



## 2N7002KDW

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

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

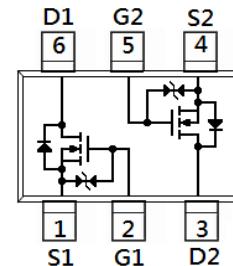
**SOT-363**

#### 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
- 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 : 0.006 grams



#### Maximum Ratings and Thermal Characteristics ( $T_A=25^\circ C$ 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	$T_A=25^\circ C$	350	mW
		4	$mW/^\circ C$
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55~150	$^\circ C$
Typical Thermal Resistance - Junction to Ambient <sup>(Note 3)</sup>	$R_{\theta JA}$	357	$^\circ C/W$



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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	$\text{BV}_{\text{DSS}}$	$\text{V}_{\text{GS}}=0\text{V}, \text{I}_{\text{D}}=10\text{uA}$	60	-	-	V
Gate Threshold Voltage	$\text{V}_{\text{GS}(\text{th})}$	$\text{V}_{\text{DS}}=\text{V}_{\text{GS}}, \text{I}_{\text{D}}=250\text{uA}$	1	-	2.5	
Drain-Source On-State Resistance	$\text{R}_{\text{DS}(\text{on})}$	$\text{V}_{\text{GS}}=10\text{V}, \text{I}_{\text{D}}=500\text{mA}$	-	-	3	$\Omega$
		$\text{V}_{\text{GS}}=4.5\text{V}, \text{I}_{\text{D}}=200\text{mA}$	-	-	4	
Zero Gate Voltage Drain Current	$\text{I}_{\text{DSS}}$	$\text{V}_{\text{DS}}=60\text{V}, \text{V}_{\text{GS}}=0\text{V}$	-	-	1	$\text{uA}$
Gate-Source Leakage Current	$\text{I}_{\text{GSS}}$	$\text{V}_{\text{GS}}=\pm 20\text{V}, \text{V}_{\text{DS}}=0\text{V}$	-	-	$\pm 10$	
Forward Transconductance	$\text{g}_{\text{fs}}$	$\text{V}_{\text{DS}}=15\text{V}, \text{I}_{\text{D}}=250\text{mA}$	100	-	-	$\text{mS}$
<b>Dynamic</b> <sup>(Note 5)</sup>						
Total Gate Charge	$\text{Q}_{\text{g}}$	$\text{V}_{\text{DS}}=15\text{V}, \text{I}_{\text{D}}=250\text{mA}, \text{V}_{\text{GS}}=5\text{V}$ <sup>(Note 1,2)</sup>	-	0.8	-	$\text{nC}$
Gate-Source Charge	$\text{Q}_{\text{gs}}$		-	0.35	-	
Gate-Drain Charge	$\text{Q}_{\text{gd}}$		-	0.2	-	
Input Capacitance	$\text{C}_{\text{iss}}$	$\text{V}_{\text{DS}}=25\text{V}, \text{V}_{\text{GS}}=0\text{V}, \text{f}=1\text{MHZ}$	-	35	-	$\text{pF}$
Output Capacitance	$\text{C}_{\text{oss}}$		-	13	-	
Reverse Transfer Capacitance	$\text{C}_{\text{rss}}$		-	8	-	
Turn-On Delay Time	$\text{t}_{\text{d}(\text{on})}$	$\text{V}_{\text{DD}}=30\text{V}, \text{I}_{\text{D}}=200\text{mA}, \text{V}_{\text{GS}}=10\text{V}, \text{R}_{\text{G}}=10\Omega$ <sup>(Note 1,2)</sup>	-	2.7	-	$\text{ns}$
Turn-On Rise Time	$\text{tr}$		-	19	-	
Turn-Off Delay Time	$\text{t}_{\text{d}(\text{off})}$		-	15	-	
Turn-Off Fall Time	$\text{tf}$		-	23	-	
<b>Drain-Source Diode</b>						
Maximum Continuous Drain-Source Diode Forward Current	$\text{I}_{\text{s}}$	---	-	-	250	$\text{mA}$
Diode Forward Voltage	$\text{V}_{\text{SD}}$	$\text{I}_{\text{s}}=200\text{mA}, \text{V}_{\text{GS}}=0\text{V}$	-	0.82	1.3	V

