To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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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DATA SHEET

MOS FIELD EFFECT TRANSISTOR
NP50P04SDG

SWITCHING
P-CHANNEL POWER MOSFET

DESCRIPTION

The NP50P04SDG is P-channel MOS Field Effect Transistor designed for high current switching applications.

ORDERING INFORMATION

PART NUMBER	LEAD PLATING	PACKING	PACKAGE
NP50P04SDG-E1-AY Note	Pure Sn (Tin)	Tape 2500 p/reel	TO-252 (MP-3ZK)
NP50P04SDG-E2-AY Note			

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

FEATURES

- Super low on-state resistance
  $R_{DS(on)1}$ = 9.6 mΩ MAX. (V_{GS} = –10 V, I_D = –25 A)
  $R_{DS(on)2}$ = 15 mΩ MAX. (V_{GS} = –4.5 V, I_D = –25 A)
- Low input capacitance
  C_{iss} = 5000 pF TYP.

(TO-252)

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	–40	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	∓20	V
Drain Current (DC) (T_C = 25°C)	$I_{D(DC)}$	∓50	A
Drain Current (pulse) Note1	$I_{D(pulse)}$	∓150	A
Total Power Dissipation (T_C = 25°C)	P_{T1}	84	W
Total Power Dissipation (T_A = 25°C)	P_{T2}	1.2	W
Channel Temperature	T_{ch}	175	°C
Storage Temperature	T_{stg}	–55 to +175	°C
Single Avalanche Current Note2	I_{AS}	37	A
Single Avalanche Energy Note2	E_{AS}	136	mJ

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

<R> **2.** Starting T_{ch} = 25°C, V_{DD} = –20 V, R_G = 25 Ω, V_{GS} = –20 → 0 V

THERMAL RESISTANCE

Channel to Case Thermal Resistance	$R_{th(ch-C)}$	1.78	°C/W
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	125	°C/W

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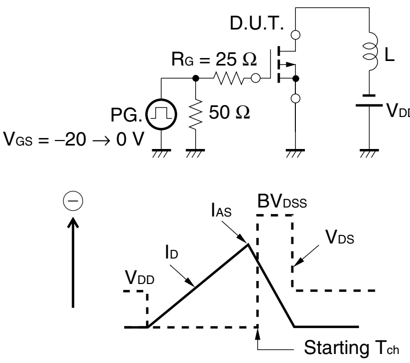
The mark <R> shows major revised points.
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

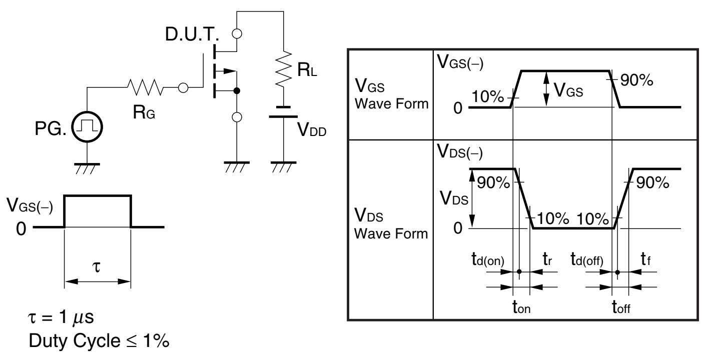
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = –40 V, V_{GS} = 0 V			–10	μA
Gate Leakage Current	I_{GSS}	V_{GS} = ∓20 V, V_{DS} = 0 V			∓100	nA
Gate to Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = –250 μA	–1.0	–1.6	–2.5	V
Forward Transfer Admittance Note	| y_{fs} |	V_{DS} = –10 V, I_D = –25 A	15	33		S
Drain to Source On-state Resistance Note	$R_{DS(on)1}$	V_{GS} = –10 V, I_D = –25 A		7.7	9.6	mΩ
	$R_{DS(on)2}$	V_{GS} = –4.5 V, I_D = –25 A		9.3	15	mΩ
Input Capacitance	C_{iss}	V_{DS} = –10 V,		5000		pF
Output Capacitance	C_{oss}	V_{GS} = 0 V,		770		pF
Reverse Transfer Capacitance	C_{rss}	f = 1 MHz		420		pF
Turn-on Delay Time	$t_{d(on)}$	V_{DD} = –20 V, I_D = –25 A,		13		ns
Rise Time	t_r	V_{GS} = –10 V,		13		ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 0 Ω		405		ns
Fall Time	t_f			180		ns
Total Gate Charge	Q_G	V_{DD} = –32 V,		100		nC
Gate to Source Charge	Q_{GS}	V_{GS} = –10 V,		12		nC
Gate to Drain Charge	Q_{GD}	I_D = –50 A		28		nC
Body Diode Forward Voltage Note	$V_{F(S-D)}$	I_F = –50 A, V_{GS} = 0 V		0.95	1.5	V
Reverse Recovery Time	t_{rr}	I_F = –50 A, V_{GS} = 0 V,		48		ns
Reverse Recovery Charge	Q_{rr}	di/dt = –100 A/μs		66		nC

