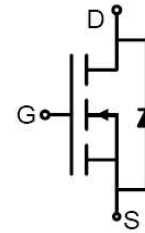


AP90N04Q

N-Channel Enhancement Mosfet

Features

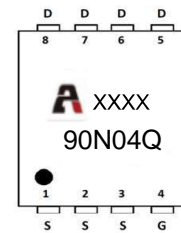
- 40V,80A
 $R_{DS(ON)} < 5.5m\ \Omega @ V_{GS}=10V$ TYP:4.2m Ω
 $R_{DS(ON)} < 10m\ \Omega @ V_{GS}=4.5V$ TYP:6.5m Ω
- Lead free and Green Device Available
- Excellent RDS(ON) and Low Gate Charge
- Lead free product Fast switching speed



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)
90N04Q	AP90N04Q	PDFN3X3	-	-	5000

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	40	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current ($T_a = 25^\circ\text{C}$)	I_D	80	A
Continuous Drain Current ($T_a = 100^\circ\text{C}$)	I_D	52	A
Pulsed Drain Current ⁽¹⁾	I_{DM}	320	A
Power Dissipation ($T_a = 25^\circ\text{C}$)	P_D	77	W
Thermal Resistance from Junction to Case	$R_{\theta JC}$	3.5	$^\circ\text{C}/\text{W}$
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	52	$^\circ\text{C}/\text{W}$
Junction Temperature	T_J	175	$^\circ\text{C}$
Storage Temperature	T_{STG}	-50~ +175	$^\circ\text{C}$

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}	$V_{DS} = 40V, V_{GS} = 0V, T_J = 25^{\circ}\text{C}$	-	-	1	μA
Gate-body leakage current	I_{GSS}	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	± 100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1.0	1.5	2.2	V
Drain-source on-resistance ⁽²⁾	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 30A$	-	4.2	5.5	m Ω
		$V_{GS} = 4.5V, I_D = 20A$		6.5	10	
Dynamic characteristics						
Input Capacitance	C_{iss}	$V_{DS} = 20V, V_{GS} = 0V, f = 1.0\text{MHz}$	-	3042	-	pF
Output Capacitance	C_{oss}		-	386	-	
Reverse Transfer Capacitance	C_{rss}		-	232	-	
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 20V, I_D = 30A, R_L = 1\Omega, R_G = 3\Omega$ $V_{GS} = 10V$	-	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	Q_g	$V_{DS} = 20V, I_D = 30A,$ $V_{GS} = 10V$	-	57	-	nC
Gate-Source Charge	Q_{gs}		-	9	-	
Gate-Drain Charge	Q_{gd}		-	11	-	
Source-Drain Diode characteristics						
Diode Forward voltage	V_{SD}	$T_J = 25^{\circ}\text{C}, V_{GS} = 0V, I_S = 30A$	-	-	1.2	V
Diode Forward current	I_S	$T_C = 25^{\circ}\text{C}$	-	-	80	A
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25^{\circ}\text{C}, I_F = 5A, di/dt = 100A/\mu s$		22		ns
Body Diode Reverse Recovery Charge	Q_{rr}	$T_J = 25^{\circ}\text{C}, I_F = 5A, di/dt = 100A/\mu s$		11		uc

