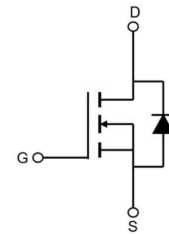
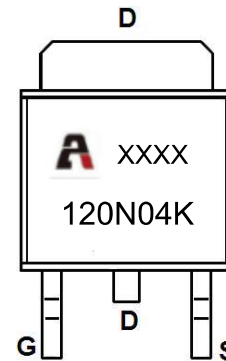


Feature

- 40V,120A
 $R_{DS(ON)} < 3.5m\Omega @ V_{GS}=10V$
 $R_{DS(ON)} < 5.5m\Omega @ V_{GS}=4.5V$
- Advanced Trench Technology
- Lead free product is acquired
- Excellent $R_{DS(ON)}$ and Low Gate Charge



Schematic Diagram



Marking and pin assignment

Application

- PWM applications
- Load Switch
- Power management

Package Marking and Ordering Information

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

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_a = 25^{\circ}C$)	I_D	120	A
Continuous Drain Current ($T_a = 100^{\circ}C$)	I_D	78	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	480	A
Singel Pulsed Avalanche Energy ⁽²⁾	E_{AS}	150	mJ
Power Dissipation	P_D	108	W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	1.4	$^{\circ}C/W$
Junction Temperature	T_J	150	$^{\circ}C$
Storage Temperature	T_{STG}	-55~ +150	$^{\circ}C$

MOSFET ELECTRICAL CHARACTERISTICS($T_a=25^{\circ}\text{C}$ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	40	-	-	V
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 100V, V_{GS} = 0V$	-	-	1	μA
Gate-body leakage current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	± 100	nA
Gate threshold voltage ⁽³⁾	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1	1.5	2.5	V
Drain-source on-resistance ⁽³⁾	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 30A$	-	2.6	3.5	m Ω
		$V_{GS} = 4.5V, I_D = 20A$	-	3.6	5.5	
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	$t_{d(on)}$	$V_{DD} = 20V, I_D = 30A, R_L = 1\Omega$ $V_{GS} = 10V, R_G = 3\Omega$	-	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}	$T_J = 25^{\circ}, I_F = 20A, di/dt = 100A/us$		22		ns
Body Diode Reverse Recovery Charge	Q_{rr}	$T_J = 25^{\circ}, I_F = 20A, di/dt = 100A/us$		11		nc

Notes:

1. Repetitive Rating: pulse width limited by maximum junction temperature
2. EAS Condition: $T_J = 25^{\circ}\text{C}, V_{DD} = 20V, R_G = 25\Omega, L = 0.5mH, I_{AS} = 24.5A$
3. Pulse Test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$
4. Surface Mounted on FR4 Board, $t \leq 10$ sec

