2N7002K

N-Channel MOSFET

FEATURES

High density cell design for low RDS(ON)

Voltage controlled small signal switch.

Rugged and reliable.

High saturation current capability.

1.Gate
2.Source
3.Drain

SOT-23

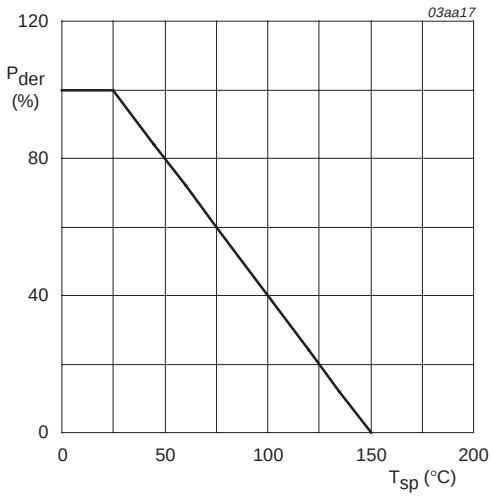
MAXIMUM RATINGS (TA=25℃ unless otherwise noted)

Symbol	Parameter	Ratings	Unit
V_{DS}	Drain-source voltage (V_{GS} = 0)	60	V
V_{DGR}	Drain-gate voltage (R_{GS} = 20 kΩ)	60	V
V_{GS}	Gate- source voltage	±15	V
I_D	Drain current (continuous) at T_C = 25°C	0.35	A
I_{DM} (1)	Drain current (pulsed)	800	mA
P_{TOT}	Total dissipation at T_C = 25°C	0.85	W
Rthj- amb	Thermal resistance junction-ambient max	357.1 (2)	°C/W
TJ, Tstg	Operating junction temperature, Storage temperature	- 55 to 150	°C

ELECTRICAL CHARACTERISTICS (Tamb=25℃ unless otherwise specified)

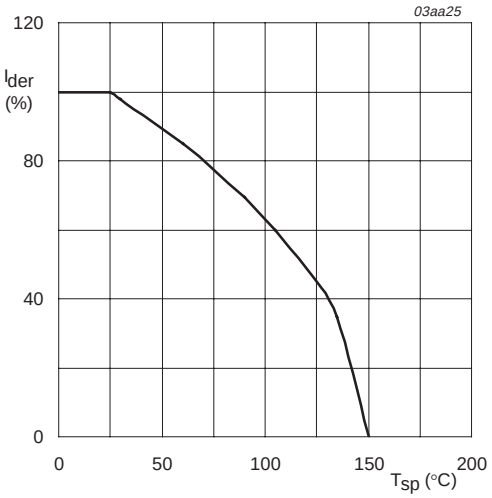
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
$V_{(BR)DSS}$	drain-source breakdown voltage	I_D = 10 µA; V_{GS} = 0 V				
		T_j = 25 °C	60	75	-	V
		T_j = –55 °C	55	-	-	V
$V_{(BR)GSS}$	drain-source breakdown voltage	I_G = ±1 mA; V_{DS} = 0 V	16	22	-	V
$V_{GS(th)}$	gate-source threshold voltage	I_D = 1 mA; V_{DS} = V_{GS}; Figure 9				V
		T_j = 25 °C	1	2	-	V
		T_j = 150 °C	0.6	-	-	V
		T_j = –55 °C	-	-	3.5	V
I_{DSS}	drain-source leakage current	V_{DS} = 48 V; V_{GS} = 0 V				
		T_j = 25 °C	-	0.01	1	µA
		T_j = 150 °C	-	-	10	µA
I_{GSS}	gate-source leakage current	V_{GS} = ±10 V; V_{DS} = 0 V	-	50	500	nA
R_{DSon}	drain-source on-state resistance	V_{GS} = 10 V; I_D = 500 mA; Figure 7 and 8				
		T_j = 25 °C	-	2.8	3.9	Ω
		T_j = 150 °C	-	5.2	7.2	Ω
		V_{GS} = 4.5 V; I_D = 200 mA; Figure 7 and 8	-	3.8	5.3	Ω
Dynamic characteristics						
C_{iss}	input capacitance	V_{GS} = 0 V; V_{DS} = 10 V; f = 1 MHz; Figure 11	-	13	40	pF
C_{oss}	output capacitance		-	8	30	pF
C_{rss}	reverse transfer capacitance		-	4	10	pF
t_{on}	turn-on time	V_{DD} = 50 V; R_L = 250 Ω; V_{GS} = 10 V; R_G = 50 Ω; R_{GS} = 50 Ω	-	3	10	ns
t_{off}	turn-off time		-	9	15	ns
Source-drain diode						
V_{SD}	source-drain (diode forward) voltage	I_S = 300 mA; V_{GS} = 0 V; Figure 12	-	0.93	1.5	V
t_{rr}	reverse recovery time	I_S = 300 mA; dI_S/dt = –100 A/µs; V_{GS} = 0 V; V_R = 25 V	-	30	-	ns
Q_r	recovered charge		-	30	-	nC

