

NP75N04VDK

40 V – 75 A – N-channel Power MOS FET
 Application: Automotive

R07DS1015EJ0100
 Rev.1.00
 Feb 21, 2013

Description

The NP75N04VDK is N-channel MOS Field Effect Transistors designed for high current switching applications.

Features

- Super low on-state resistance
 $R_{DS(on)} = 5.7 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 38 \text{ A)}$
- Low C_{iss} : $C_{iss} = 1630 \text{ pF TYP. (} V_{DS} = 25 \text{ V)}$
- Logic level drive type
- Designed for automotive application and AEC-Q101 qualified

Ordering Information

Part No.	Lead Plating	Packing		Package
NP75N04VDK-E1-AY *1	Pure Sn (Tin)	Tape 2500 p/reel	Taping (E1 type)	TO-252 (MP-3ZP)
NP75N04VDK-E2-AY *1			Taping (E2 type)	

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

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$)

Item	Symbol	Ratings	Unit
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) ($T_C = 25^\circ\text{C}$)	$I_{D(DC)}$	± 75	A
Drain Current (pulse) *1	$I_{D(pulse)}$	± 225	A
Total Power Dissipation ($T_C = 25^\circ\text{C}$)	P_{T1}	75	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	$^\circ\text{C}$
Repetitive Avalanche Current *2	I_{AR}	22	A
Repetitive Avalanche Energy *2	E_{AR}	48	mJ

Notes: *1 $T_C = 25^\circ\text{C}$, $P_W \leq 10 \mu\text{s}$, Duty Cycle $\leq 1\%$

*2 $R_G = 25 \Omega$, $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$

Thermal Resistance

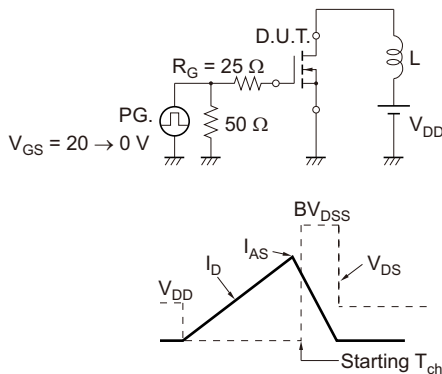
Channel to Case Thermal Resistance	$R_{th(ch-C)}$	2.00	$^\circ\text{C/W}$
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	125	$^\circ\text{C/W}$

Electrical Characteristics (T_A = 25°C)

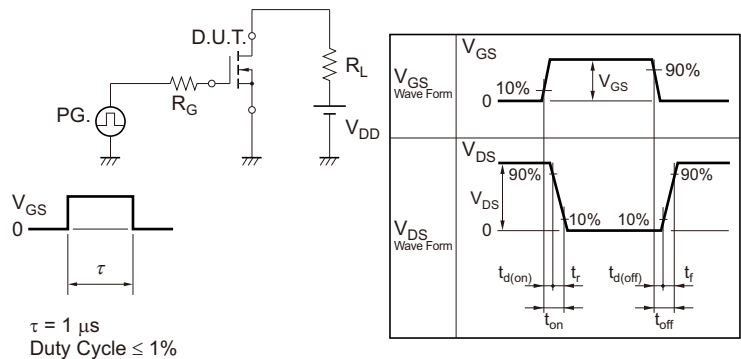
Item	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Zero Gate Voltage Drain Current	I _{DSS}	—	—	1	μA	V _{DS} = 40 V, V _{GS} = 0 V
Gate Leakage Current	I _{GSS}	—	—	±100	nA	V _{GS} = ±20 V, V _{DS} = 0 V
Gate to Source Threshold Voltage	V _{GS(th)}	1.5	1.8	2.5	V	V _{DS} = V _{GS} , I _D = 250 μA
Forward Transfer Admittance *1	y _{fs}	26	52	—	S	V _{DS} = 5 V, I _D = 38 A
Drain to Source On-state Resistance *1	R _{DS(on)1}	—	4.7	5.7	mΩ	V _{GS} = 10 V, I _D = 38 A
	R _{DS(on)2}	—	6.3	12.6	mΩ	V _{GS} = 4.5 V, I _D = 19 A
Input Capacitance	C _{iss}	—	1630	2450	pF	V _{DS} = 25 V V _{GS} = 0 V f = 1 MHz
Output Capacitance	C _{oss}	—	220	330	pF	
Reverse Transfer Capacitance	C _{rss}	—	100	180	pF	
Turn-on Delay Time	t _{d(on)}	—	12	26	ns	V _{DD} = 20 V, I _D = 38 A V _{GS} = 10 V R _G = 0 Ω
Rise Time	t _r	—	5	13	ns	
Turn-off Delay Time	t _{d(off)}	—	40	80	ns	
Fall Time	t _f	—	5	13	ns	
Total Gate Charge	Q _G	—	27	41	nC	V _{DD} = 32 V V _{GS} = 10 V I _D = 75 A
Gate to Source Charge	Q _{GS}	—	8	—	nC	
Gate to Drain Charge	Q _{GD}	—	4	—	nC	
Body Diode Forward Voltage *1	V _{F(S-D)}	—	0.9	1.5	V	I _F = 75 A, V _{GS} = 0 V
Reverse Recovery Time	t _{rr}	—	32	—	ns	I _F = 75 A, V _{GS} = 0 V
Reverse Recovery Charge	Q _{rr}	—	35	—	nC	di/dt = 100 A/μs

