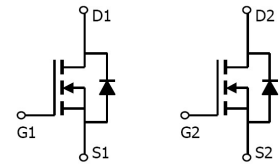


**Feature**

- 40V,20A  
 $R_{DS(ON)} < 15m\Omega @ V_{GS}=10V$  TYP:13 m $\Omega$   
 $R_{DS(ON)} < 20m\Omega @ V_{GS}=4.5V$  TYP:17 m $\Omega$
- Advanced Trench Technology
- Lead free product is acquired
- Excellent  $R_{DS(ON)}$  and Low Gate Charge



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)
50N04QD	AP50N04QD	PDFN3X3	13 inch	-	5000

**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	$V_{GS}$	$\pm 20$	V
Continuous Drain Current ( $T_a = 25^{\circ}C$ )	$I_D$	20	A
Continuous Drain Current ( $T_a = 100^{\circ}C$ )	$I_D$	14	A
Pulsed Drain Current <sup>(1)</sup>	$I_{DM}$	60	A
Singel Pulsed Avalanche Energy <sup>(2)</sup>	$E_{AS}$	12.25	mJ
Power Dissipation	$P_D$	35	W
Thermal Resistance from Junction to Case <sup>(4)</sup>	$R_{\theta JC}$	3.6	$^{\circ}C/W$
Junction Temperature	$T_J$	150	$^{\circ}C$
Storage Temperature	$T_{STG}$	-55~ +150	$^{\circ}C$

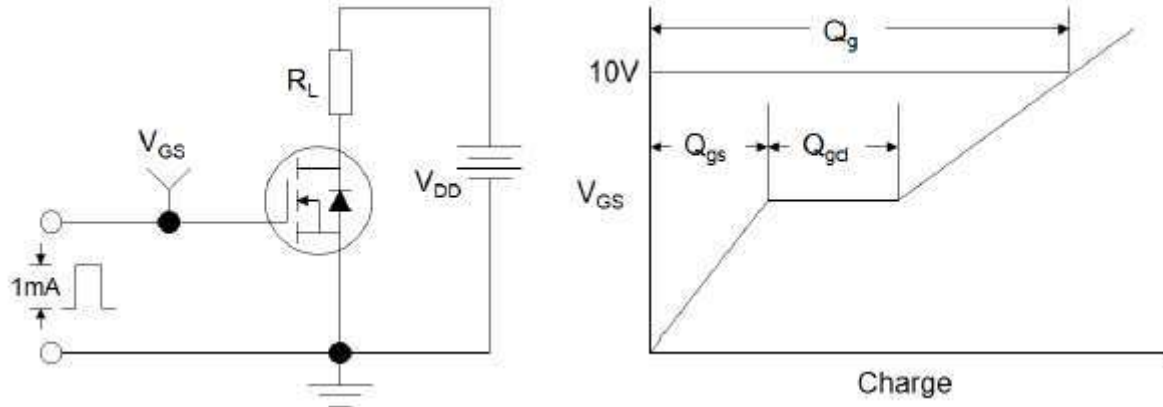
MOSFET ELECTRICAL CHARACTERISTICS( $T_a=25^{\circ}\text{C}$  unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
<b>Static Characteristics</b>						
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	40	-	-	V
Zero gate voltage drain current	$I_{DSS}$	$V_{DS} = 40V, V_{GS} = 0V$	-	-	1	$\mu A$
Gate-body leakage current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$	-	-	$\pm 100$	nA
Gate threshold voltage <sup>(3)</sup>	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1	1.5	2.5	V
Drain-source on-resistance <sup>(3)</sup>	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 10A$	-	13	15	m $\Omega$
		$V_{GS} = 4.5V, I_D = 8A$	-	17	20	
<b>Dynamic characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS} = 20V, V_{GS} = 0V, f = 1MHz$	-	1250	-	pF
Output Capacitance	$C_{oss}$		-	114	-	
Reverse Transfer Capacitance	$C_{rss}$		-	85	-	
<b>Switching characteristics</b>						
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 20V, I_D = 1A, R_L = 6\Omega$ $V_{GS} = 10V, R_G = 1\Omega$	-	10	-	ns
Turn-on rise time	$t_r$		-	9	-	
Turn-off delay time	$t_{d(off)}$		-	32	-	
Turn-off fall time	$t_f$		-	16	-	
Total Gate Charge	$Q_g$	$V_{DS} = 20V, I_D = 10A,$ $V_{GS} = 10V$	-	20	-	nC
Gate-Source Charge	$Q_{gs}$		-	3.5	-	
Gate-Drain Charge	$Q_{gd}$		-	4.2	-	
<b>Source-Drain Diode characteristics</b>						
Diode Forward voltage <sup>(3)</sup>	$V_{DS}$	$V_{GS} = 0V, I_S = 10A$	-	-	1.2	V
Diode Forward current <sup>(4)</sup>	$I_S$		-	-	20	A

