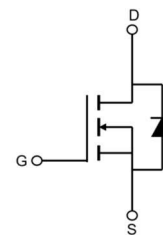


Features

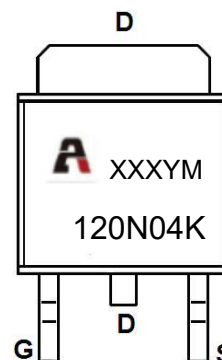
- 40V, 120A
 $R_{DS(ON)} < 4.2m\ \Omega @ V_{GS}=10V$ TYP:3.3m Ω
 $R_{DS(ON)} < 7.5m\ \Omega @ V_{GS}=4.5V$ TYP:5.4m Ω
- Advanced Trench Technology
- High Power and current handing capability
- Lead free product is acquired



Schematic Diagram

Application

- PWM applications
- Load Switch
- Power management



Marking and pin assignment

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
120N04K	AP120N04K	TO-252	13inch	-	2500

ABSOLUTE MAXIMUM RATINGS ($T_J=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_C = 25^\circ\text{C}$)	I_D	120	A
Continuous Drain Current ($T_C = 100^\circ\text{C}$)	I_D	78	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	480	A
Single Pulsed Avalanche Energy ⁽²⁾	E_{AS}	150	mJ
Drain Power Dissipation	P_D	90	W
Thermal Resistance from Junction to Case ⁽²⁾	$R_{\theta JC}$	1.4	$^\circ\text{C}/\text{W}$
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	56	$^\circ\text{C}/\text{W}$
Junction Temperature	T_J	150	$^\circ\text{C}$
Storage Temperature	T_{STG}	-55~ +150	$^\circ\text{C}$

MOSFET ELECTRICAL CHARACTERISTICS(T_J=25°C 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} = 100V, V _{GS} = 0V	-	-	1	μA
Gate-body leakage current	I _{GSS}	V _{GS} = ±20V, V _{DS} = 0V	-	-	±100	nA
Gate threshold voltage ⁽³⁾	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250μA	1	1.6	2.5	V
Drain-source on-resistance ⁽³⁾	R _{DS(on)}	V _{GS} = 10V, I _D = 30A	-	3.3	4.2	mΩ
		V _{GS} = 4.5V, I _D = 20A	-	5.4	7.5	
Forward tranconductance ⁽³⁾	g _{FS}	V _{DS} = 10V, I _D = 30A	-	10	-	S
Dynamic characteristics						
Input Capacitance	C _{iss}	V _{DS} = 20V, V _{GS} = 0V, f = 1MHz	-	5128	-	pF
Output Capacitance	C _{oss}		-	390	-	
Reverse Transfer Capacitance	C _{rss}		-	341	-	
Switching characteristics						
Turn-on delay time	t _{d(on)}	V _{DD} = 20V, I _D = 30A, R _L = 1Ω V _{GS} = 10V, R _G = 3Ω	-	12	-	ns
Turn-on rise time	t _r		-	16	-	
Turn-off delay time	t _{d(off)}		-	39	-	
Turn-off fall time	t _f		-	15	-	
Total Gate Charge	Q _g	V _{DS} = 20V, I _D = 30A, V _{GS} = 10V	-	65	-	nC
Gate-Source Charge	Q _{gs}		-	12.5	-	
Gate-Drain Charge	Q _{gd}		-	15	-	
Source-Drain Diode characteristics						
Diode Forward voltage ⁽³⁾	V _{DS}	V _{GS} = 0V, I _S = 30A	-	-	1.2	V
Diode Forward current ⁽⁴⁾	I _S		-	-	120	A
Body Diode Reverse Recovery Time	t _{rr}	T _J = 25° , IF = 20A, di/dt = 100A/us		22		ns
Body Diode Reverse Recovery Charge	Q _{rr}	T _J = 25° , IF = 20A, di/dt = 100A/us		11		nc

Notes:

1. Repetitive Rating: pulse width limited by maximum junction temperature
2. EAS Condition: T_J = 25°C, V_{DD} = 20V, R_G = 25 Ω, L = 0.5mH, I_{AS} = 24.5A
3. Pulse Test: pulse width ≤ 300μs, duty cycle ≤ 2%
4. Surface Mounted on FR4 Board, t ≤ 10 sec

