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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

NP36P06KDG

SWITCHING

P-CHANNEL POWER MOSFET

DESCRIPTION

The NP36P06KDG is P-channel MOS Field Effect Transistor designed for high current switching applications.

<R> ORDERING INFORMATION

PART NUMBER	LEAD PLATING	PACKING	PACKAGE
NP36P06KDG-E1-AY ^{Note}	Pure Sn (Tin)	Tape 800 p/reel	TO-263 (MP-25ZK)
NP36P06KDG-E2-AY ^{Note}			

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

FEATURES

- Super low on-state resistance

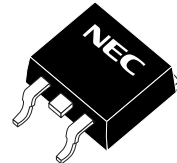
$R_{DS(on)1} = 29.5 \text{ m}\Omega \text{ MAX. (} V_{GS} = -10 \text{ V, } I_D = -18 \text{ A)}$

$R_{DS(on)2} = 37.5 \text{ m}\Omega \text{ MAX. (} V_{GS} = -4.5 \text{ V, } I_D = -18 \text{ A)}$

- Low input capacitance

$C_{iss} = 3100 \text{ pF TYP.}$

(TO-263)



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

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) ($T_C = 25^\circ\text{C}$)	$I_{D(DC)}$	± 36	A
Drain Current (pulse) ^{Note1}	$I_{D(pulse)}$	± 108	A
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_{T1}	56	W
Total Power Dissipation ($T_A = 25^\circ\text{C}$)	P_{T2}	1.8	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}	23	A
Single Avalanche Energy ^{Note2}	E_{AS}	54	mJ

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

2. Starting $T_{ch} = 25^\circ\text{C}$, $V_{DD} = -30 \text{ V}$, $R_G = 25 \text{ }\Omega$, $V_{GS} = -20 \rightarrow 0 \text{ V}$

THERMAL RESISTANCE

Channel to Case Thermal Resistance	$R_{th(ch-C)}$	2.68	$^\circ\text{C/W}$
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	83.3	$^\circ\text{C/W}$

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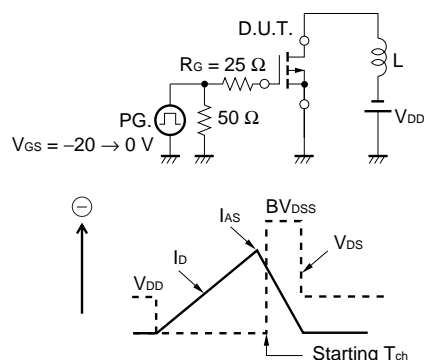
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ELECTRICAL CHARACTERISTICS (T_A = 25°C)

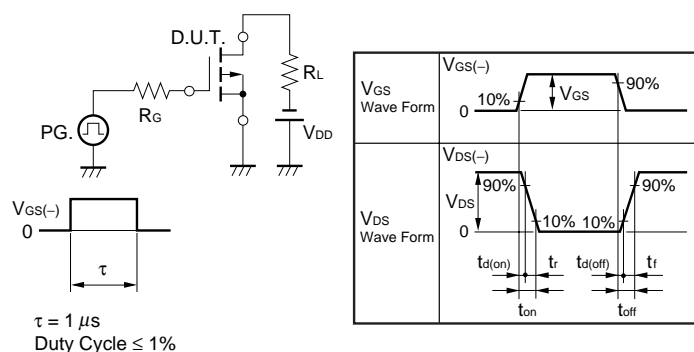
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = -60 V, V _{GS} = 0 V			-10	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V			±100	nA
Gate to Source Threshold Voltage	V _{GS(th)}	V _{DS} = -10 V, I _D = -1 mA	-1.0	-1.6	-2.5	V
Forward Transfer Admittance ^{Note}	y _{fs}	V _{DS} = -10 V, I _D = -18 A	12	23		S
Drain to Source On-state Resistance ^{Note}	R _{DS(on)1}	V _{GS} = -10 V, I _D = -18 A		23.1	29.5	mΩ
	R _{DS(on)2}	V _{GS} = -4.5 V, I _D = -18 A		27.0	37.5	mΩ
Input Capacitance	C _{iss}	V _{DS} = -10 V,		3100		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V,		350		pF
Reverse Transfer Capacitance	C _{rss}	f = 1 MHz		205		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = -30 V, I _D = -18 A,		8		ns
Rise Time	t _r	V _{GS} = -10 V,		11		ns
Turn-off Delay Time	t _{d(off)}	R _G = 0 Ω		210		ns
Fall Time	t _f			110		ns
Total Gate Charge	Q _G	V _{DD} = -48 V,		54		nC
Gate to Source Charge	Q _{GS}	V _{GS} = -10 V,		7		nC
Gate to Drain Charge	Q _{GD}	I _D = -36 A		15		nC
Body Diode Forward Voltage ^{Note}	V _{F(S-D)}	I _F = -36 A, V _{GS} = 0 V		0.98	1.5	V
Reverse Recovery Time	t _{rr}	I _F = -36 A, V _{GS} = 0 V,		43		ns
Reverse Recovery Charge	Q _{rr}	di/dt = -100 A/μs		56		nC

