

QN7002

R07DS0269EJ0100

Rev.1.00

Mar 11, 2011

N-CHANNEL MOSFET FOR SWITCHING

Description

The QN7002, N-channel vertical type MOSFET designed for general-purpose switch, is a device which can be driven directly by a 4.5 V power source.

Features

- Directly driven by a 4.5 V power source.
- Low on-state resistance
 $R_{DS(on)1} = 2.7 \Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 100 \text{ mA)}$
 $R_{DS(on)2} = 3.2 \Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 50 \text{ mA)}$

Ordering Information

Part Number	Lead Plating	Packing	Package
QN7002-T1B-AT	Pure Sn	3000p/Reel	SC-59 (Mini Mold)

Remark "-AT" indicates Pb-free. This product does not contain Pb in external electrode and other parts.

Remark for Agent

ORDER NUMBER "2SK4079(1)" must be used to order, instead of "QN7002". For instance, "2SK4079(1)-T1B-AT"

Absolute Maximum Ratings (TA = 25°C)

Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	60	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 20	V
Drain Current (DC)	$I_{D(DC)}$	200	mA
Drain Current (pulse) ^{Note}	$I_{D(pulse)}$	± 800	mA
Total Power Dissipation	P_T	200	mW
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	-55 to +150	°C

Note $PW \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$

Caution This product is electrostatic-sensitive device due to low ESD capability and should be handled with caution for electrostatic discharge.

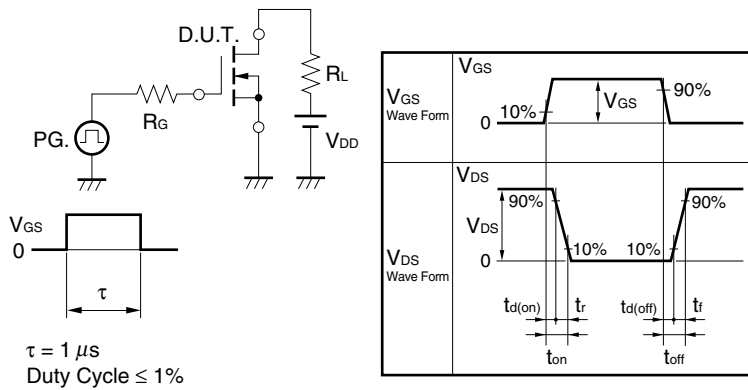
$V_{ESD} \pm 400 \text{ V (MIL STD; } C = 100 \text{ pF, } R = 1.5 \text{ k}\Omega, 5 \text{ times)}$, as reference value.

Electrical Characteristics (TA = 25°C)

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$			1	μA
Gate Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			± 10	μA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	1.0		2.5	V
Forward Transfer Admittance ^{Note}	$ y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 100\text{ mA}$	150			mS
Drain to Source On-state Resistance ^{Note}	$R_{DS(on)1}$	$V_{GS} = 10\text{ V}, I_D = 100\text{ mA}$		2.1	2.7	Ω
	$R_{DS(on)2}$	$V_{GS} = 4.5\text{ V}, I_D = 50\text{ mA}$		2.4	3.2	Ω
Input Capacitance	C_{iss}	$V_{DS} = 10\text{ V},$		20		pF
Output Capacitance	C_{oss}	$V_{GS} = 0\text{ V},$		9		pF
Reverse Transfer Capacitance	C_{rss}	$f = 1.0\text{ MHz}$		2		pF
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 10\text{ V},$		16		ns
Rise Time	t_r	$I_D = 200\text{ mA},$		6.5		ns
Turn-off Delay Time	$t_{d(off)}$	$V_{GS} = 10\text{ V},$		82		ns
Fall Time	t_f	$R_G = 10\ \Omega$		32		ns
Total Gate Charge	Q_G	$I_D = 200\text{ mA}, V_{DD} = 25\text{ V}, V_{GS} = 10\text{ V}$		2		nC
Body Diode Forward Voltage ^{Note}	$V_{F(S-D)}$	$I_F = 200\text{ mA}, V_{GS} = 0\text{ V}$		0.86		V