Typical Performance Characteristics

Figure 1: Output Characteristics

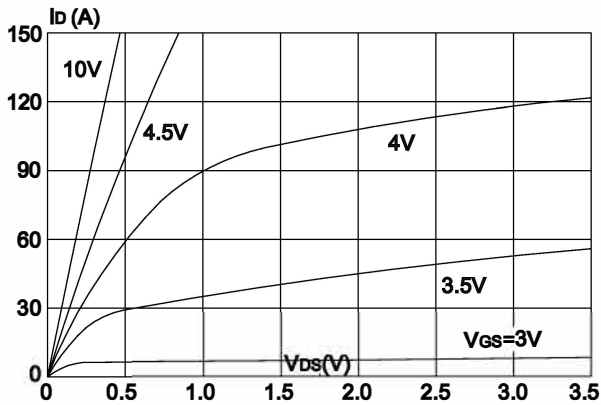


Figure 2: Typical Transfer Characteristics

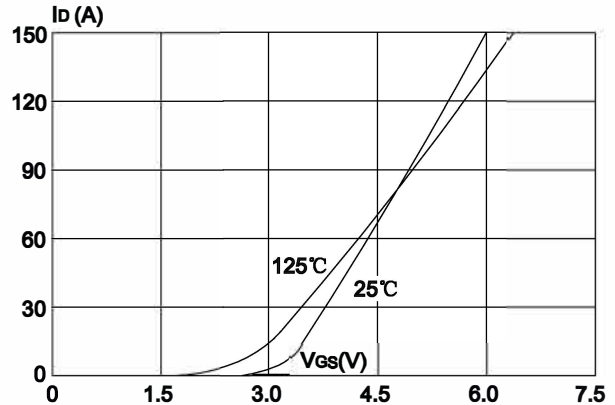


Figure 3: On-resistance vs. Drain Current

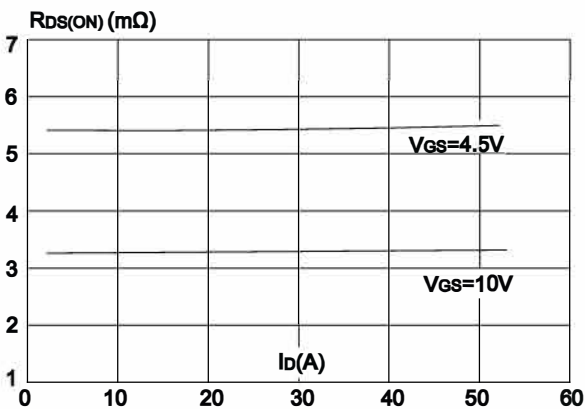


Figure 4: Body Diode Characteristics

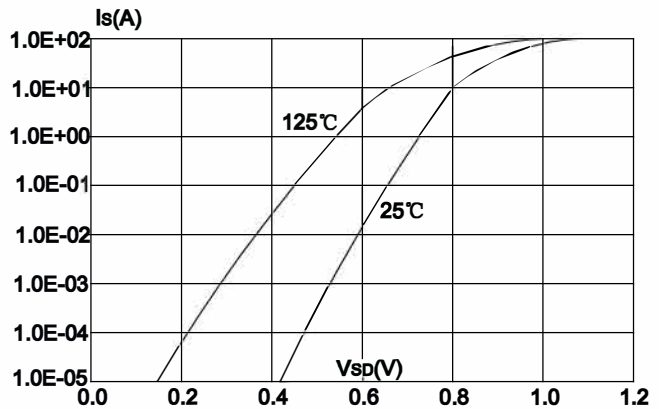


Figure 5: Gate Charge Characteristics

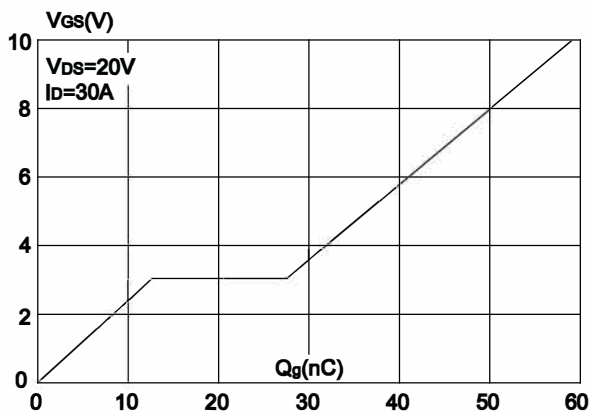