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 0.5\%$

Test Circuit

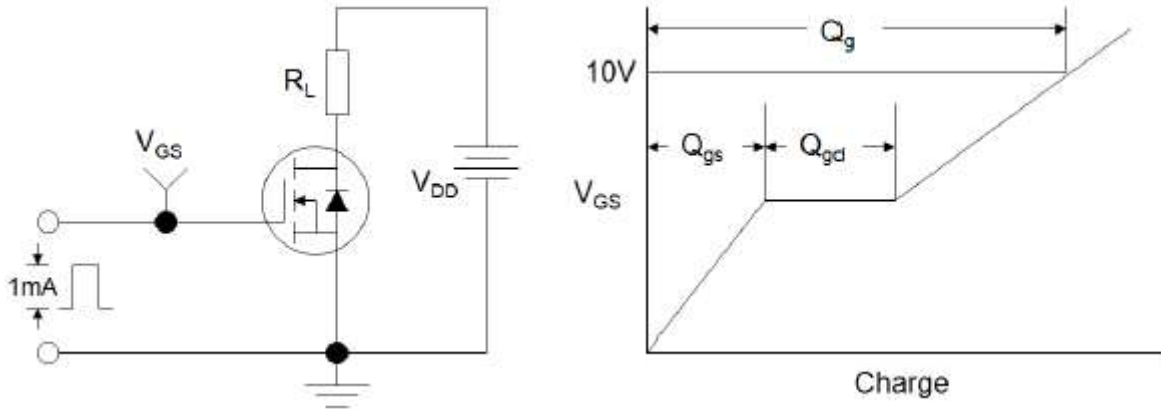


Figure1: Gate Charge Test Circuit & Waveform

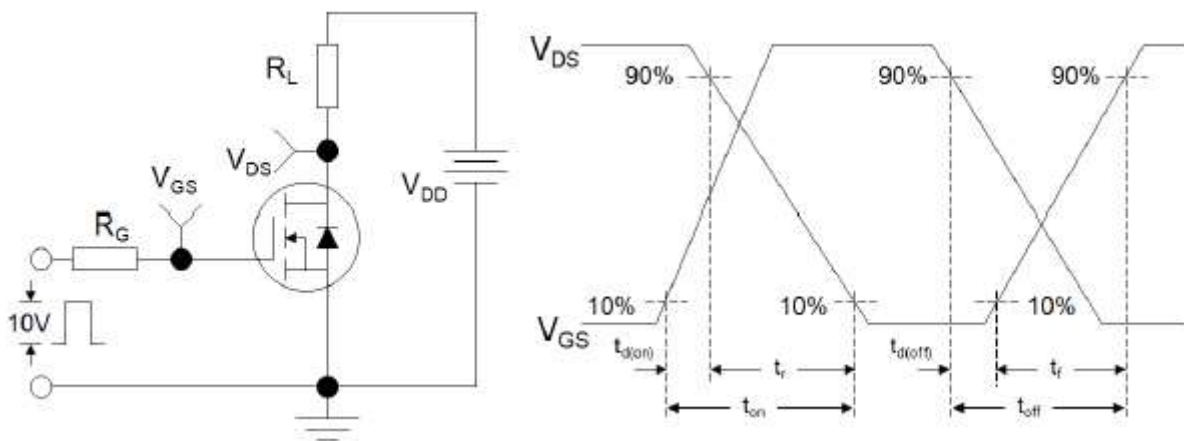


Figure 2: Resistive Switching Test Circuit & Waveforms

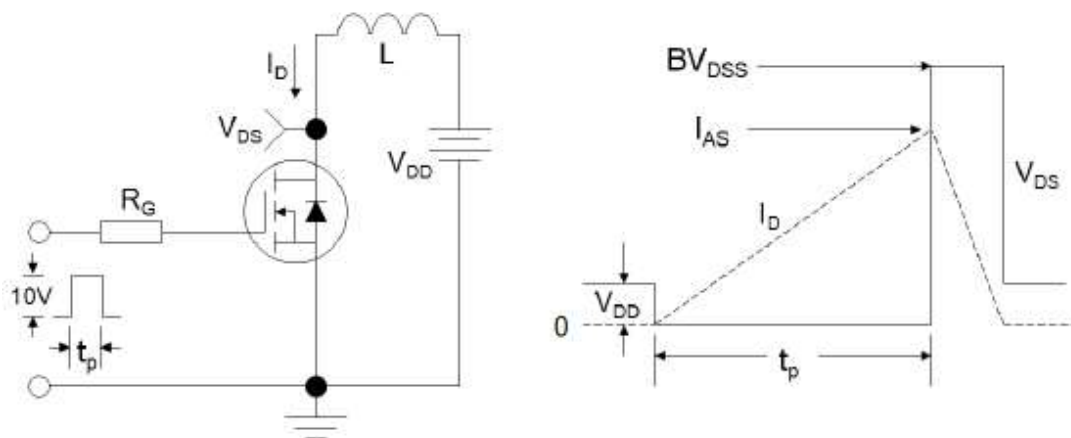


Figure 3: Unclamped Inductive Switching Test Circuit & Waveforms

Typical Performance Characteristics

Figure 1: Output Characteristics