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

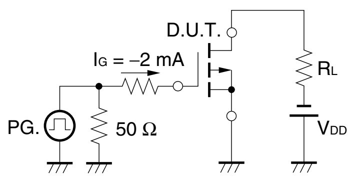
TEST CIRCUIT 1 AVALANCHE CAPABILITY



TEST CIRCUIT 2 SWITCHING TIME

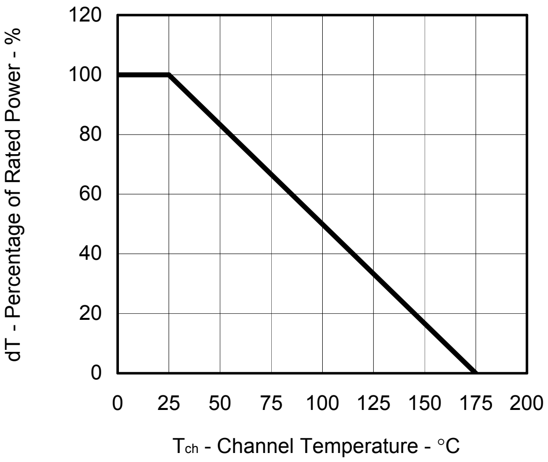


TEST CIRCUIT 3 GATE CHARGE

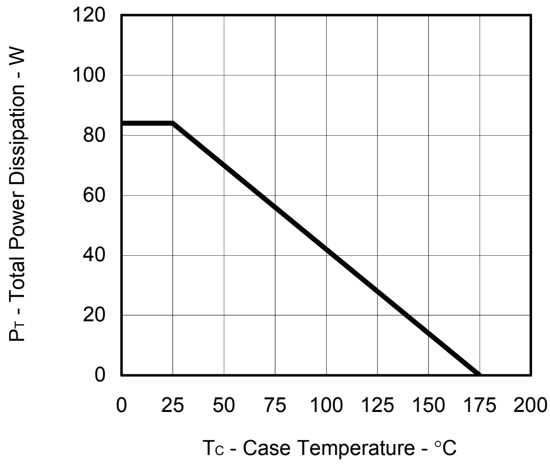


TYPICAL CHARACTERISTICS (T_A = 25°C)

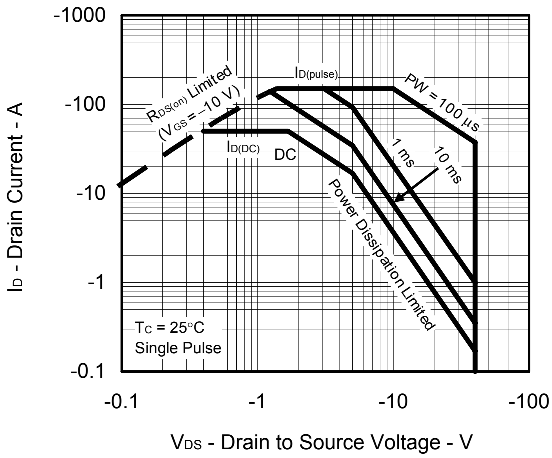
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



