N6004NZ

N-channel MOSFET
600V, 4A, 2.0Ω

R07DS1022EC0100
Rev.1.00
Feb 18, 2013

Description

The N6004NZ is N-channel MOS Field Effect Transistor designed for high current switching applications.

Features

- Low on-state resistance

  $R_{DS\ (on)}$ = 2.0Ω MAX. (V_{GS} = 10 V, I_D = 2.0 A)

- Low input capacitance

  C_{iss} = 900pF TYP. (V_{DS} = 10V, V_{GS} = 0 V)

- High current

  $I_{D(DC)}$ = ±4.0 A

- RoHS Compliant

Ordering Information

Part No.	Lead Plating	Packing	Package
N6004NZ-S17-AY *1	Pure Sn (Tin)	Tube 50 p/tube	Isolated TO-220 1.95g TYP.

Note: *1. Pb-free (This product does not contain Pb in the external electrode.)

Absolute Maximum Ratings (T_A = 25°C, all terminals are connected)

Item	Symbol	Ratings	Unit
Drain to Source Voltage (V_{GS} = 0 V)	V_{DSS}	600	V
Gate to Source Voltage (V_{DS} = 0 V)	V_{GSS}	±30	V
Drain Current (DC)	$I_{D(DC)}$	±4.0	A
Drain Current (pulse) *1	$I_{D(pulse)}$	±16.0	A
Total Power Dissipation (T_C = 25°C)	P_{T1}	30	W
Total Power Dissipation (T_A = 25°C)	P_{T2}	2.0	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	-55 to 150	°C
Single Avalanche Current *2	I_{AS}	4.0	A
Single Avalanche Energy *2	E_{AS}	10.7	mJ

Thermal Resistance

Channel to Case (Drain) Thermal Resistance	$R_{th(ch-C)}$	4.16	°C/W
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	62.5	°C/W

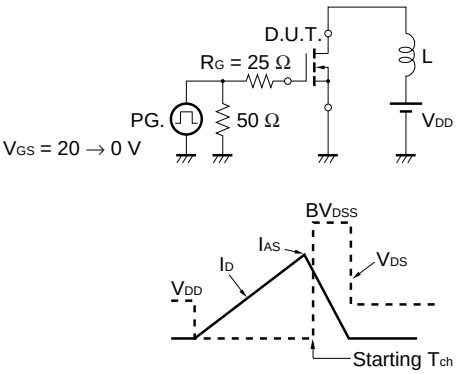
Notes: *1. PW ≤ 10 μs, Duty Cycle ≤ 1%
*2. Starting T_{ch} = 25°C, R_G = 25 Ω, V_{DD} = 150 V, V_{GS} = 20 → 0 V, L = 1mH

Electrical Characteristics (T_A = 25°C, all terminals are connected)

