



# 2N7002KDW-AU

## 60V N-Channel Enhancement Mode MOSFET – ESD Protected

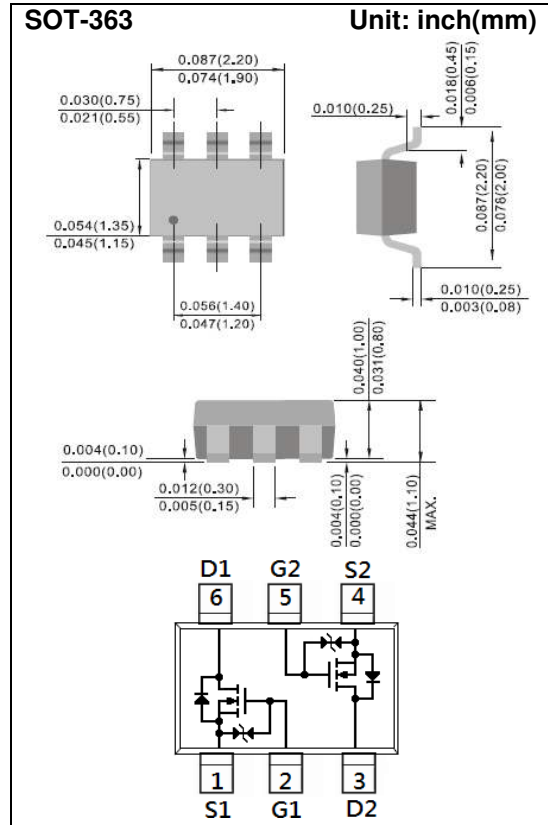
**Voltage** 60 V **Current** 250mA

### Features

- $R_{DS(ON)}$ ,  $V_{GS}@10V$ ,  $I_D@500mA < 3\Omega$
- $R_{DS(ON)}$ ,  $V_{GS}@4.5V$ ,  $I_D@200mA < 4\Omega$
- Advanced Trench Process Technology
- High Density Cell Design For Ultra Low On-Resistance
- Very Low Leakage Current In Off Condition
- Specially Designed for Battery Operated Systems, Solid-State Relays Drivers: Relay, Displays, Memories, etc
- ESD Protected 2KV HBM
- AEC-Q101 qualified
- Lead free in compliance with EU RoHS 2.0
- Green molding compound as per IEC 61249 standard

### Mechanical Data

- Case : SOT-363 Package
- Terminals : Solderable per MIL-STD-750, Method 2026
- Approx. Weight : 0.0002 ounces, 0.006 grams



## Maximum Ratings and Thermal Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

PARAMETER		SYMBOL	LIMIT	UNITS
Drain-Source Voltage		$V_{DS}$	60	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	
Continuous Drain Current		$I_D$	250	mA
Pulsed Drain Current		$I_{DM}$	1000	
Power Dissipation	$T_A=25^\circ\text{C}$	$P_D$	350	mW
	Derate above $25^\circ\text{C}$		4	mW/ $^\circ\text{C}$
Operating Junction and Storage Temperature Range		$T_J, T_{STG}$	-55~150	$^\circ\text{C}$
Typical Thermal Resistance		$R_{\theta JA}$	357	$^\circ\text{C/W}$
- Junction to Ambient <sup>(Note 3)</sup>				



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

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNITS
<b>Static</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=10\mu A$	60	-	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1	-	2.5	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=500mA$	-	-	3	$\Omega$
		$V_{GS}=4.5V, I_D=200mA$	-	-	4	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=60V, V_{GS}=0V$	-	-	1	$\mu A$
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$	-	-	$\pm 10$	
Forward Transconductance	$g_{fs}$	$V_{DS}=15V, I_D=250mA$	100	-	-	mS
<b>Dynamic</b> (Note 5)						
Total Gate Charge	$Q_g$	$V_{DS}=15V, I_D=250mA,$ $V_{GS}=5V$ (Note 1,2)	-	0.8	-	nC
Gate-Source Charge	$Q_{gs}$		-	0.35	-	
Gate-Drain Charge	$Q_{gd}$		-	0.2	-	
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V,$ $f=1MHz$	-	35	-	$\mu F$
Output Capacitance	$C_{oss}$		-	13	-	
Reverse Transfer Capacitance	$C_{rss}$		-	8	-	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=30V, I_D=200mA,$ $V_{GS}=10V,$ $R_G=10\Omega$ (Note 1,2)	-	2.7	-	ns
Turn-On Rise Time	$t_r$		-	19	-	
Turn-Off Delay Time	$t_{d(off)}$		-	15	-	
Turn-Off Fall Time	$t_f$		-	23	-	
<b>Drain-Source Diode</b>						
Maximum Continuous Drain-Source Diode Forward Current	$I_S$	---	-	-	250	mA
Diode Forward Voltage	$V_{SD}$	$I_S=200mA, V_{GS}=0V$	-	0.82	1.3	V

