

FEATURES

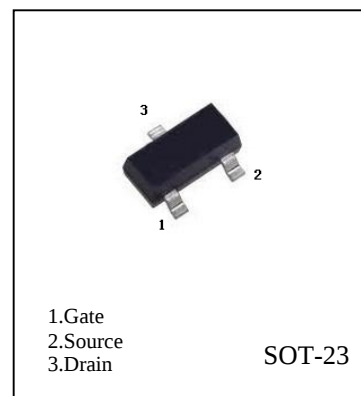
High density cell design for low RDS(ON)
Voltage controlled small signal switch.
Rugged and reliable.
High saturation current capability.

MAXIMUM RATINGS (TA=25°C 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
R _{thj- amb}	Thermal resistance junction-ambient max	357.1 ⁽²⁾	°C/W
T _J , T _{stg}	Operating junction temperature, Storage temperature	- 55 to 150 °C	

2N7002K

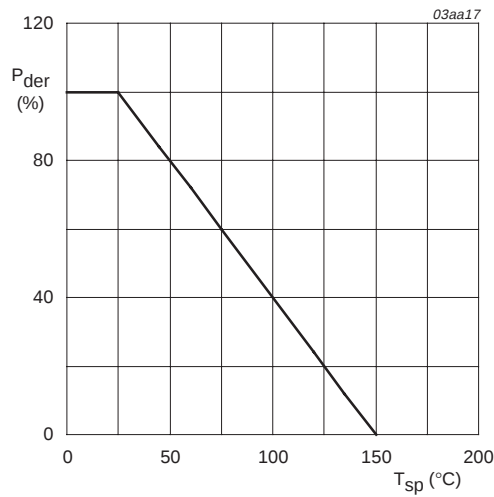
N-Channel MOSFET



ELECTRICAL CHARACTERISTICS (Tamb=25°C unless otherwise specified)

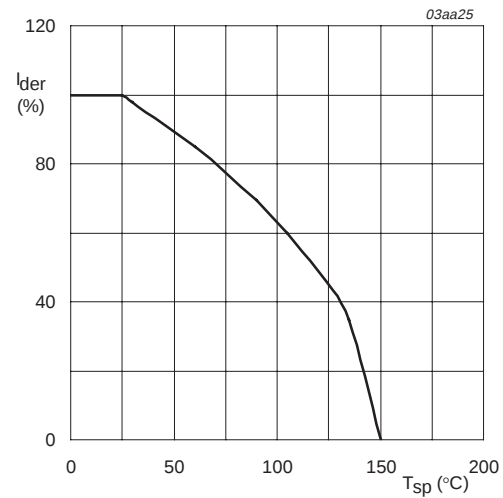
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _{(BR)DSS}	drain-source breakdown voltage	I _D = 10 μA; V _{GS} = 0 V T _J = 25 °C	60	75	-	V
		T _J = -55 °C	55	-	-	V
V _{(BR)GSS}	drain-source breakdown voltage	I _G = ±1 mA; V _{DS} = 0 V	16	22	-	V
V _{GS(th)}	gate-source threshold 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 _{DS(on)}	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



