



Small Signal MOSFET Bare Die - 2N7002

Rev 1.0
02/26/18

N-Channel Enhancement Mode Field Effect Transistor in bare die form

Features:

- High Density Cell Design for Low $R_{DS(ON)}$
- Voltage Controlled Small Signal Switch
- Rugged and Reliable with Gold Back Metal
- High Reliability tested grades for Military + Space

Ordering Information:

The following part suffixes apply:

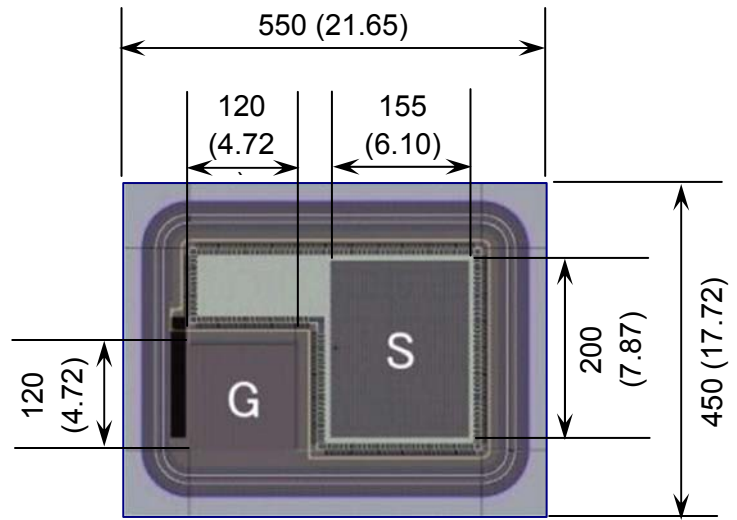
- No suffix - MIL-STD-750 /2072 Visual Inspection
- "H" - MIL-PRF-750 /2072 Visual Inspection
+ MIL-STD-38534 Class H LAT
- "K" - MIL-PRF-750 /2072 Visual Inspection
+ MIL-STD-38534 Class K LAT

LAT = Lot Acceptance Test.

For further information on LAT process flows see below.

www.siliconsupplies.com/quality/bare-die-lot-qualification

Die Dimensions in μm (mils)



G = GATE S = SOURCE

DIE BACK = DRAIN

Supply Formats:

- Default – Die in Waffle Pack (400 per tray capacity)
- Sawn Wafer on Tape – On request
- Unsawn Wafer – On request
- With additional electrical selection – On request
- Sawn as pairs or adjacent pair pick – On request
- Assembled in metal or ceramic package – On request

Mechanical Specification

Die Size (Excluding Saw Street)	550 x 450 22 x 18	μm mils
Gate Pad Size	120 x 120 4.72 x 4.72	μm mils
Source Pad Size	155 x 200 6.10 x 7.87	μm mils
Die Thickness	140 (± 20) 5.51 (± 0.79)	μm mils
Top Metal Composition	Al-Si 4.6 μm	
Back Metal Composition	Au 0.9 μm	





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Absolute Maximum Ratings¹ $T_J = 25^\circ\text{C}$ unless otherwise stated

PARAMETER	SYMBOL	VALUE	UNIT
Drain-to-Source Voltage	V_{DSS}	60	V
Drain-Gate Voltage ($R_{GS} \leq 1M\Omega$)	V_{DGR}	60	V
Gate-Source Voltage - Continuous	V_{GSS}	± 20	V
Gate-Source Voltage – Non Repetitive ($t_p < 50\mu s$)		± 40	
Maximum Drain Current - Continuous	I_D	115	mA
Maximum Drain Current - Pulsed		800	
Maximum Power Dissipation Derated above 25°C^2	P_D	200	mW
		1.6	$\text{mW}/^\circ\text{C}$
Junction & Storage Temperature	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
THERMAL CHARACTERISTICS			
Thermal Resistance, Junction to Ambient ²	$R_{\theta JA}$	625	$^\circ\text{C}/\text{W}$

1. Operation above the absolute maximum rating may cause device failure. Operation at the absolute maximum ratings, for extended periods, may reduce device reliability.
2. Power dissipation & thermal characterisation in SOT-23 package. Performance at die level dependent on assembly method and substrate choice.

Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise stated

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 10\mu A$	60	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60V, V_{GS} = 0$	-	-	1	μA
		$V_{DS} = 60V, V_{GS} = 0, T_J = 125^\circ\text{C}$	-	-	0.5	mA
Gate-Body Leakage, Forward	I_{GSSF}	$V_{GS} = 20V, V_{DS} = 0V$	-	-	100	nA
Gate-Body Leakage, Reverse	I_{GSSR}	$V_{GS} = -20V, V_{DS} = 0V$	-	-	-100	nA
ON CHARACTERISTICS³						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	1	2.1	2.5	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 500mA$	-	1.2	7.5	Ω
		$V_{GS} = 10V, I_D = 500mA, T_J = 100^\circ\text{C}$	-	1.7	13.5	
		$V_{GS} = 5V, I_D = 50mA$	-	1.7	7.5	
		$V_{GS} = 5V, I_D = 50mA, T_J = 100^\circ\text{C}$	-	2.4	13.5	
Drain-Source On-Voltage	$V_{DS(on)}$	$V_{GS} = 10V, I_D = 500mA$	-	0.6	3.75	V
		$V_{GS} = 5V, I_D = 50mA$	-	0.09	1.5	V
On-State Drain Current	$I_{D(on)}$	$V_{GS} = 10V, V_{DS} \geq 2 V_{DS(on)}$	500	2700	-	mA
Forward Transconductance	g_{FS}	$V_{DS} \geq 2 V_{DS(on)}, I_D = 200mA$	80	320	-	mS
DYNAMIC CHARACTERISTICS⁴						
Input Capacitance	C_{iss}	$V_{DS} = 25V, V_{GS} = 0V, f = 1MHz$	-	20	50	pF
Output Capacitance	C_{oss}		-	11	25	
Reverse Transfer Capacitance	C_{rss}		-	4	5	
Turn-On Time	t_{on}	$V_{DD} = 30V, R_L = 150\Omega, I_D = 200mA, V_{GS} = 10V, R_{GEN} = 25\Omega$	-	-	20	ns
Turn-Off Time	t_{off}		-	-	20	

3. Pulse Test: Pulse width $\leq 300\mu s$, Duty Cycle $\leq 2\%$ 4. Not production testing in die form, characterized by chip design & tested in package LAT.





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Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise stated

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Maximum Continuous Drain-Source Diode Forward Current	I_S	-	-	-	115	mA
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}	-	-	-	800	mA
Drain-Source Diode Forward Voltage ⁴	V_{SD}	$V_S = 0V, I_S = 115mA$	-	-	100	nA