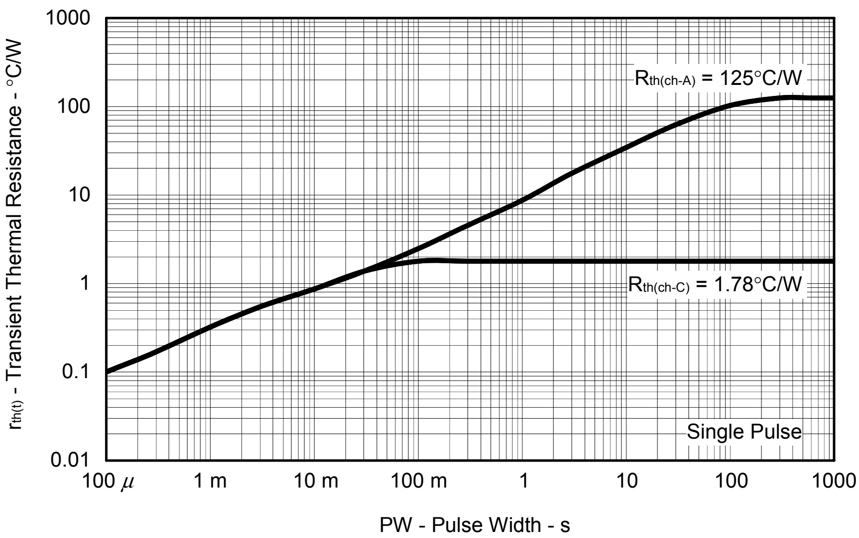
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



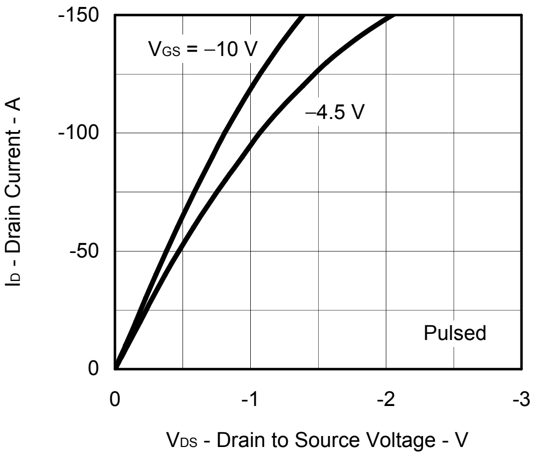
FORWARD BIAS SAFE OPERATING AREA



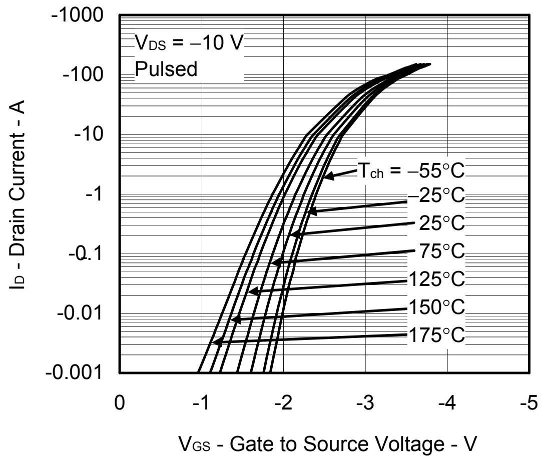
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



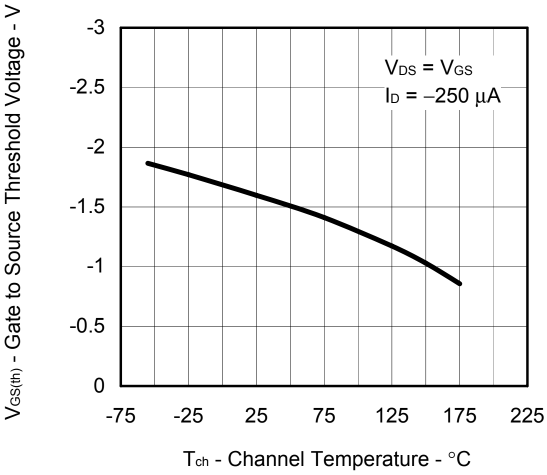
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