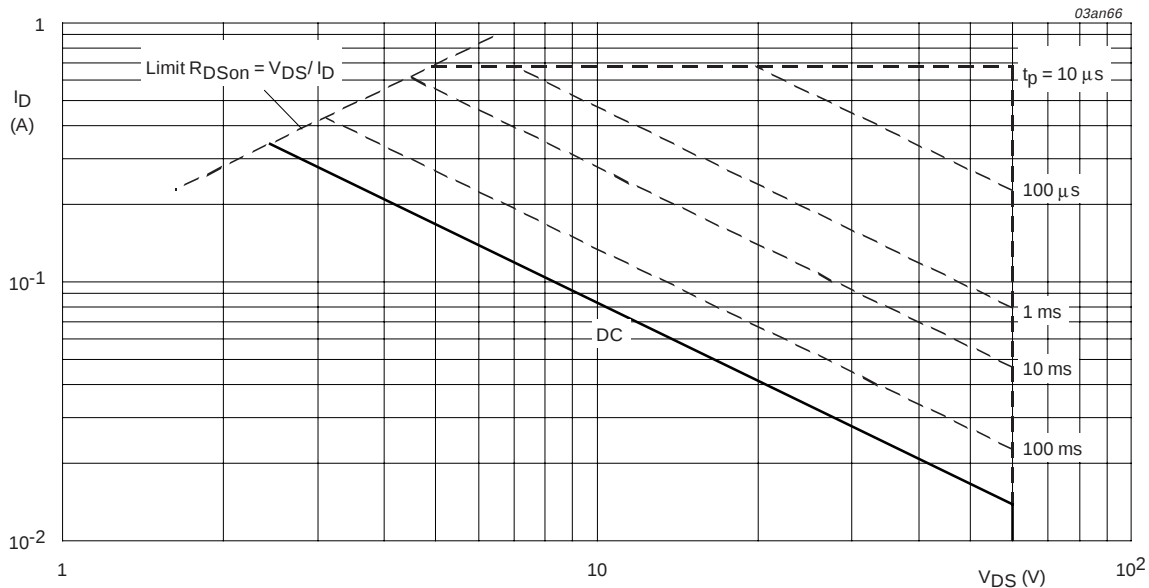
$$P_{der} = \frac{P_{tot}}{P_{tot(25^{\circ}\text{C})}} \times 100\%$$

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



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

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



$T_{sp} = 25^{\circ}\text{C}$; I_{DM} is single pulse; $V_{GS} = 10\text{ V}$

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

2N7002K Typical Characteristics

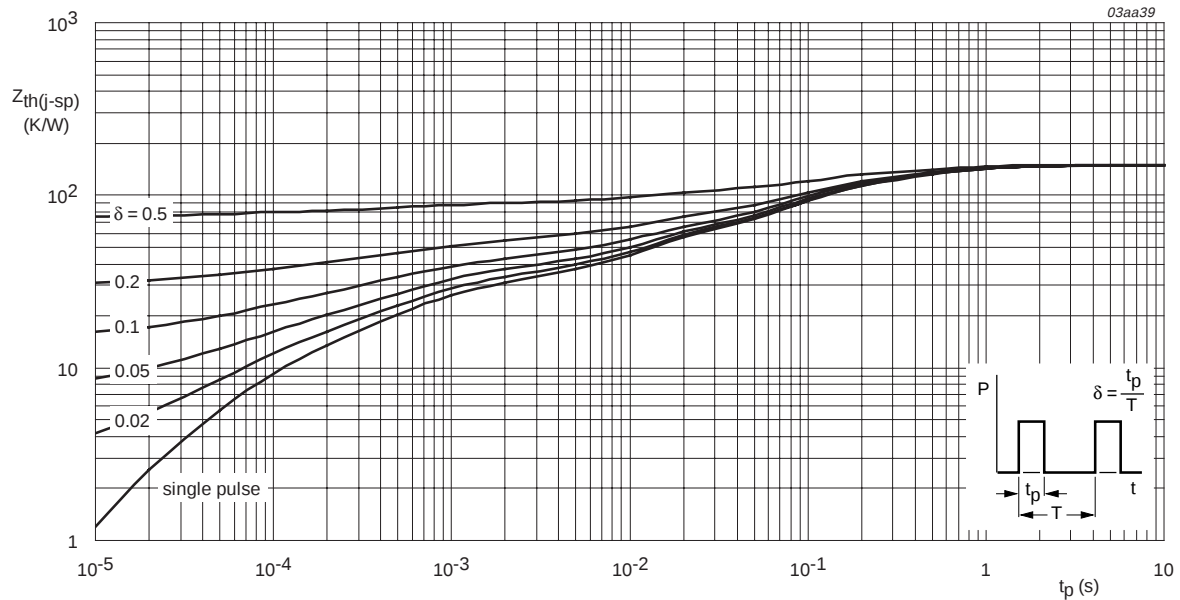
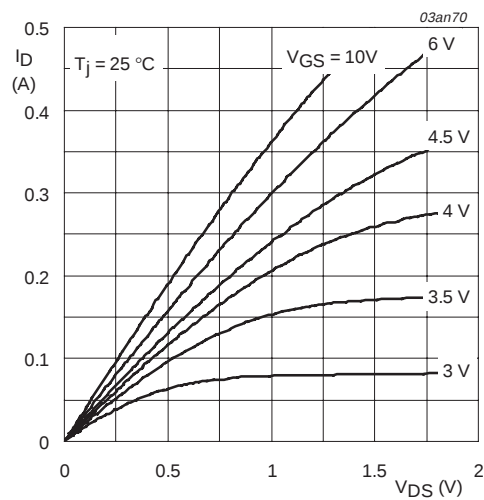
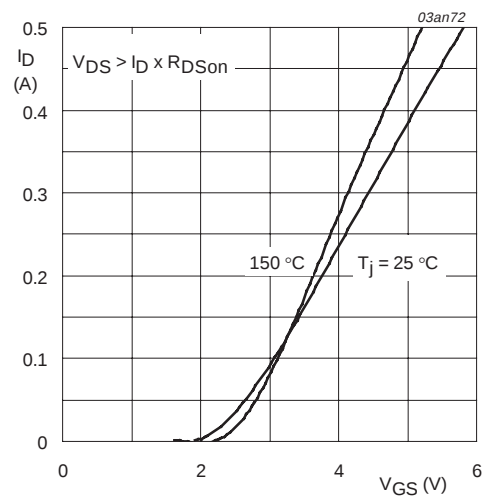