2N7002K Typical Characteristics



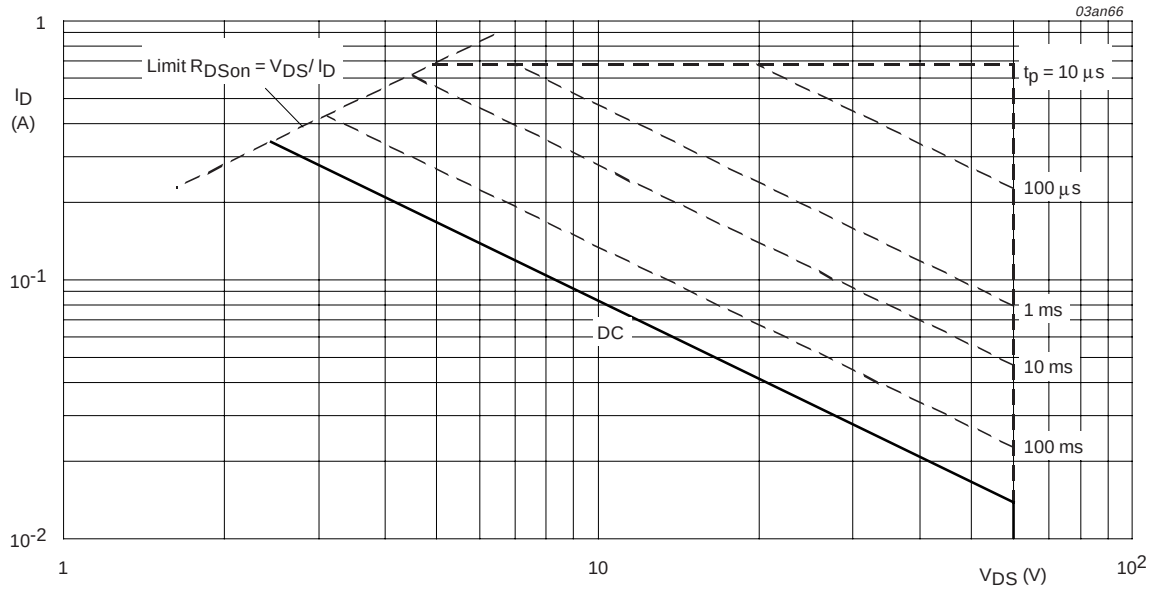
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}C)}} \times 100\%$$

Fig 1. Normalized total power dissipation as a function of solder point temperature.



$$I_{der} = \frac{I_D}{I_{D(25^{\circ}C)}} \times 100\%$$

Fig 2. Normalized continuous drain current as a function of solder point temperature.



T_{sp} = 25 °C; I_{DM} is single pulse; V_{GS} = 10 V

Fig 3. Safe operating area; continuous and peak drain currents as a function of drain-source voltage.