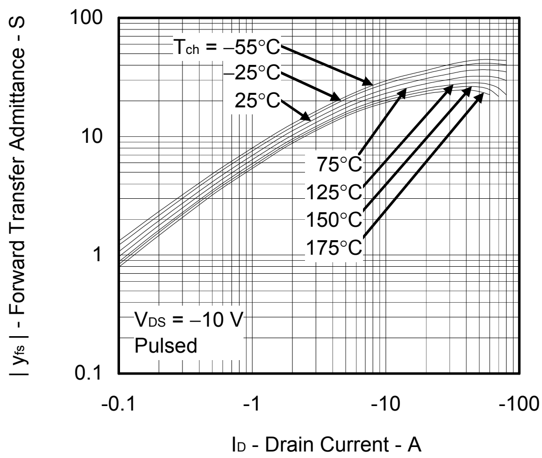
FORWARD TRANSFER CHARACTERISTICS



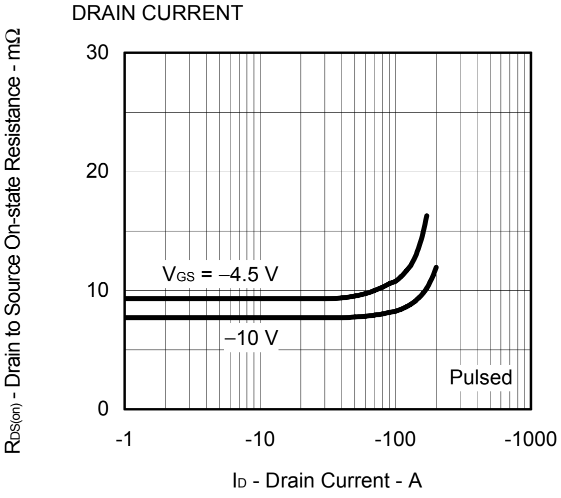
GATE TO SOURCE THRESHOLD VOLTAGE vs.
CHANNEL TEMPERATURE



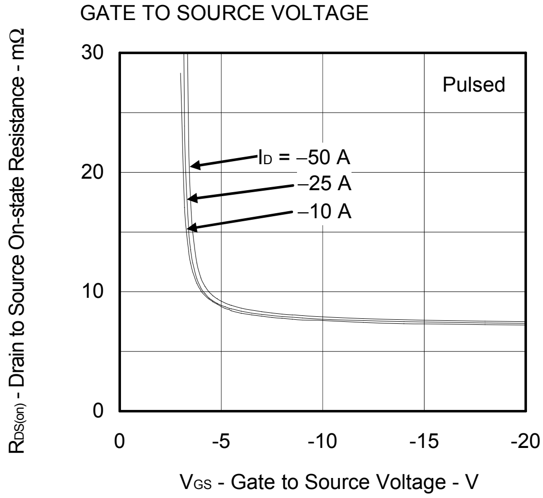
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



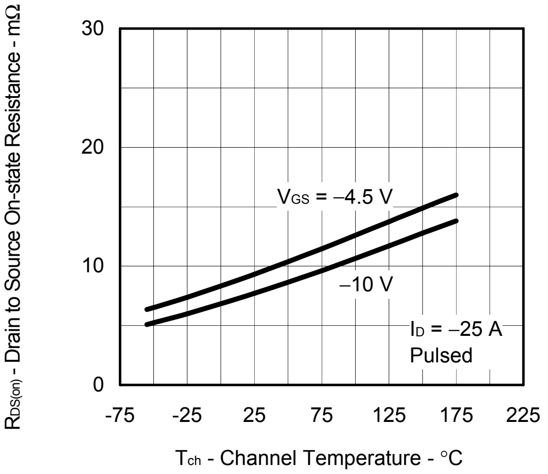
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



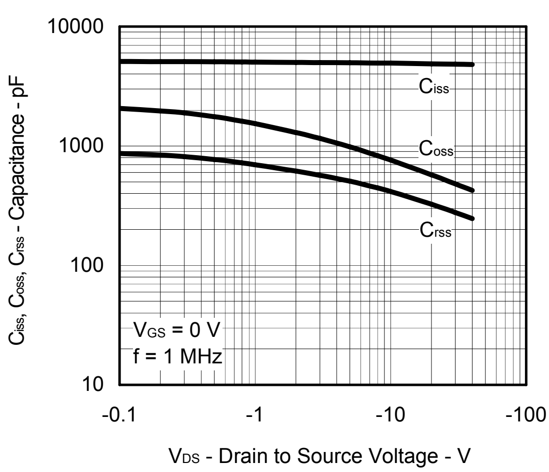
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



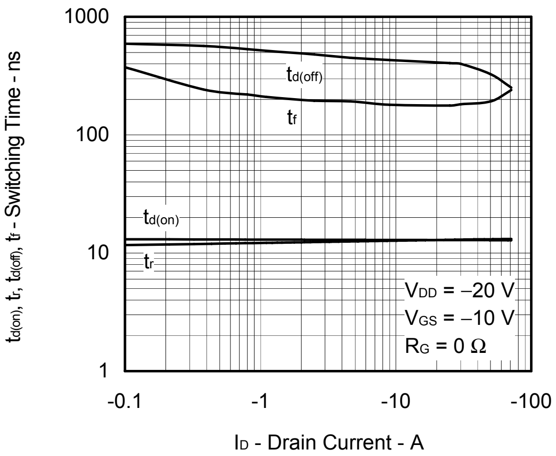
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