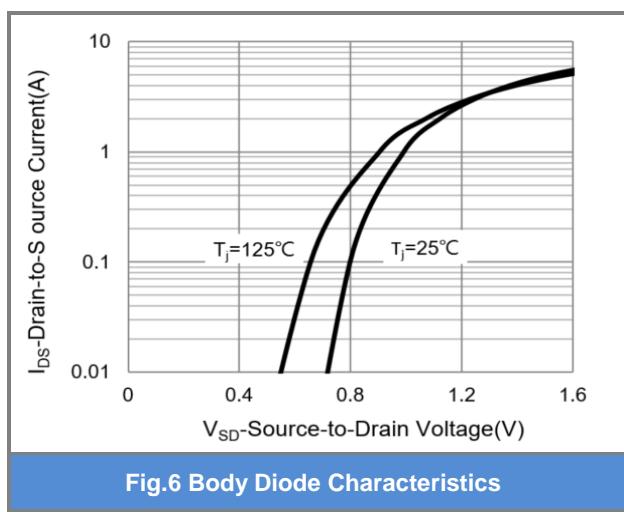
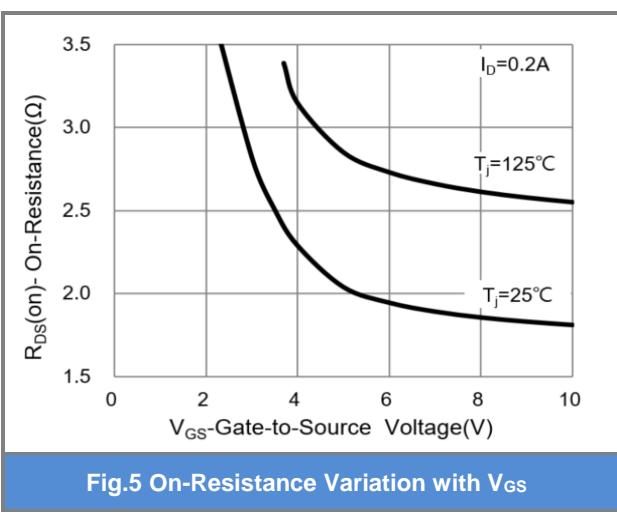
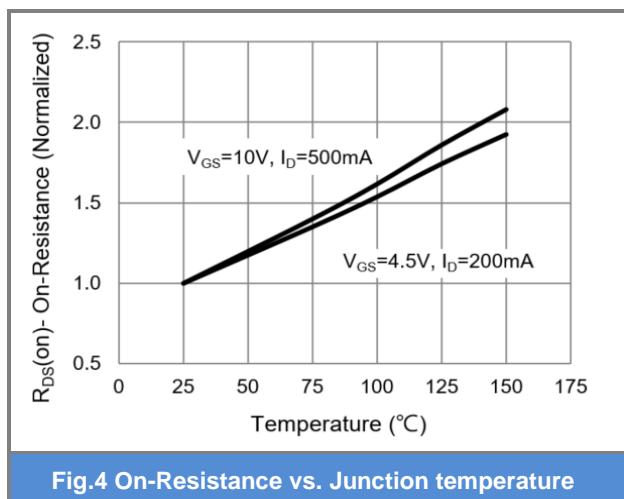
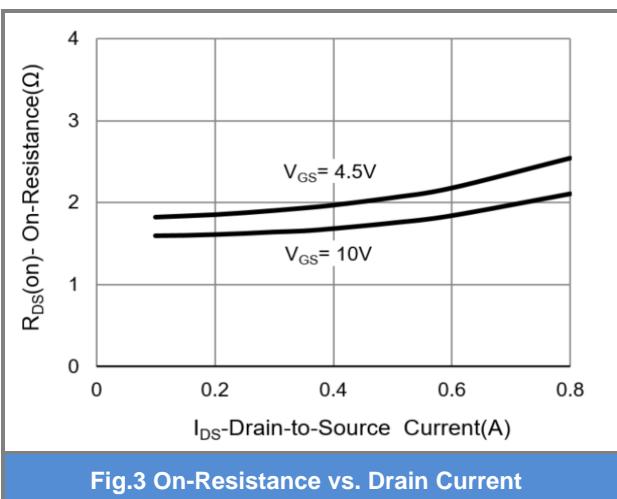
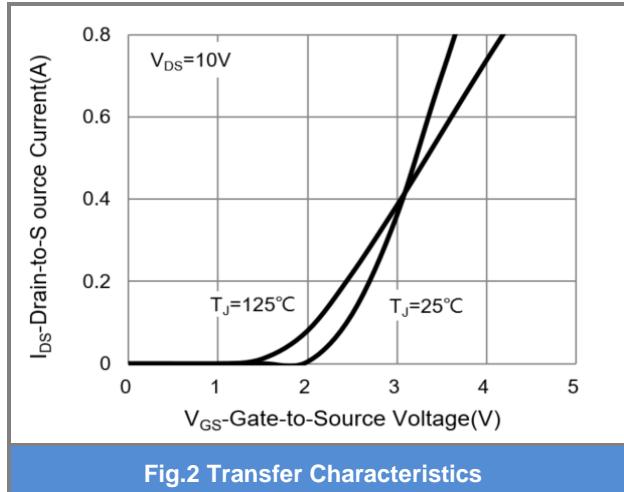
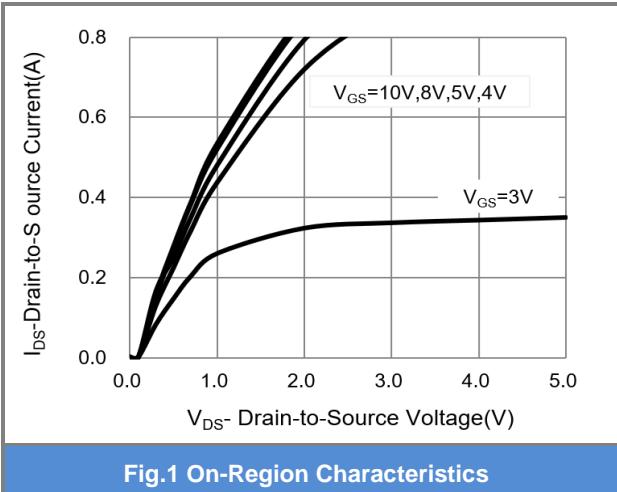
#### NOTES :