NOTES :

1. Pulse width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .
2. Essentially independent of operating temperature typical characteristics.
3.  $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins mounted on a 1 inch FR-4 with 2oz. square pad of copper.
4. The maximum current rating is package limited.
5. Guaranteed by design, not subject to production testing.



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## TYPICAL CHARACTERISTIC CURVES

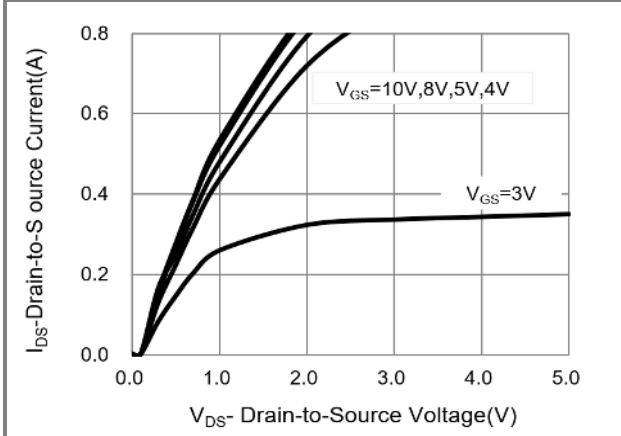


Fig.1 On-Region Characteristics

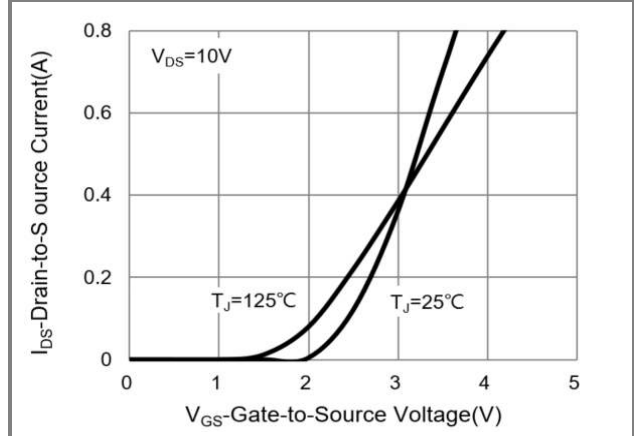


Fig.2 Transfer Characteristics

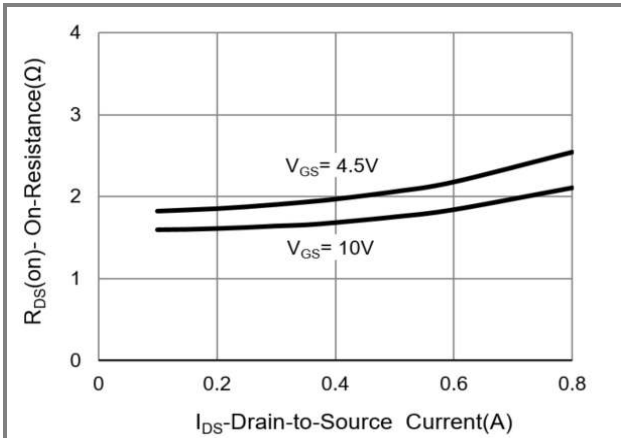


Fig.3 On-Resistance vs. Drain Current

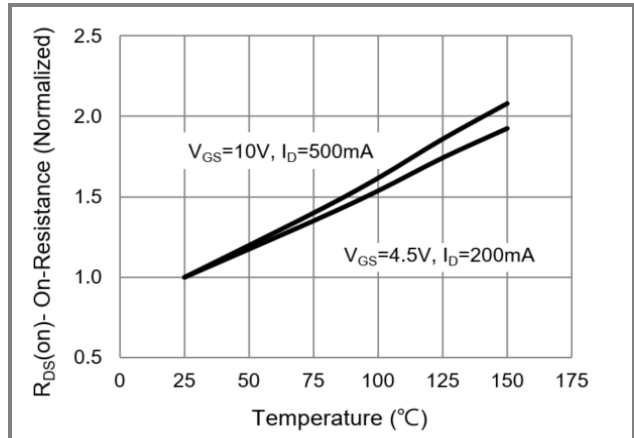


Fig.4 On-Resistance vs. Junction temperature

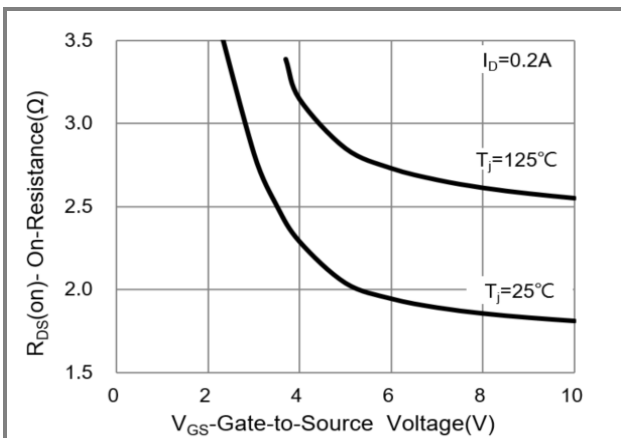


Fig.5 On-Resistance Variation with  $V_{GS}$

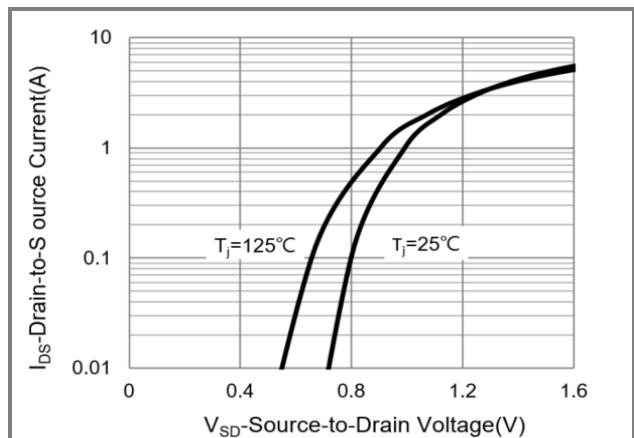


Fig.6 Body Diode Characteristics



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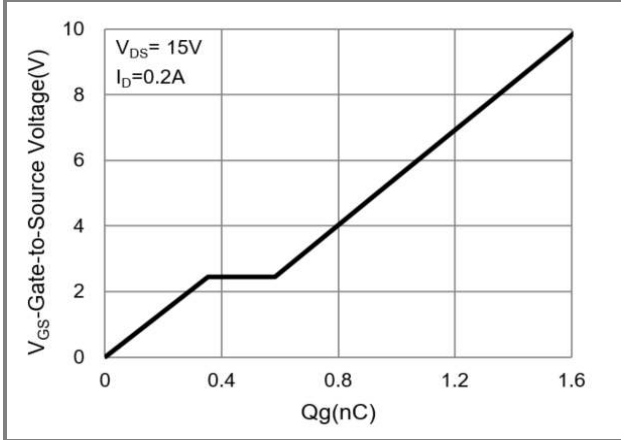