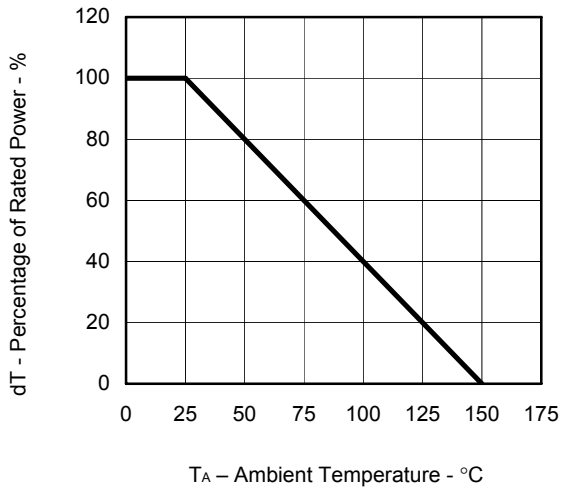
Note Pulsed

Test Circuit Switching Time

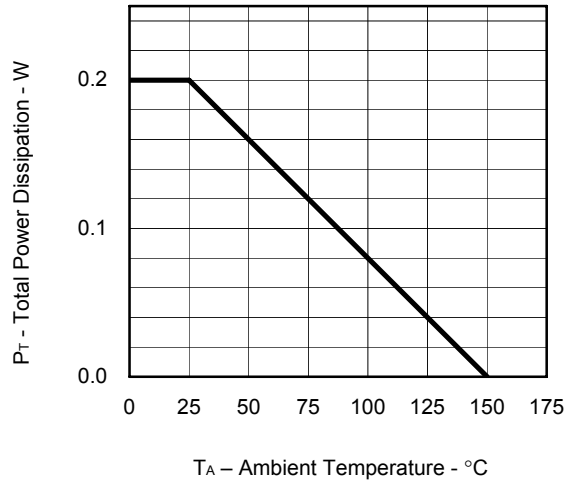


Typical Characteristics (T_A = 25°C)

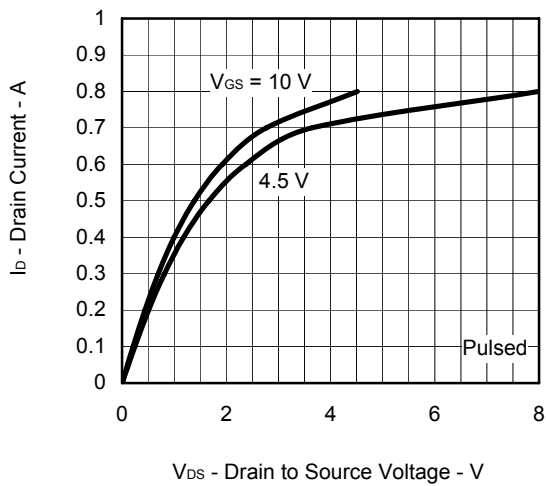
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



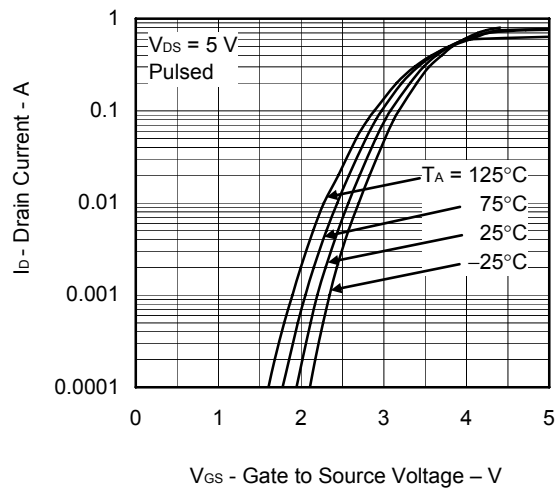
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



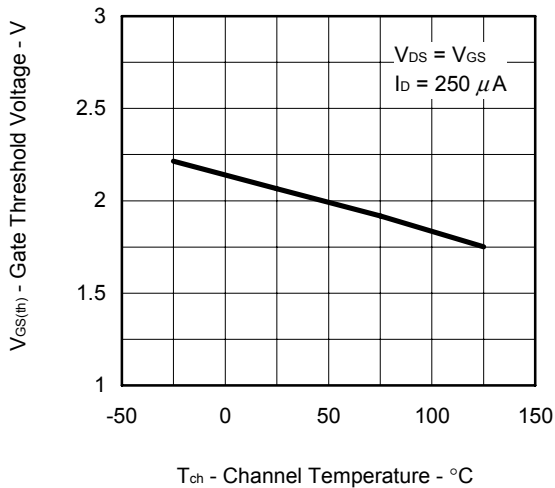
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