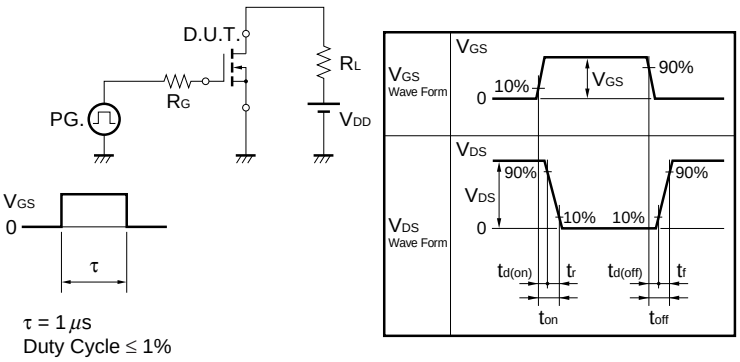
Item	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Zero Gate Voltage Drain Current	I_{DSS}			1	μA	V_{DS} = 600 V, V_{GS} = 0 V
Gate Leakage Current	I_{GSS}			±100	nA	V_{GS} = ± 30 V, V_{DS} = 0 V
Gate to Source Cut-off Voltage	$V_{GS(off)}$	2.0	3.0	4.0	V	V_{DS} = 10V, I_D = 1mA
Forward Transfer Admittance *1	$\|y_{fs}\|$	1.5	2.9		S	V_{DS} = 10 V, I_D = 2.0 A
Drain to Source On-state Resistance *1	$R_{DS(on)}$		1.52	2.0	Ω	V_{GS} = 10 V, I_D = 2.0 A
Input Capacitance	C_{iss}		900		pF	V_{DS} = 10 V,
Output Capacitance	C_{oss}		310		pF	V_{GS} = 0 V,
Reverse Transfer Capacitance	C_{rss}		65		pF	f = 1 MHz
Turn-on Delay Time	$t_{d(on)}$		14		ns	V_{DD} = 150 V, I_D = 2.0 A,
Rise Time	t_r		9		ns	V_{GS} = 10 V,
Turn-off Delay Time	$t_{d(off)}$		35		ns	R_G = 10 Ω
Fall Time	t_f		14		ns	
Total Gate Charge	Q_G		21		nC	V_{DD} = 450 V,
Gate to Source Charge	Q_{GS}		4.8		nC	V_{GS} = 10 V,
Gate to Drain Charge	Q_{GD}		8		nC	I_D = 4.0 A
Body Diode Forward Voltage *1	$V_{F(S-D)}$		0.85	1.5	V	I_F = 4.0 A, V_{GS} = 0 V
Reverse Recovery Time	t_{rr}		270		ns	I_F = 4.0 A, V_{GS} = 0 V,
Reverse Recovery Charge	Q_{rr}		1115		nC	di/dt = 50 A/μs