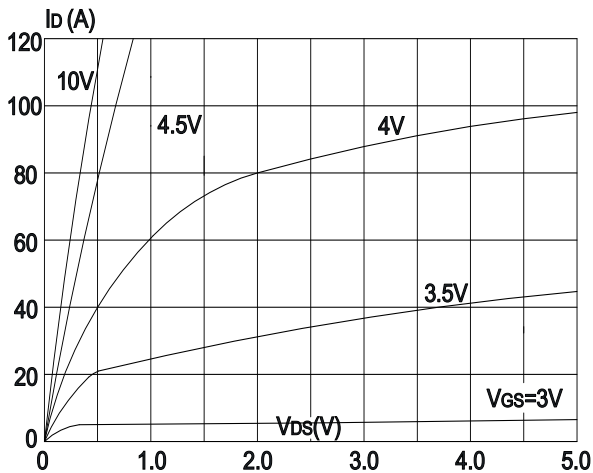


Figure 2: Typical Transfer Characteristics

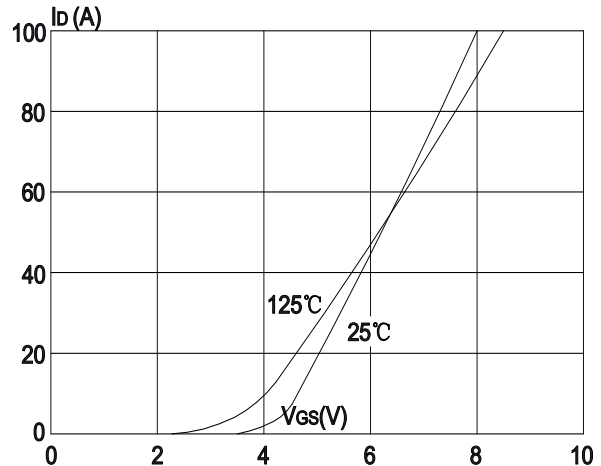


Figure 3: On-resistance vs. Drain Current

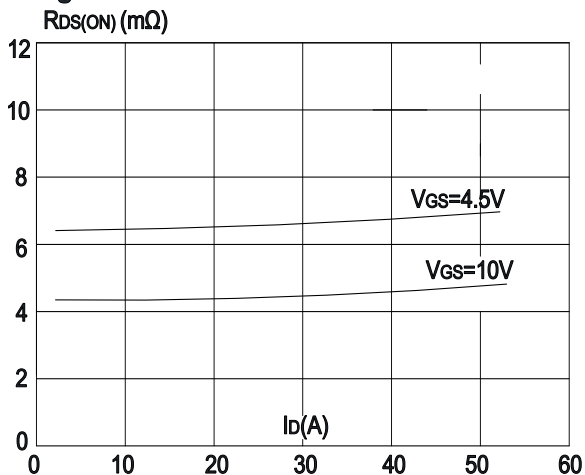


Figure 4: Body Diode Characteristics

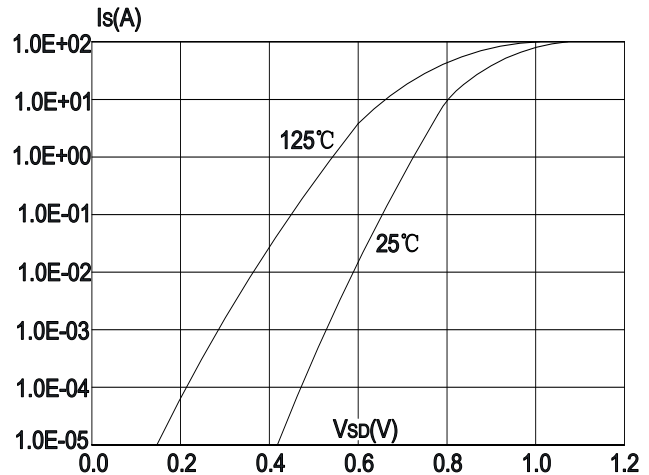


Figure 5: Gate Charge Characteristics

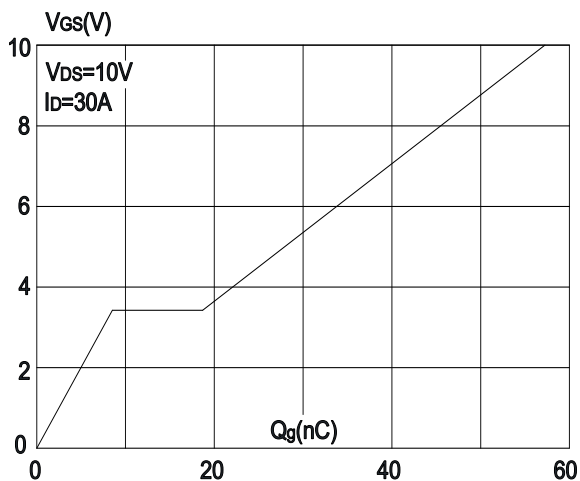
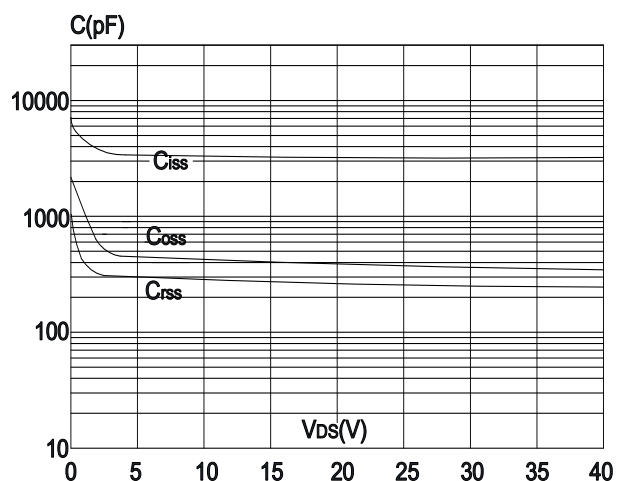