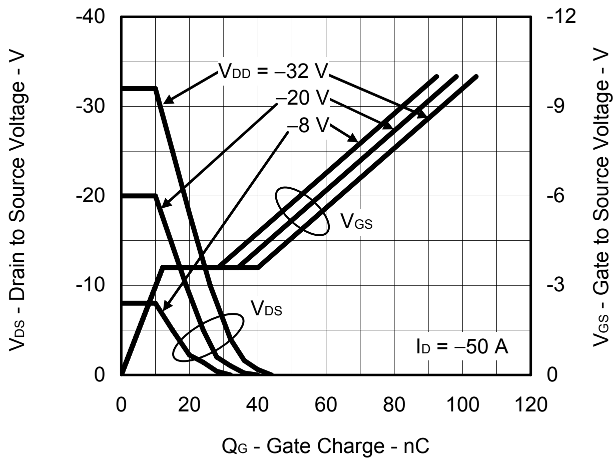
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



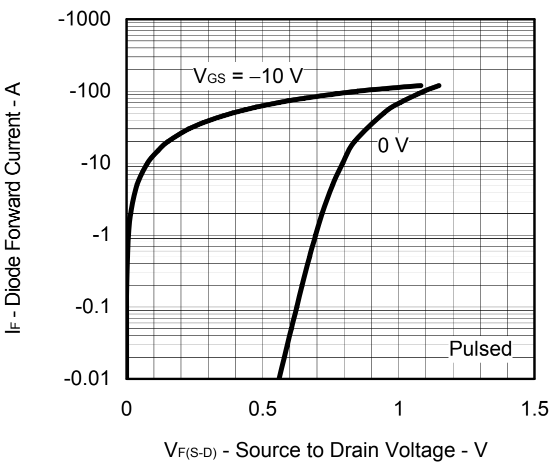
SWITCHING CHARACTERISTICS



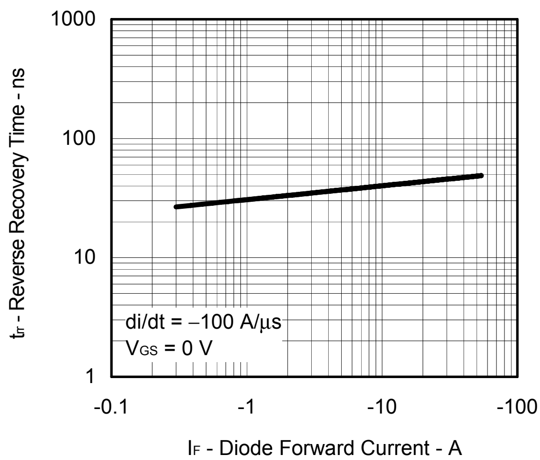
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

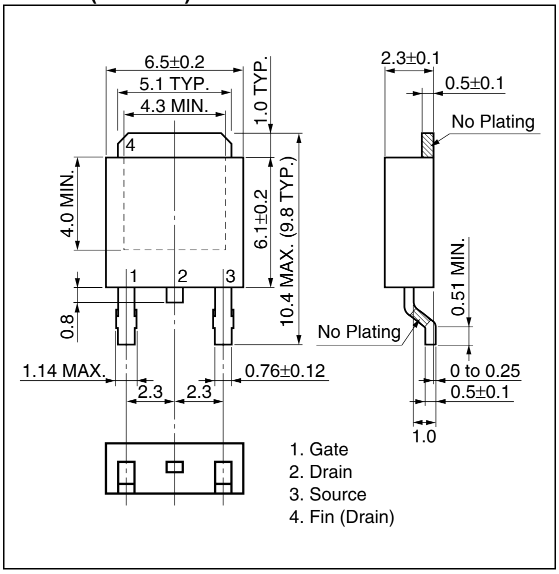


REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

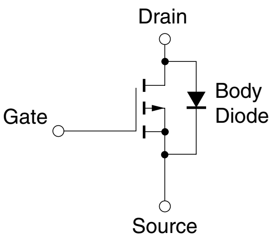


PACKAGE DRAWING (Unit: mm)

TO-252 (MP-3ZK)



EQUIVALENT CIRCUIT



Remark 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.