

# NP75N04YUK

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

R07DS1004EJ0100  
 Rev.1.00  
 Feb 08, 2013

## Description

The NP75N04YUK is N-channel MOS Field Effect Transistors designed for high current switching applications.

## Features

- Super low on-state resistance  
 $R_{DS(on)} = 3.3 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 38 \text{ A)}$
- Non logic level drive type
- Designed for automotive application and AEC-Q101 qualified

## Ordering Information

Part No.	Lead Plating	Packing		Package
NP75N04YUK-E1-AY *1	Pure Sn (Tin)	Tape 2500 p/reel	Taping (E1 type)	8-pin HSON
NP75N04YUK-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 ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 20$	V
Drain Current (DC) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 75$	A
Drain Current (pulse) *1	$I_{D(pulse)}$	$\pm 300$	A
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T1}$	138	W
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ ) *2	$P_{T2}$	1.0	W
Channel Temperature	$T_{ch}$	175	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +175	$^\circ\text{C}$
Repetitive Avalanche Current *3	$I_{AR}$	35	A
Repetitive Avalanche Energy *3	$E_{AR}$	123	mJ

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

\*2 Mounted on glass epoxy substrate of 40 mm  $\times$  40 mm  $\times$  1.6 mm with 4% Copper area (35  $\mu\text{m}$ )

\*3  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$

## Thermal Resistance

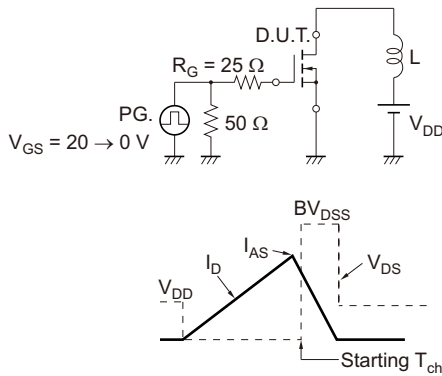
Channel to Case Thermal Resistance	$R_{th(ch-C)}$	1.09	$^\circ\text{C/W}$
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	150	$^\circ\text{C/W}$

Electrical Characteristics (T<sub>A</sub> = 25°C)

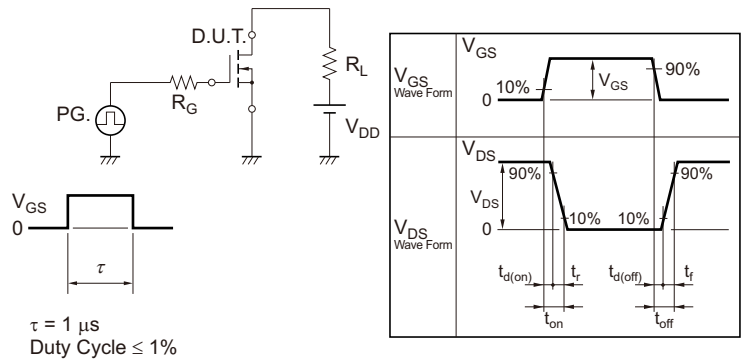
Item	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	—	—	1	μA	V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V
Gate Leakage Current	I <sub>GSS</sub>	—	—	±100	nA	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V
Gate to Source Threshold Voltage	V <sub>GS(th)</sub>	2.0	3.0	4.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA
Forward Transfer Admittance *1	y <sub>fs</sub>	31	62	—	S	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 38 A
Drain to Source On-state Resistance *1	R <sub>DS(on)</sub>	—	2.6	3.3	mΩ	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 38 A
Input Capacitance	C <sub>iss</sub>	—	3400	5100	pF	V <sub>DS</sub> = 25 V V <sub>GS</sub> = 0 V f = 1 MHz
Output Capacitance	C <sub>oss</sub>	—	480	720	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>	—	180	330	pF	
Turn-on Delay Time	t <sub>d(on)</sub>	—	24	48	ns	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 38 A V <sub>GS</sub> = 10 V R <sub>G</sub> = 0 Ω
Rise Time	t <sub>r</sub>	—	10	25	ns	
Turn-off Delay Time	t <sub>d(off)</sub>	—	60	120	ns	
Fall Time	t <sub>f</sub>	—	7	17	ns	
Total Gate Charge	Q <sub>G</sub>	—	58	87	nC	V <sub>DD</sub> = 32 V
Gate to Source Charge	Q <sub>GS</sub>	—	16	—	nC	V <sub>GS</sub> = 10 V
Gate to Drain Charge	Q <sub>GD</sub>	—	15	—	nC	I <sub>D</sub> = 75 A
Body Diode Forward Voltage *1	V <sub>F(S-D)</sub>	—	0.9	1.5	V	I <sub>F</sub> = 75 A, V <sub>GS</sub> = 0 V
Reverse Recovery Time	t <sub>rr</sub>	—	42	—	ns	I <sub>F</sub> = 75 A, V <sub>GS</sub> = 0 V
Reverse Recovery Charge	Q <sub>rr</sub>	—	51	—	nC	di/dt = 100 A/μs