Figure 6: Capacitance Characteristics

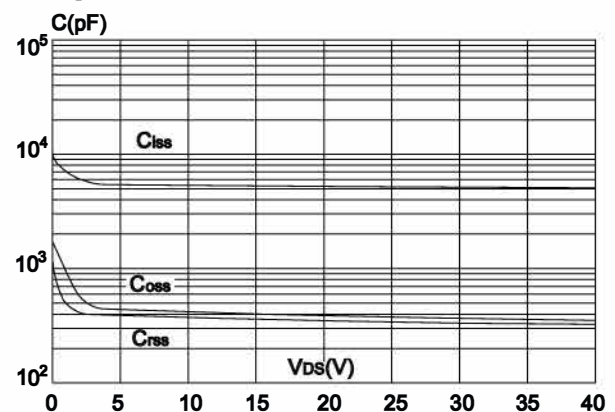


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

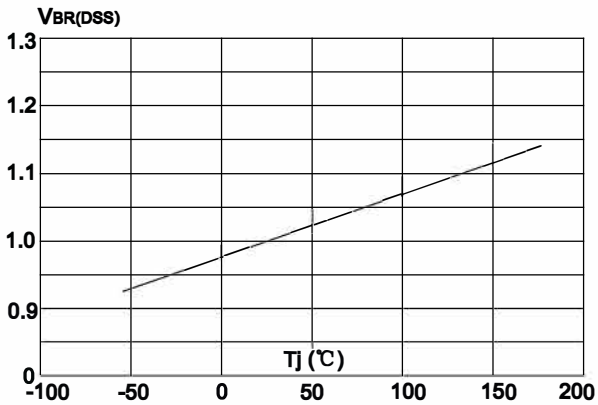


Figure 8: Normalized on Resistance vs. Junction Temperature

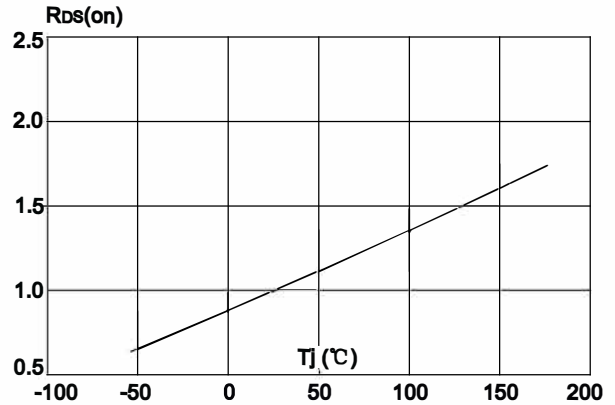


Figure 9: Maximum Safe Operating Area

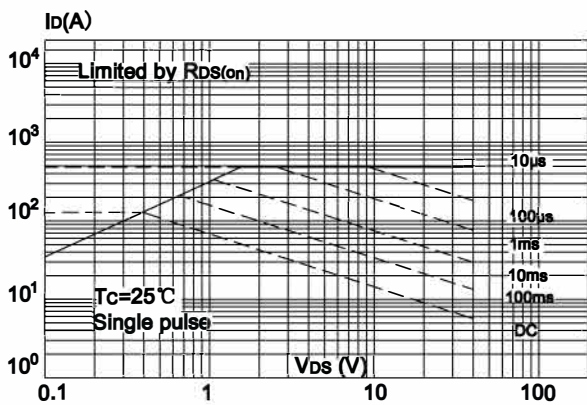
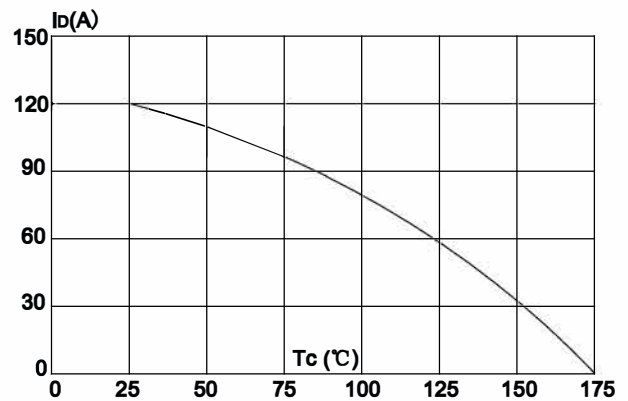
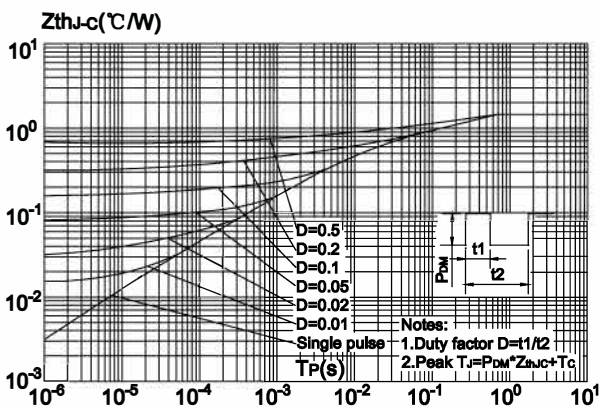


