

# 2N7002KTB89

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

**Voltage**

**60 V**

**Current**

**115 mA**

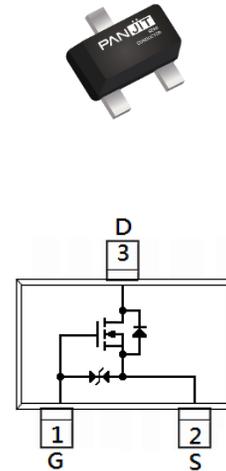
### Features

- $R_{DS(ON)}$  ,  $V_{GS}@10V$ ,  $I_D@500mA<3\Omega$
- $R_{DS(ON)}$  ,  $V_{GS}@4.5V$ ,  $I_D@200mA<4\Omega$
- 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
- Lead free in compliance with EU RoHS 2.0
- Green molding compound as per IEC 61249 standard

### Mechanical Data

- Case : SC-89 Package
- Terminals : Solderable per MIL-STD-750, Method 2026
- Approx. Weight : 0.0026 grams

SC-89



### 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 <sup>(Note 4)</sup>	$I_D$	115	mA	
Pulsed Drain Current <sup>(Note 1)</sup>	$I_{DM}$	800		
Power Dissipation	$P_D$	$T_A=25^\circ\text{C}$	200	mW
		$T_A=75^\circ\text{C}$	150	
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55~150	$^\circ\text{C}$	
Thermal Resistance	$R_{\theta JA}$	883	$^\circ\text{C/W}$	
- Junction to Ambient <sup>(Note 3,4)</sup>				

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## Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNITS
<b>Static</b>						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>D</sub> =10uA	60	-	-	V
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	1	-	2.5	
Drain-Source On-State Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =200mA	-	-	4	Ω
		V <sub>GS</sub> =10V, I <sub>D</sub> =500mA	-	-	3	
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V	-	-	1	uA
Gate-Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±10	
<b>Dynamic</b> (Note 6)						
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =15V, I <sub>D</sub> =200mA, V <sub>GS</sub> =4.5V	-	-	0.8	nC
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, f=1MHz	-	-	35	pF
Output Capacitance	C <sub>oss</sub>		-	-	10	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	-	5	
Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =30V, R <sub>L</sub> =150Ω, I <sub>D</sub> =200mA, V <sub>GEN</sub> =10V, R <sub>G</sub> =10Ω	-	-	20	ns
Turn-Off Delay Time	t <sub>d(off)</sub>		-	-	125	
<b>Drain-Source Diode</b>						
Continuous Diode Forward Current	I <sub>S</sub>	---	-	-	115	mA
Pulsed Diode Forward Current	I <sub>SM</sub>	---	-	-	800	
Diode Forward Voltage	V <sub>SD</sub>	I <sub>S</sub> =200mA, V <sub>GS</sub> =0V	-	0.82	1.3	V

**NOTES :**

1. Pulse width ≤ 300us, Duty cycle ≤ 2%.
2. Essentially independent of operating temperature typical characteristics.
3. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150°C. Ratings are based on low frequency and duty cycles to keep initial T<sub>J</sub> = 25°C.
4. R<sub>θJA</sub> 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.
5. The maximum current rating is package limited.
6. Guaranteed by design, not subject to production testing.

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## TYPICAL CHARACTERISTIC CURVES