Note: *1. Pulsed

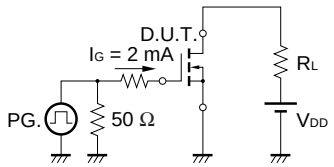
TEST CIRCUIT 1 AVALANCHE CAPABILITY



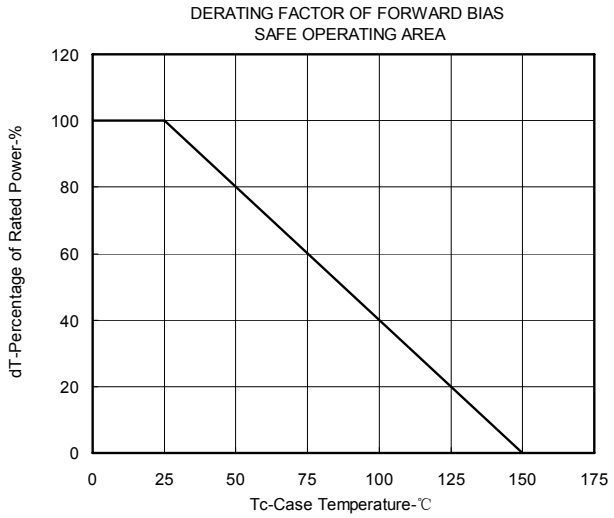
TEST CIRCUIT 2 SWITCHING TIME

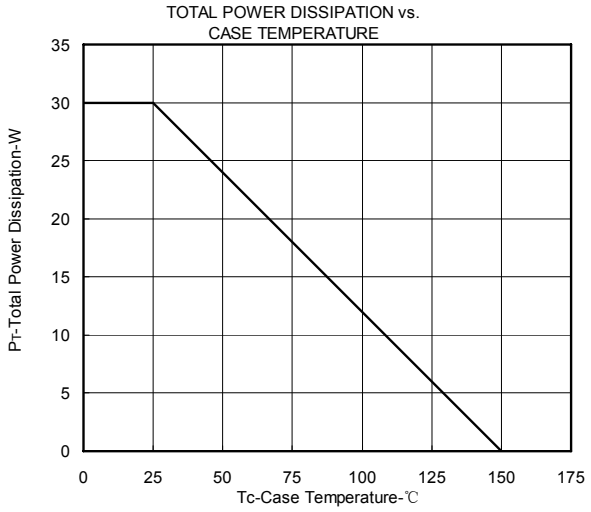


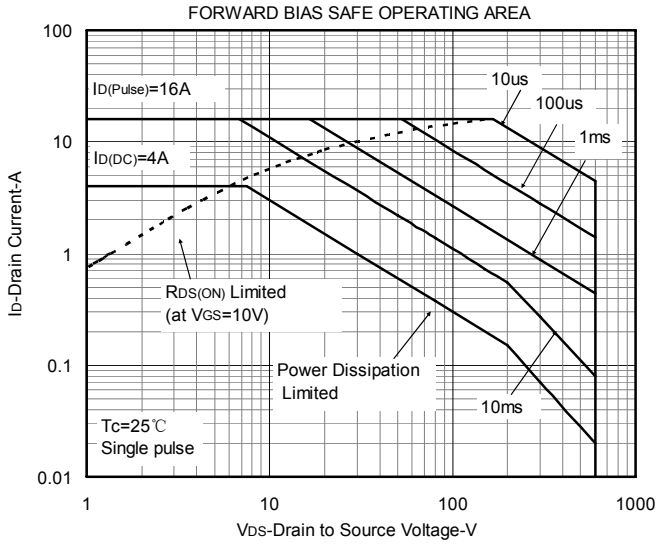
TEST CIRCUIT 3 GATE CHARGE

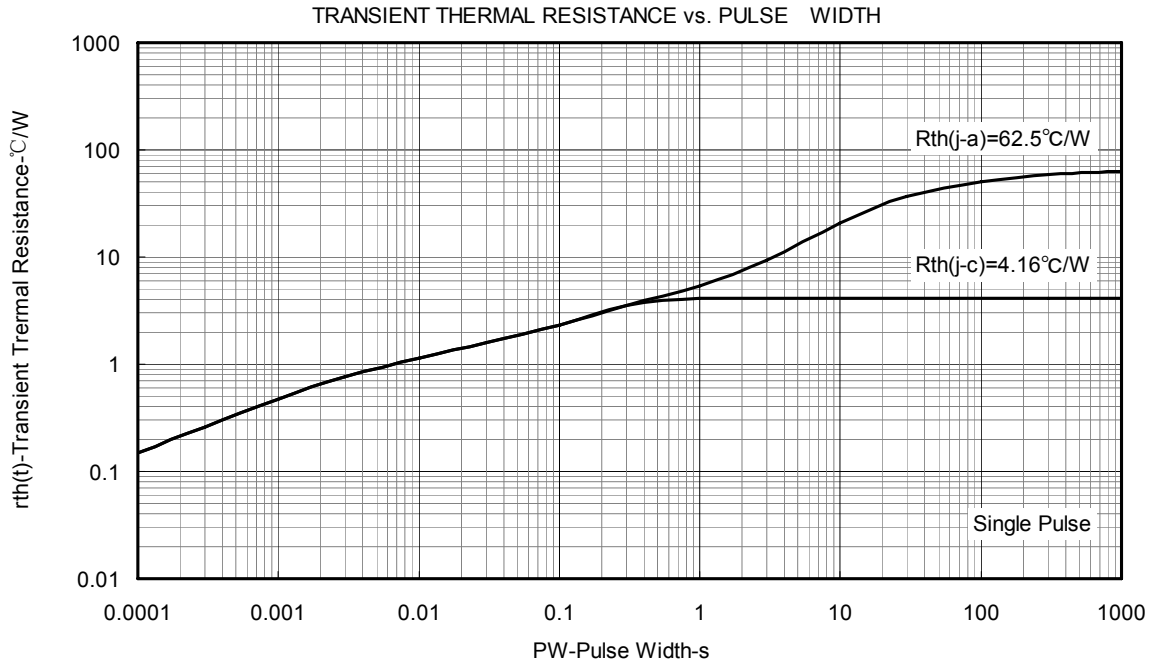


Typical Characteristics (T_A = 25°C)