Note: *1 Pulsed test

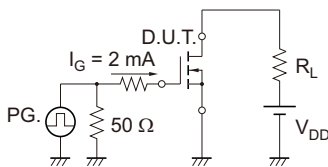
TEST CIRCUIT 1 AVALANCHE CAPABILITY



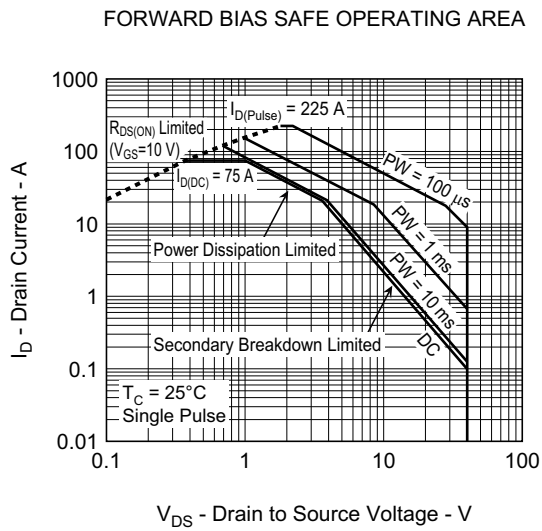
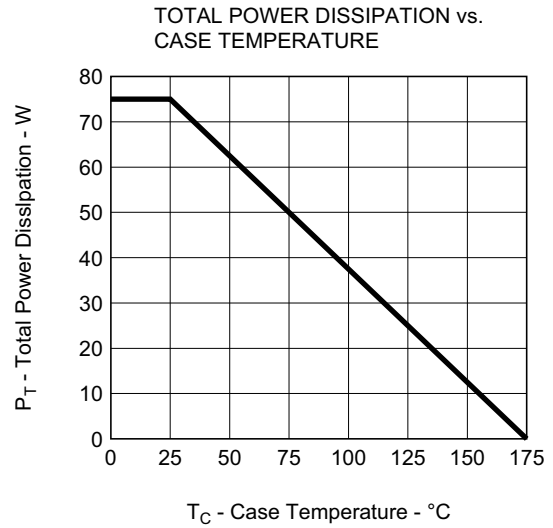
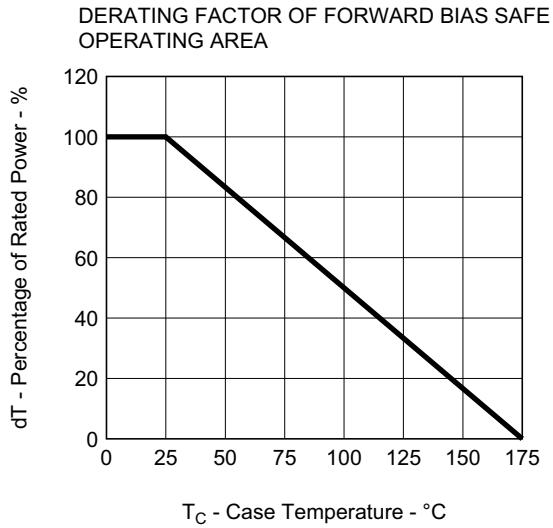
TEST CIRCUIT 2 SWITCHING TIME



