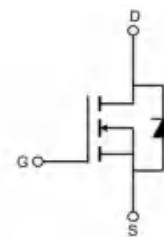


# AP90N04G

## N-Channel Power MOSFET

### Features

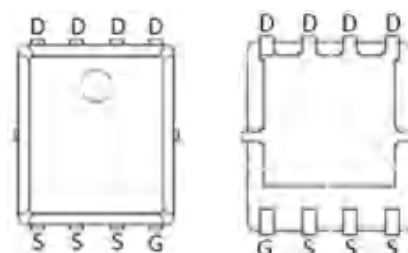
- 40V,80A  
 $R_{DS(ON)} < 5.5m\Omega @ V_{GS} = 10V$   
 $R_{DS(ON)} < 10m\Omega @ V_{GS} = 4.5V$
- Lead free and Green Device Available
- Excellent  $R_{DS(ON)}$  and Low Gate Charge
- Lead free product is acquired



Schematic Diagram

### Application

- Load Switch
- PWM Application
- Power management



PDFN5X6-8L

### Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Max.	Units
$V_{DSS}$	Drain-Source Voltage	40	V
$V_{GSS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Continuous Drain Current	$T_C = 25^\circ\text{C}$	80
		$T_C = 100^\circ\text{C}$	52
$I_{DM}$	Pulsed Drain Current <sup>note1</sup>	320	A
$E_{AS}$	Single Pulsed Avalanche Energy <sup>note2</sup>	104	mJ
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	77
$R_{\theta JC}$	Thermal Resistance, Junction to Case	3.0	$^\circ\text{C}/\text{W}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$

**AP90N04G**
**N-Channel Power MOSFET**
**Electrical Characteristics** ( $T_J=25^{\circ}\text{C}$  unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	40	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS}=40V, V_{GS}=0V,$	-	-	1.0	$\mu A$
$I_{GSS}$	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	$\pm 100$	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.5	2.5	V
$R_{DS(on)}$	Static Drain-Source on-Resistance <small>note3</small>	$V_{GS}=10V, I_D=30A$	-	4.2	5.5	m $\Omega$
		$V_{GS}=4.5V, I_D=20A$	-	6.5	10	
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=20V, V_{GS}=0V,$ $f=1.0\text{MHz}$	-	3042	-	pF
$C_{oss}$	Output Capacitance		-	386	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	232	-	pF
$Q_g$	Total Gate Charge	$V_{DS}=20V, I_D=30A,$ $V_{GS}=10V$	-	57	-	nC
$Q_{gs}$	Gate-Source Charge		-	9	-	nC
$Q_{gd}$	Gate-Drain("Miller") Charge		-	11	-	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=20V, I_D=30A,$ $R_L=1\Omega, R_{GEN}=3\Omega,$ $V_{GS}=10V$	-	8	-	ns
$t_r$	Turn-on Rise Time		-	18	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	24	-	ns
$t_f$	Turn-off Fall Time		-	14	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain to Source Diode Forward Current		-	-	80	A
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current		-	-	320	A
$V_{SD}$	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_S=30A$	-	-	1.2	V
$t_{rr}$	Body Diode Reverse Recovery Time	$T_J=25^{\circ}\text{C},$ $I_F=20A, di/dt=100A/\mu s$	-	22	-	ns
$Q_{rr}$	Body Diode Reverse Recovery Charge		-	11	-	nC

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

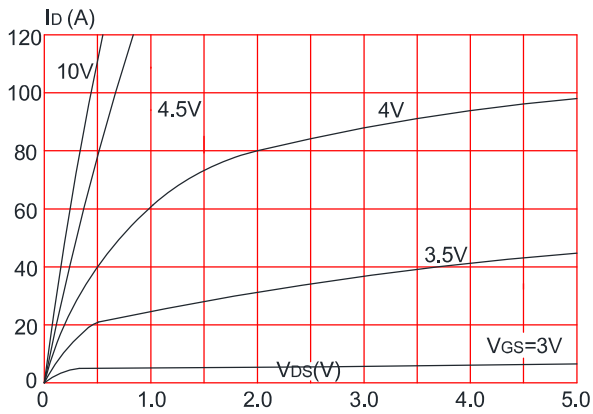
 2. EAS condition:  $T_J=25^{\circ}\text{C}, V_{DD}=20V, R_G=25\Omega, L=0.5\text{mH}, I_{AS}=20.4A$ 