Note: \*1 Pulsed test

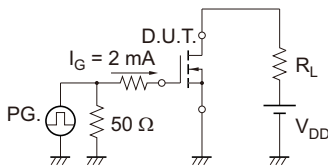
TEST CIRCUIT 1 AVALANCHE CAPABILITY



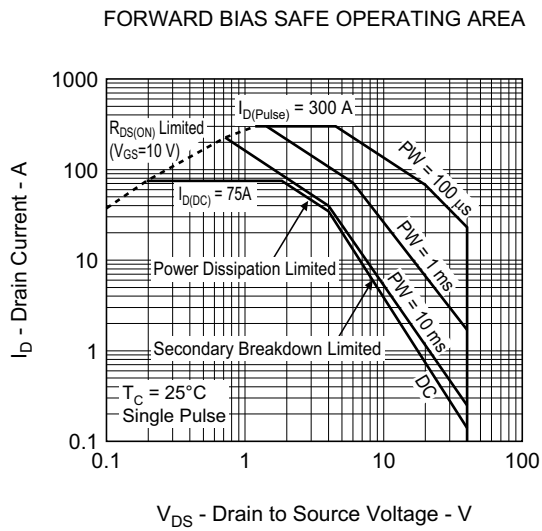
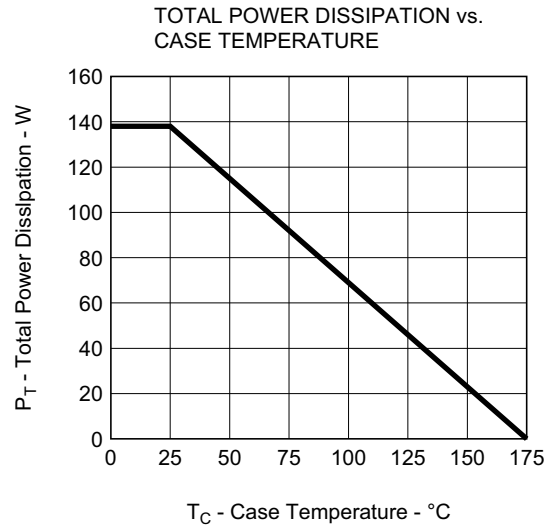
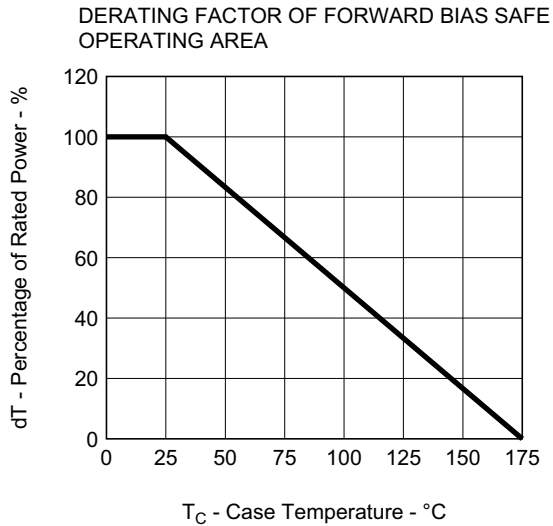
TEST CIRCUIT 2 SWITCHING TIME