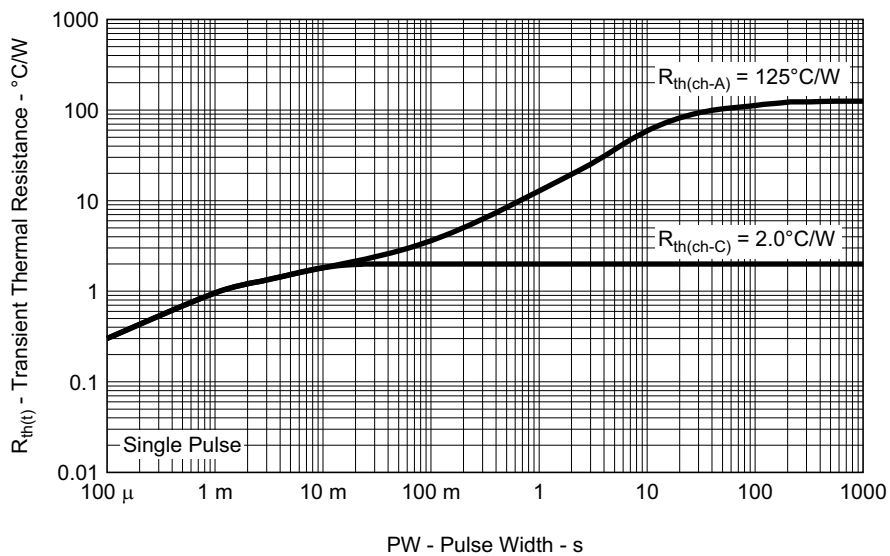
TEST CIRCUIT 3 GATE CHARGE



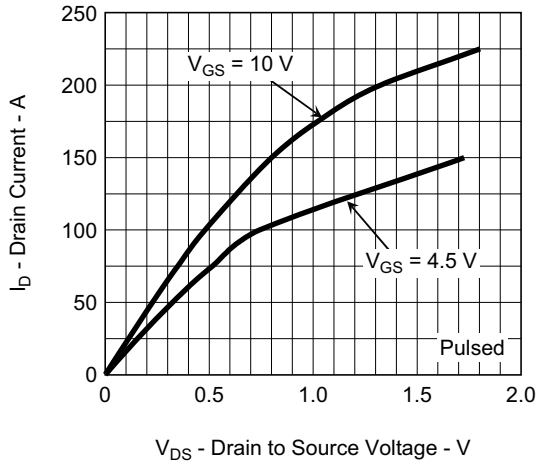
Typical Characteristics ($T_A = 25^\circ\text{C}$)



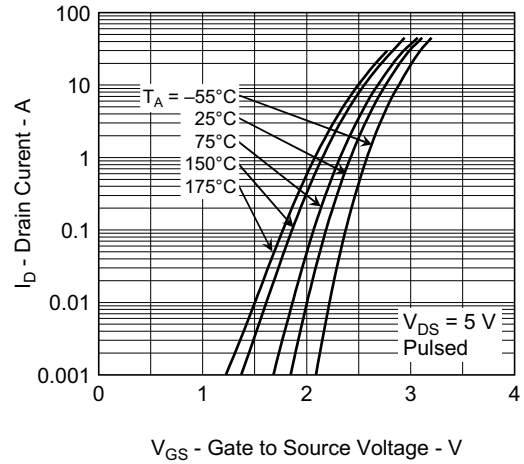
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



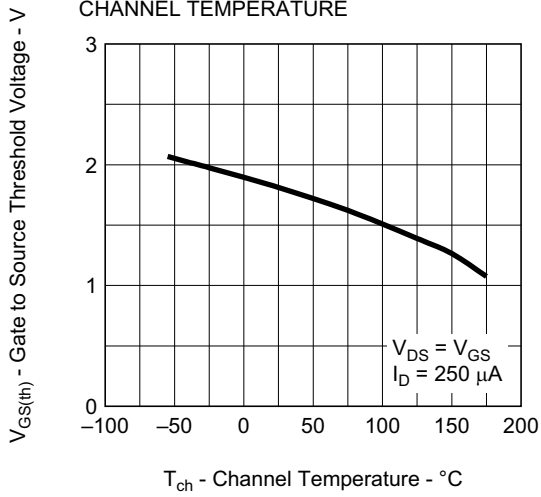
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



