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April 1<sup>st</sup>, 2010 Renesas Electronics Corporation

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## NP82N055PUG

## SWITCHING N-CHANNEL POWER MOS FET

#### **DESCRIPTION**

The NP82N055PUG is N-channel MOS Field Effect

Transistor designed for high current switching applications.

### ORDERING INFORMATION

PART NUMBER	PACKAGE
NP82N055PUG	TO-263 (MP-25ZP)

#### **FEATURES**

- Channel temperature 175 degree rating
- Super low on-state resistance

 $R_{DS(on)}$  = 5.2 m $\Omega$  MAX. (Vgs = 10 V, ID = 41 A)

• Low Ciss: Ciss = 6400 pF TYP.

(TO-263)



### ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

Drain to Source Voltage (VGS = 0 V)	VDSS	55	V
Gate to Source Voltage (V <sub>DS</sub> = 0 V)	Vgss	±20	V
Drain Current (DC) (Tc = 25°C)	ID(DC)	±82	Α
Drain Current (pulse) Note1	D(pulse)	±328	Α
Total Power Dissipation (T <sub>A</sub> = 25°C)	P <sub>T1</sub>	1.8	W
Total Power Dissipation (Tc = 25°C)	P <sub>T2</sub>	143	W
Channel Temperature	Tch	175	°C
Storage Temperature	Tstg	-55 to +175	°C
Repetitive Avalanche Current Note2	Iar	38	Α
Repetitive Avalanche Energy Note2	Ear	144	mJ

**Notes 1.** PW  $\leq$  10  $\mu$ s, Duty Cycle  $\leq$  1%

**2.** Tch  $\leq$  150°C, VDD = 28 V, RG = 25  $\Omega$ , VGS = 20  $\rightarrow$  0 V

### THERMAL RESISTANCE

Channel to Case Thermal Resistance	Rth(ch-C)	1.05	°C/W
Channel to Ambient Thermal Resistance	Rth(ch-A)	83.3	°C/W

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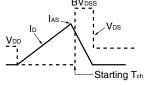
**ELECTRICAL CHARACTERISTICS (TA = 25°C)** 

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	IDSS	V <sub>DS</sub> = 55 V, V <sub>GS</sub> = 0 V			1	μΑ
Gate Leakage Current	Igss	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±100	nA
Gate to Source Threshold Voltage Note	V <sub>GS(th)</sub>	$V_{DS} = V_{GS}, I_{D} = 250 \mu A$	2.0	3.0	4.0	V
Forward Transfer Admittance Note	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 41 A	19	37		S
Drain to Source On-state Resistance Note	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 41 A		4.1	5.2	mΩ
Input Capacitance	Ciss	V <sub>DS</sub> = 25 V		6400	9600	pF
Output Capacitance	Coss	V <sub>GS</sub> = 0 V		465	700	pF
Reverse Transfer Capacitance	Crss	f = 1 MHz		275	500	pF
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> = 28 V, I <sub>D</sub> = 41 A		40	90	ns
Rise Time	tr	V <sub>GS</sub> = 10 V		93	240	ns
Turn-off Delay Time	t <sub>d(off)</sub>	R <sub>G</sub> = 0 Ω		72	150	ns
Fall Time	tf			10	30	ns
Total Gate Charge	QG	V <sub>DD</sub> = 44 V		106	160	nC
Gate to Source Charge	Q <sub>GS</sub>	V <sub>GS</sub> = 10 V		29		nC
Gate to Drain Charge	Q <sub>GD</sub>	I <sub>D</sub> = 82 A		35		nC
Body Diode Forward Voltage Note	V <sub>F</sub> (S-D)	I <sub>F</sub> = 82 A, V <sub>GS</sub> = 0 V		0.92	1.5	V
Reverse Recovery Time	trr	I <sub>F</sub> = 82 A, V <sub>GS</sub> = 0 V		42		ns
Reverse Recovery Charge	Qrr	di/dt = 100 A/μs		57		nC

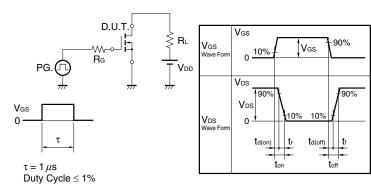
Note Pulsed

### **TEST CIRCUIT 1 AVALANCHE CAPABILITY**

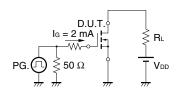
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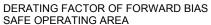
### **TEST CIRCUIT 2 SWITCHING TIME**