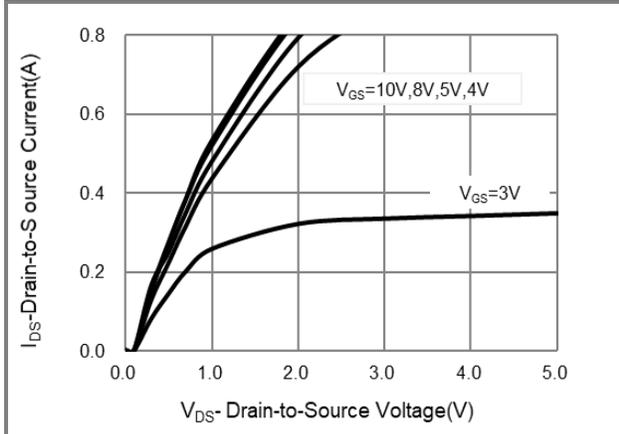


Fig.1 On-Region Characteristics

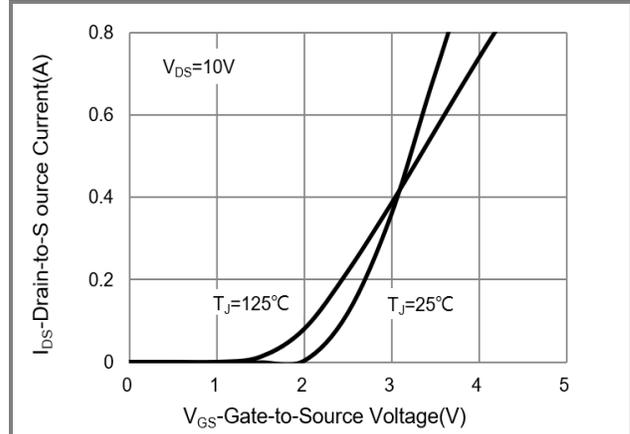


Fig.2 Transfer Characteristics

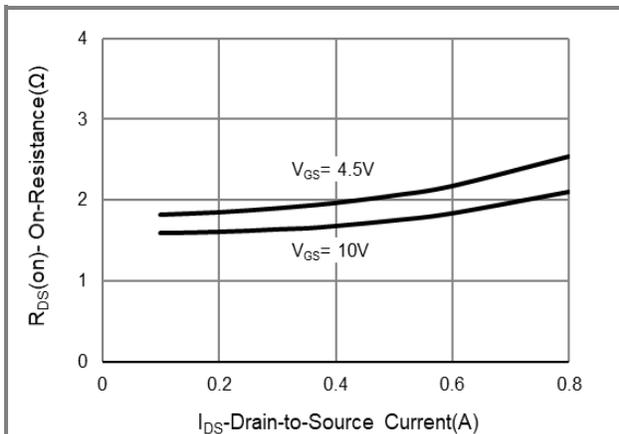


Fig.3 On-Resistance vs. Drain Current

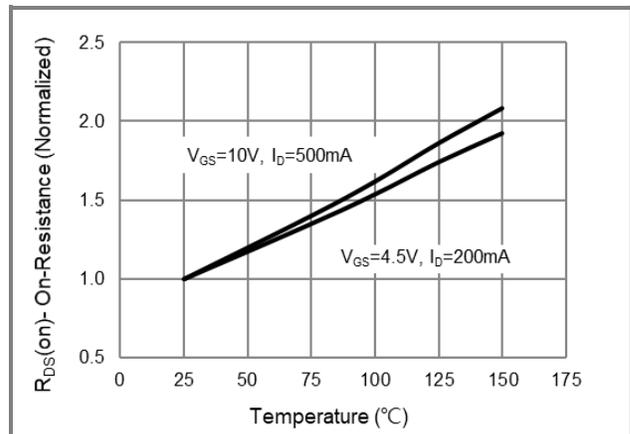


Fig.4 On-Resistance vs. Junction temperature

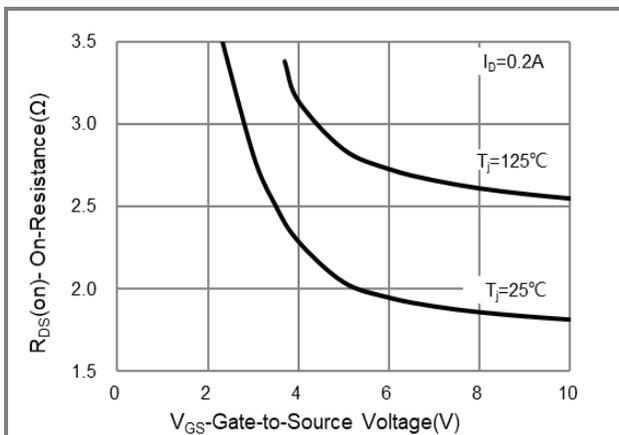