Typical Electrical Characteristics

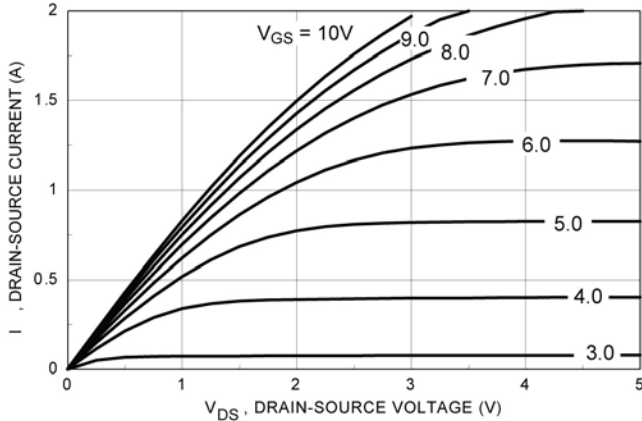


Fig 1 – On-Region Characteristics

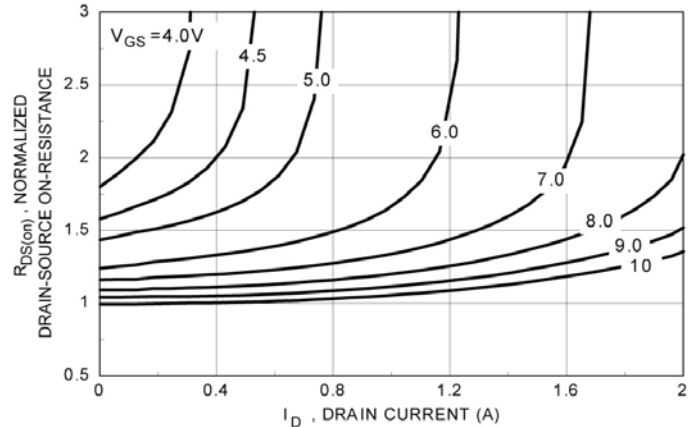


Fig 2 – On-Resistance Variation with Gate Voltage and Drain Current

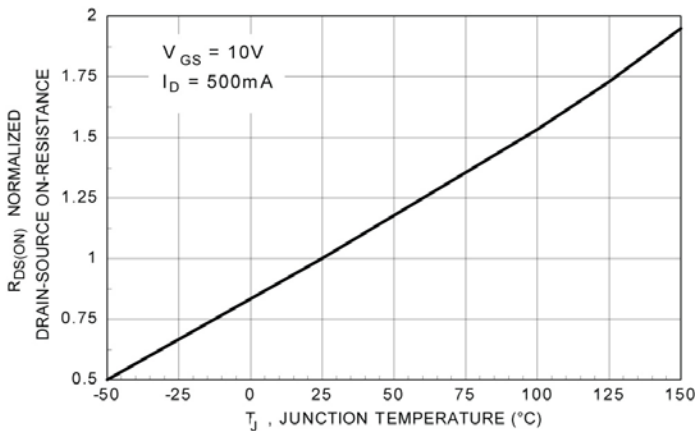


Fig 3 – On-Resistance Variation with Temperature

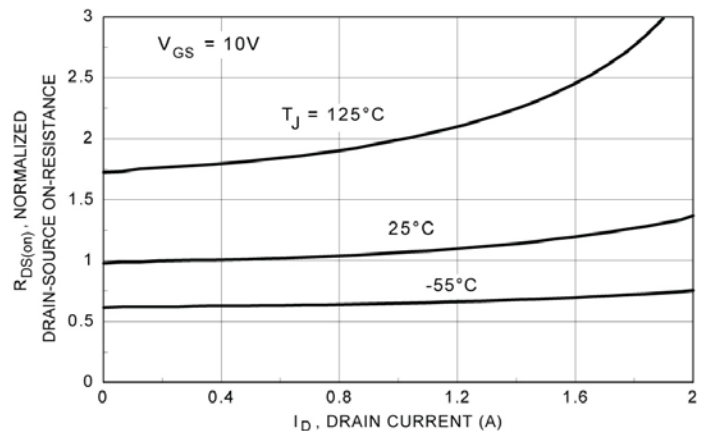


Fig 4 – On-Resistance Variation with Drain Current and Temperature





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Typical Electrical Characteristics continued