Figure 10: Maximum Continuous Drain Current vs. Case Temperature



Maximum Effective Transient Thermal Impedance, Junction-to-Case



Test Circuit

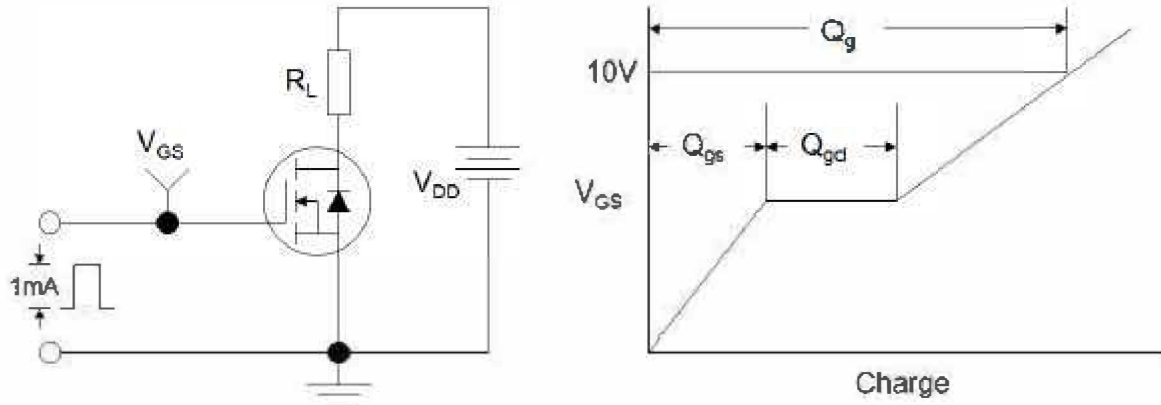


Figure1:Gate Charge Test Circuit & Waveform

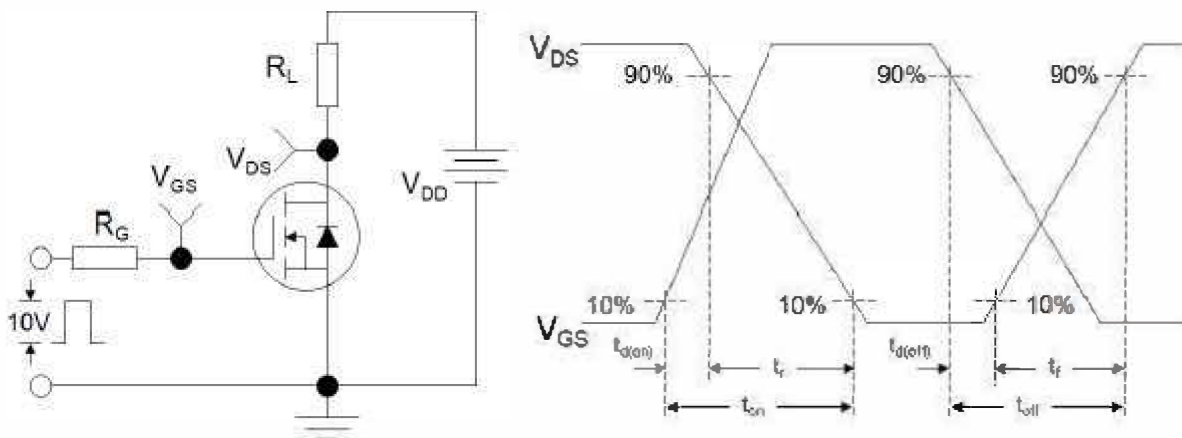


Figure 2: Resistive Switching Test Circuit & Waveforms

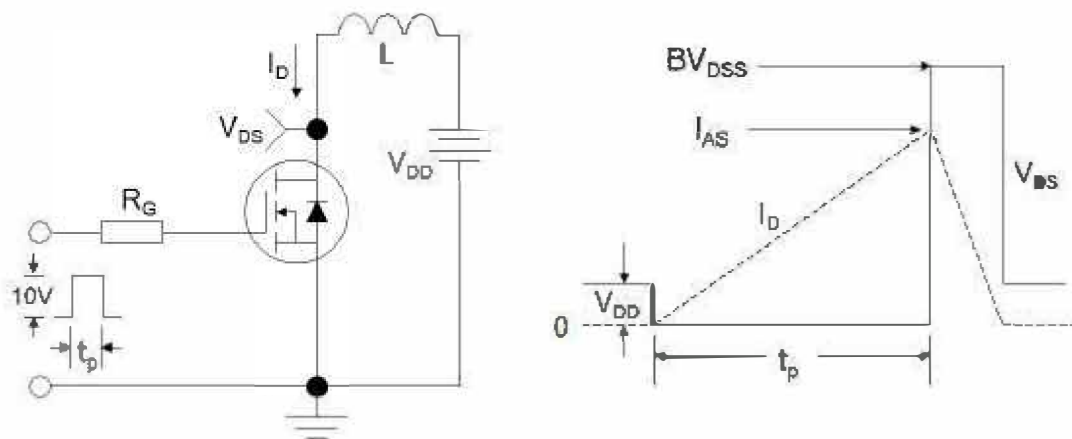
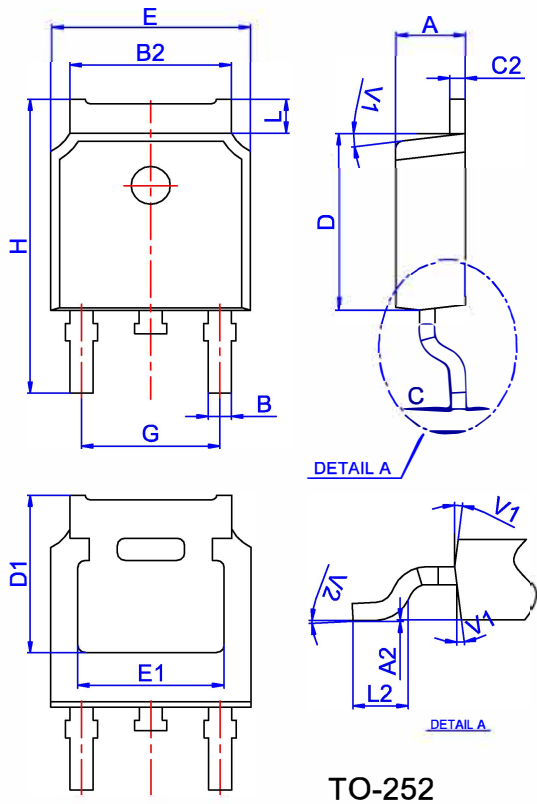


