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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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MOS FIELD EFFECT TRANSISTOR NP20P04SLG

SWITCHING P-CHANNEL POWER MOSFET

DESCRIPTION

The NP20P04SLG is P-channel MOS Field Effect Transistor designed for high current switching applications.

ORDERING INFORMATION

PART NUMBER	LEAD PLATING	PACKING	PACKAGE
NP20P04SLG-E1-AY ^{Note}	Pure Sn (Tin)	Tape 2500 p/reel	TO-252 (MP-3ZK)
NP20P04SLG-E2-AY ^{Note}			

Note Pb-free (This product does not contain Pb in external electrode.)

FEATURES

- Super low on-state resistance
 $R_{DS(on)1} = 25 \text{ m}\Omega \text{ MAX. (} V_{GS} = -10 \text{ V, } I_D = -10 \text{ A)}$
 $R_{DS(on)2} = 38 \text{ m}\Omega \text{ MAX. (} V_{GS} = -4.5 \text{ V, } I_D = -10 \text{ A)}$
- Low input capacitance
 $C_{iss} = 1650 \text{ pF TYP.}$
- Built-in gate protection diode

(TO-252)



ABSOLUTE MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$)

Drain to Source Voltage ($V_{GS} = 0 \text{ V}$)	V_{DSS}	-40	V
Gate to Source Voltage ($V_{DS} = 0 \text{ V}$)	V_{GSS}	± 20	V
Drain Current (DC) ($T_C = 25^\circ\text{C}$)	$I_{D(DC)}$	± 20	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	± 60	A
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_{T1}	38	W
Total Power Dissipation ($T_A = 25^\circ\text{C}$)	P_{T2}	1.2	W
Channel Temperature	T_{ch}	175	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +175	$^\circ\text{C}$
Single Avalanche Current ^{Note2}	I_{AS}	20	A
Single Avalanche Energy ^{Note2}	E_{AS}	40	mJ

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

2. Starting $T_{ch} = 25^\circ\text{C}$, $V_{DD} = -20 \text{ V}$, $R_G = 25 \Omega$, $V_{GS} = -20 \rightarrow 0 \text{ V}$

THERMAL RESISTANCE

Channel to Case Thermal Resistance	$R_{th(ch-C)}$	3.9	$^\circ\text{C/W}$
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	125	$^\circ\text{C/W}$

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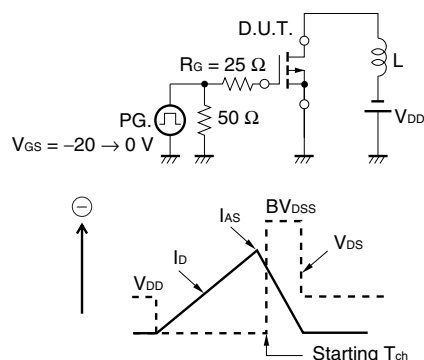
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ELECTRICAL CHARACTERISTICS (T_A = 25°C)