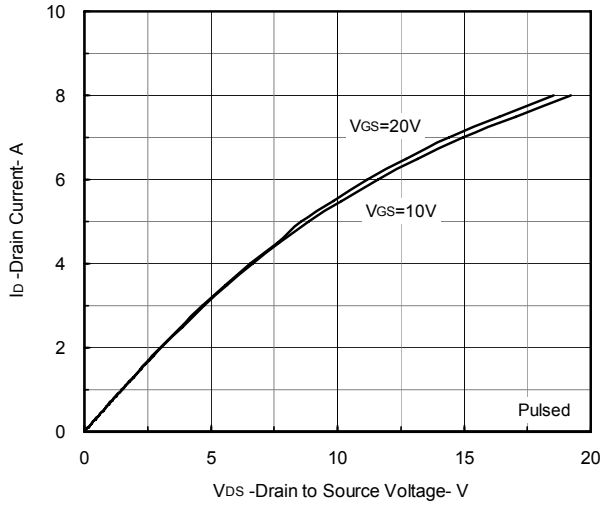




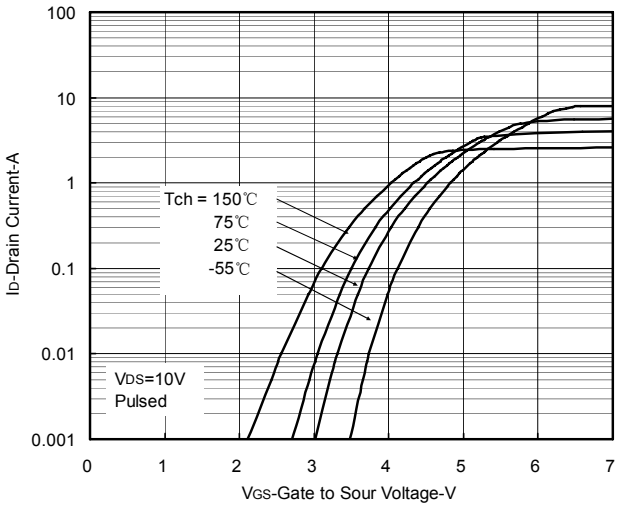




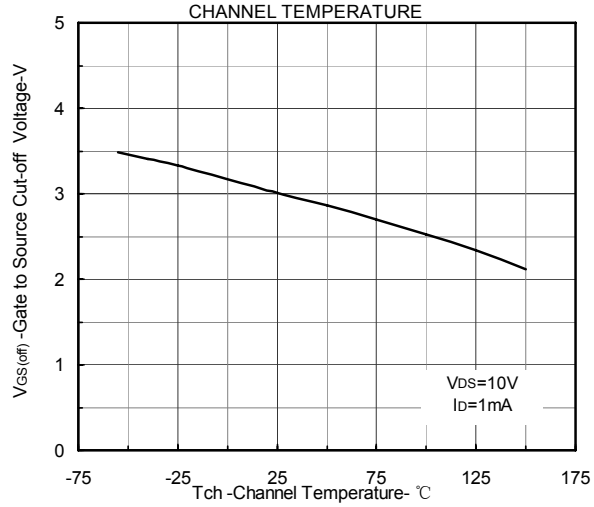
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