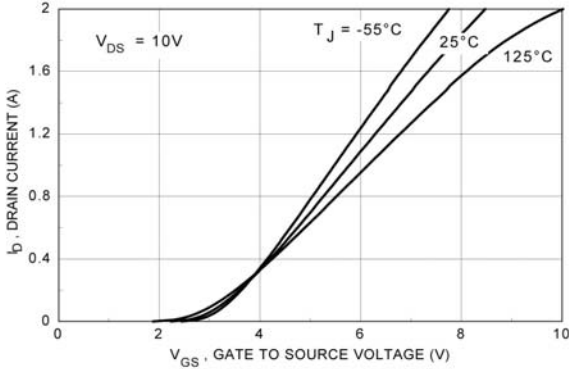


Fig 5 – Transfer Characteristics

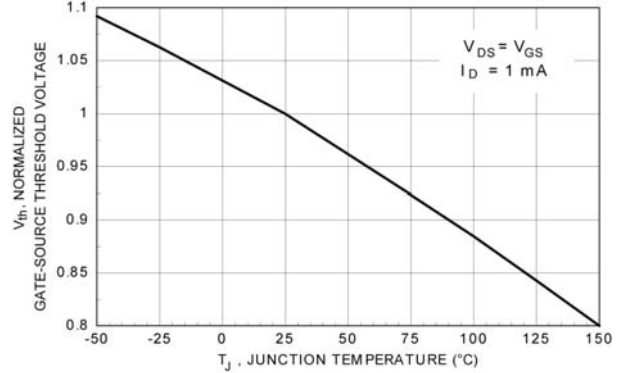


Fig 6 – Gate Threshold variation with Temperature

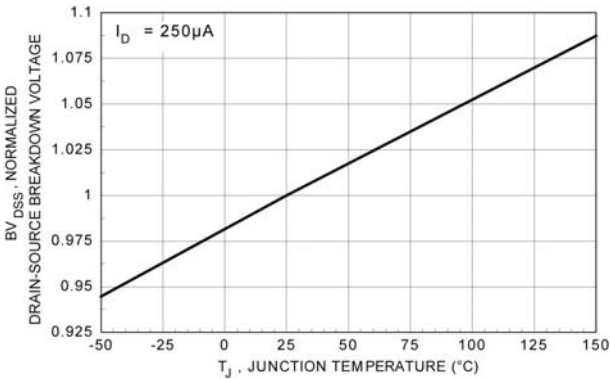


Fig 7 – Gate Threshold variation with Temperature

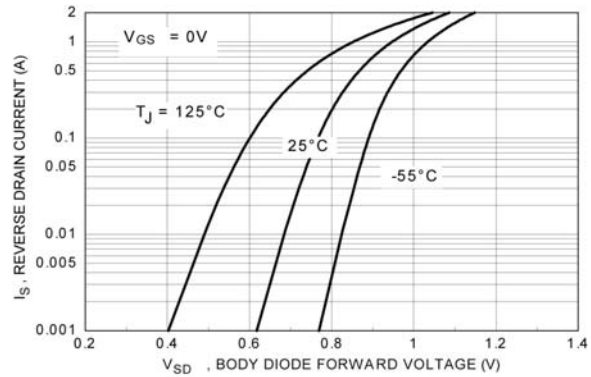


Fig 8 – Body Diode Forward Voltage variation with Temperature

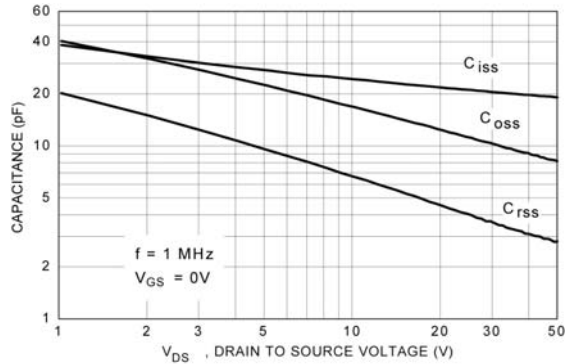


Fig 9 – Capacitance Characteristics

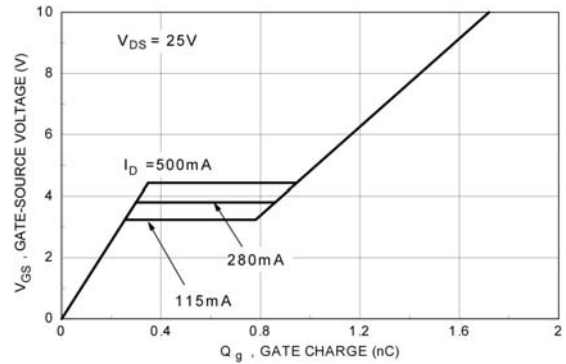


Fig 10 – Gate Charge Characteristics

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