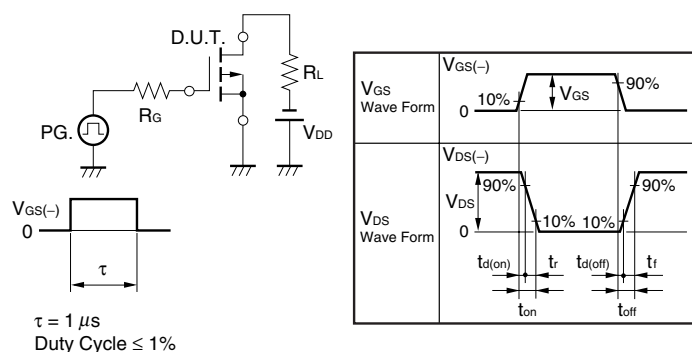
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = -40 V, V _{GS} = 0 V			-10	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V			±10	μA
Gate to Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250 μA	-1.0	-1.6	-2.5	V
Forward Transfer Admittance ^{Note}	y _{fs}	V _{DS} = -10 V, I _D = -10 A	7	14		S
Drain to Source On-state Resistance ^{Note}	R _{DS(on)1}	V _{GS} = -10 V, I _D = -10 A		20	25	mΩ
	R _{DS(on)2}	V _{GS} = -4.5 V, I _D = -10 A		24	38	mΩ
Input Capacitance	C _{iss}	V _{DS} = -10 V,		1650		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V,		260		pF
Reverse Transfer Capacitance	C _{rss}	f = 1 MHz		175		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = -20 V, I _D = -10 A,		8		ns
Rise Time	t _r	V _{GS} = -10 V,		6		ns
Turn-off Delay Time	t _{d(off)}	R _G = 0 Ω		160		ns
Fall Time	t _f			80		ns
Total Gate Charge	Q _G	V _{DD} = -32 V,		34		nC
Gate to Source Charge	Q _{GS}	V _{GS} = -10 V,		4		nC
Gate to Drain Charge	Q _{GD}	I _D = -20 A		8		nC
Body Diode Forward Voltage ^{Note}	V _{F(S-D)}	I _F = -20 A, V _{GS} = 0 V		0.92	1.5	V
Reverse Recovery Time	t _{rr}	I _F = -20 A, V _{GS} = 0 V,		35		ns
Reverse Recovery Charge	Q _{rr}	di/dt = -100 A/μs		36		nC