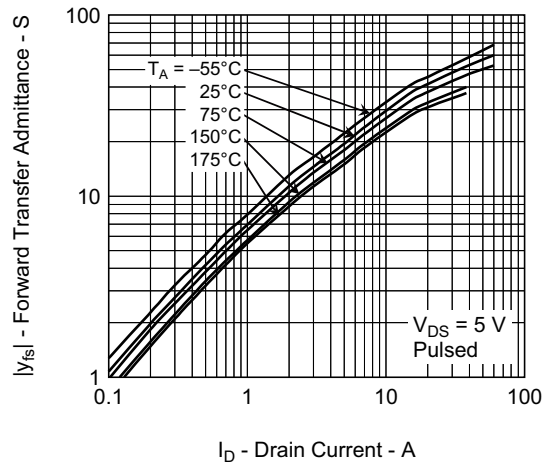
FORWARD TRANSFER CHARACTERISTICS



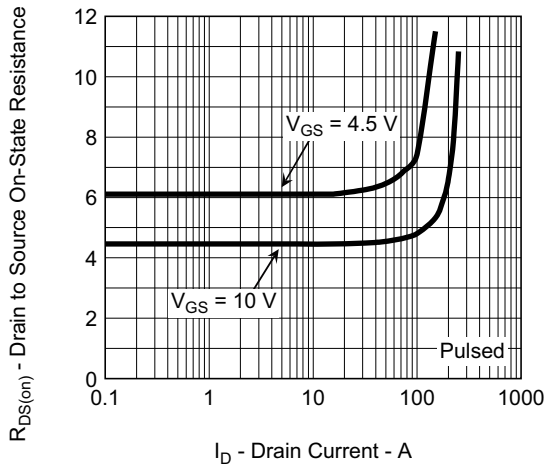
GATE TO SOURCE THRESHOLD VOLTAGE vs. CHANNEL TEMPERATURE



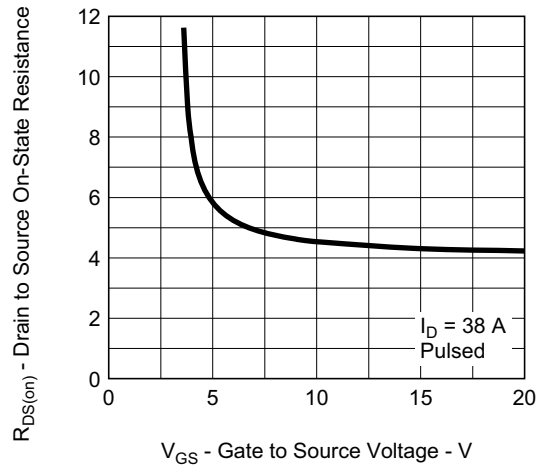
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



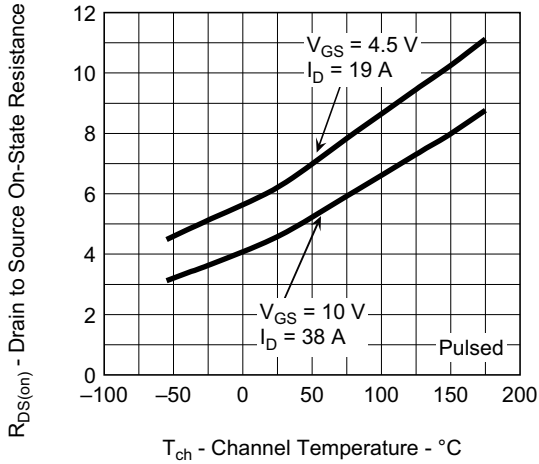
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



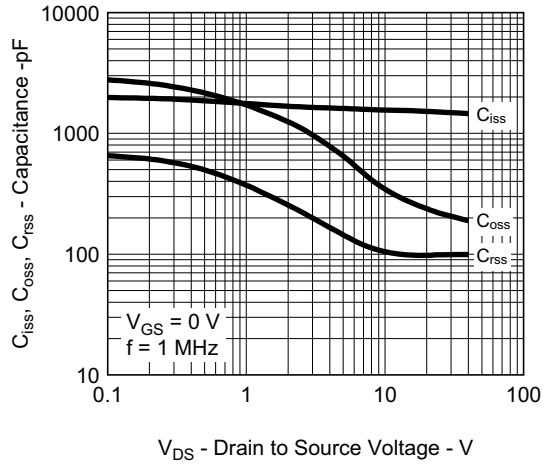
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



