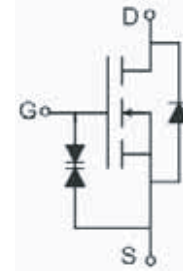




## N-Channel Enhancement Mode Power MOSFET

**General Features**

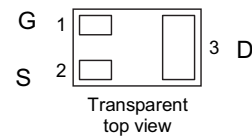
- $V_{DS} = 60V, I_D = 0.35A$
- $R_{DS(ON)} < 3.2\Omega @ V_{GS}=5V$
- $R_{DS(ON)} < 2.8\Omega @ V_{GS}=10V$
- ESD Rating: HBM 2300V
- Logic-level compatible
- High fast switching
- Halogen-free



Schematic diagram

**Application**

- Direct logic-level interface: TTL/CMOS
- Drivers: relays, solenoids, lamps, hammers, display, memories, transistors, etc.
- Switching circuits
- Solid-state relays



DFN1006-3

**Package Marking And Ordering Information**

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
72	2N7002	DFN1006	Ø180mm	8 mm	

**Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current ( $T_J = 150^\circ\text{C}$ )	$I_D$	$T_A = 25^\circ\text{C}$	0.35
		$T_A = 100^\circ\text{C}$	0.2
Drain Current-Pulsed (Note 1)	$I_{DM}$	0.8	A
Maximum Power Dissipation	$P_D$	0.35	W
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 150	$^\circ\text{C}$

**Thermal Characteristic**

Thermal Resistance, Junction-to-Ambient (Note 2)	$R_{\theta JA}$	360(max)	$\text{W}/^\circ\text{C}$
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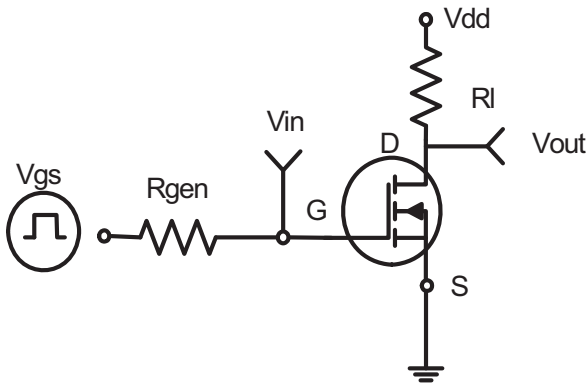
**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	60	68	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±10V, V <sub>DS</sub> =0V	-	±100	±500	nA
		V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	±4	±10	μA
<b>On Characteristics</b> (Note 3)						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1	1.7	1.9	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =5V, I <sub>D</sub> =0.2A	-	2.5	3.2	Ω
		V <sub>GS</sub> =10V, I <sub>D</sub> =0.2A	-	2.2	2.8	Ω
Gate Resistance	R <sub>g</sub>	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1.0MHz	-	150	155	Ω
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =10V, I <sub>D</sub> =0.2A	0.1	0.25	0.28	S
<b>Dynamic Characteristics</b> (Note 4)						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1.0MHz	-	21	50	PF
Output Capacitance	C <sub>oss</sub>		-	5	10	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	4.2	5	PF
<b>Switching Characteristics</b> (Note 4)						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =30V, I <sub>D</sub> =0.2A V <sub>GS</sub> =10V, R <sub>GEN</sub> =10Ω	-	2.7	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	19	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	15	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	23	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =30V, I <sub>D</sub> =0.2A, V <sub>GS</sub> =10V	-	3	5	nC
<b>Drain-Source Diode Characteristics</b>						
Diode Forward Voltage (Note 3)	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =0.2A	-	-	1.3	V
Diode Forward Current (Note 2)	I <sub>S</sub>		-	-	0.2	A

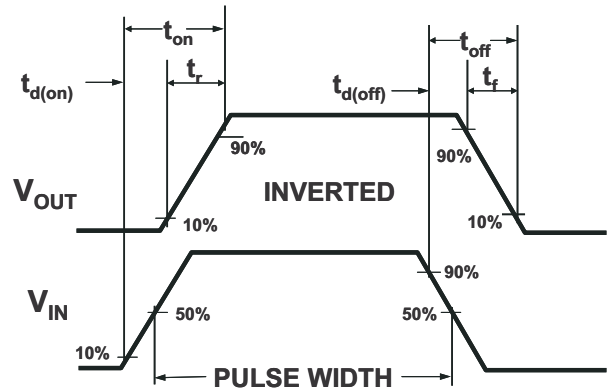
**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production