Fig 4. Transient thermal impedance from junction to solder point as a function of pulse duration.



$T_J = 25\text{ }^{\circ}\text{C}$

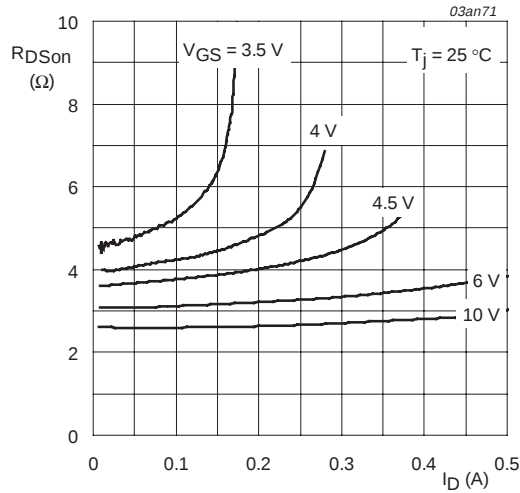
Fig 5. Output characteristics: drain current as a function of drain-source voltage; typical values.



$T_J = 25\text{ }^{\circ}\text{C}$ and $150\text{ }^{\circ}\text{C}$; $V_{DS} > I_D \times R_{DSon}$

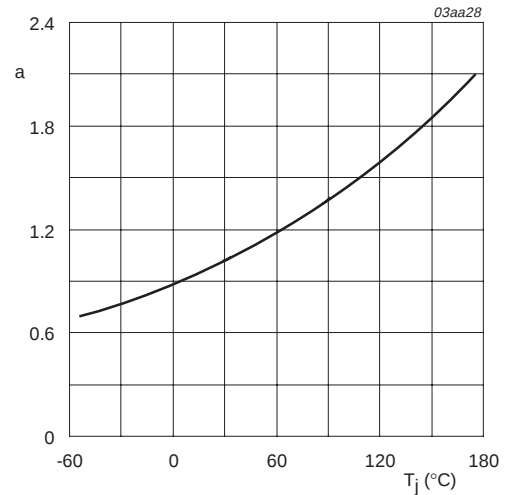
Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values.