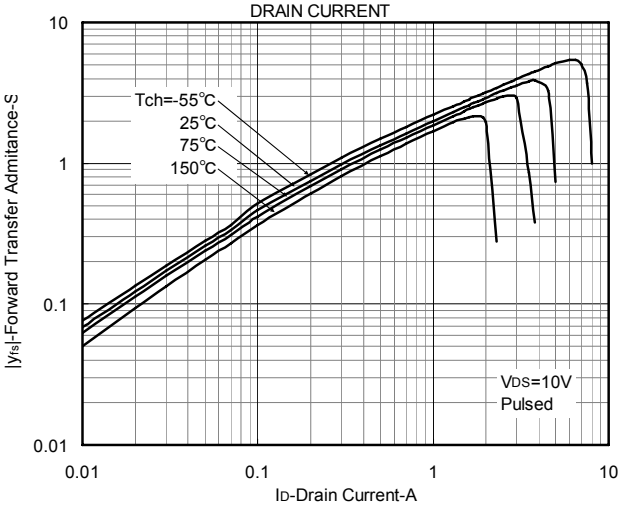
FORWARD TRANSFER CHARACTERISTICS



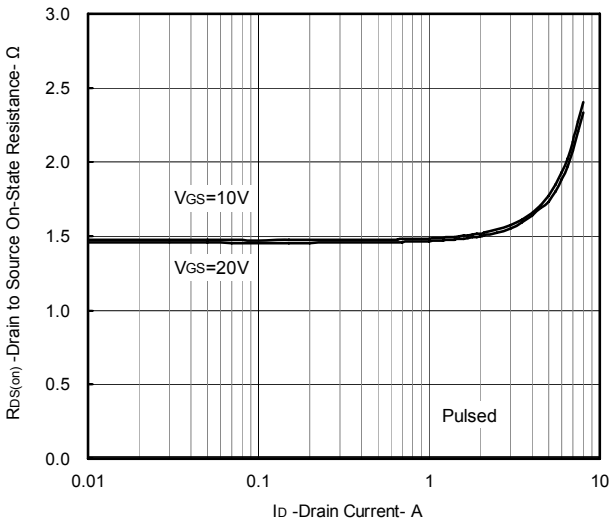
GATE TO SOURCE THRESHOLD VOLTAGE vs. CHANNEL TEMPERATURE



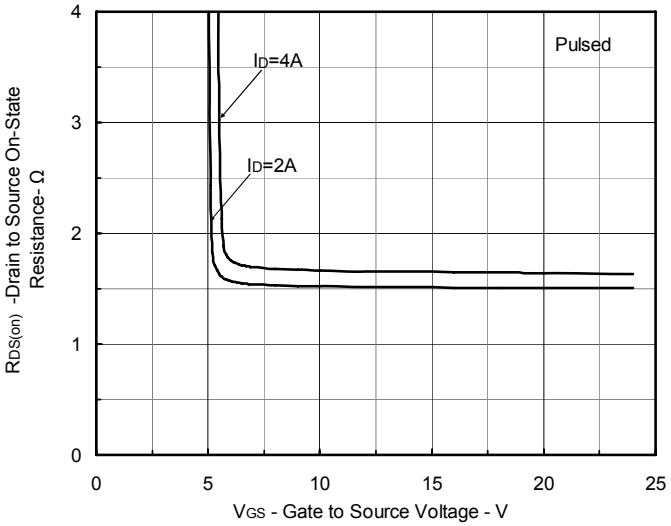
FORWARD TRANSFE ADMITANCE vs. DRAIN CURRENT



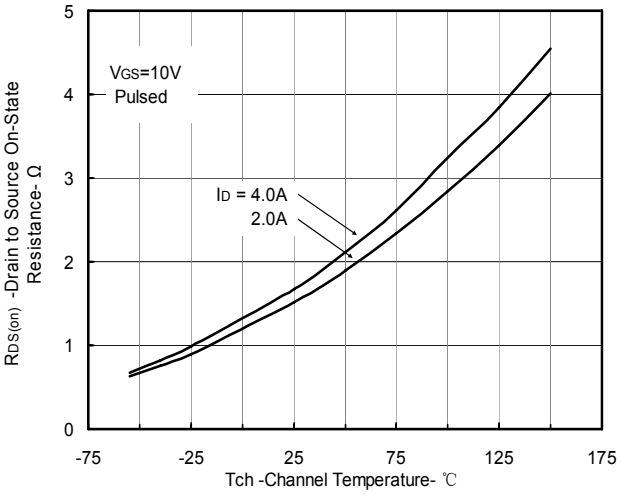
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