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

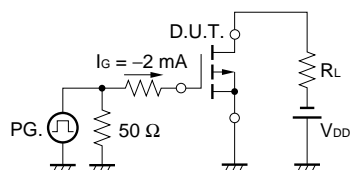
TEST CIRCUIT 1 AVALANCHE CAPABILITY



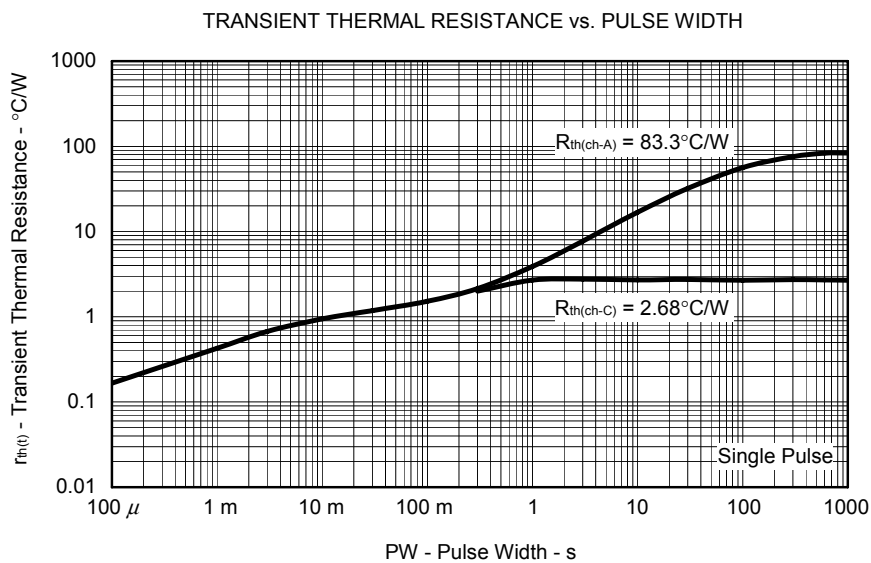
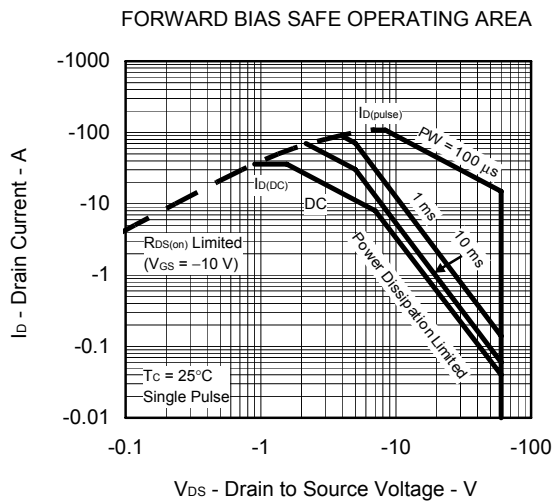
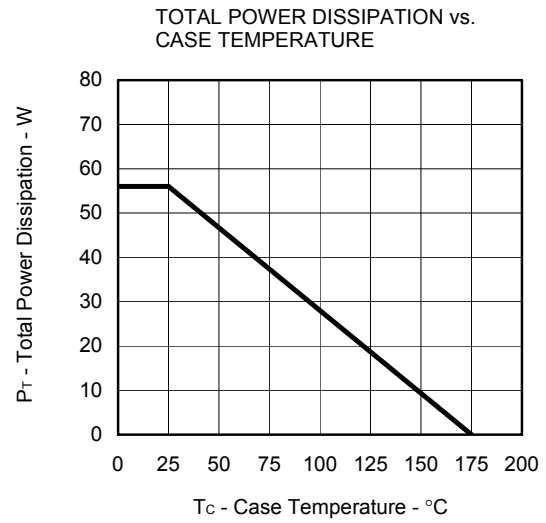
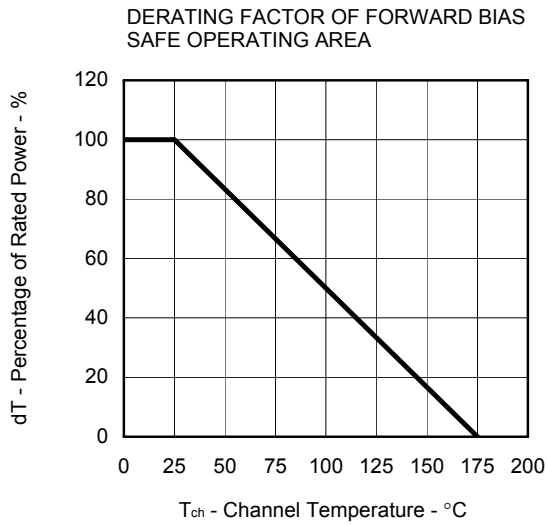
TEST CIRCUIT 2 SWITCHING TIME