1. Pulse width $\leq 300\text{us}$ , Duty cycle $\leq 2\%$ .
2. Essentially independent of operating temperature typical characteristics.
3.  $\text{R}_{\text{QJA}}$  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





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## TYPICAL CHARACTERISTIC CURVES

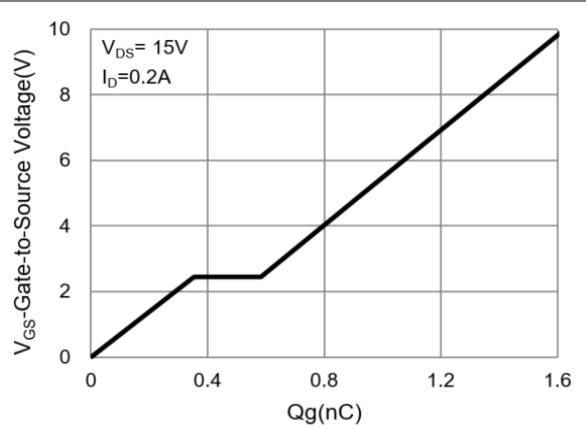


Fig.7 Gate-Charge Characteristics

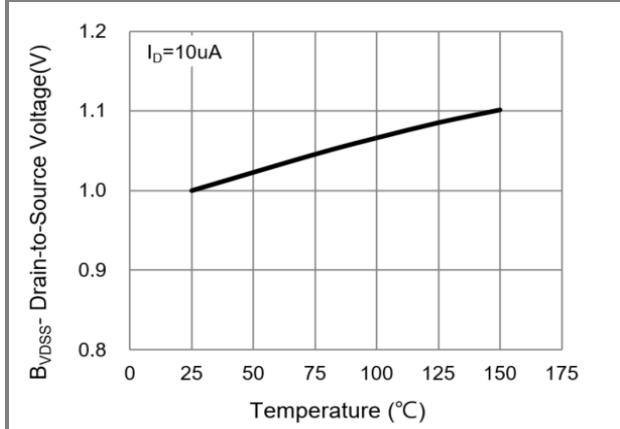


Fig.8 Breakdown Voltage Variation vs. Temperature

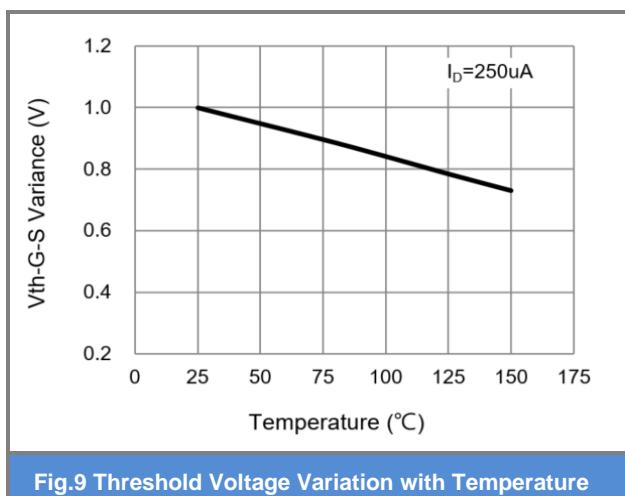