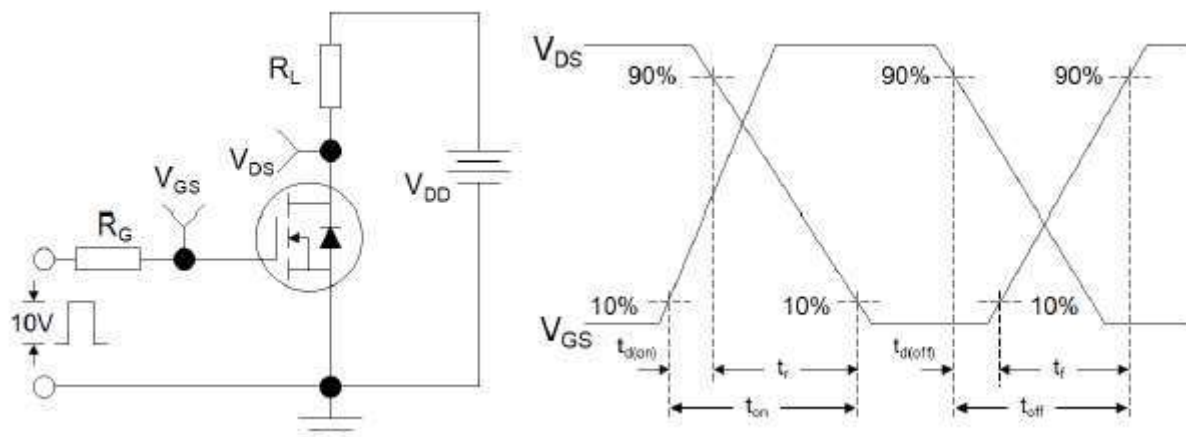
**Notes:**

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

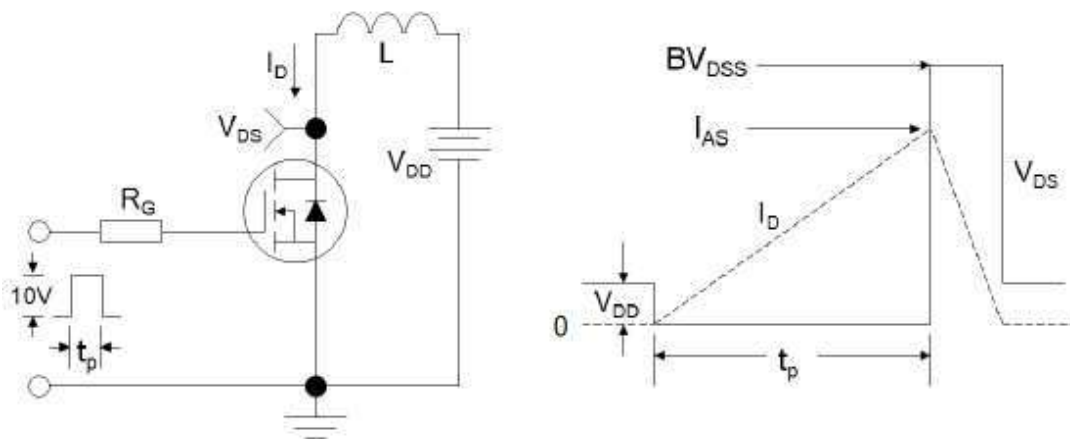
**Test Circuit**



**Figure 1: Gate Charge Test Circuit & Waveform**



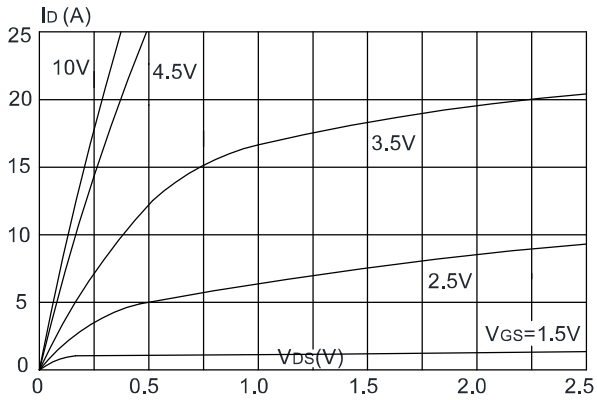
**Figure 2: Resistive Switching Test Circuit & Waveforms**