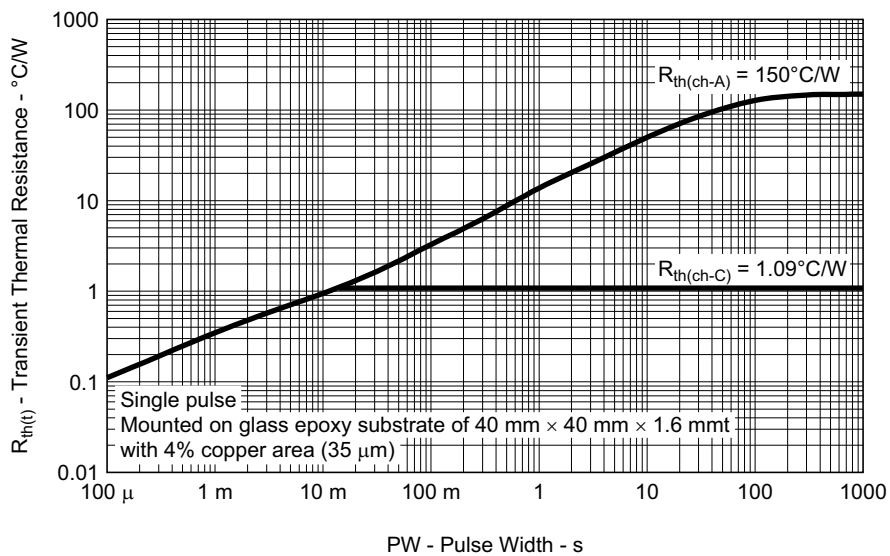
TEST CIRCUIT 3 GATE CHARGE



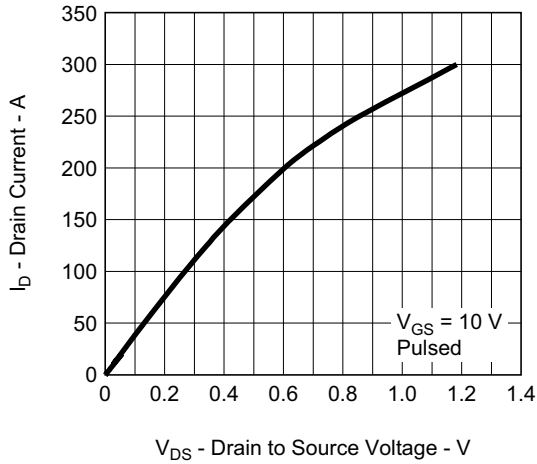
Typical Characteristics ( $T_A = 25^\circ\text{C}$ )



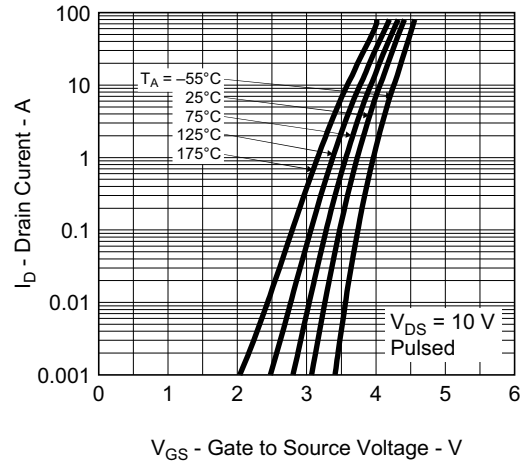
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



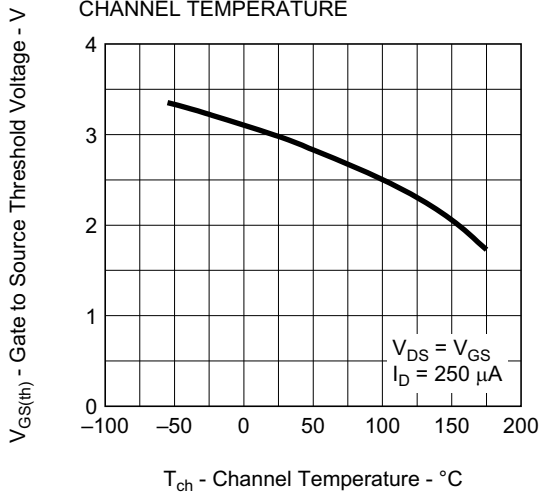
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