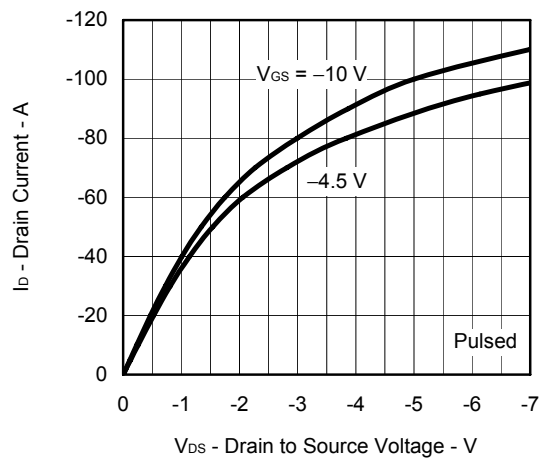
TEST CIRCUIT 3 GATE CHARGE



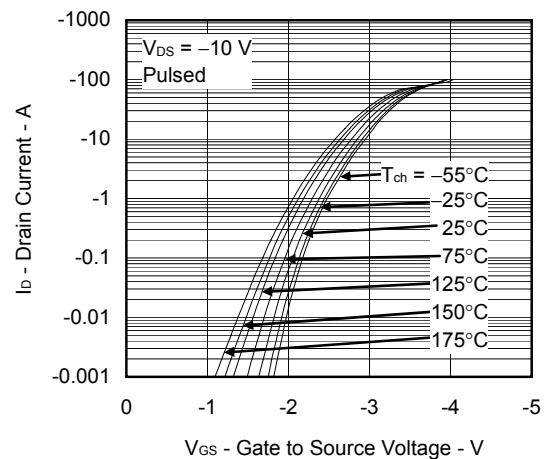
TYPICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)



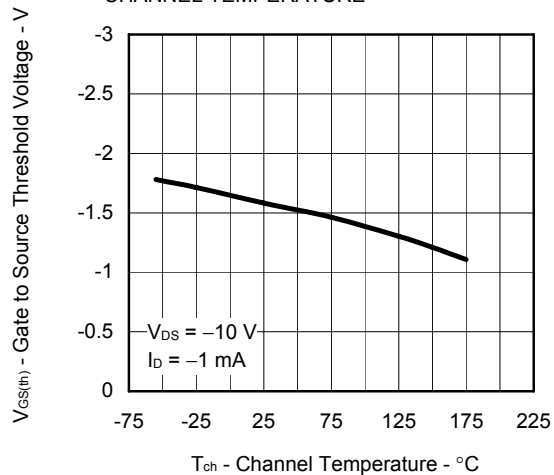
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



