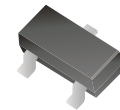


2N7002K-HF

**N-Channel
RoHS Device
Halogen Free**

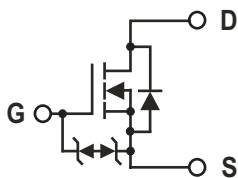


Features

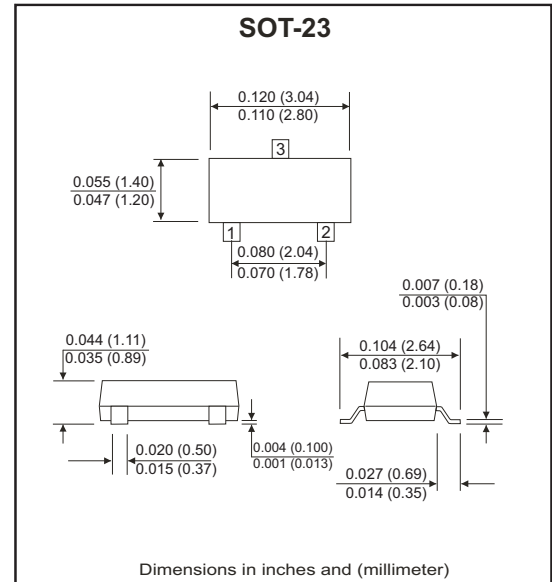
- Small Signal MOSFET.
- ESD protected: 1000V.

Marking: 702

Equivalent Circuit



G : Gate
S : Source
D : Drain



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

Rating	Symbol	Value	Unit
Drain-Source voltage	V_{DSS}	60	Vdc
Drain-Gate Voltage ($R_{GS}=1.0\text{ M}\Omega$)	V_{DGR}	60	Vdc
Drain current	@Continuous $T_c=25^\circ\text{C}$ (Note 1)	± 115	mAcd
	@Continuous $T_c=100^\circ\text{C}$ (Note 1)	± 75	
	@Pulsed (Note 2)	± 800	
Gate-Source voltage	@Continuous	± 20	Vdc
	@Non-repetitive ($t_p \leq 50\mu\text{s}$)	± 40	Vpk

Thermal Characteristics

Characteristics	Symbol	Max. Value	Unit
Total Device Dissipation FR-5 Board (Note 3) @ $T_A = 25^\circ\text{C}$	P_D	225	mW
		1.8	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	°C/W
Total Device Dissipation Alumina Substrate (Note 4) @ $T_A = 25^\circ\text{C}$	P_D	300	mW
		2.4	mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature	T_J, T_{STG}	-55 to +150	°C

- Note: 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 $\leq 2.0\%$.
 3. FR-5 = 1.0 x 0.75 x 0.062 in.
 4. Alumina = 0.4 x 0.3 x 0.025 in 99.5% alumina.

Company reserves the right to improve product design , functions and reliability without notice.

REV: A

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

Characteristics	Conditions	Symbol	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=10\mu A$	$V_{(BR)DSS}$	60			V
Zero Gate Voltage Drain Current ($V_{GS}=0V, V_{DS}=60V$)	$T_J=25^\circ\text{C}$	I_{DSS}			1.0	μA
	$T_J=125^\circ\text{C}$				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	$V_{DS}\geq 2.0V_{DS(ON)}, V_{GS}=10V$	$I_{D(ON)}$	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	$V_{GS}=10V, I_D=500mA @T_C=25^\circ\text{C}$	$R_{DS(ON)}$		1.4	7.5	Ω
	$V_{GS}=10V, I_D=500mA @T_C=125^\circ\text{C}$				13.5	
	$V_{GS}=5V, I_D=50mA @T_C=25^\circ\text{C}$			1.8	7.5	
	$V_{GS}=5V, I_D=50mA @T_C=125^\circ\text{C}$				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	$V_{DD}=25V, I_D=500mA, R_G=25\Omega, R_L=50\Omega, V_{GEN}=10V$	$t_{d(on)}$		7	20	nS
Turn-Off Delay Time		$t_{d(off)}$		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

Note: 1. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2.0\%$.

