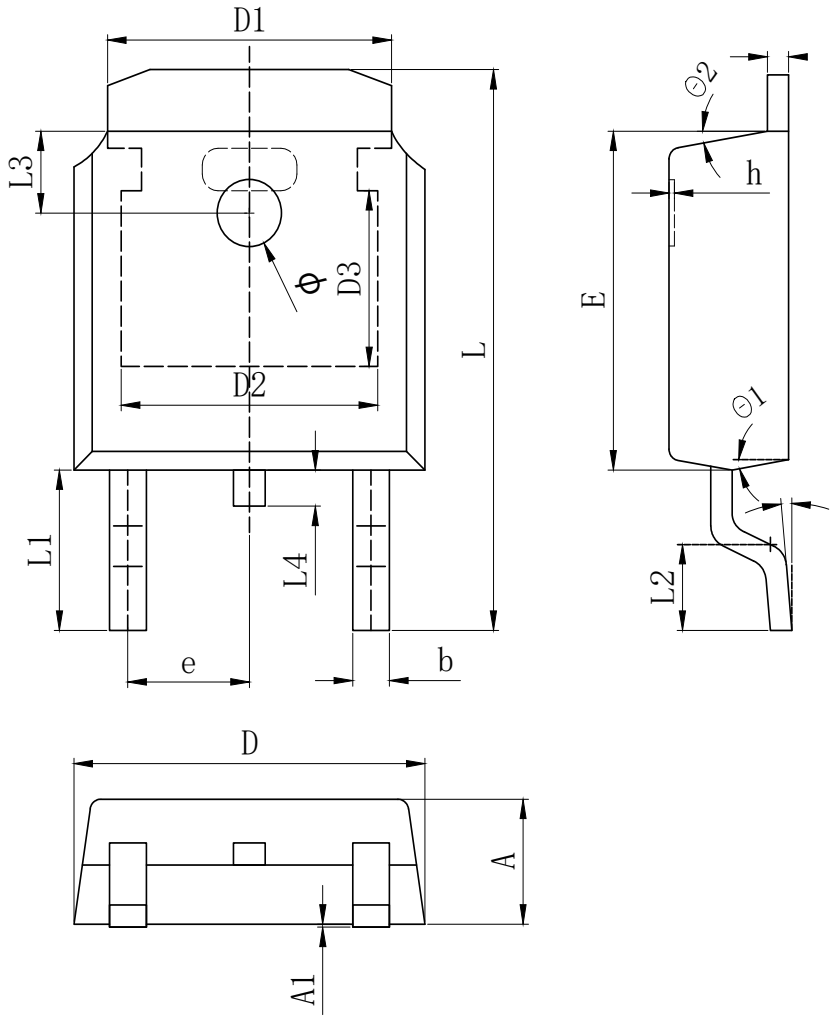


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



TO-252 Package Information



SYMBOL	MILLIMETER		
	MIN	Typ.	MAX
A	2.200	2.300	2.400
A1	0.000		0.127
b	0.640	0.690	0.740
c(电镀后)	0.460	0.520	0.580
D	6.500	6.600	6.700
D1	5.334 REF		
D2	4.826 REF		
D3	3.166 REF		
E	6.000	6.100	6.200
e	2.286 TYP		
h	0.000	0.100	0.200
L	9.900	10.100	10.300
L1	2.888 REF		
L2	1.400	1.550	1.700
L3	1.600 REF		
L4	0.600	0.800	1.000
Φ	1.100	1.200	1.300
θ	0°		8°
θ1	9° TYP		
θ2	9° TYP		

Revision History

Revision	Release	Remark
V1.0	2024/04/09	Initial Release
V1.1	2025/04/06	Update the $R_{DS(on)}$ value

Disclaimer

The information given in this document describes the independent performance of the product,but similar performance is not guaranteed under other working conditions,and cannot be guaranteed when installed with other products or equipment.To achieve the required performance of the product in actual scenarios,the customer should conduct a complete application test to assess the functionality of the product.

Allpower assumes no responsibility for equipment failures result from using products at values that exceed the ratings,operating conditions,or other parameters listed in the product specifications.

The product described in this specification is not applicable for aerospace or other applications which requires high reliability.Customers using or selling these products for use in medical,life-saving,or life-sustaining applications do so at their own risk and agree to fully indemnify.

Due to product or technical improvements,the information described or contained herein may be changed without prior notice.