Typical Performance Characteristics

Figure 1: Output Characteristics

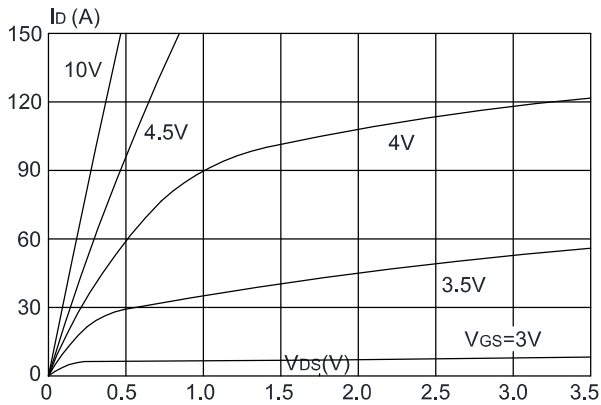


Figure 2: Typical Transfer Characteristics

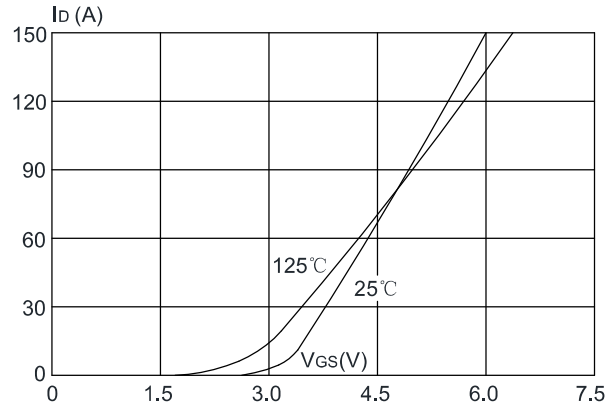


Figure 3: On-resistance vs. Drain Current

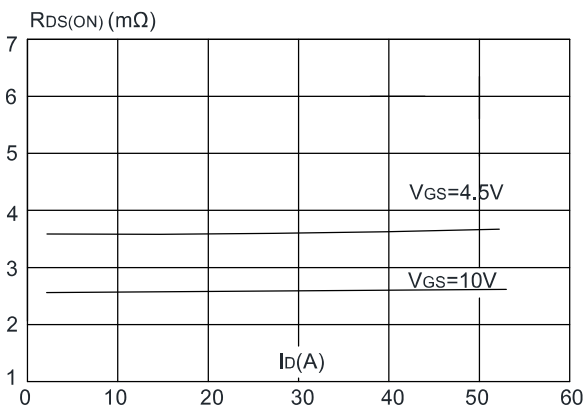


Figure 4: Body Diode Characteristics

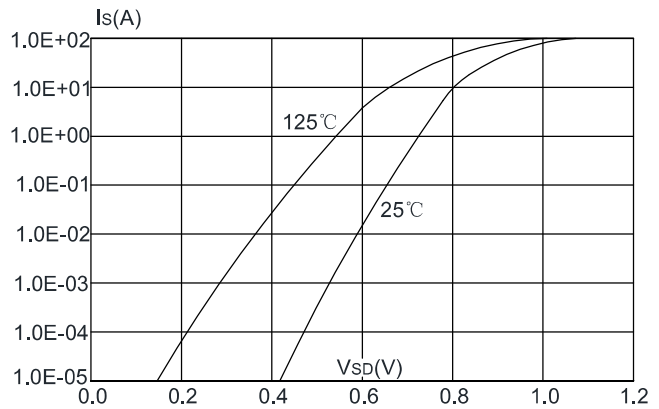


Figure 5: Gate Charge Characteristics

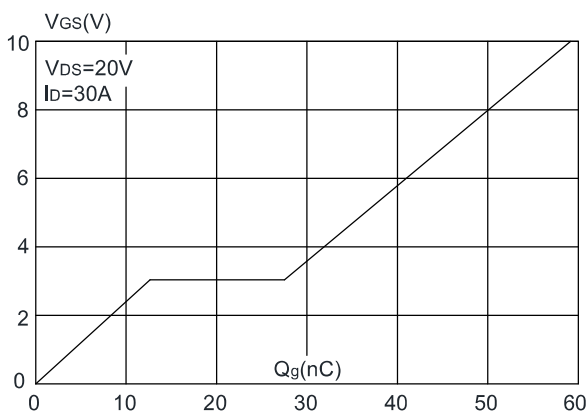


