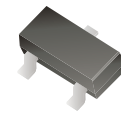


2N7002K-HF

N-Channel
RoHS Device
Halogen Free



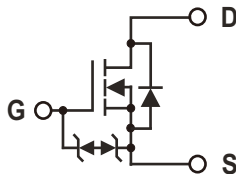
Features

- Small signal MOSFET.
- ESD protected: 1000V.

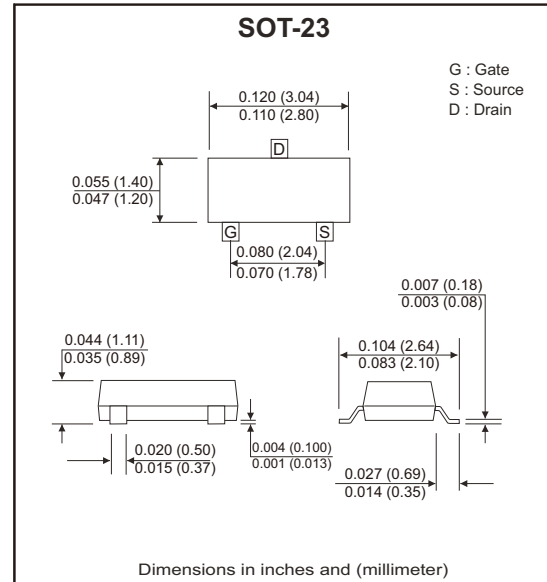
Mechanical data

- Case: SOT-23, molded plastic.
- Mounting position: Any.

Circuit Diagram



G : Gate
S : Source
D : Drain



Maximum Ratings (at TA=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	60	V
Drain-gate voltage ($R_{GS}=1.0\text{ M}\Omega$)	V_{DGR}	60	V
Drain current	@Continuous $T_c=25^\circ\text{C}$ (Note 1)	I_D	± 115
	@Continuous $T_c=100^\circ\text{C}$ (Note 1)	I_D	± 75
	@Pulsed (Note 2)	I_{DM}	± 800
Gate-source voltage	@Continuous	V_{GS}	± 20
	@Non-repetitive ($t_p \leq 50\mu\text{s}$)	V_{GSM}	± 40

Thermal Characteristics

Parameter	Symbol	Max. Value	Unit
Total device dissipation FR-5 board (Note 3)	P_D	225	mW
@ $T_A = 25^\circ\text{C}$		1.8	mW/ $^\circ\text{C}$
Thermal resistance, junction to ambient	$R_{\theta JA}$	556	$^\circ\text{C/W}$
Total device dissipation alumina substrate (Note 4)	P_D	300	mW
@ $T_A = 25^\circ\text{C}$		2.4	mW/ $^\circ\text{C}$
Thermal resistance, junction to ambient	$R_{\theta JA}$	417	$^\circ\text{C/W}$
Junction and storage temperature range	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$

Notes: 1. The power dissipation of the package may result in a lower continuous drain current.

2. Pulse test: pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.

3. FR-5 = $1.0 \times 0.75 \times 0.062\text{ in.}$

4. Alumina = $0.4 \times 0.3 \times 0.025\text{ in}$ in 99.5% alumina.

Electrical Characteristics (at $T_A=25^{\circ}\text{C}$ unless otherwise noted)