Note Pulsed test PW ≤ 350 μs, Duty Cycle ≤ 2%

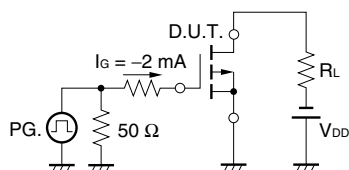
TEST CIRCUIT 1 AVALANCHE CAPABILITY



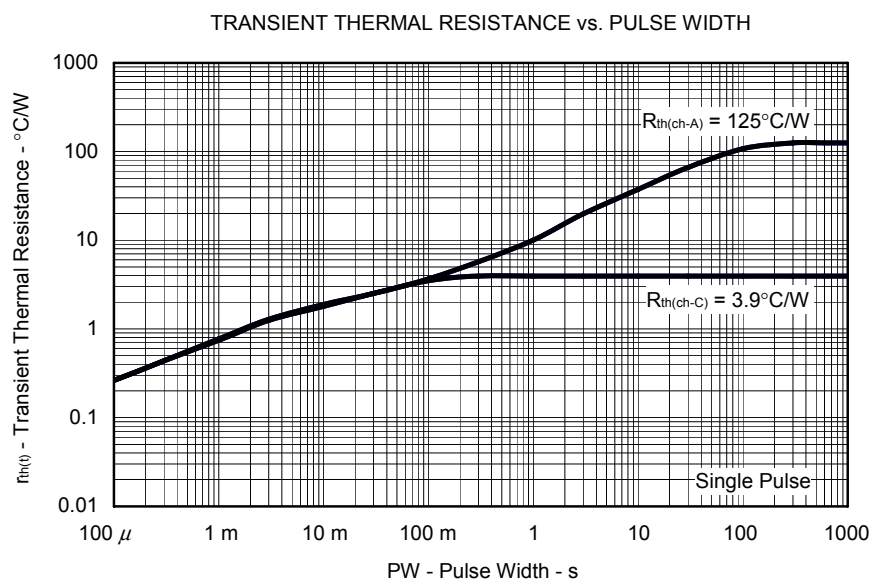
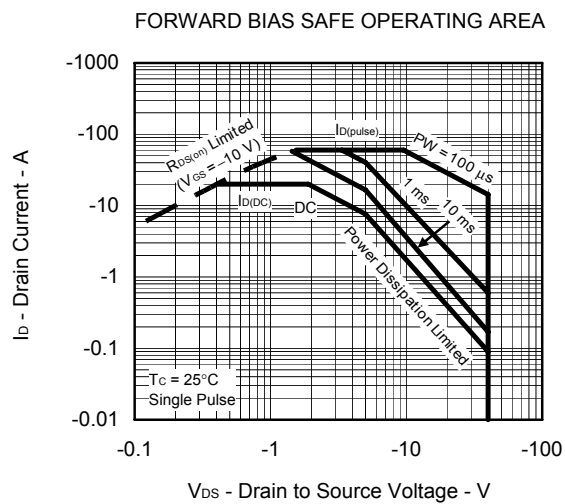
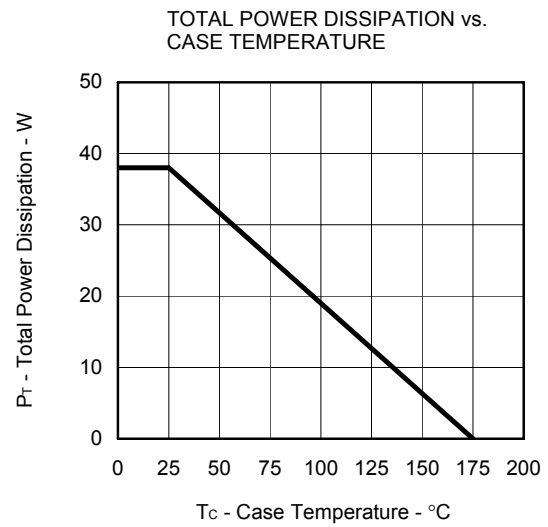
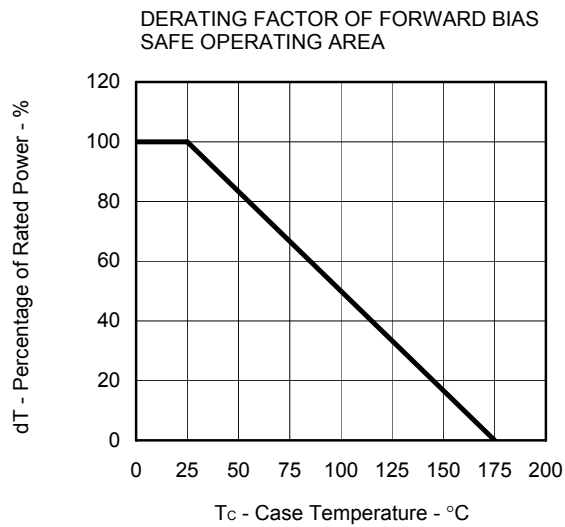
TEST CIRCUIT 2 SWITCHING TIME