Figure 6: Capacitance Characteristics



Typical Performance Characteristics

Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

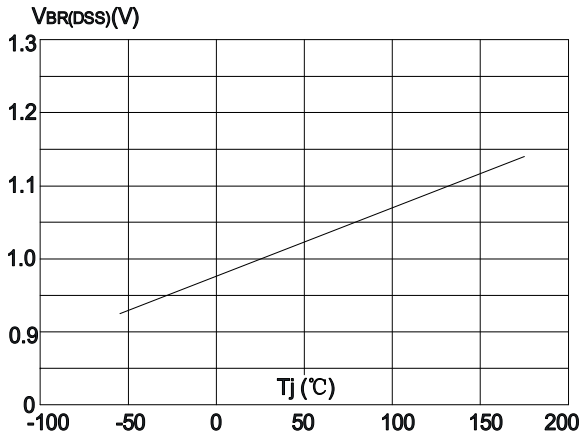


Figure 8: Normalized on Resistance vs. Junction Temperature

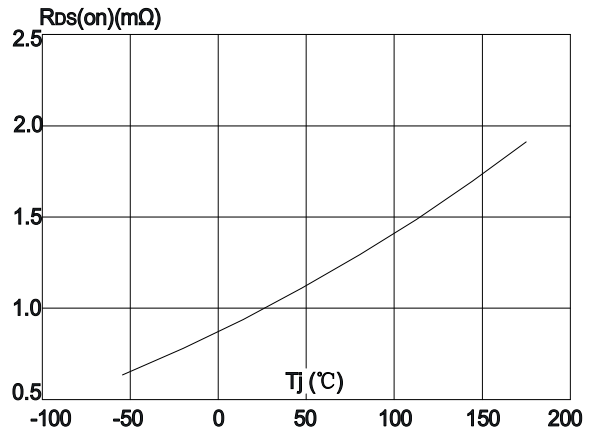


Figure 9: Maximum Safe Operating Area

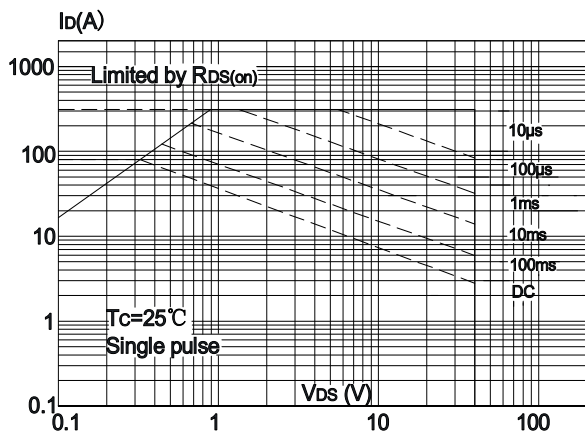


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

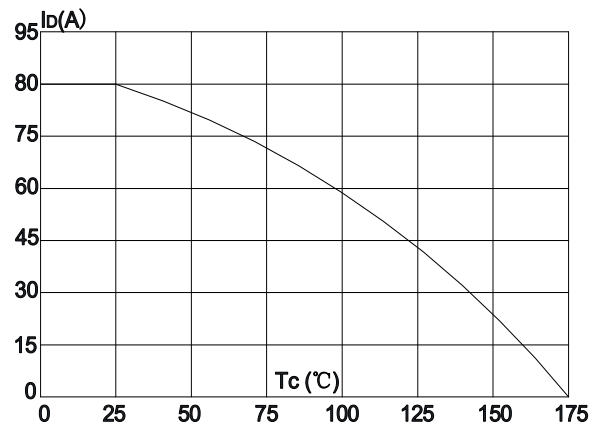