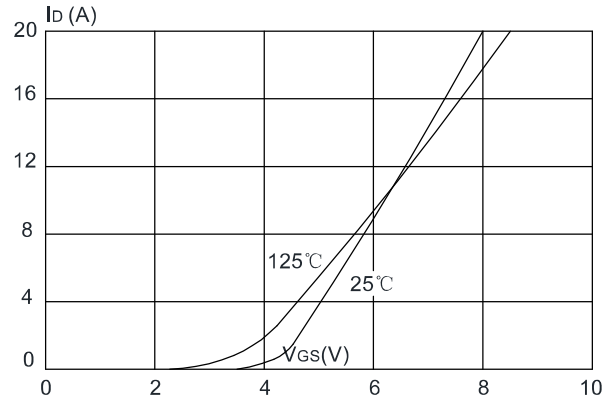
**Figure 3: Unclamped Inductive Switching Test Circuit & Waveforms**

**Typical Performance Characteristics**

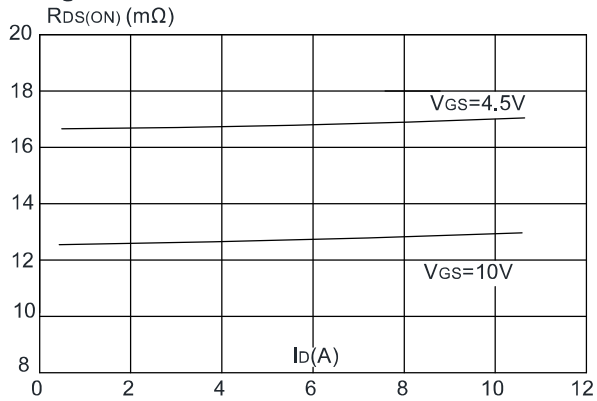
**Figure 1: Output Characteristics**



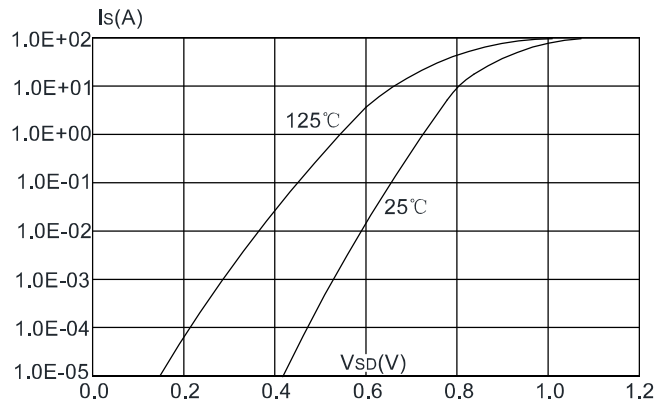
**Figure 2: Typical Transfer Characteristics**



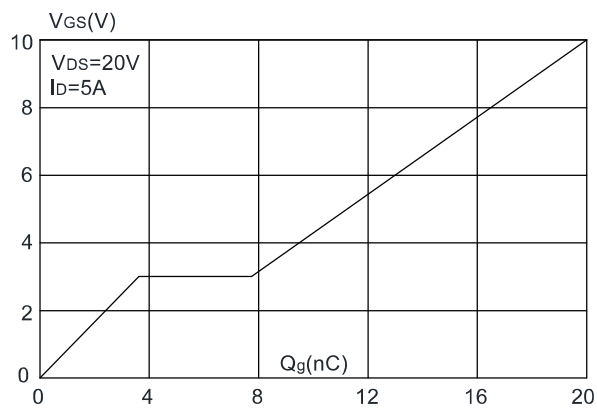
**Figure 3: On-resistance vs. Drain Current**



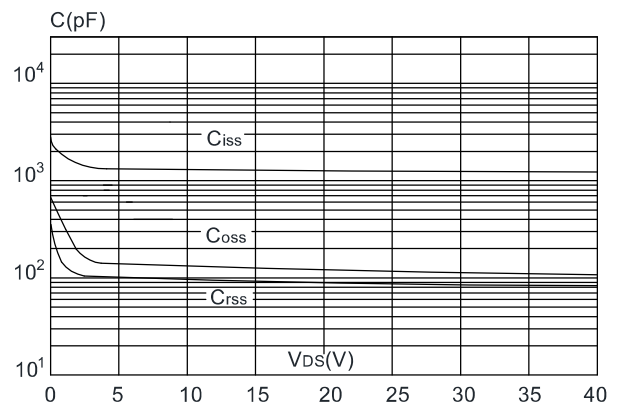
**Figure 4: Body Diode Characteristics**