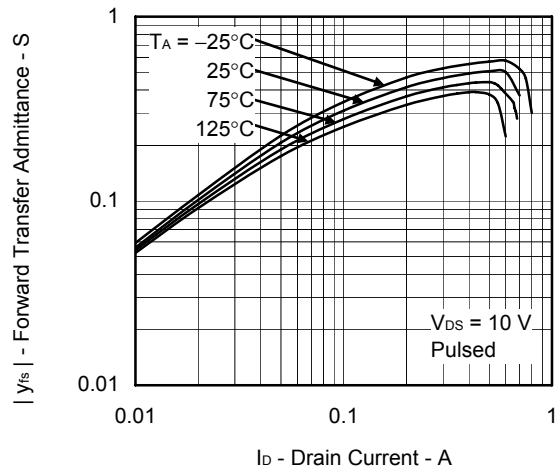
FORWARD TRANSFER CHARACTERISTICS



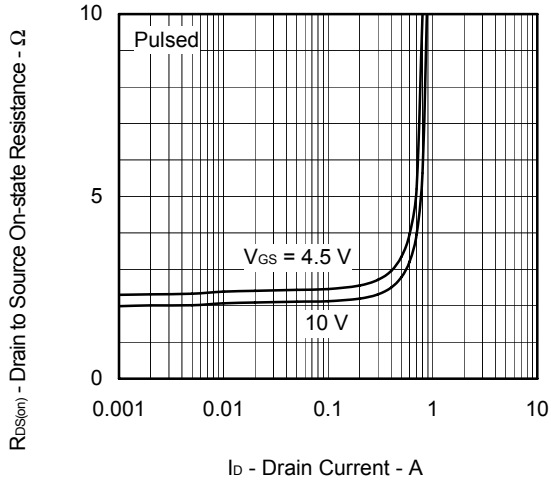
GATE THRESHOLD VOLTAGE vs. CHANNEL TEMPERATURE



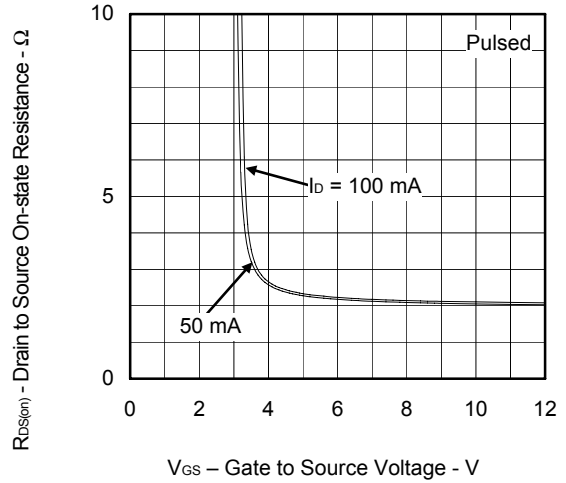
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



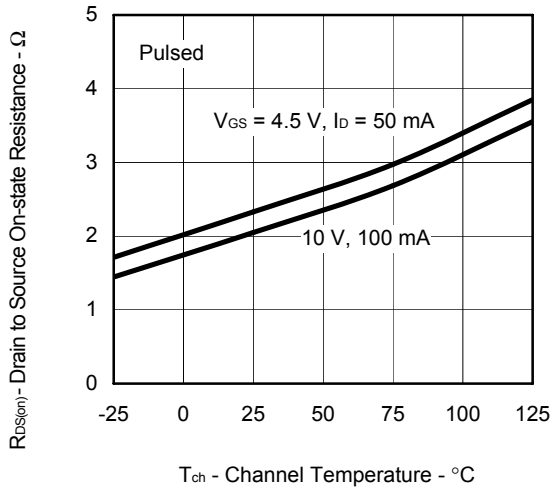
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



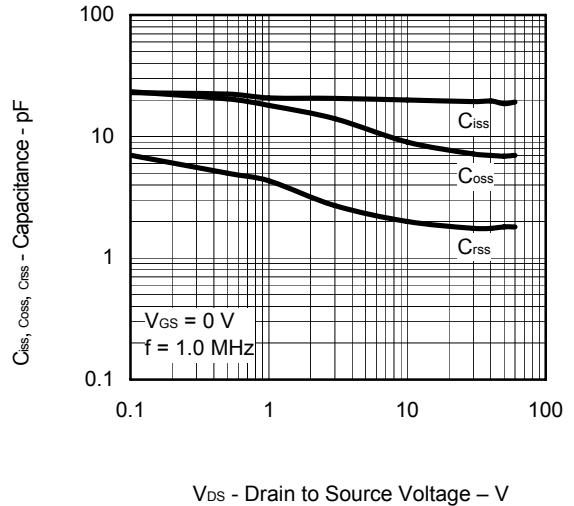
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