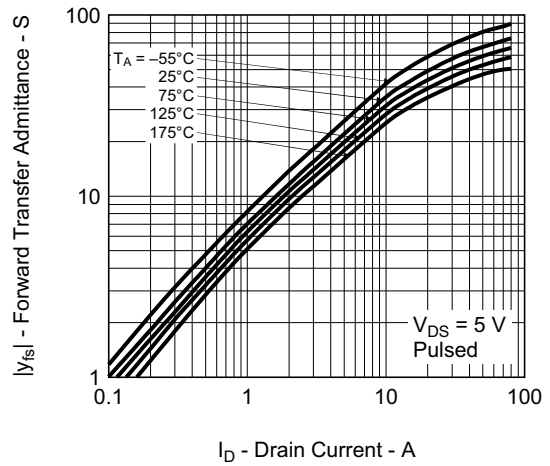
FORWARD TRANSFER CHARACTERISTICS



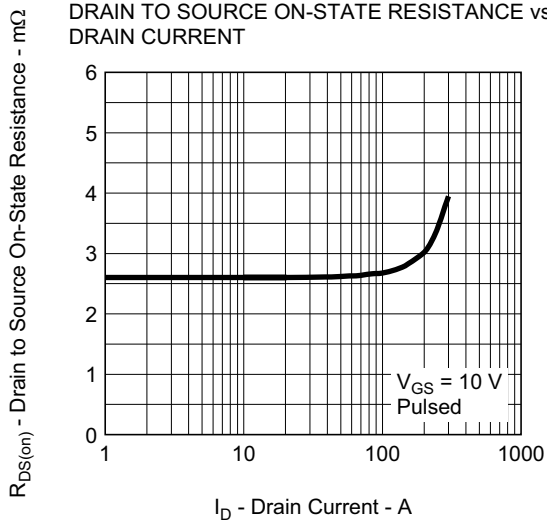
GATE TO SOURCE THRESHOLD VOLTAGE vs. CHANNEL TEMPERATURE



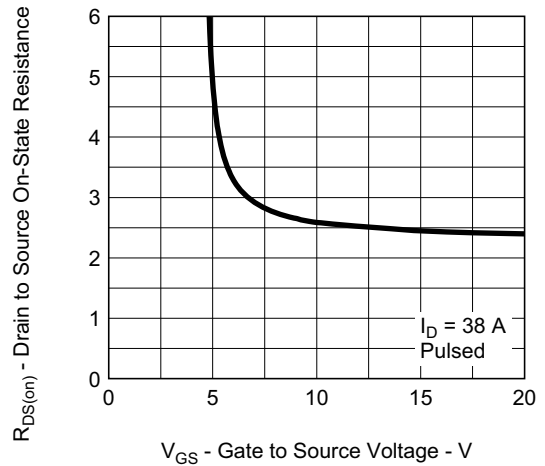
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



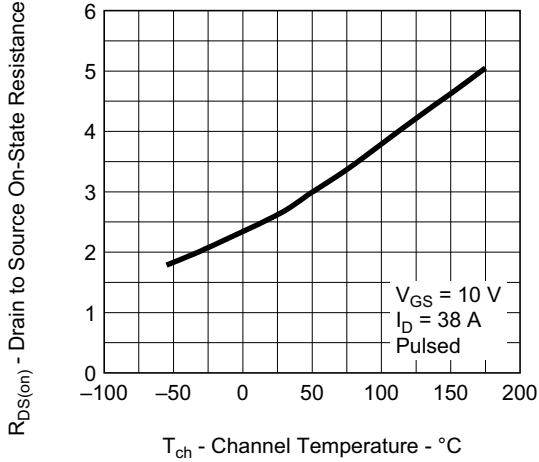
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



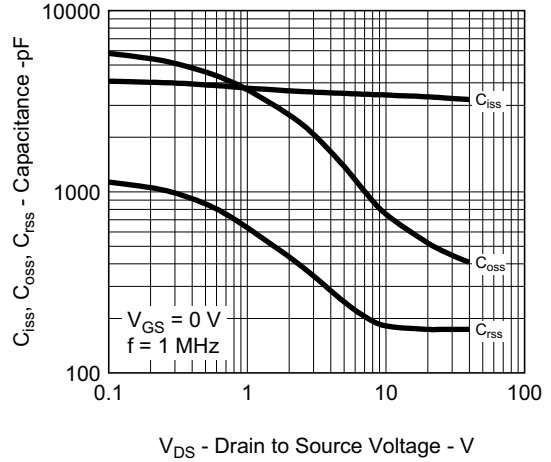
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



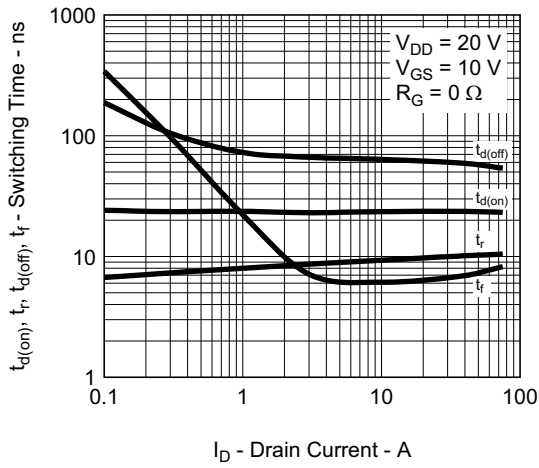
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