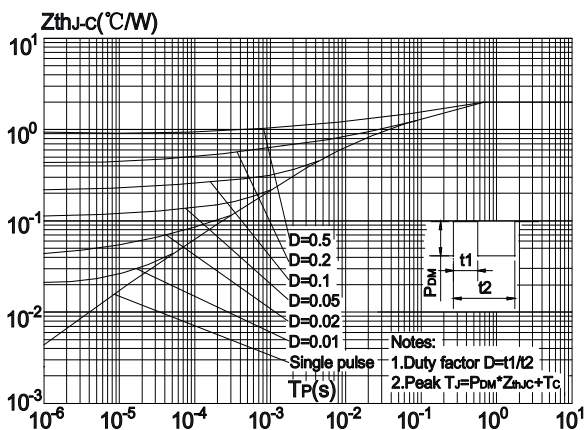
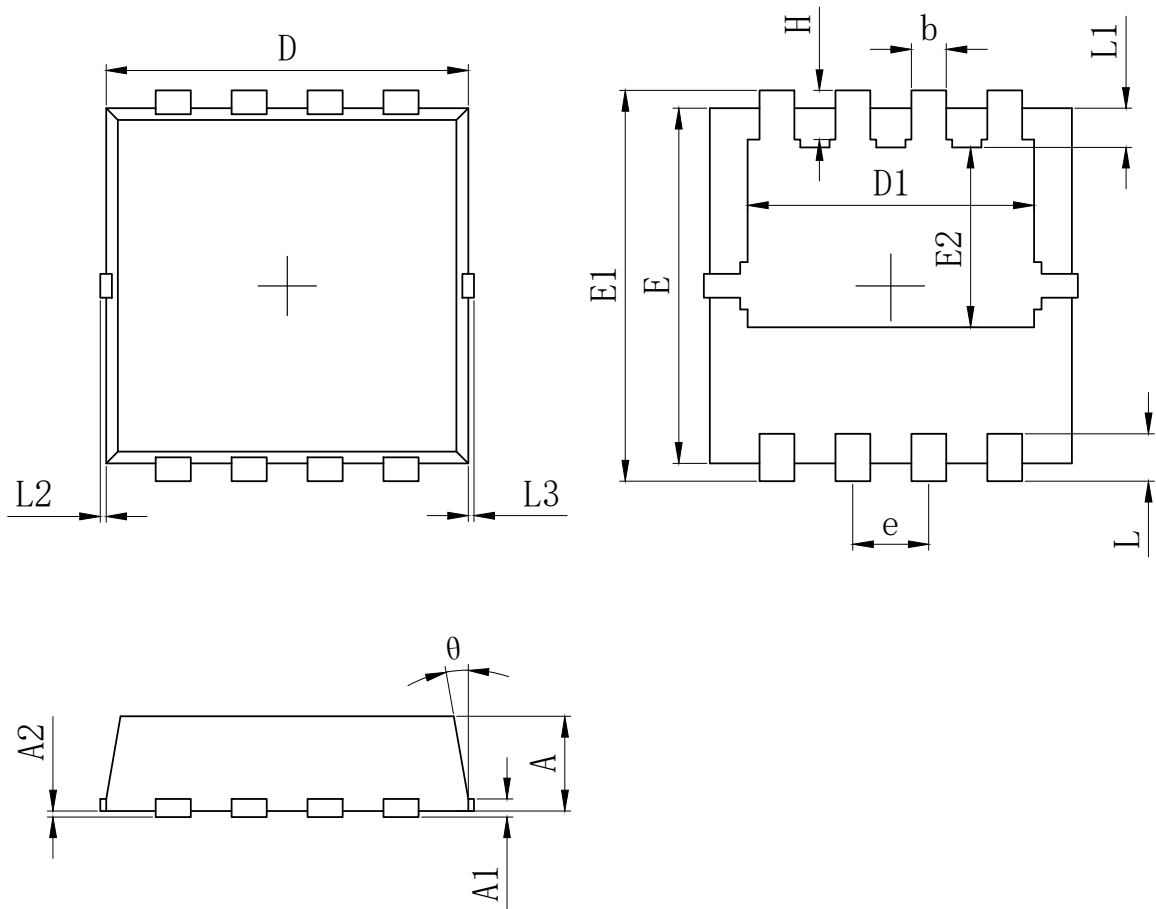


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case



Package Mechanical Data



SYMBOL	MILLIMETER		
	MIN	Typ.	MAX
A	0.700	0.800	0.900
A1	0.152 REF.		
A2	0~0.05		
D	3.000	3.100	3.200
D1	2.300	2.450	2.600
E	2.900	3.000	3.100
E1	3.150	3.300	3.450
E2	1.320	1.520	1.720
b	0.200	0.300	0.400
e	0.550	0.650	0.750
L	0.300	0.400	0.500
L1	0.180	0.330	0.480
L2	0~0.100		
L3	0~0.100		
H	0.315	0.415	0.515
θ	8°	10°	12°