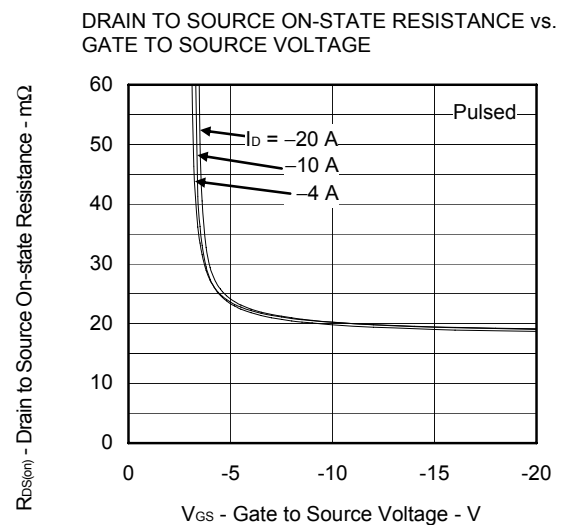
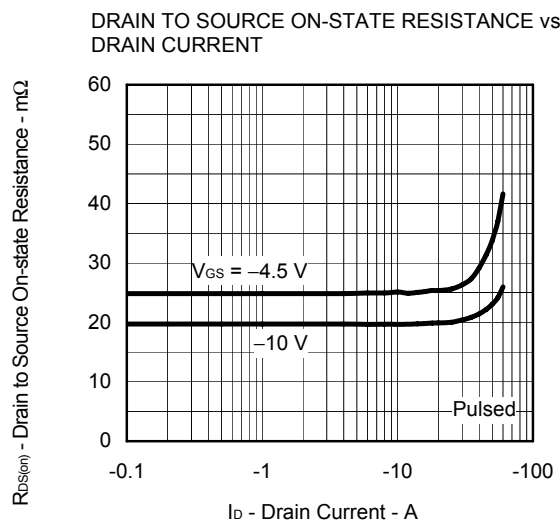
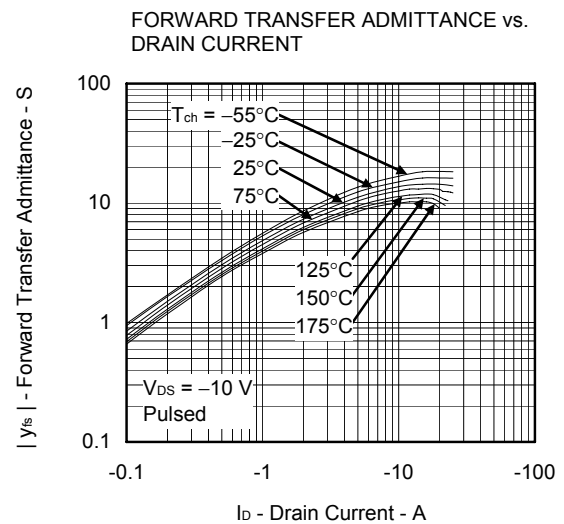
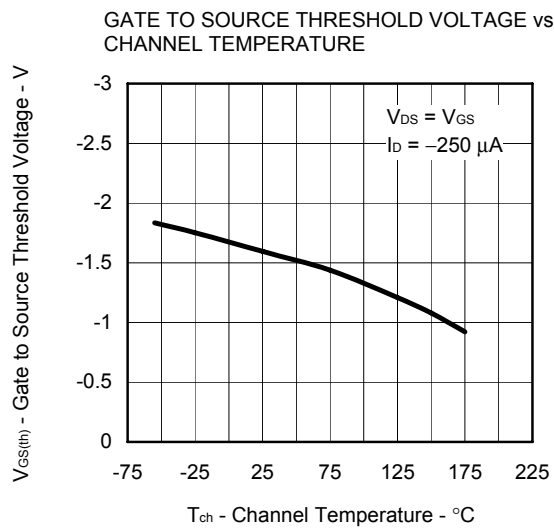
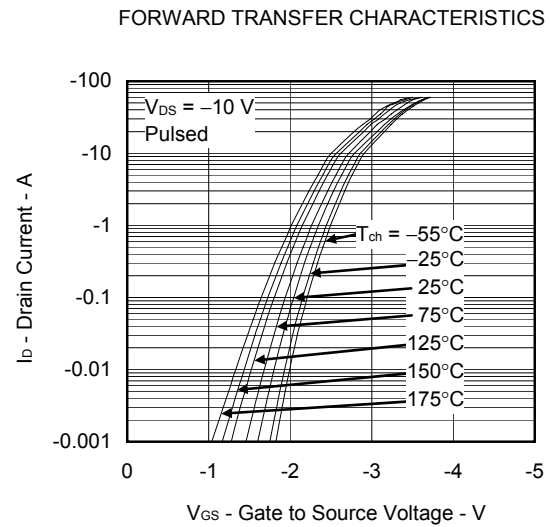
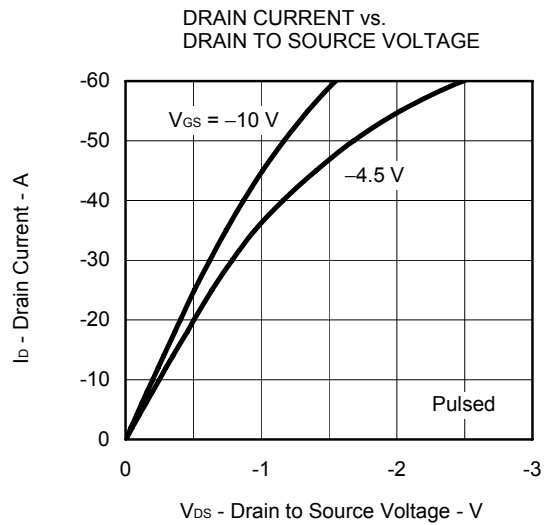