Characteristics	Conditions	Symbol	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	$V_{GS} = 0V, I_D = 10\mu A$	BV_{DSS}	60			V
Zero gate voltage drain current	$V_{GS} = 0V, V_{DS} = 60V, T_J = 25^{\circ}C$	I_{DSS}			1.0	μA
	$V_{GS} = 0V, V_{DS} = 60V, T_J = 125^{\circ}C$				500	
Gate-body leakage current, forward	$V_{GS} = 20V$	I_{GSSF}			1	μA
Gate-body leakage current, reverse	$V_{GS} = -20V$	I_{GSSR}			-1	μA
On Characteristics (Note 1)						
Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	$V_{GS(th)}$	1	1.5	2.5	V
On-state drain current	$V_{DS} \geq 2.0 V_{DS(ON)}, V_{GS}=10V$	$I_{D(ON)}$	500			mA
Static drain-source on-state voltage	$V_{GS} = 10V, I_D = 500mA$	$V_{DS(ON)}$			3.75	V
	$V_{GS} = 5V, I_D = 50mA$				0.375	
Static drain-source on-state resistance	$V_{GS} = 10V, I_D = 500mA, T_C = 25^{\circ}C$	$R_{DS(ON)}$		1.4	7.5	Ω
	$V_{GS} = 10V, I_D = 500mA, T_C = 125^{\circ}C$				13.5	
	$V_{GS} = 5V, I_D = 50mA, T_C = 25^{\circ}C$			1.8	7.5	
	$V_{GS} = 5V, I_D = 50mA, T_C = 125^{\circ}C$				13.5	
Forward transconductance	$V_{DS} \geq 2.0V_{DS(ON)}, I_D = 200mA$	g_{fs}	80			mS
Dynamic Characteristics						
Input capacitance	$V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz$	C_{iss}		17	50	pF
Output capacitance		C_{oss}		10	25	
Reverse transfer capacitance		C_{rss}		2.5	5.0	
Switching Characteristics (Note 1)						
Turn-on delay time	$V_{DD} = 25V, I_D = 500mA,$	$t_{d(on)}$		7	20	nS
Turn-off delay time	$R_G = 25\Omega, R_L = 50\Omega, V_{GEN} = 10\Omega$	$t_{d(off)}$		11	40	
Body-Drain Diode Ratings						
Diode forward on-voltage	$I_S = 115mA, V_{GS} = 0V$	V_{SD}			1.5	V
Source current continuous	Body diode	I_S			115	mA
Source current pulsed		I_{SM}			800	mA

Notes: 1. Pulse test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

Typical Rating and Characteristic Curves (2N7002K-HF)