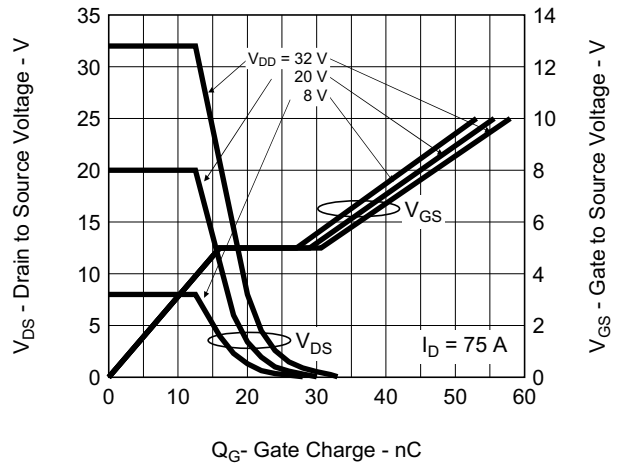
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



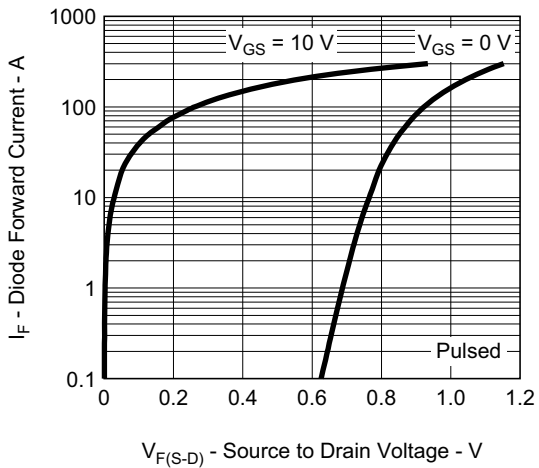
SWITCHING CHARACTERISTICS



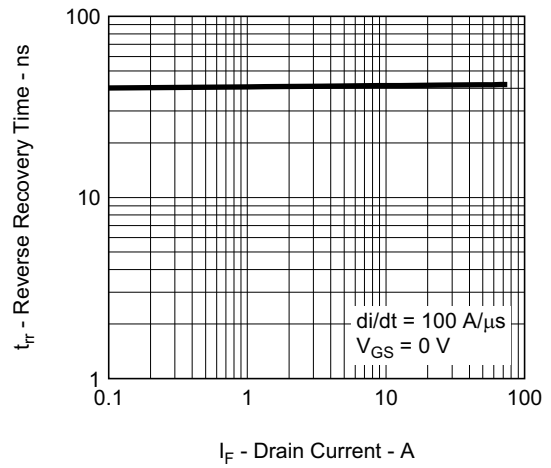
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