TEST CIRCUIT 3 GATE CHARGE

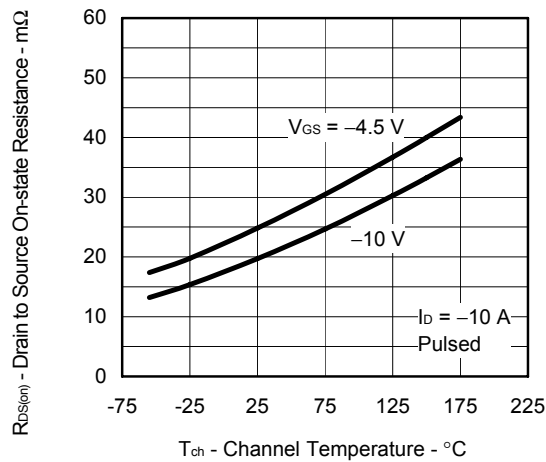


TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

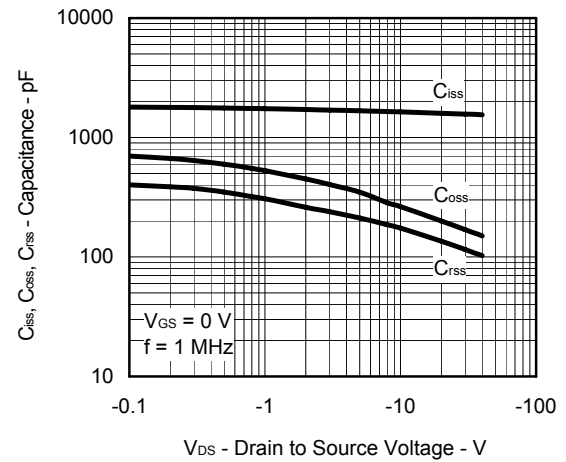




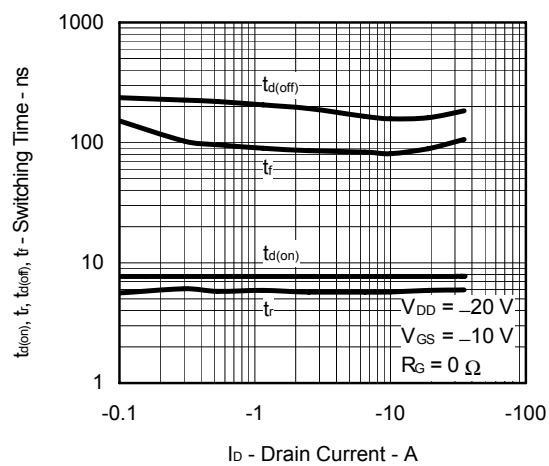
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