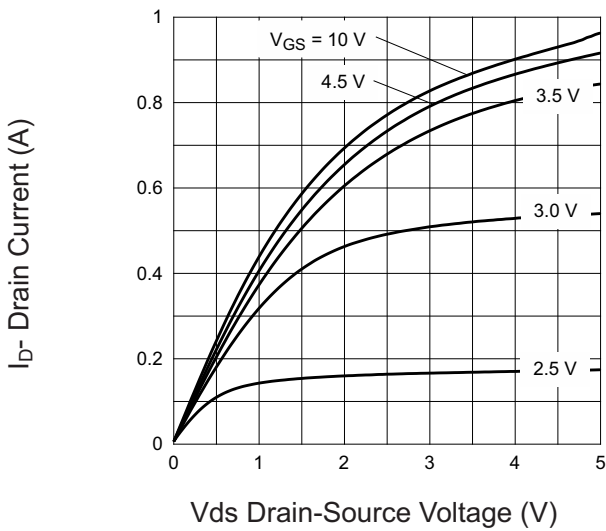
**RATING AND CHARACTERISTICS CURVES**



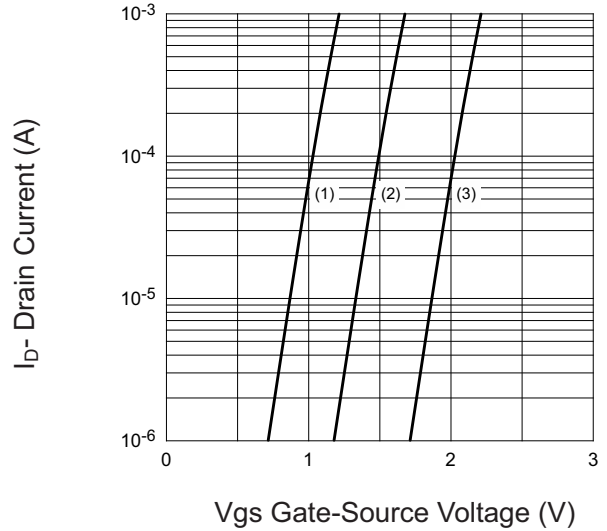
**Figure 1: Switching Test Circuit**



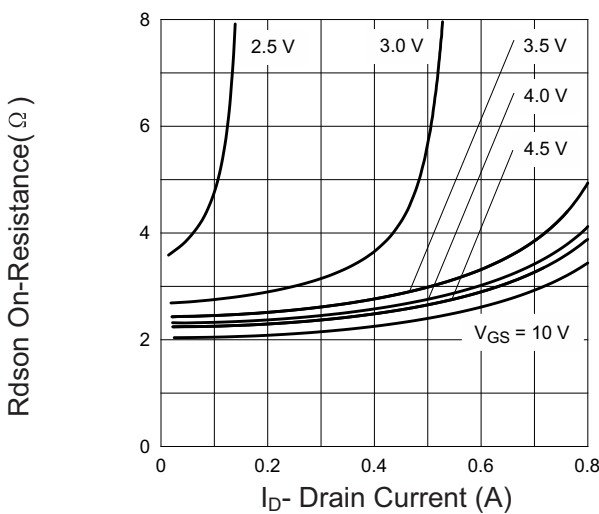
**Figure 2: Switching Waveforms**



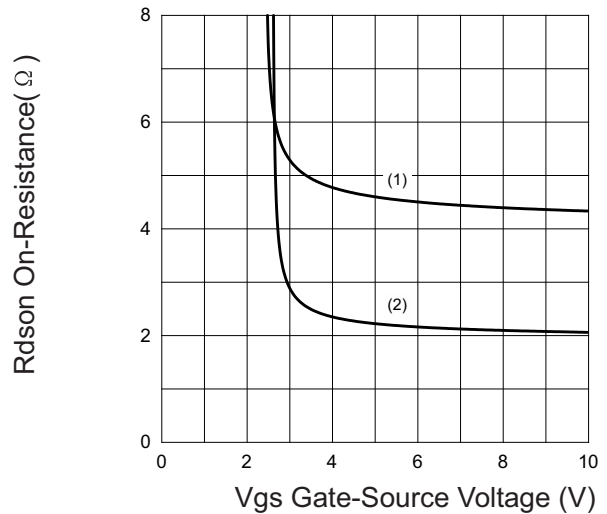
**Figure 3 Output Characteristics**



**Figure 4 Transfer Characteristics**

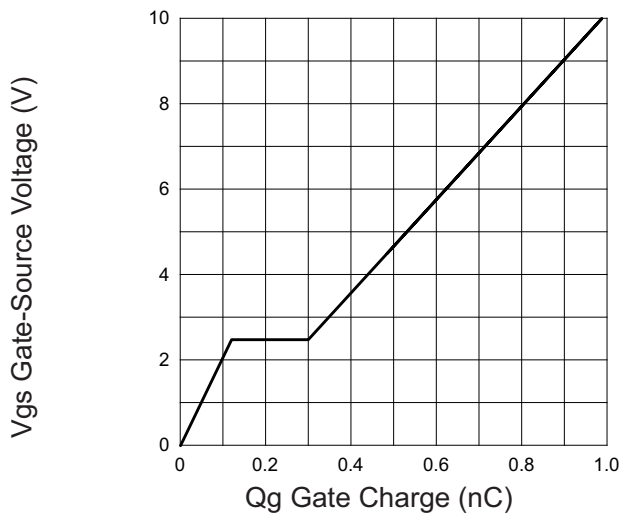


**Figure 5 Drain-Source On-Resistance**

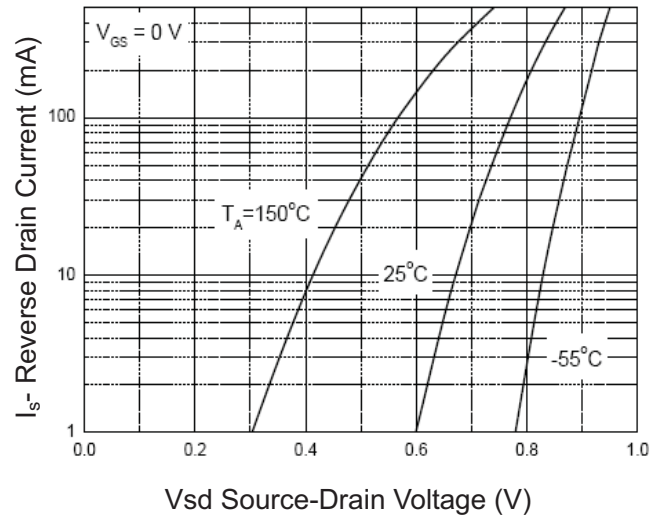