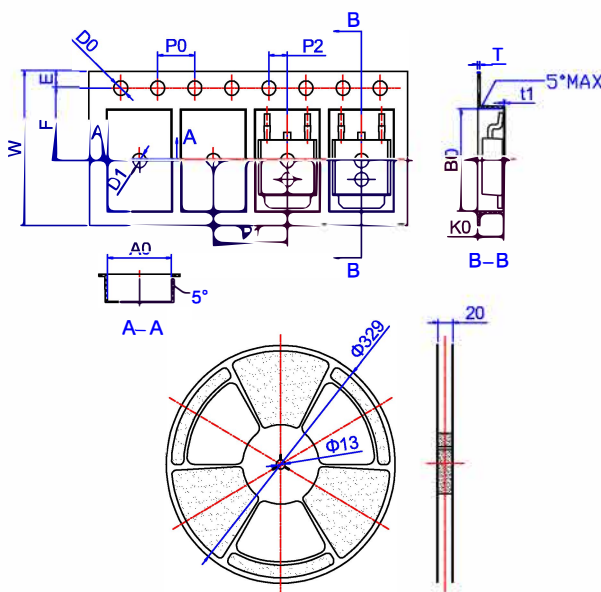
Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

TO-252 Package Information



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 Specification-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

Revision History

Revision	Release	Remark
V1.0	2023/11/28	Initial Release

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.