Fig.1 - Ohmic Region

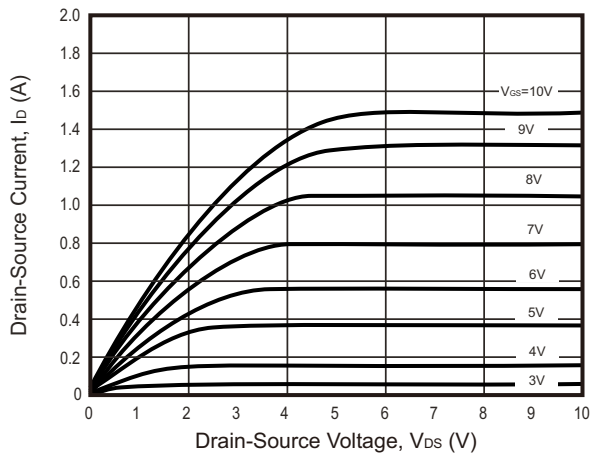


Fig.2 - Transfer Characteristics

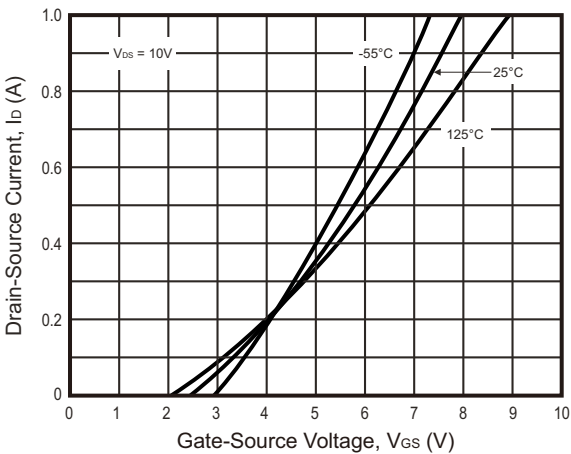


Fig.3 - Temperature Versus Static Drain-Source On-Resistance

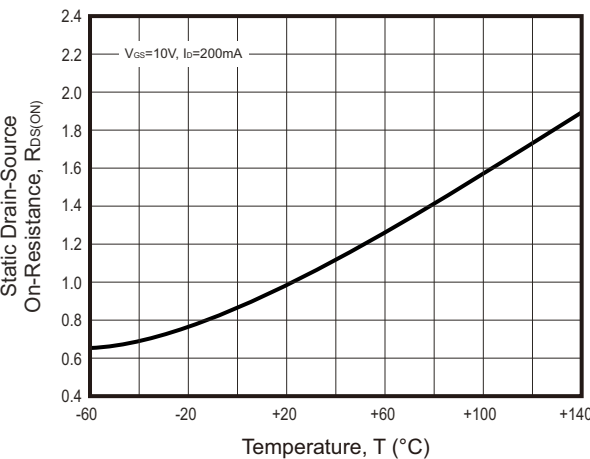
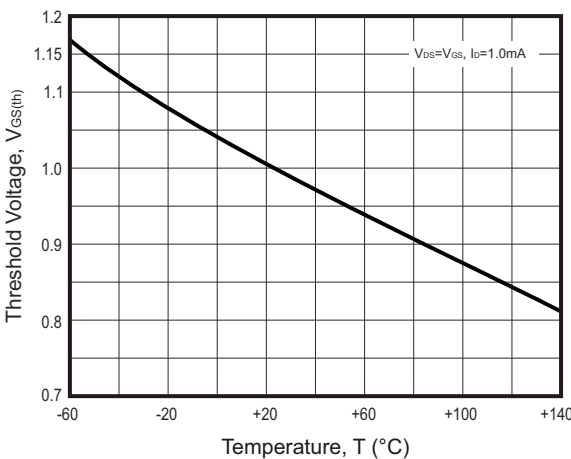
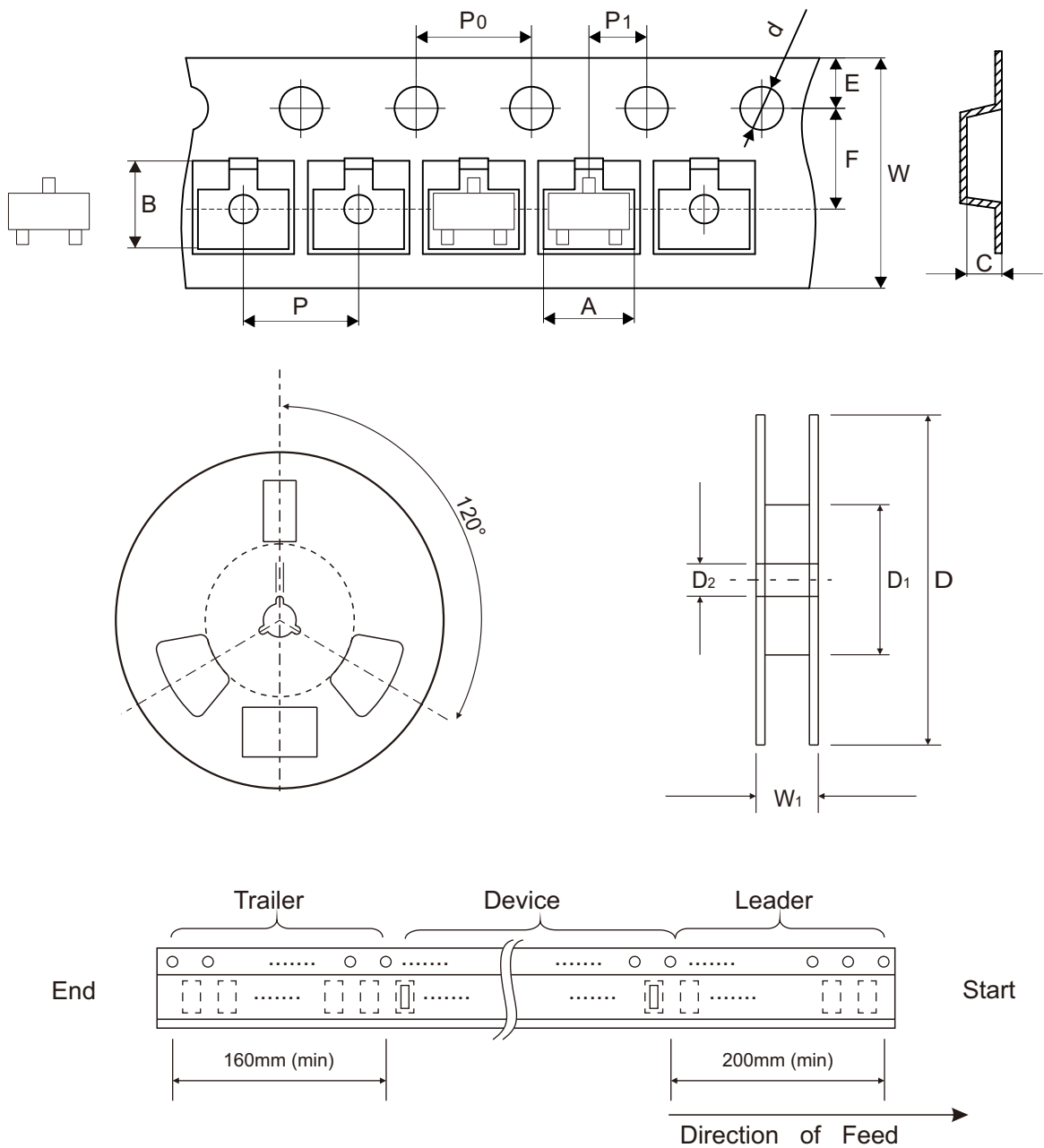