Fig.7 Gate-Charge Characteristics

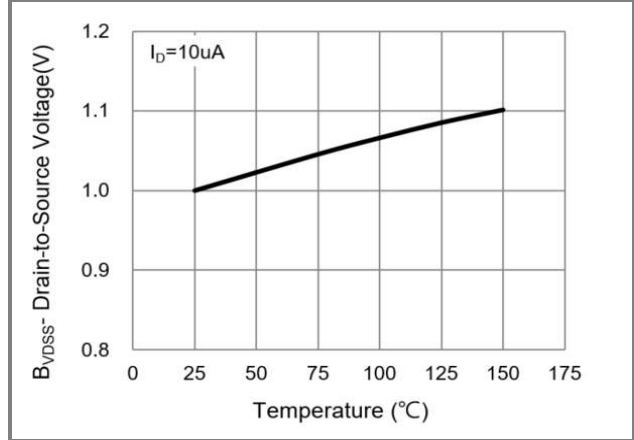


Fig.8 Breakdown Voltage Variation vs. Temperature

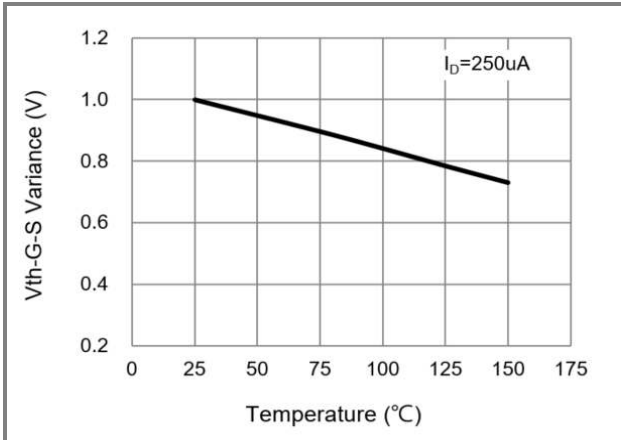


Fig.9 Threshold Voltage Variation with Temperature

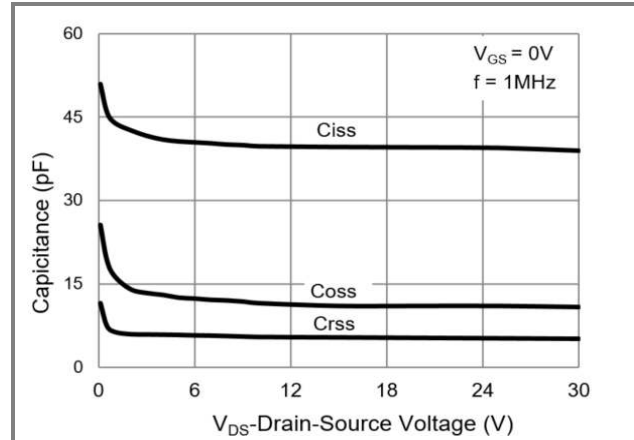


Fig.10 Capacitance vs. Drain-Source Voltage

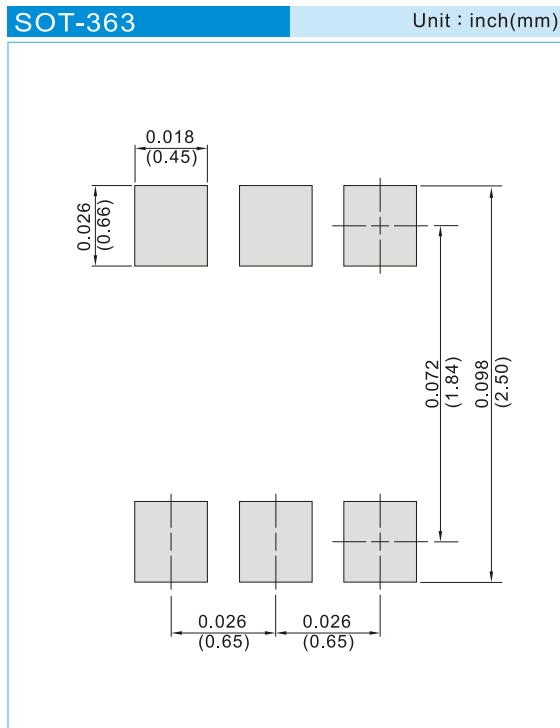


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## Part No Packing Code Version

Part No Packing Code	Package Type	Packing Type	Marking	Version
2N7002KDW-AU_R1_000A1	SOT-363	3K pcs / 7" reel	K27	Halogen free

## Mounting Pad Layout





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