2N7002K Typical Characteristics

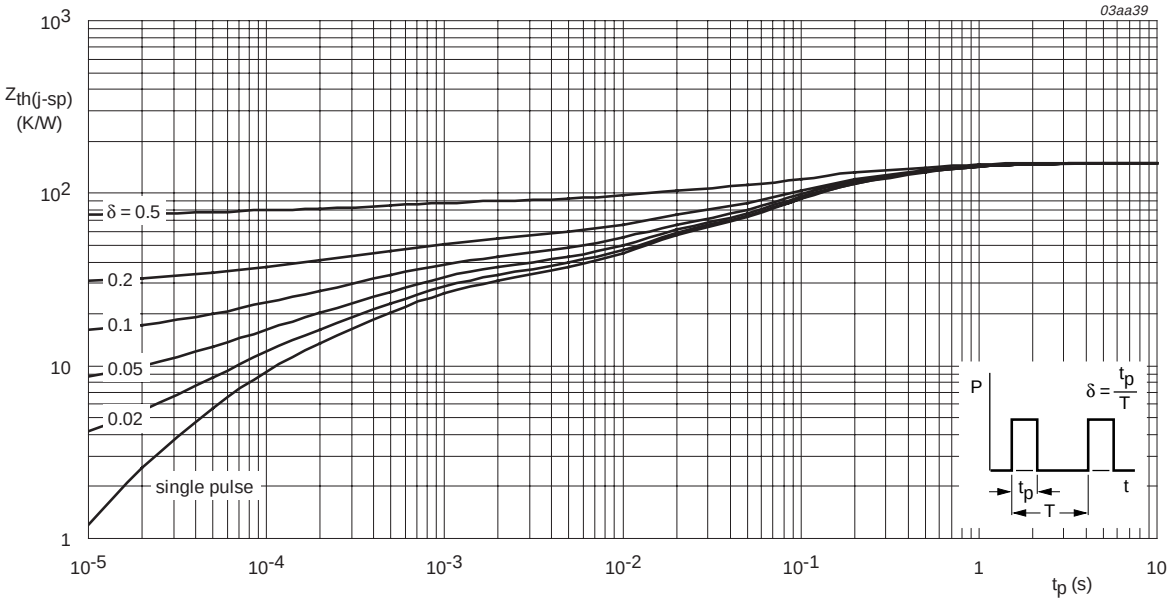
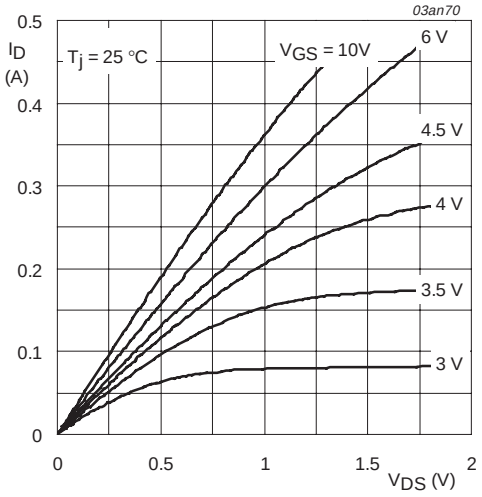
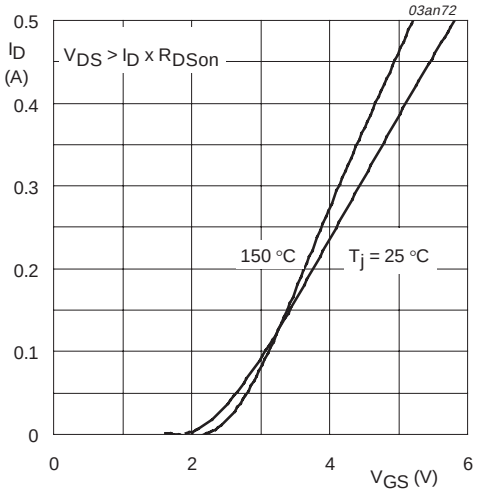


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration.



T_j = 25 °C

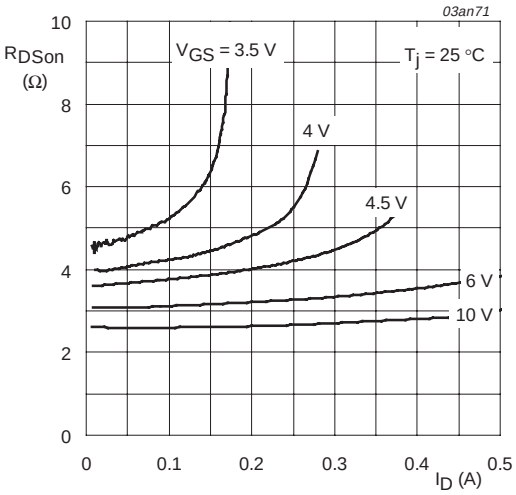
Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values.



T_j = 25 °C and 150 °C; $V_{DS} > I_D \times R_{DSon}$

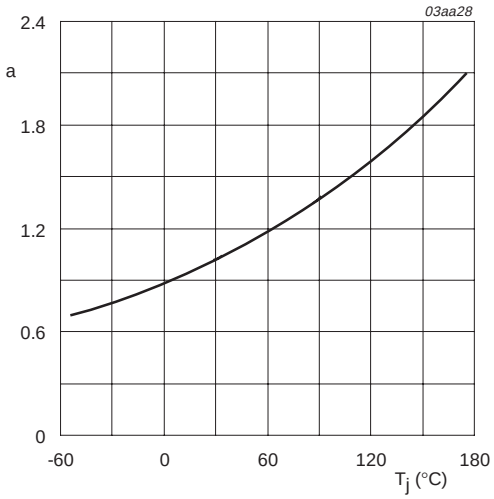
Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values.

2N7002K Typical Characteristics



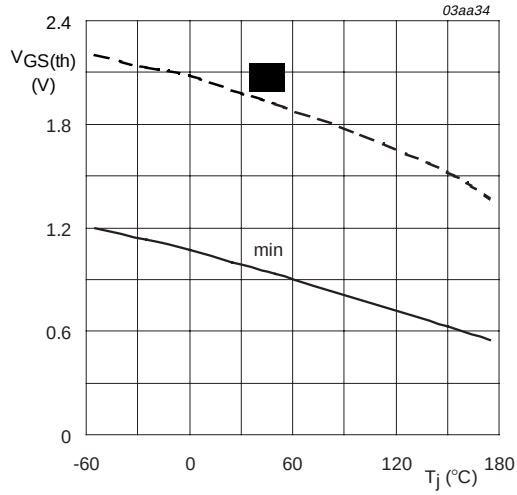
T_j = 25 °C

Fig 7. Drain-source on-state resistance as a function of drain current; typical values.