Fig.5 On-Resistance Variation with  $V_{GS}$

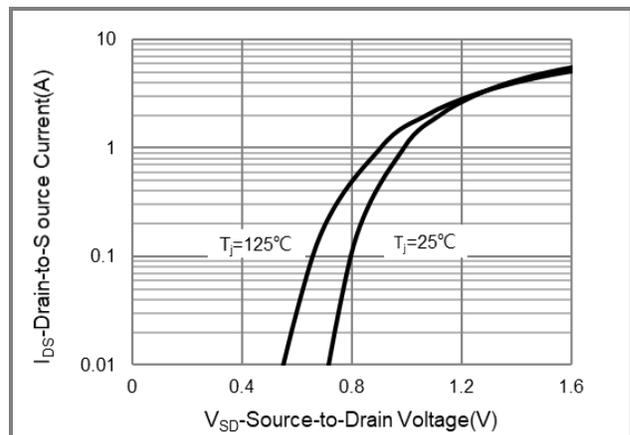
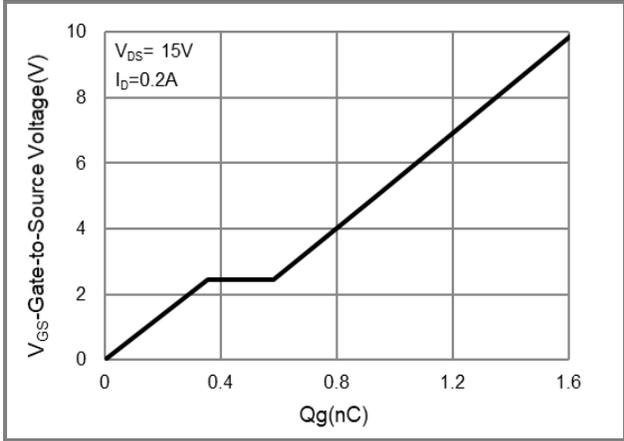


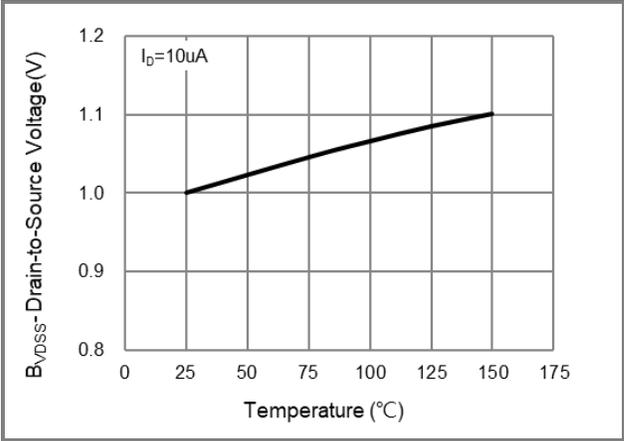
Fig.6 Body Diode Characteristics

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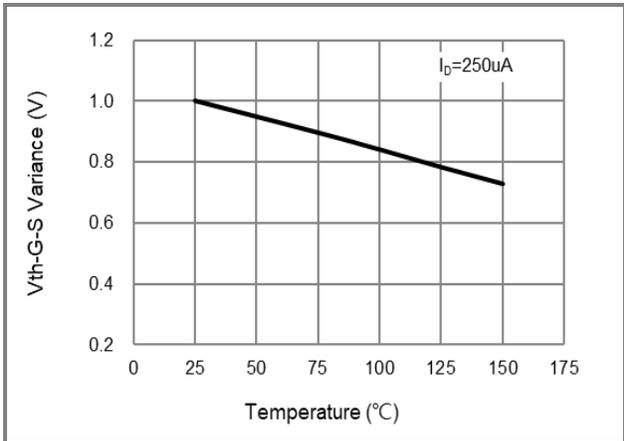
## TYPICAL CHARACTERISTIC CURVES