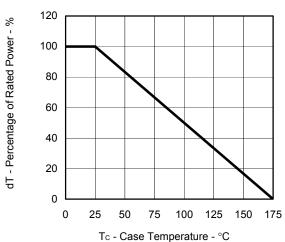


### **TEST CIRCUIT 3 GATE CHARGE**

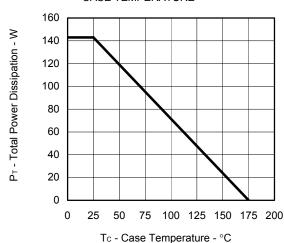


### TYPICAL CHARACTERISTICS (TA = 25°C)

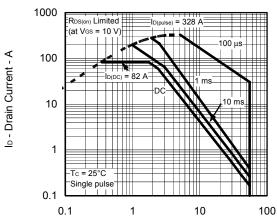




#### TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

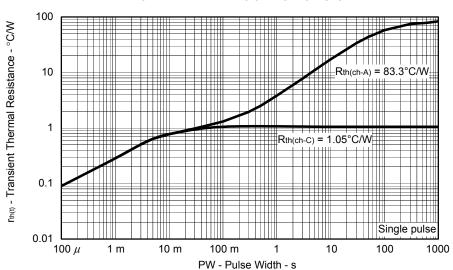


#### FORWARD BIAS SAFE OPERATING AREA



VDS - Drain to Source Voltage - V



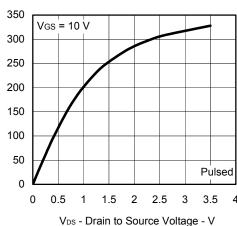


3

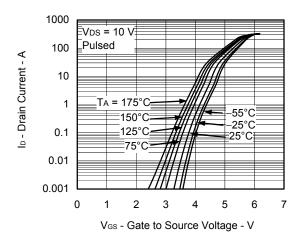
lo - Drain Current - A

Vos(th) - Gate to Source Threshold Voltage - V

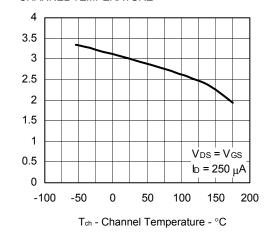
### DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



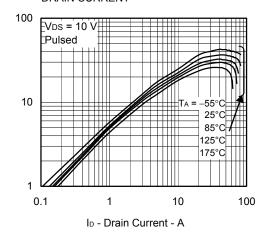
### FORWARD TRANSFER CHARACTERISTICS



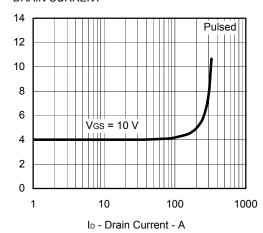
### GATE TO SOURCE THRESHOLD VOLTAGE vs. CHANNEL TEMPERATURE



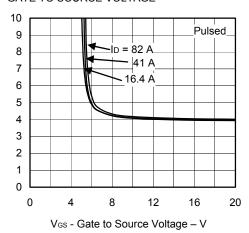
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



### DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



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



 $\mathsf{R}_{\mathsf{DS}(\mathsf{on})}$  - Drain to Source On-state Resistance -  $m\Omega$ 

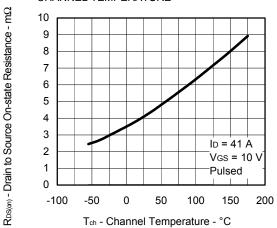
y<sub>fs</sub> | - Forward Transfer Admittance - S

R<sub>DS(on)</sub> - Drain to Source On-state Resistance - mΩ

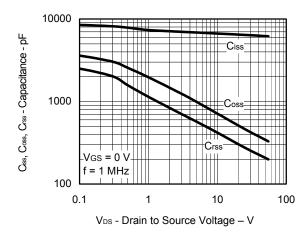
ta(on), tr, td(off), tr - Switching Time - ns

IF - Diode Forward Current - A

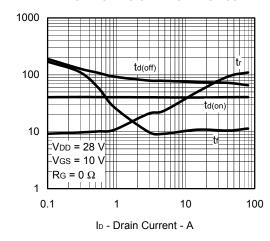
### DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



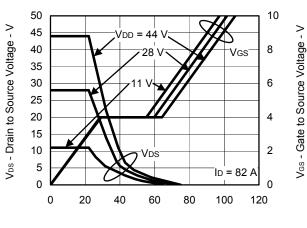
### CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



#### SWITCHING CHARACTERISTICS

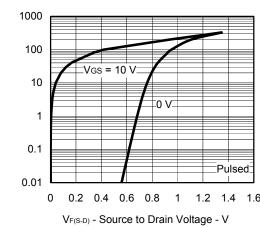


### DYNAMIC INPUT/OUTPUT CHARACTERISTICS

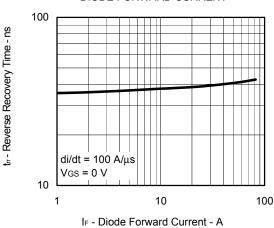


Q<sub>G</sub> - Gate Charge - nC

### SOURCE TO DRAIN DIODE FORWARD VOLTAGE

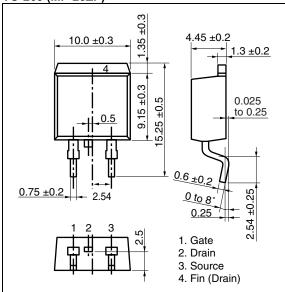


### REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

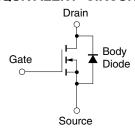


### PACKAGE DRAWING (Unit: mm)

### TO-263 (MP-25ZP)



### **EQUIVALENT CIRCUIT**



**Remark** Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

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