Figure 6: Capacitance Characteristics

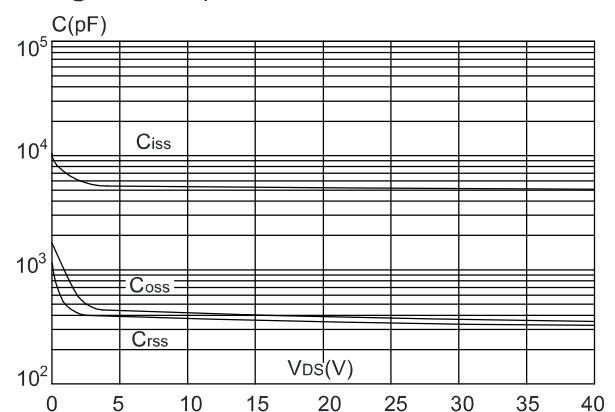


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

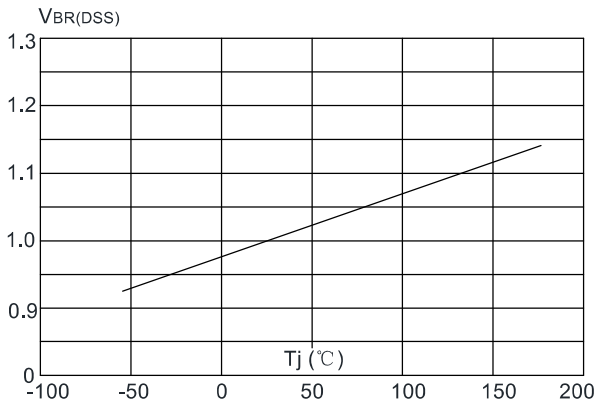


Figure 8: Normalized on Resistance vs. Junction Temperature

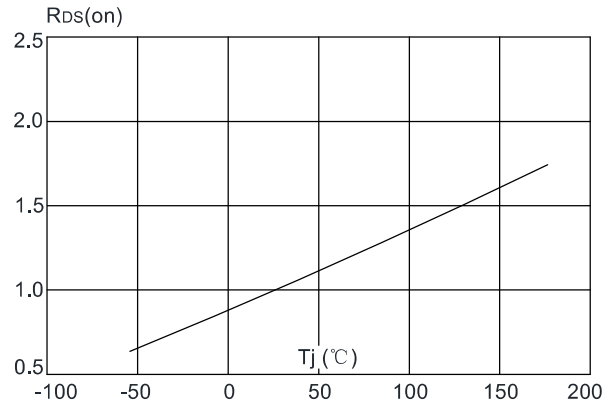


Figure 9: Maximum Safe Operating Area

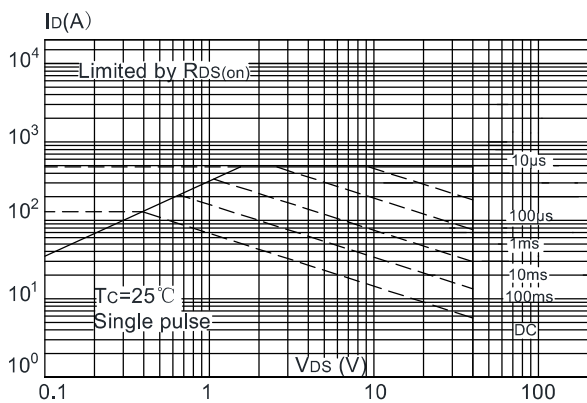
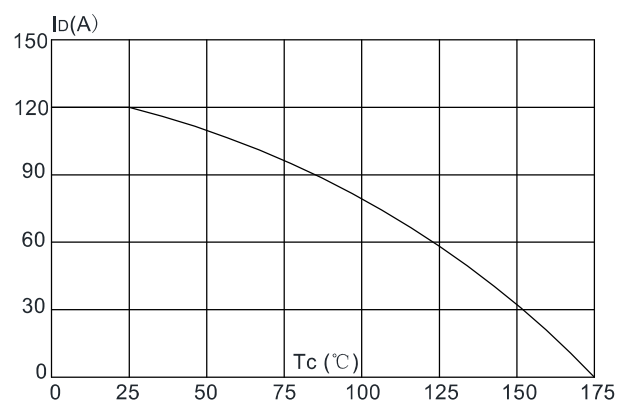
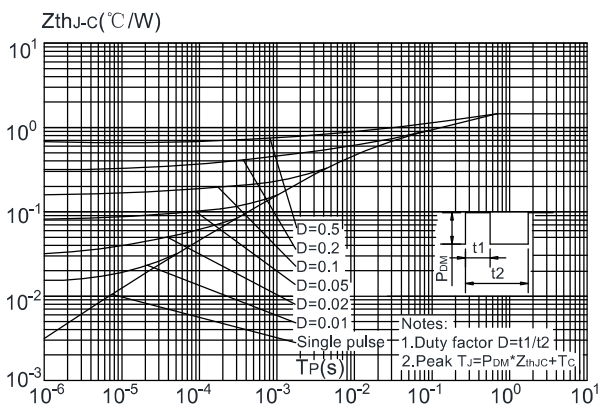