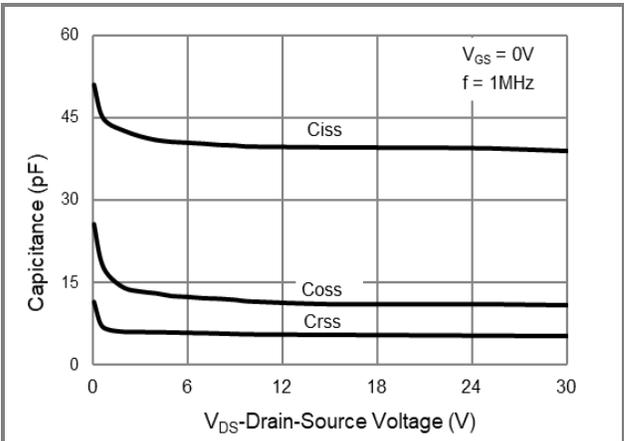
**Fig.7 Gate-Charge Characteristics**



**Fig.8 Breakdown Voltage Variation vs. Temperature**



**Fig.9 Threshold Voltage Variation with Temperature**



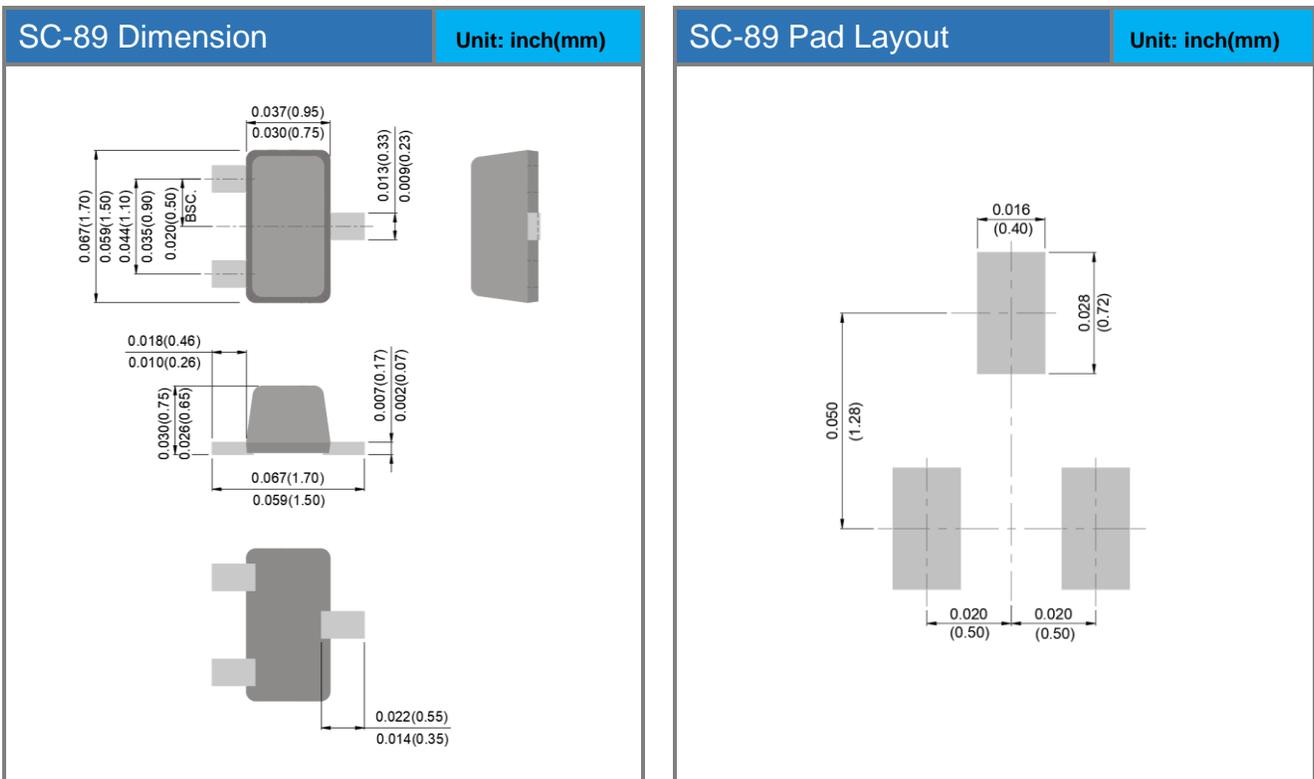
**Fig.10 Capacitance vs. Drain-Source Voltage**

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## Product and Packing Information

Part No.	Package Type	Packing Type	Marking
2N7002KTB89	SC-89	4K pcs / 7" reel	27

## Packaging Information & Mounting Pad Layout



## 2N7002KTB89

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