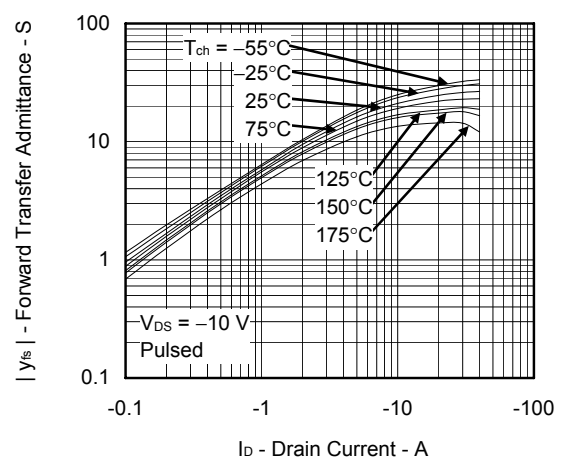
FORWARD TRANSFER CHARACTERISTICS



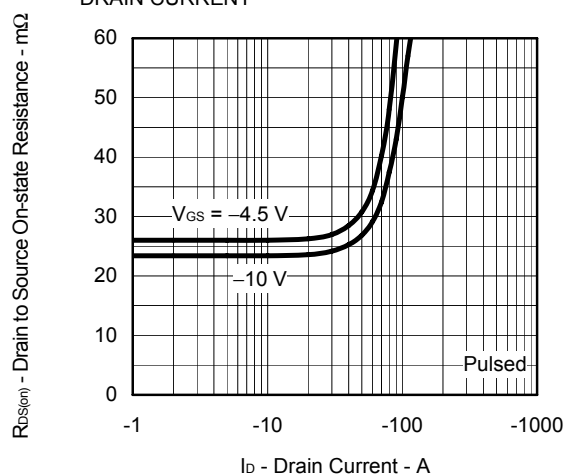
GATE TO SOURCE THRESHOLD VOLTAGE vs.
CHANNEL TEMPERATURE



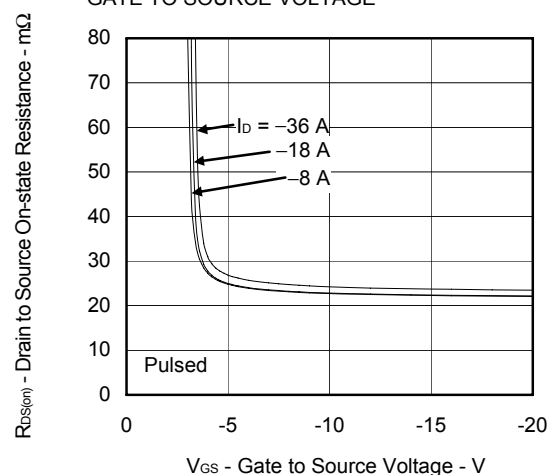
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



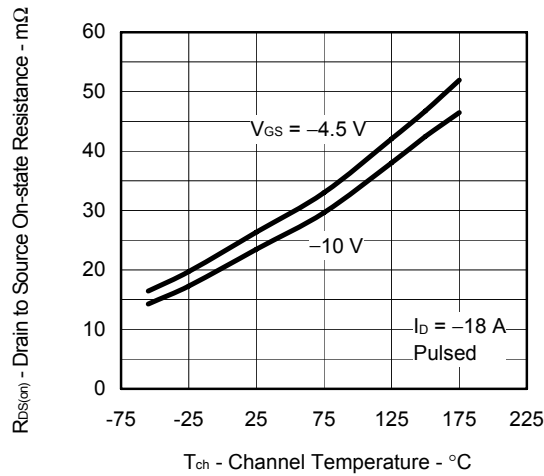
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



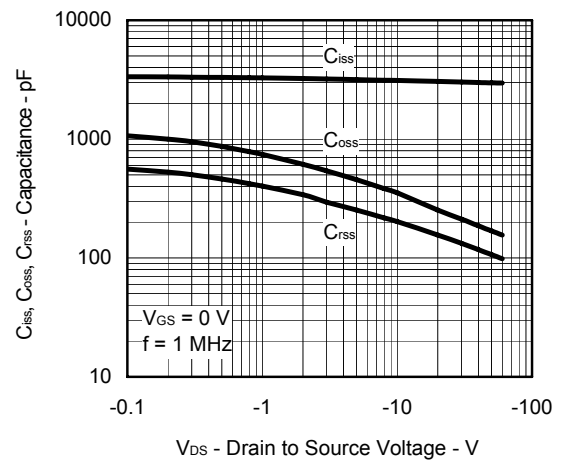
DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