**Figure 6 Rds(on) vs VGS**

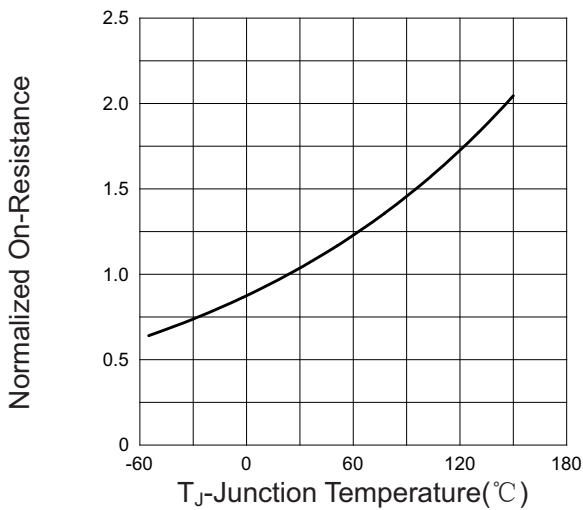
**RATING AND CHARACTERISTICS CURVES**



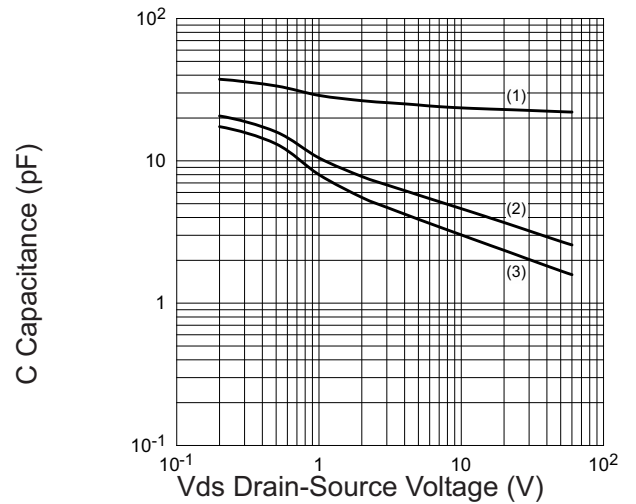
**Figure 7 Gate Charge**



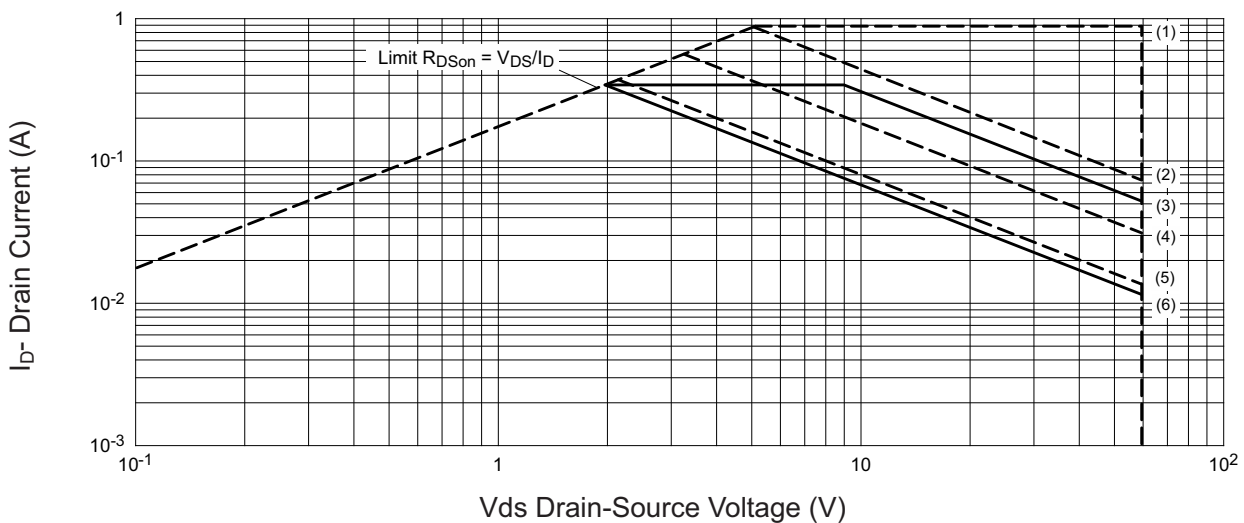
**Figure 8 Source-Drain Diode Forward**



**Figure 9 Drain-Source On-Resistance**

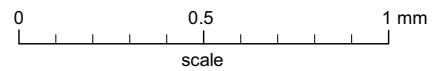
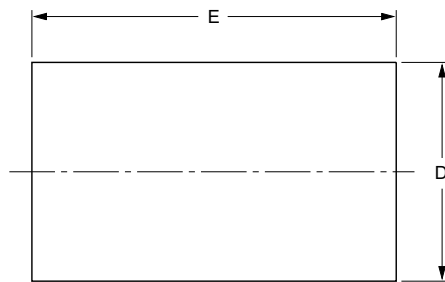
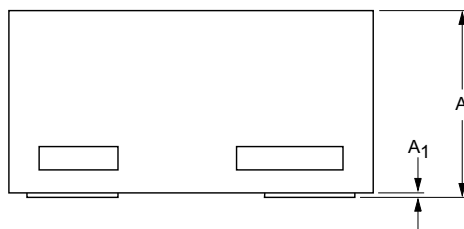
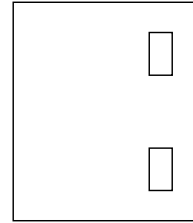
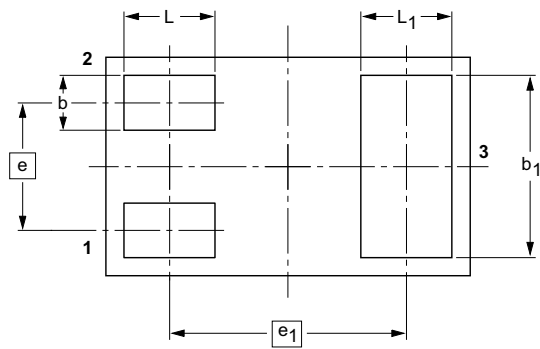


**Figure 10 Capacitance vs Vds**



**Figure 11 Safe Operation Area**

DFN1006 Package Information



DIMENSIONS (mm are the original dimensions)

UNIT	A <sup>(1)</sup>	A <sub>1</sub> max.	b	b <sub>1</sub>	D	E	e	e <sub>1</sub>	L	L <sub>1</sub>
mm	0.50 0.46	0.03	0.20 0.12	0.55 0.47	0.62 0.55	1.02 0.95	0.35	0.65	0.30 0.22	0.30 0.22

Package	Tube (pcs/tube)	Tube (pcs/inner box)	Tube (pcs/cartoon)	Tape&Reel (pcs/reel)	Tape&Reel (pcs/inner box)	Tape&Reel (pcs/cartoon)
DFN1006	—	—	—	10,000	10,000	