2N7002K Typical Characteristics



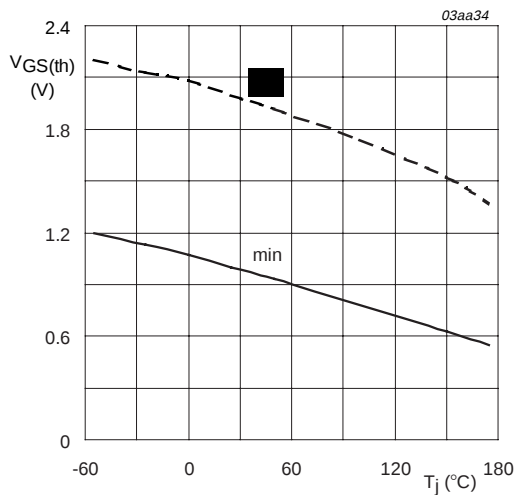
$T_J = 25\text{ }^{\circ}\text{C}$

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



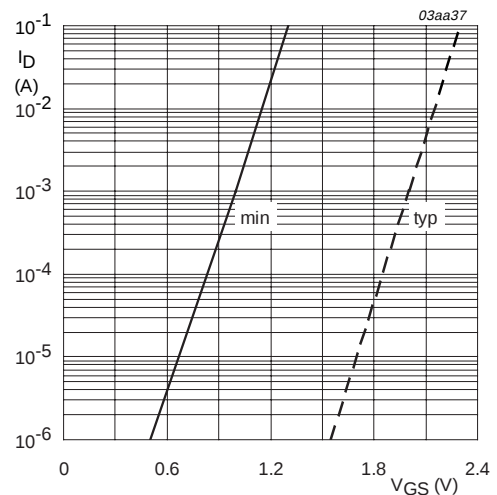
$$a = \frac{R_{DS(on)}}{R_{DS(on)(25^{\circ}\text{C})}}$$

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



$I_D = 1\text{ mA}; V_{DS} = V_{GS}$

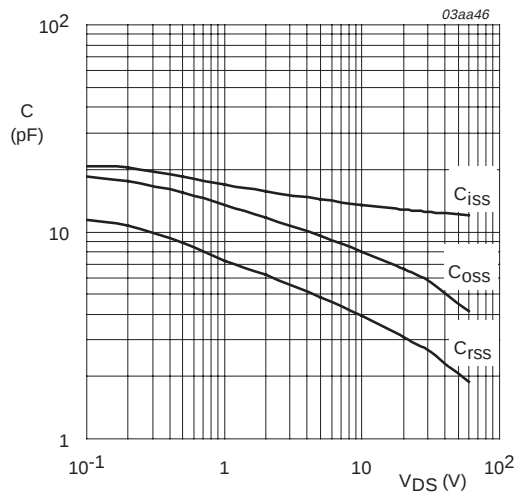
Fig 9. Gate-source threshold voltage as a function of junction temperature.



$T_J = 25\text{ }^{\circ}\text{C}; V_{DS} = 5\text{ V}$

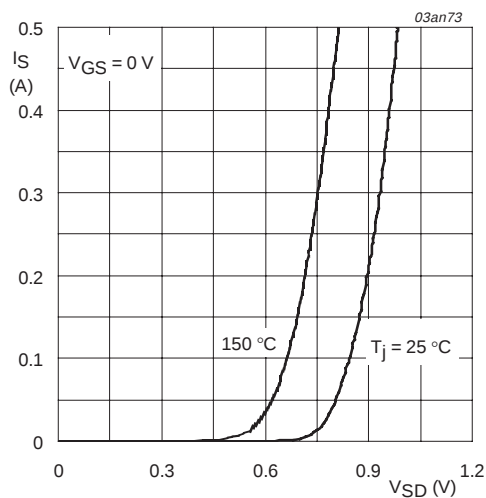
Fig 10. Sub-threshold drain current as a function of gate-source voltage.

2N7002K Typical Characteristics



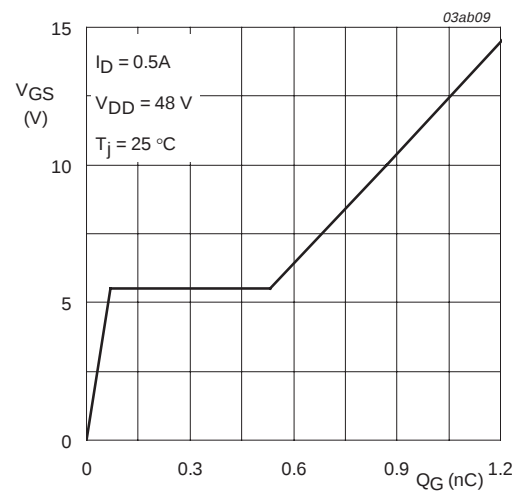
$V_{GS} = 0 \text{ V}$; $f = 1 \text{ MHz}$

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



$T_j = 25^\circ\text{C}$ and 150°C ; $V_{GS} = 0 \text{ V}$

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



$I_D = 0.5 \text{ A}$; $V_{DD} = 48 \text{ V}$

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