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

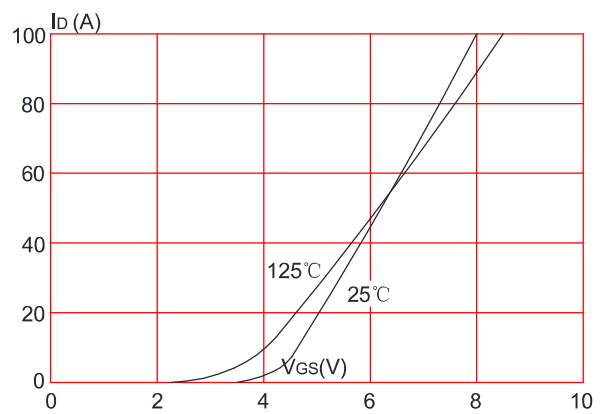
**AP90N04G**

**N-Channel Power MOSFET**

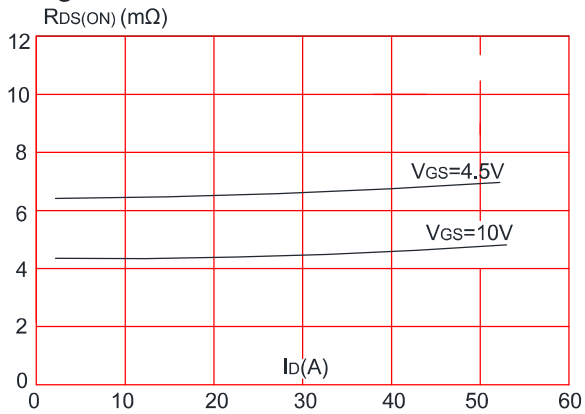
**Figure 1: Output Characteristics**



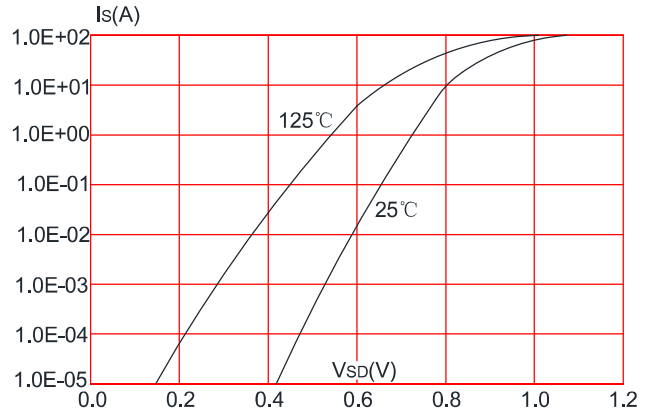
**Figure 2: Typical Transfer Characteristics**



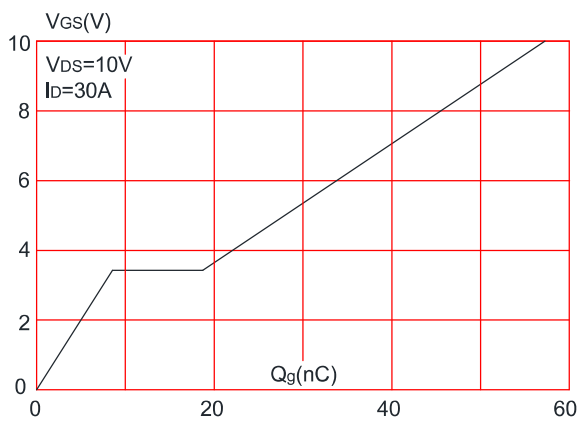
**Figure 3: On-resistance vs. Drain Current**