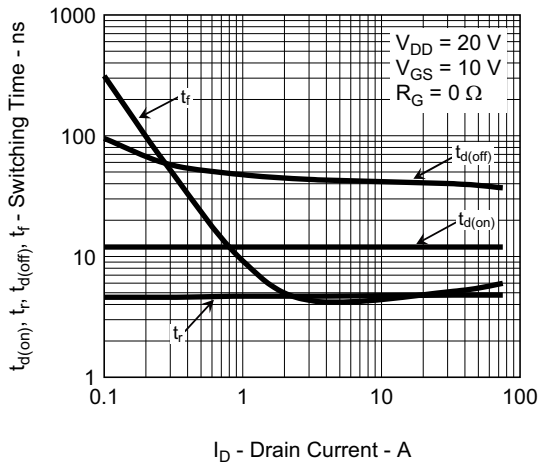
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



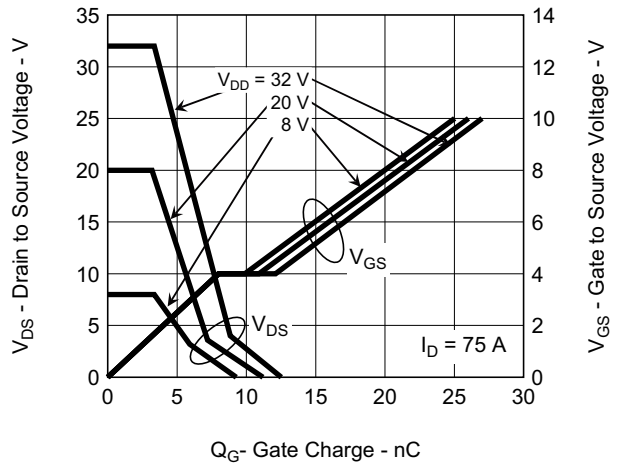
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



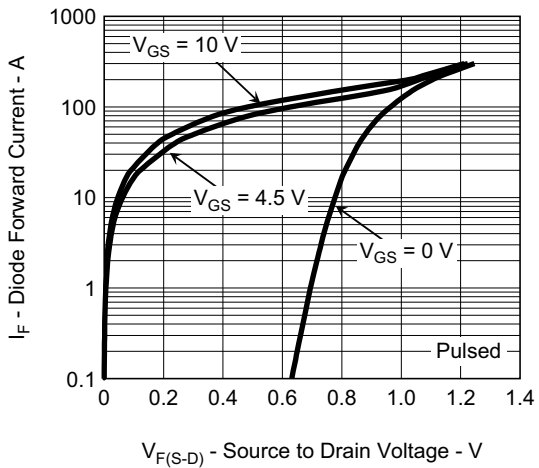
SWITCHING CHARACTERISTICS



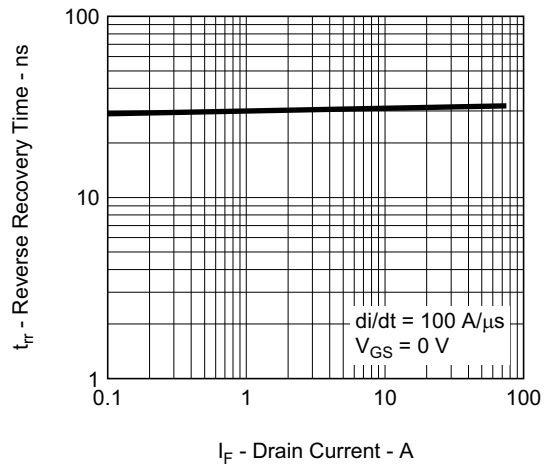
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