RATING AND CHARACTERISTIC CURVES (2N7002K-HF)

Fig.1 Ohmic Region

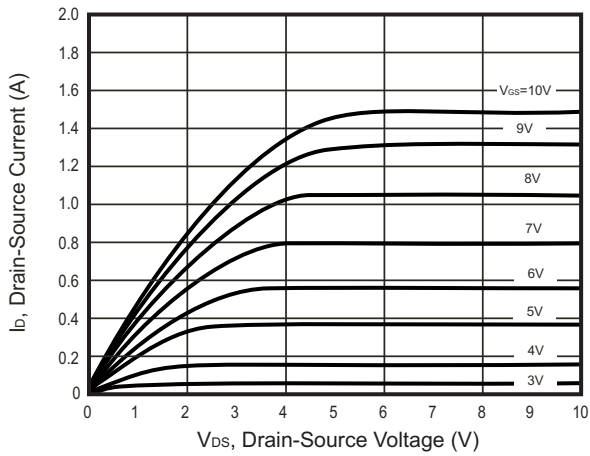


Fig.2 Transfer Characteristics

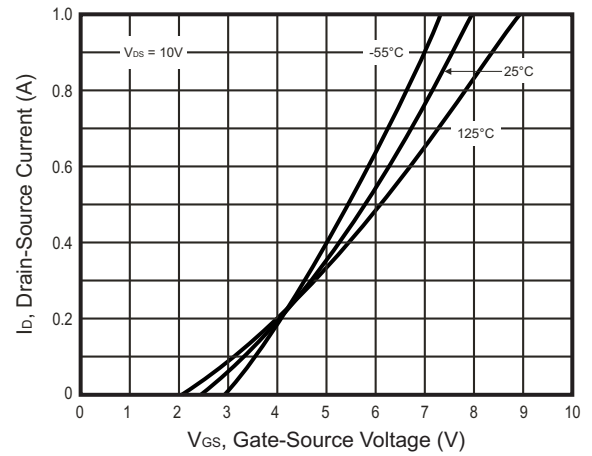


Fig.3 Temperature Versus Static Drain-Source On-Resistance

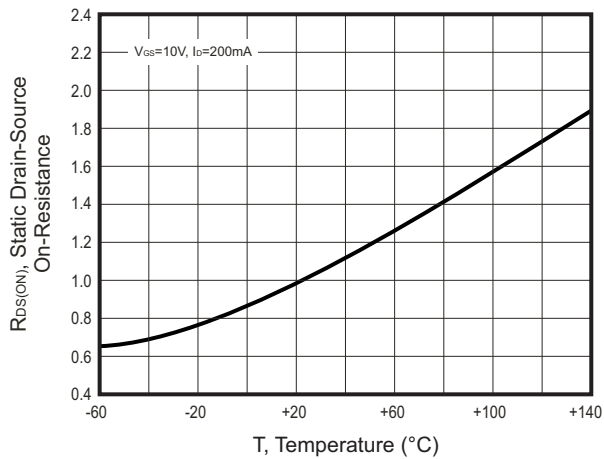
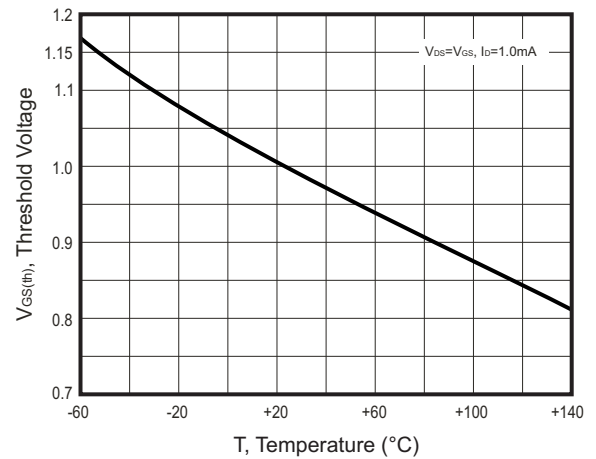
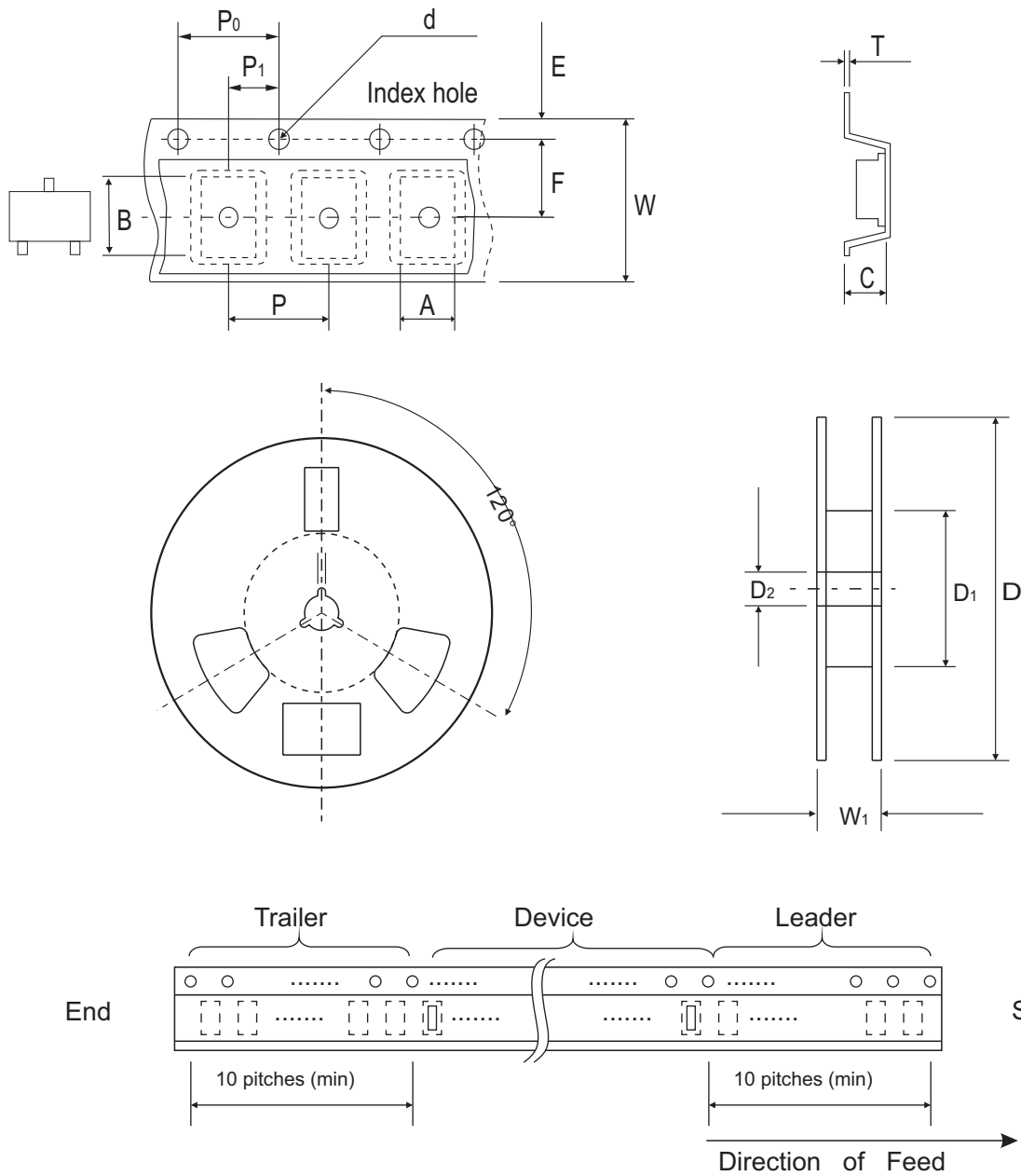