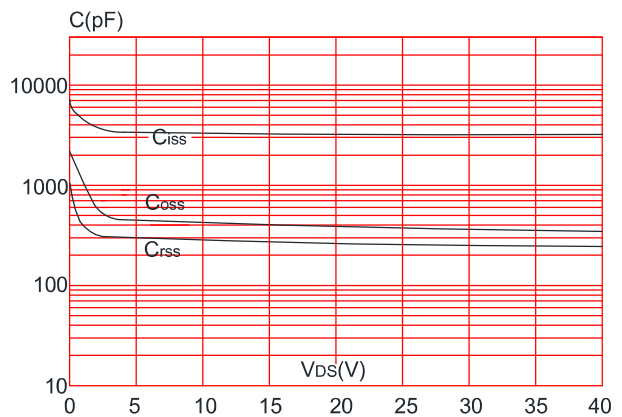
**Figure 4: Body Diode Characteristics**



**Figure 5: Gate Charge Characteristics**

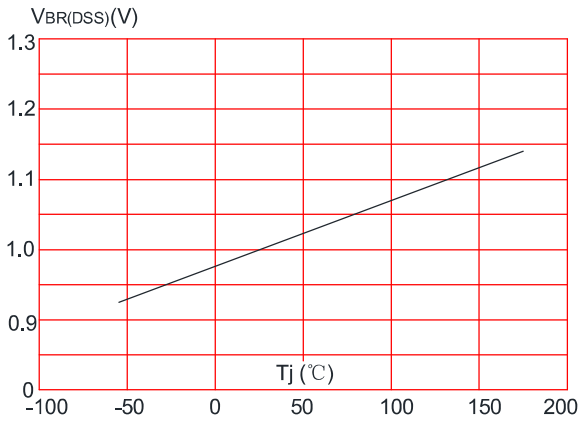


**Figure 6: Capacitance Characteristics**

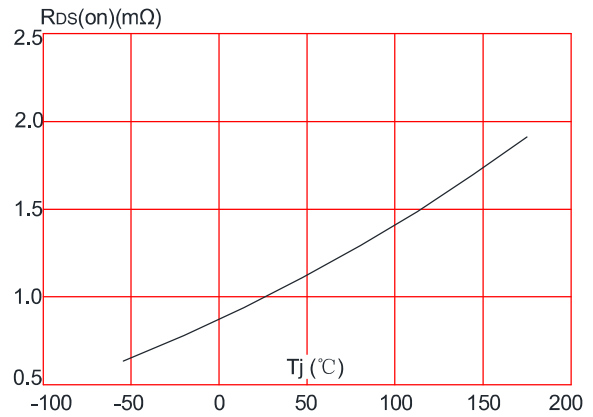


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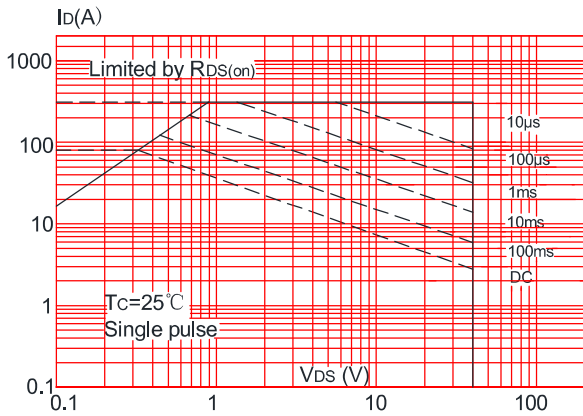
**Figure 7: Normalized Breakdown Voltage vs. Junction Temperature**



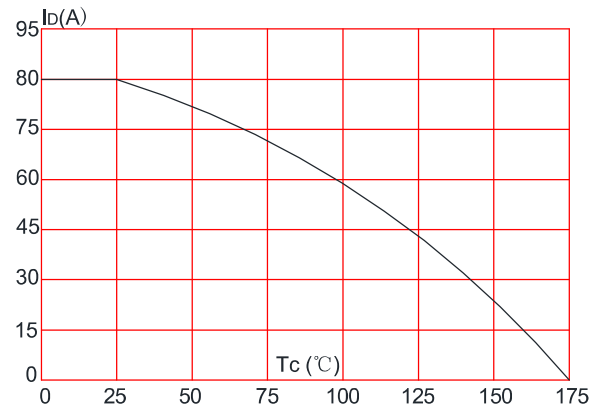
**Figure 8: Normalized on Resistance vs. Junction Temperature**