Figure 10: Maximum Continuous Drain Current vs. Case Temperature



Maximum Effective Transient Thermal Impedance, Junction-to-Case



Test Circuit

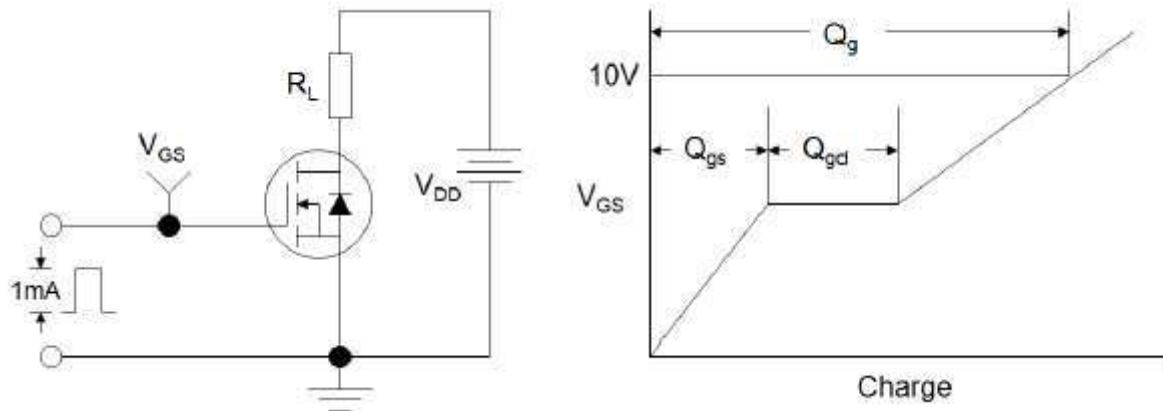


Figure1:Gate Charge Test Circuit & Waveform

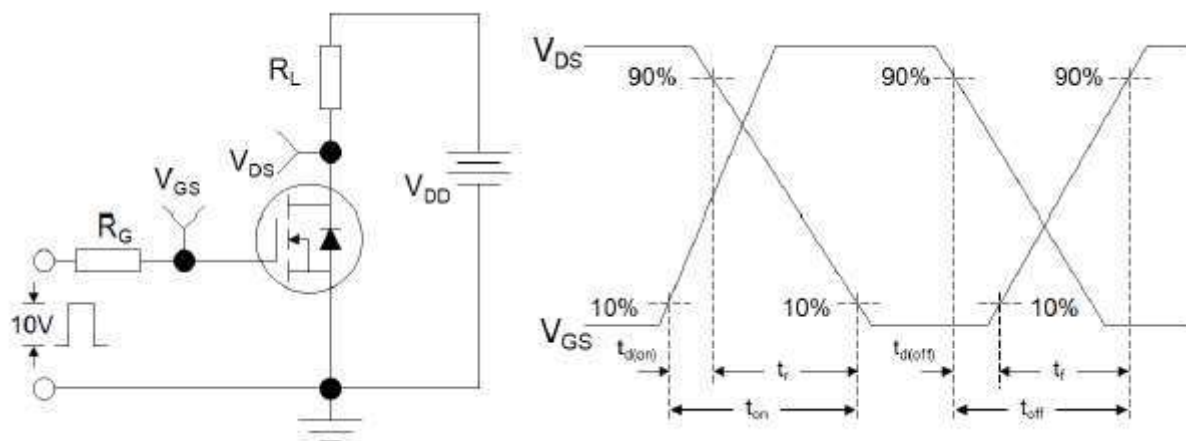


Figure 2: Resistive Switching Test Circuit & Waveforms

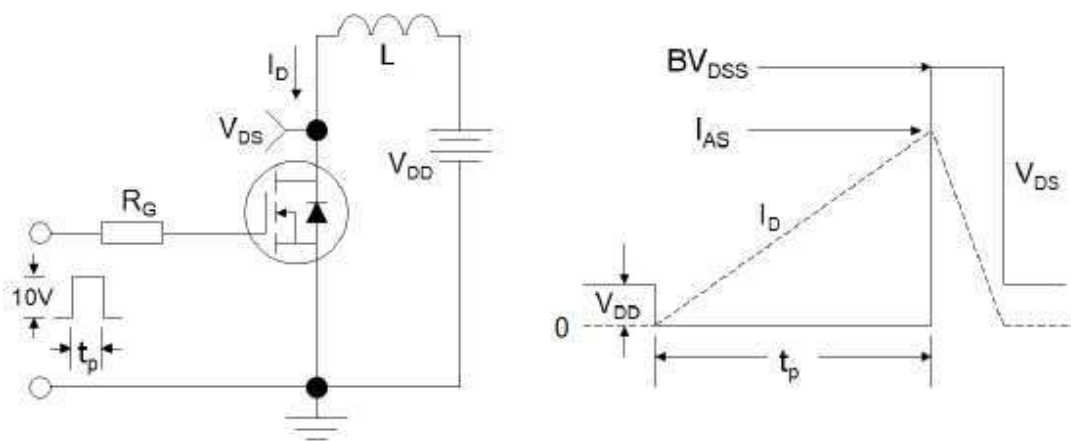


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