Fig.9 Threshold Voltage Variation with Temperature

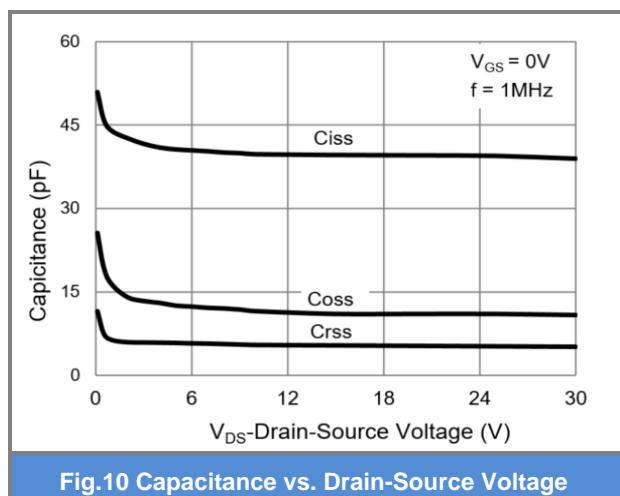


Fig.10 Capacitance vs. Drain-Source Voltage

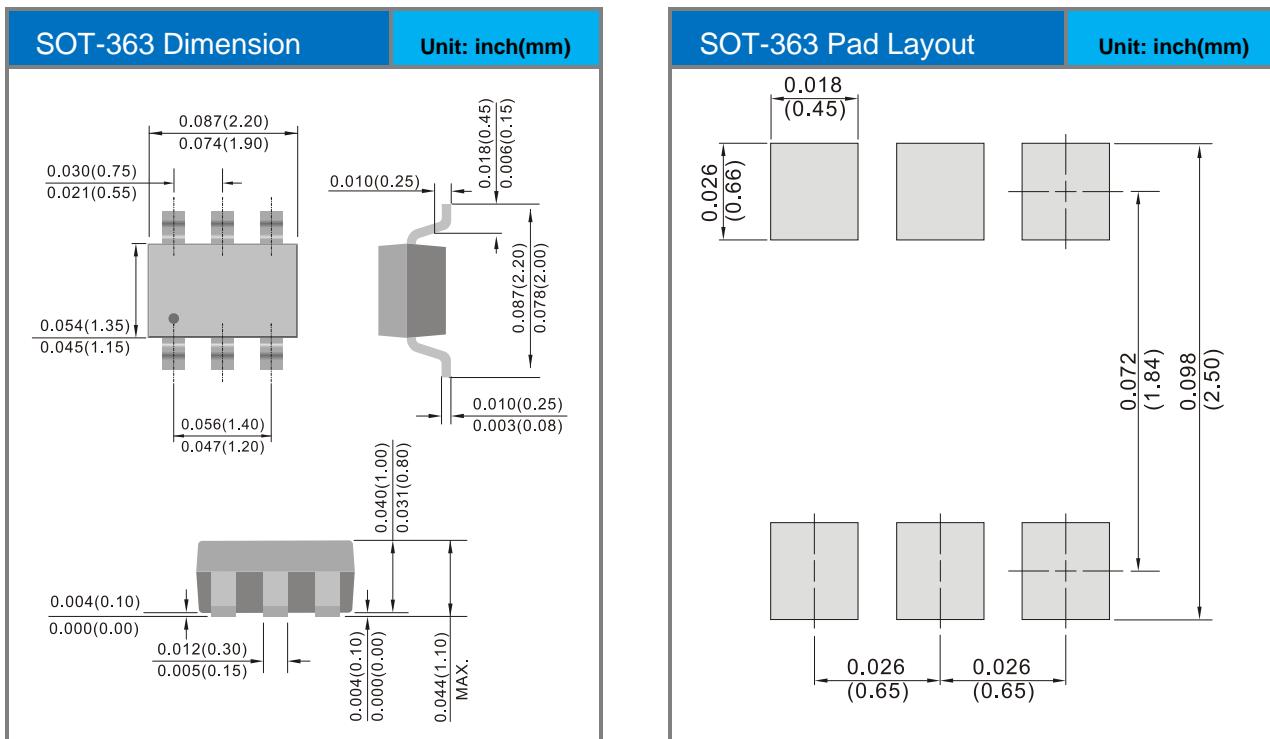


# 2N7002KDW

## Part No. Packing Code Version

Part No. Packing Code	Package Type	Packing Type	Marking	Version
2N7002KDW_R1_00501	SOT-363	3K pcs / 7" reel	K27	Halogen free RoHS compliant

## Packaging Information & Mounting Pad Layout





## 2N7002KDW

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