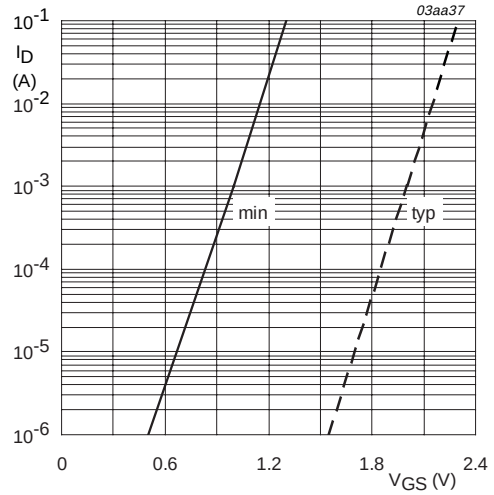
$$a = \frac{R_{DSon}}{R_{DSon(25^{\circ}C)}}$$

Fig 8. Normalized drain-source on-state resistance factor as a function of junction temperature.



I_D = 1 mA; V_{DS} = V_{GS}

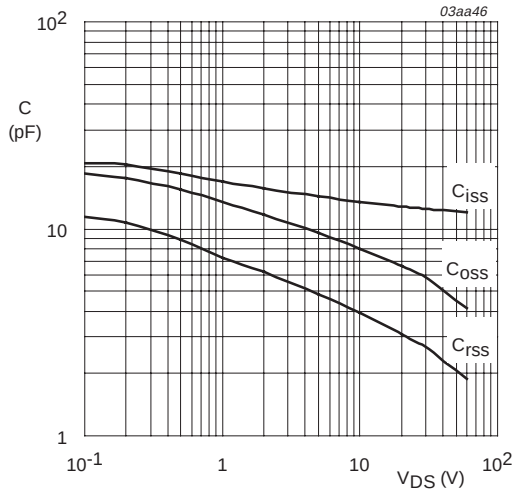
Fig 9. Gate-source threshold voltage as a function of junction temperature.



T_j = 25 °C; V_{DS} = 5 V

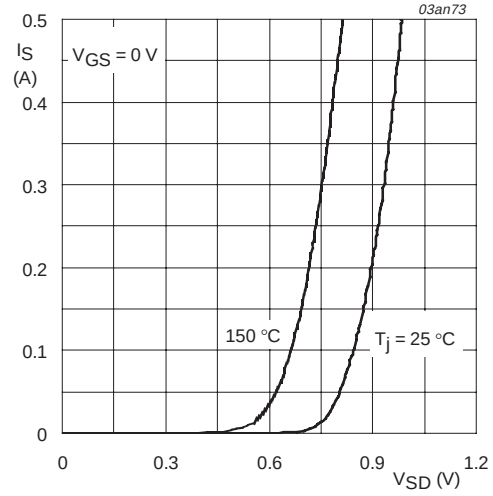
Fig 10. Sub-threshold drain current as a function of gate-source voltage.

2N7002K Typical Characteristics



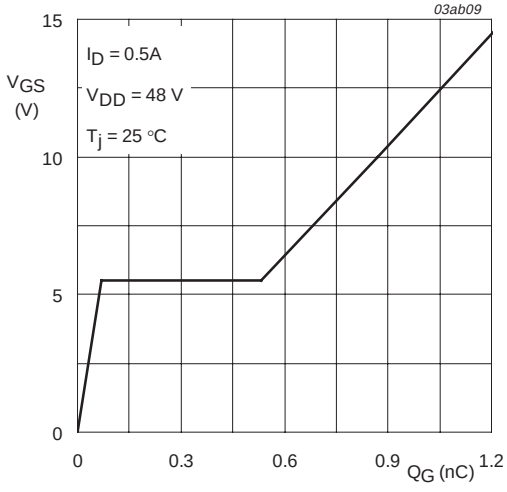
V_{GS} = 0 V; f = 1 MHz

Fig 11. Input, output and reverse transfer capacitances as a function of drain-source voltage; typical values.



T_j = 25 °C and 150 °C; V_{GS} = 0 V

Fig 12. Source (diode forward) current as a function of source-drain (diode forward) voltage; typical values.



I_D = 0.5 A; V_{DD} = 48 V

Fig 13. Gate-source voltage as a function of gate charge; typical values.