Fig.4 Temperature Versus Gate Threshold Voltage



$V_{GS} = 5V, I_D = 0.05A$

Reel Taping Specification



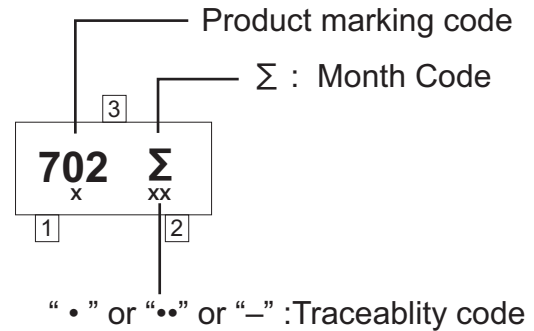
SOT-23	SYMBOL	A	B	C	d	D	D ₁	D ₂
	(mm)	3.10 ± 0.10	2.85 ± 0.10	1.40 ± 0.10	1.55 ± 0.10	178 ± 1	50.0 MIN.	13.0 ± 0.20
	(inch)	0.122 ± 0.004	0.112 ± 0.004	0.055 ± 0.004	0.061 ± 0.004	7.008 ± 0.04	1.969 MIN.	0.512 ± 0.008

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.

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Marking Code

Part Number	Marking Code
2N7002K-HF	702 Σ



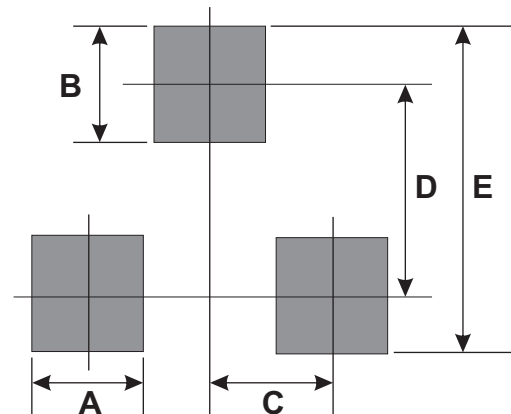
Month Code:

Month	Odd Year (per A.D.)	Even Year (per A.D.)
Jan	1	E
Feb	2	F
Wer	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 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

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