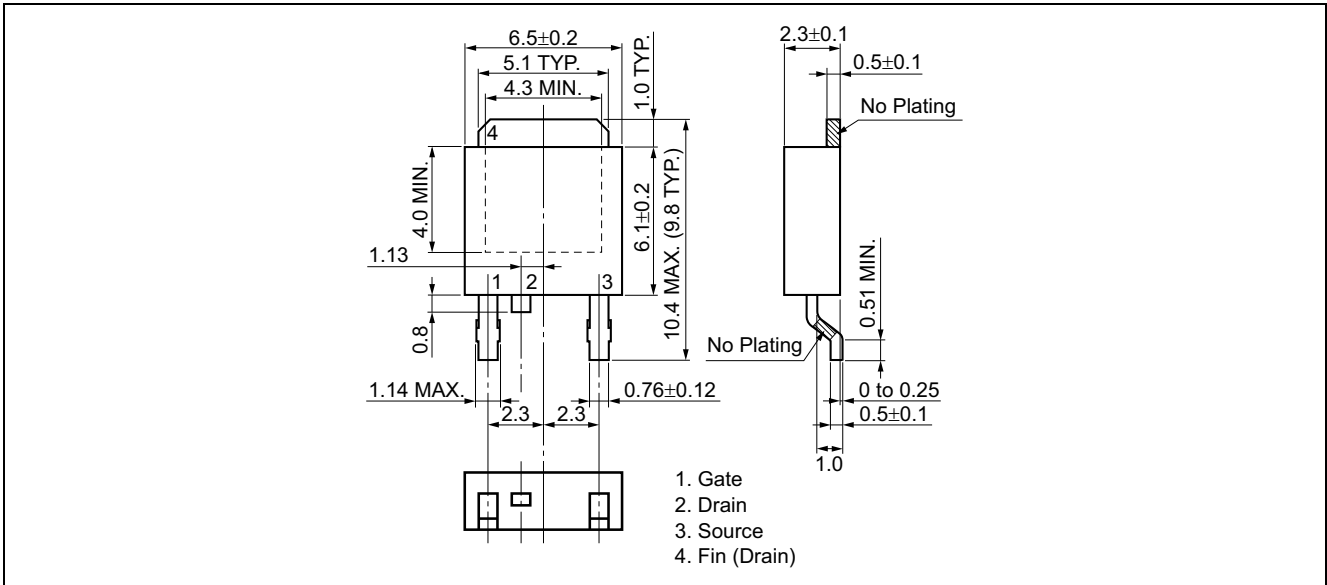


REVERSE RECOVERY TIME vs. DRAIN CURRENT

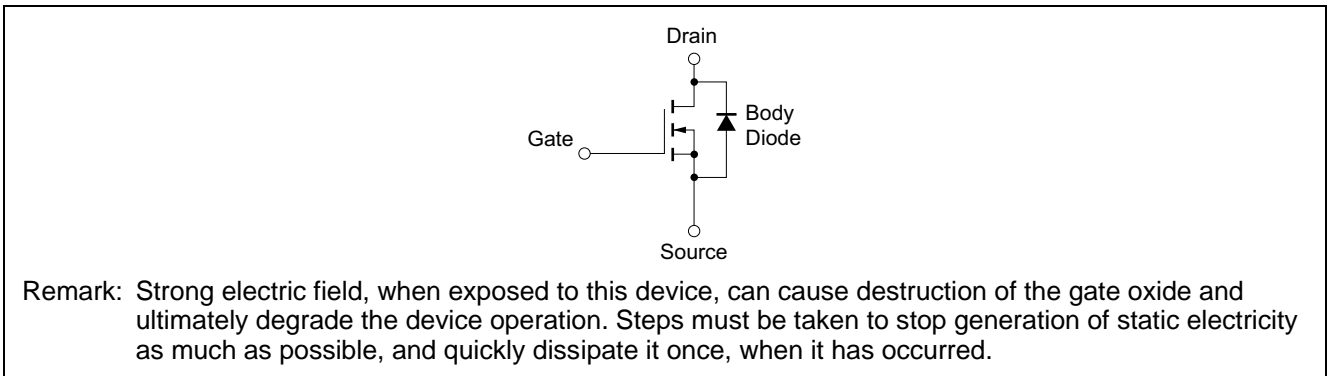


Package Drawing (Unit: mm)

TO-252 (MP-3ZP) (Mass: 0.3g TYP.)



Equivalent Circuit



Revision History	NP75N04VDK Data Sheet
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Rev.	Date	Description	
		Page	Summary
1.00	Feb 21, 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: +60-3-7955-3390, Fax: +60-3-7955-9510

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