Fig.4 - Temperature Versus Gate Threshold Voltage



Reel Taping Specification

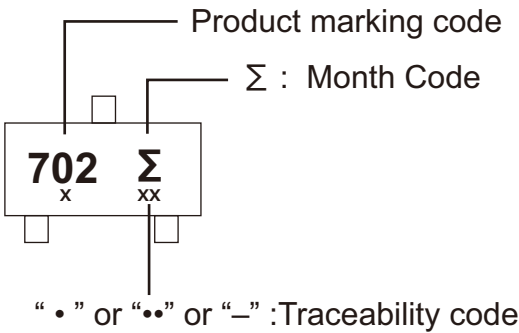


SOT-23	SYMBOL	A	B	C	d	D	D ₁	D ₂
	(mm)	3.10 ± 0.10	2.85 ± 0.10	1.40 ± 0.10	1.55 ± 0.10	178 ± 1	50.0 MIN.	13.0 ± 0.20
	(inch)	0.122 ± 0.004	0.112 ± 0.004	0.055 ± 0.004	0.061 ± 0.004	7.008 ± 0.04	1.969 MIN.	0.512 ± 0.008

SOT-23	SYMBOL	E	F	P	P ₀	P ₁	W	W ₁
	(mm)	1.75 ± 0.10	3.50 ± 0.05	4.00 ± 0.10	4.00 ± 0.10	2.00 ± 0.05	8.00 ± 0.30	14.4 MAX.
	(inch)	0.069 ± 0.004	0.138 ± 0.002	0.157 ± 0.004	0.157 ± 0.004	0.079 ± 0.004	0.315 ± 0.008	0.567 MAX.

Marking Code

Part Number	Marking Code
2N7002K-HF	702 Σ



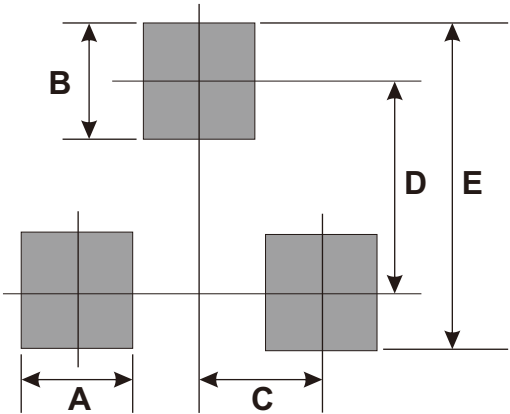
Month Code:

Month	Odd Year (per A.D.)	Even Year (per A.D.)
Jan	1	E
Feb	2	F
Mar	3	H
Apr	4	J
May	5	K
Jun	6	L

Month	Odd Year (per A.D.)	Even Year (per A.D.)
Jul	7	N
Aug	8	P
Sep	9	U
Oct	T	X
Nov	V	Y
Dec	C	Z

Suggested P.C.B. PAD Layout

SIZE	SOT-23	
	(mm)	(inch)
A	0.80	0.031
B	0.90	0.035
C	0.95	0.037
D	2.00	0.079
E	2.90	0.114



Standard Packaging

Case Type	REEL PACK	
	REEL (pcs)	Reel Size (inch)
SOT-23	3,000	7