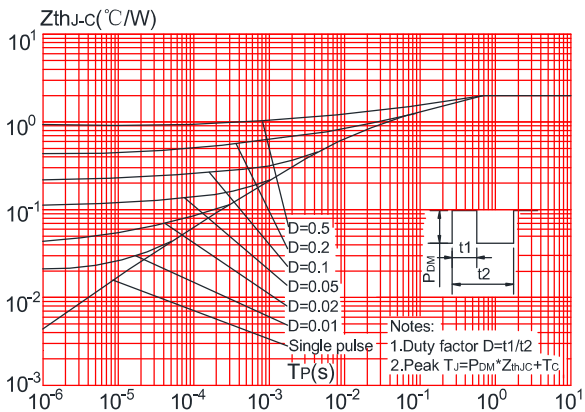
**Figure 9: Maximum Safe Operating Area**



**Figure 10: Maximum Continuous Drain Current vs. Case Temperature**



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



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**Test Circuit**

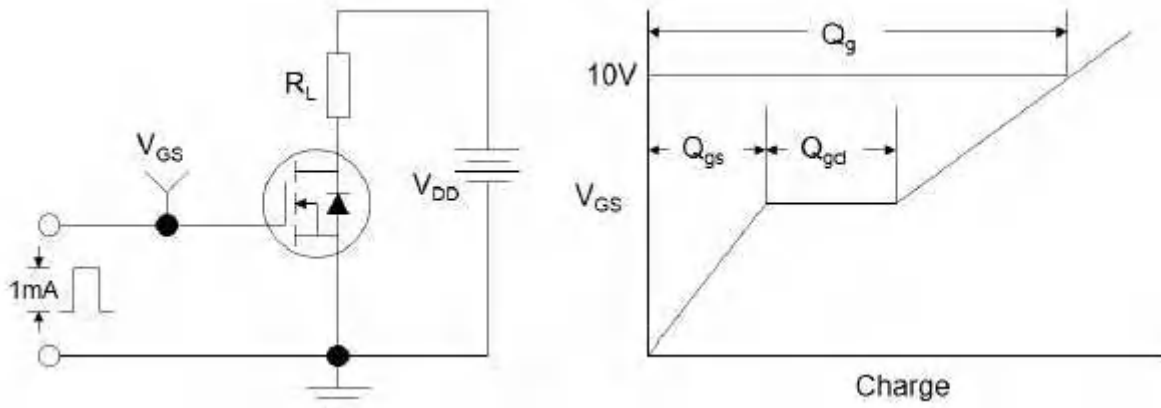


Figure 1: Gate Charge Test Circuit & Waveform

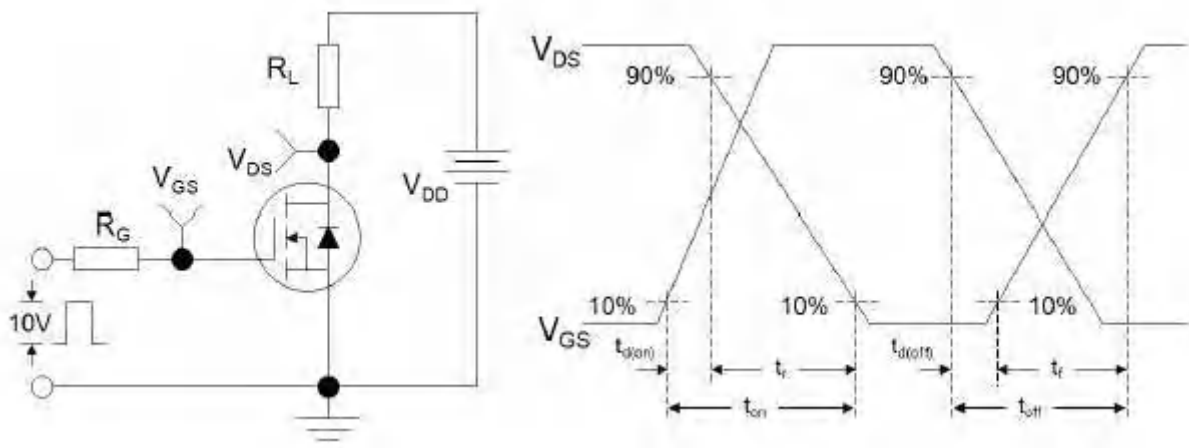


Figure 2: Resistive Switching Test Circuit & Waveforms

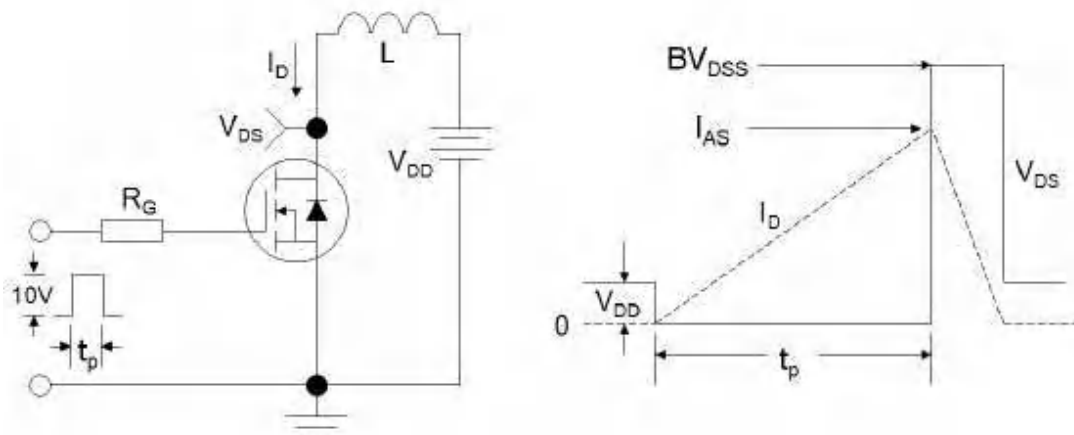
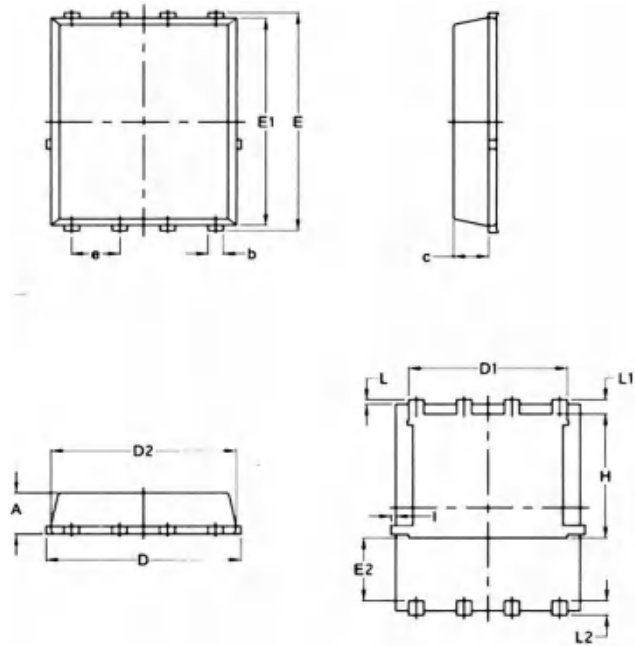


Figure 3: Unclamped Inductive Switching Test Circuit & Waveforms

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**Package Mechanical Data**



PDFN5X6-8L

SYMBOL	COMMON			
	MM		INCH	
	MIN.	MAX.	MIN.	MAX.
A	1.03	1.17	0.0406	0.0461
b	0.34	0.48	0.0134	0.0189
c	0.824	0.970	0.0324	0.0382
D	4.80	5.40	0.1890	0.2126
D1	4.11	4.31	0.1618	0.1697
D2	4.80	5.00	0.1890	0.1969
E	5.95	6.15	0.2343	0.2421
E1	5.65	5.85	0.2224	0.2303
E2	1.60	—	0.0630	—
e	1.27 BSC		0.05 BSC	
L	0.05	0.25	0.0020	0.0098
L1	0.38	0.50	0.0150	0.0197
L2	0.38	0.50	0.0150	0.0197
H	3.30	3.50	0.1299	0.1378
I	—	0.18	—	0.0070

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