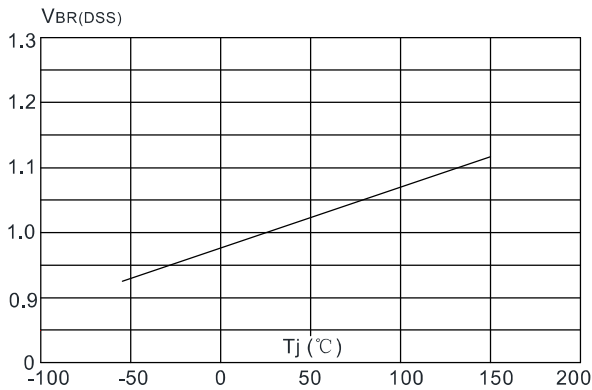
**Figure 5: Gate Charge Characteristics**



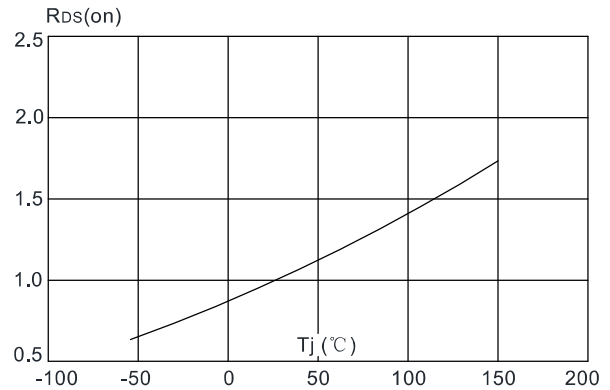
**Figure 6: Capacitance Characteristics**



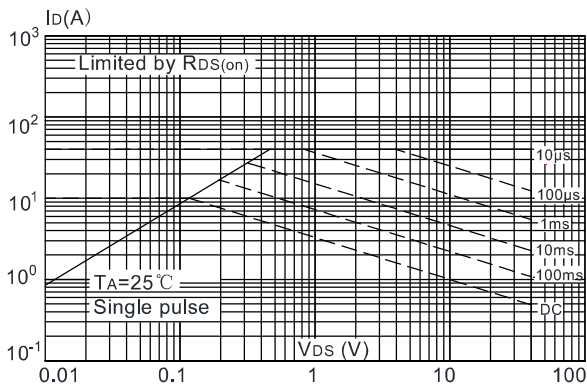
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



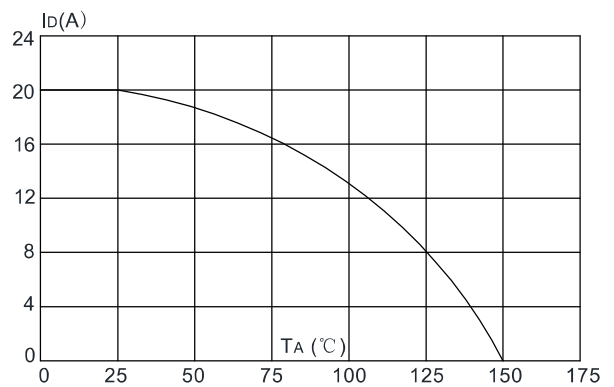
**Figure 8:** Normalized on Resistance vs. Junction Temperature



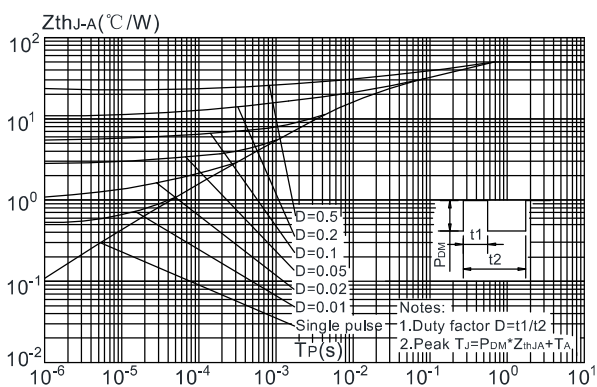
**Figure 9:** Maximum Safe Operating Area



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



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



PDFN3X3 Package Information