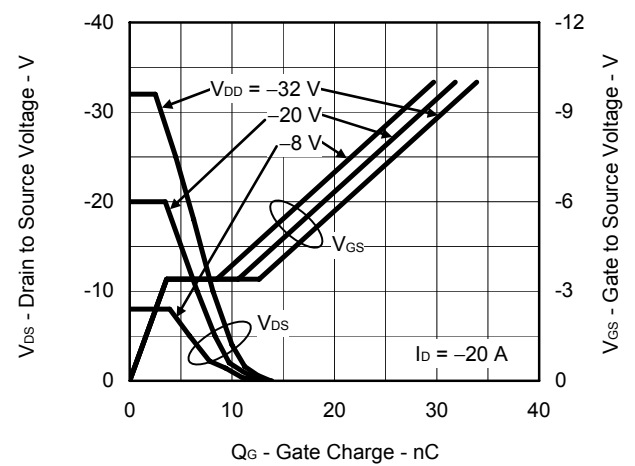
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



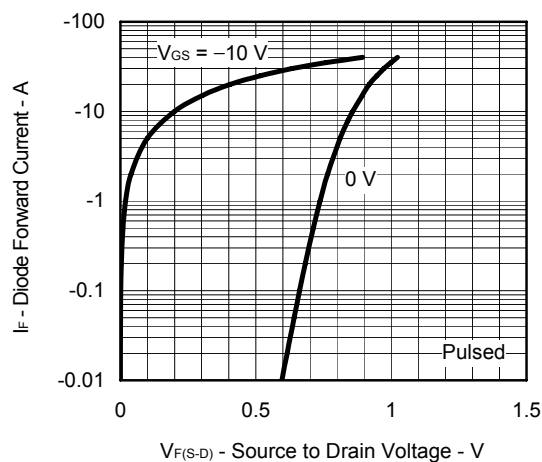
SWITCHING CHARACTERISTICS



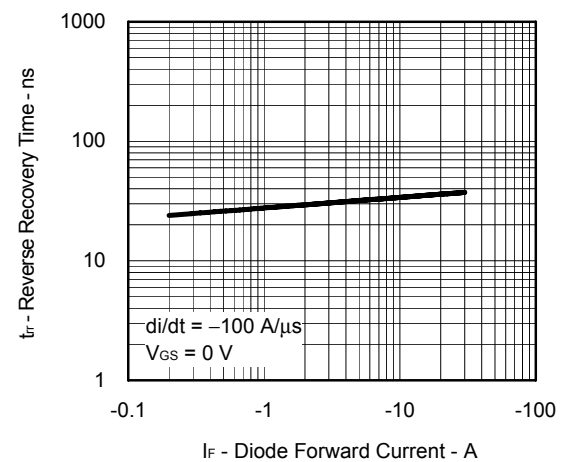
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

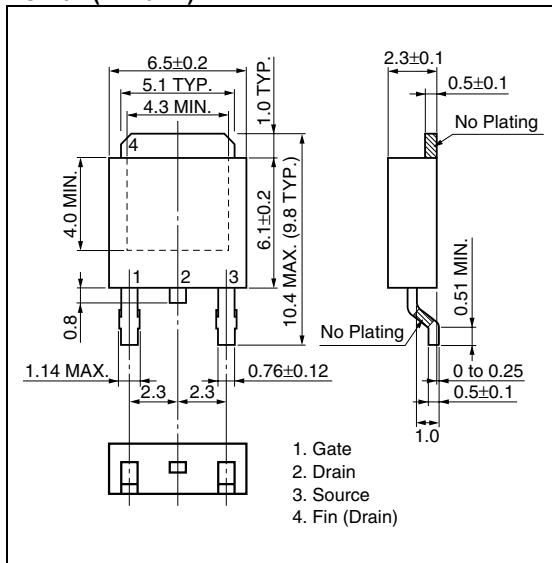


REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

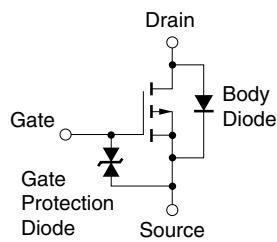


PACKAGE DRAWING (Unit: mm)

TO-252 (MP-3ZK)



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.

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