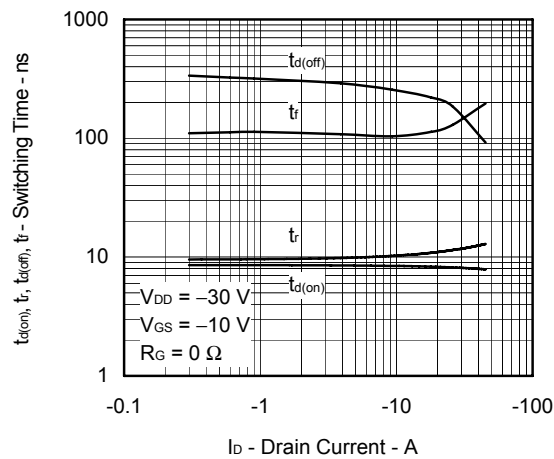
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



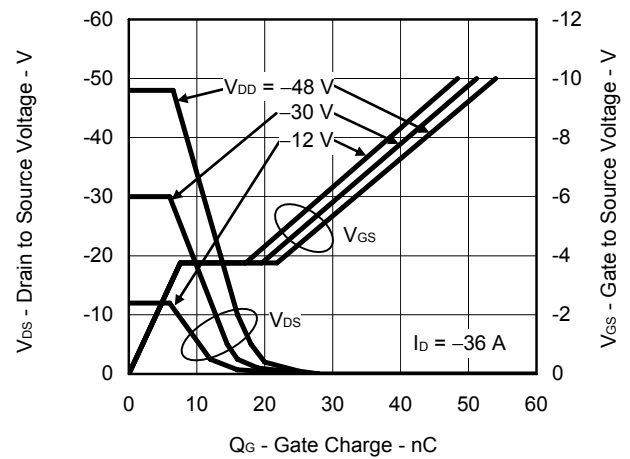
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



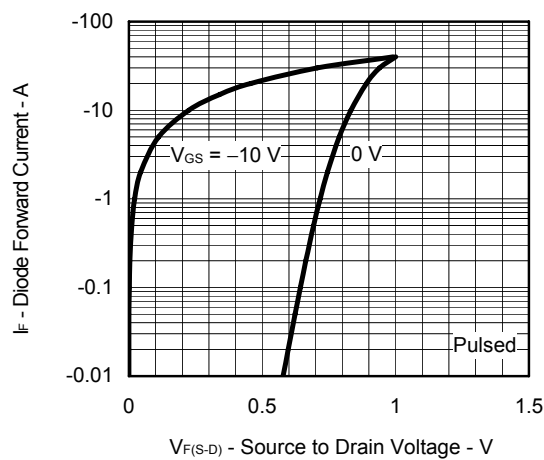
SWITCHING CHARACTERISTICS



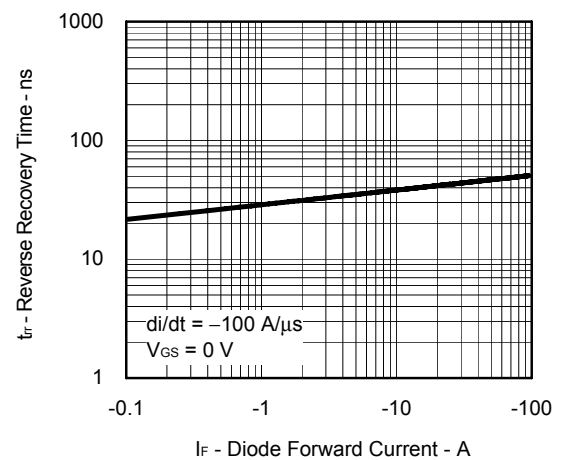
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



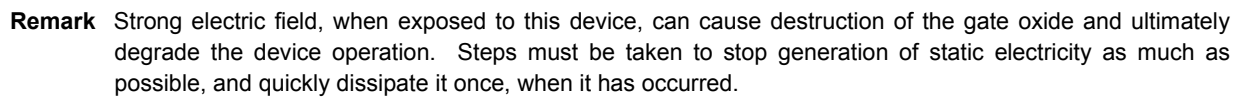
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



TO-263 (MP-25ZK)



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