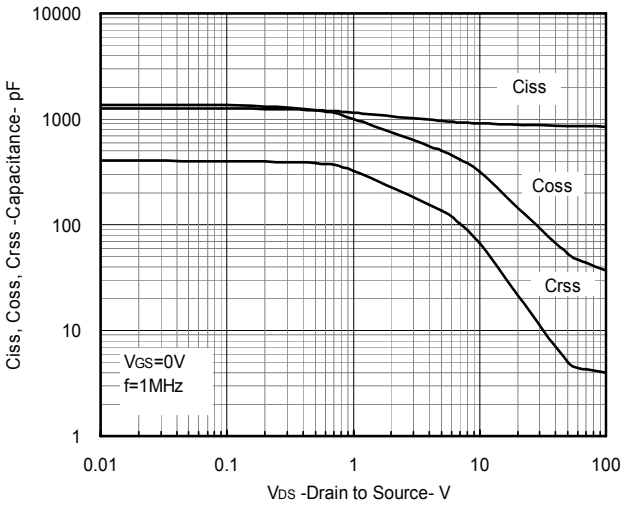
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



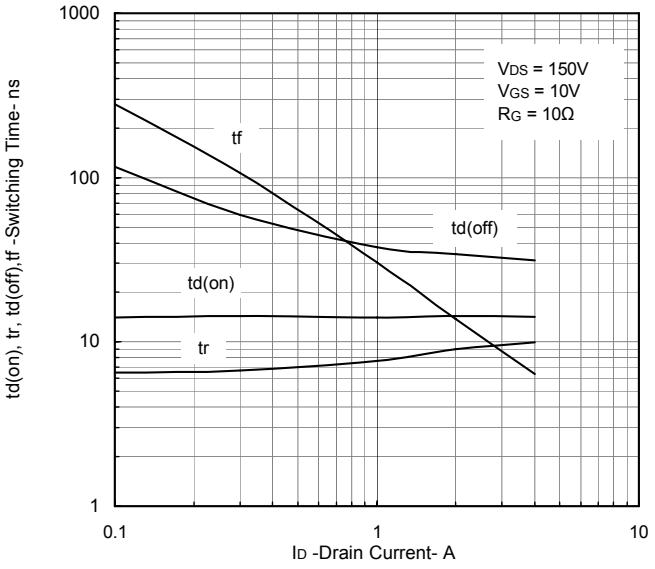
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



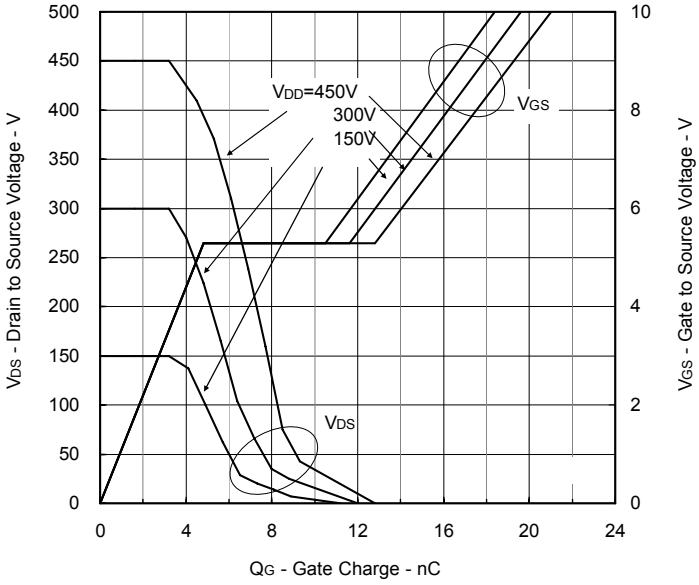
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