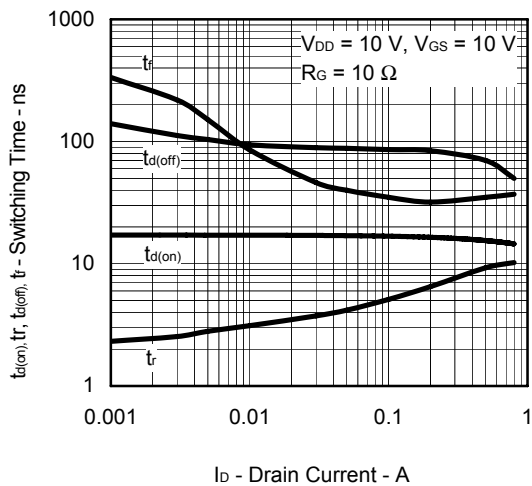
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



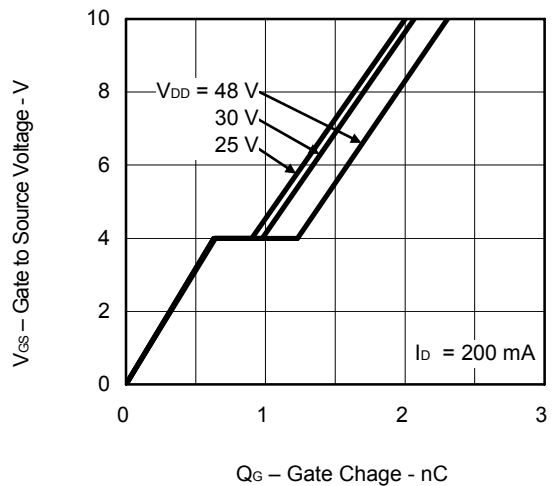
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



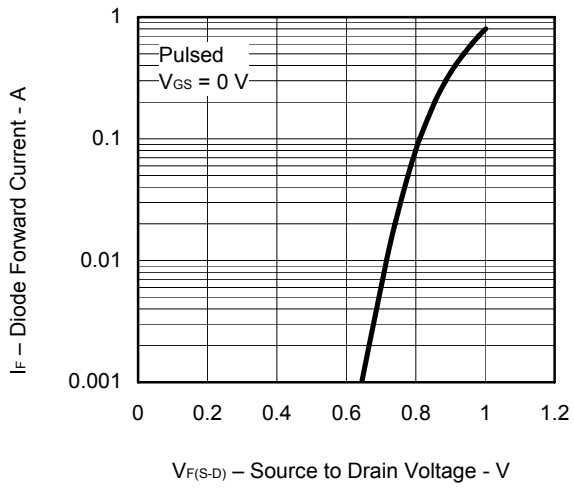
SWITCHING CHARACTERISTICS



DYNAMIC INPUT CHARACTERISTICS

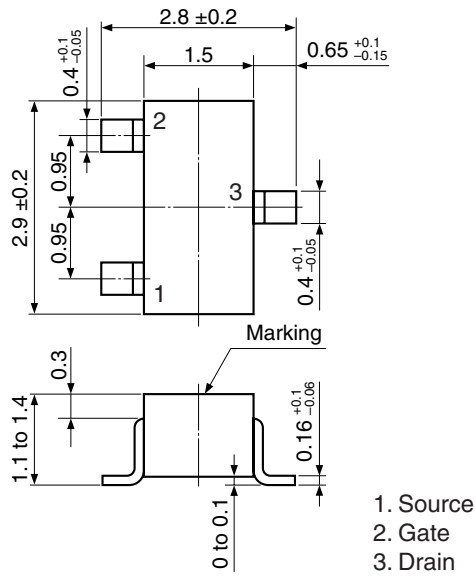


SOURCE TO DRAIN DIODE FORWARD VOLTAGE

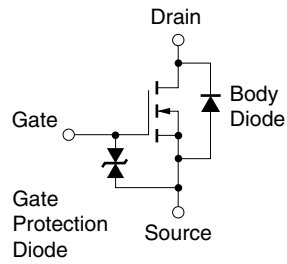


Package Drawings (Unit: mm)

SC-59 (Mini Mold)



Equivalent Circuit



Remark The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

Revision History	QN7002 Data Sheet
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Rev.	Date	Description	
		Page	Summary
1.00	Mar 11, 2011	-	First Edition Issued

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Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH
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Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
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