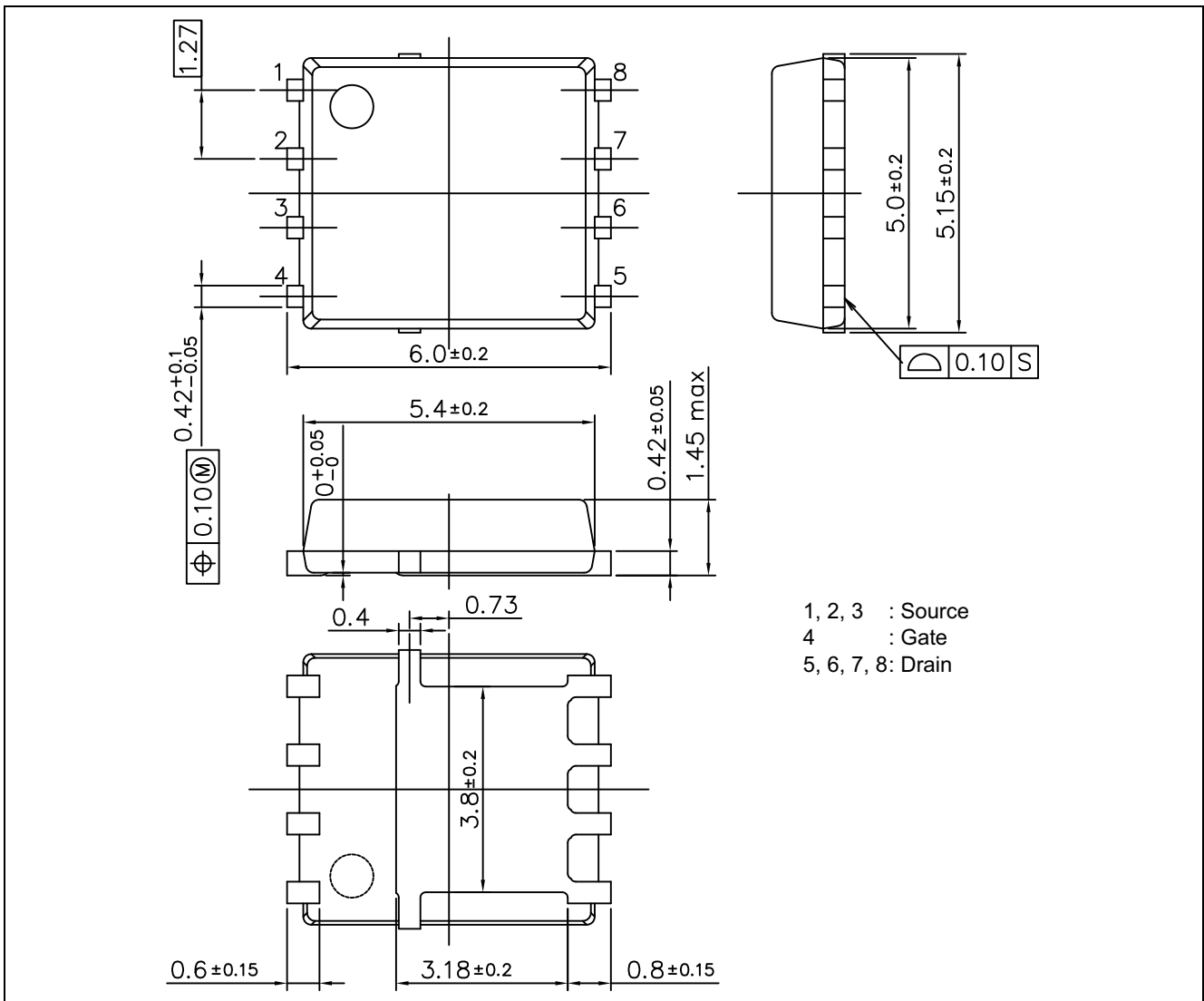


REVERSE RECOVERY TIME vs. DRAIN CURRENT

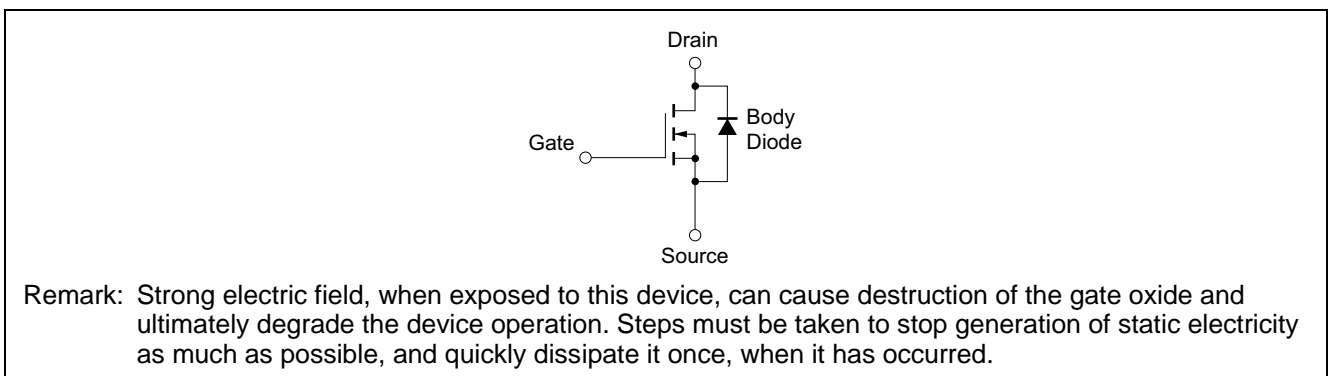


Package Drawing (Unit: mm)

8-pin HSON (Mass: 0.128 g TYP.)



Equivalent Circuit



<b>Revision History</b>	<b>NP75N04YUK Data Sheet</b>
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Rev.	Date	Description	
		Page	Summary
1.00	Feb 08, 2013	—	First Edition Issued

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