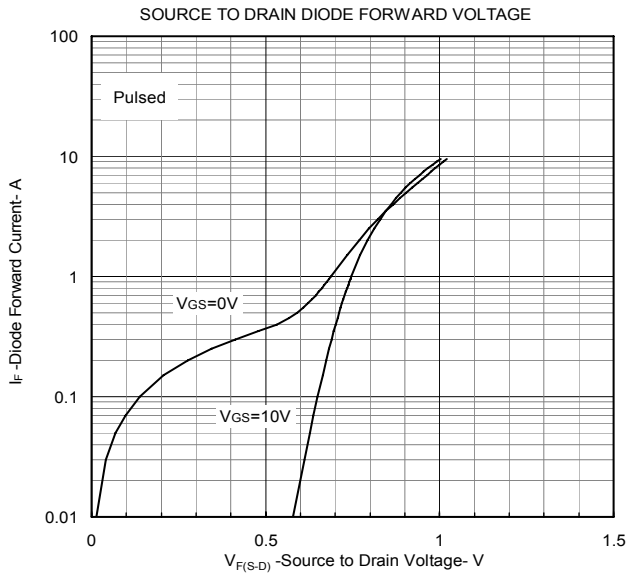
SWITCHING CHARASTARISTICS



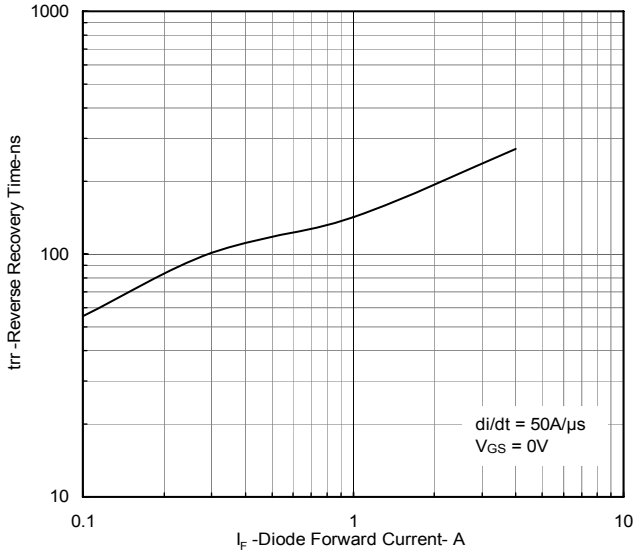
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

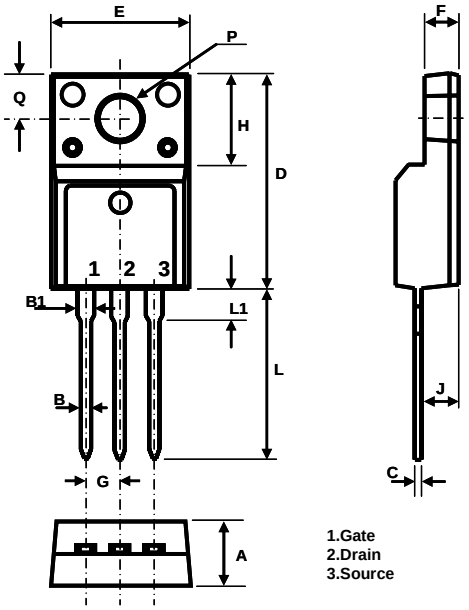


REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT



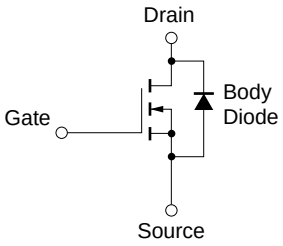
Package Drawing (Unit: mm)

Isolated TO-220



Symbol	Package Dimensions	
	Min	Max
A	4.53	4.93
B	0.71	0.91
B1	1.15	1.39
C	0.36	0.53
D	15.67	16.07
E	9.96	10.36
F	2.34	2.74
G	2.54TYP.	
H	6.50	6.90
J	2.56	2.96
L	12.78	13.18
L1	2.90	3.30
P	2.98	3.38
Q	3.10	3.50

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.

Revision History	N6004NZ Data Sheet

Rev.	Date	Description	
		Page	Summary
1.00	Feb 18, 2013	–	First Edition Issued

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Renesas Electronics America Inc.
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-65030, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

Renesas Electronics Hong Kong Limited
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics Korea Co., Ltd.
11F., Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141

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