

KGF6N05D

N-Channel 5.5V Dual Power MOSFET

FN8788
Rev 1.00

The KGF6N05D is a dual 5.5V, 2.5mΩ, chip-scale, N-channel power MOSFET. The device uses technology that uniquely integrates low cost CMOS and LGA fabrication processes. The chip-scale WLCSP package offers small area, low vertical profile and is fully compatible with standard SMT assembly processes. The KGF6N05D device offers unprecedented low on-resistance and total gate charge, outperforming conventional trench MOSFETs and enabling high frequency, low voltage switching. The device offers extremely high power density, reducing the board size of DC/DC converters and other power management systems.

Features

- Industry leading figures of merit: $r_{DS(ON)} \times Q_g$ and $r_{DS(ON)} \times Q_{gd}$
- Low profile/small footprint chip-scale WLCSP package
- High frequency switching
- Known Good FET (KGF) Quality Assurance Process
- Low thermal resistance

Applications

- Point-of-load DC/DC converters
- Portable electronics
- OR'ing diodes

PRODUCT SUMMARY (PER FET)			
I_D	$T_A = +25^\circ C$	6A	Maximum
$V_{(BR)DSS}$	$I_D = 5mA$	5.5V	Minimum
$r_{DS(ON)}$	$V_{GS} = 4.5V$	2.50mΩ	Typical
$r_{DS(ON)}$	$V_{GS} = 4.5V$ (in Parallel)	1.25mΩ	Typical
Q_g	$V_{GS} = 4.5V$	4.4nC	Typical
Q_{gd}	$I_D = 6A$	0.8nC	Typical

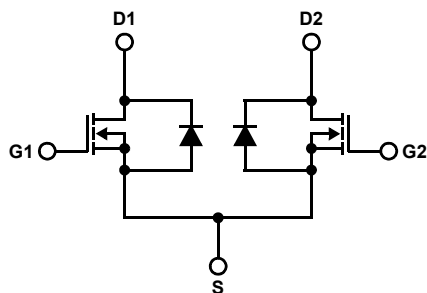


FIGURE 1. EQUIVALENT CIRCUIT

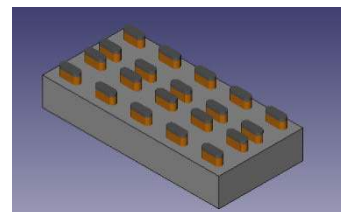


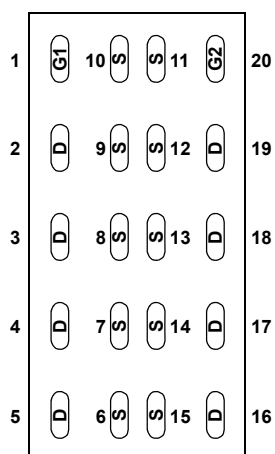
FIGURE 2. WLCSP, DIE SIZE 2.475mmx1.170mm

Ordering Information

PART NUMBER	PART MARKING	TEMP RANGE (°C)	PACKAGE (RoHS Compliant)
KGF6N05D-400	T	-55°C to +150°C	20 Bump WLCSP

Pin Configuration

KGF6N05D
(20 BUMP WLCSP)
BOTTOM VIEW



Pin Descriptions

PIN #	PIN NAME	DESCRIPTION
1	G1	Gate of MOSFET 1
2, 3, 4, 5	D1	Drain of MOSFET 1
6, 7, 8, 9, 10, 11, 12, 13, 14, 15	S	Source of both MOSFETs
16, 17, 18, 19	D2	Drain of MOSFET 2
20	G2	Gate of MOSFET 2

Absolute Maximum Ratings (Note 1)

Drain-to-Source Voltage (V_{DS})	5.5V
Gate-to-Source Voltage (V_{GS})	±5.5V
Drain Current ($I_{D1} + I_{D2}$)	
Continuous (I_D)	12A
Pulsed (I_{DM})	40A
Single Pulse Avalanche Current (I_{AS}), ($I_{D1} + I_{D2}$)	
$L \leq 50\mu\text{H}$, $R_G \leq 25\Omega$	10A

Thermal Information

Thermal Resistance (Typical)	θ_{JA} ($^{\circ}\text{C}/\text{W}$)	θ_{JP} ($^{\circ}\text{C}/\text{W}$)
WLCSP Package	50	10
Maximum Power Dissipation (P_D) (Note 2)		
$T_A = +25^{\circ}\text{C}$	2.5W (10s)	
$T_A = +70^{\circ}\text{C}$	1.6W	
Junction and Storage Temperature Range (T_J , T_{stg})	-55 $^{\circ}\text{C}$ to +150 $^{\circ}\text{C}$	
Pb-Free Reflow Profile	see TB493	

CAUTION: Do not operate at or near the maximum ratings listed for extended periods of time. Exposure to such conditions may adversely impact product reliability and result in failures not covered by warranty.

NOTES:

- $T_J = +25^{\circ}\text{C}$ unless otherwise noted.
- When mounted on 1 inch square 2oz copper clad FR-4.

Electrical Characteristics Specifications are for single MOSFET unless otherwise specified. $T_J = +25^{\circ}\text{C}$ unless otherwise noted.

SYMBOL	PARAMETER	TEST CONDITION	MIN (Note 3)	TYP	MAX (Note 3)	UNIT
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	$V_{GS} = 0\text{V}$, $I_D = 5\text{mA}$	5.5			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 3.5\text{V}$, $V_{GS} = 0\text{V}$, $T_J = +25^{\circ}\text{C}$			1	μA
		$V_{DS} = 5.5\text{V}$, $V_{GS} = 0\text{V}$, $T_J = +25^{\circ}\text{C}$			12	
		$V_{DS} = 5.5\text{V}$, $V_{GS} = 0\text{V}$, $T_J = +125^{\circ}\text{C}$			125	
I_{GSS}	Gate-Body Leakage	$V_{GS} = 5.5\text{V}$, $V_{DS} = 0\text{V}$			75	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu\text{A}$	0.60	0.75	0.90	V
$r_{DS(on)}$	Drain-to-Source On-State Resistance (per MOSFET)	$V_{GS} = 3.5\text{V}$, $I_D = 6\text{A}$		2.7	3.4	m Ω
		$V_{GS} = 4.5\text{V}$, $I_D = 6\text{A}$		2.5	3.0	m Ω
$r_{DS(on)}$	Drain-to-Source On-State Resistance (in Parallel)	$V_{GS} = 3.5\text{V}$, $I_D = 6\text{A}$		1.35	1.7	m Ω
		$V_{GS} = 4.5\text{V}$, $I_D = 6\text{A}$		1.25	1.5	m Ω
C_{iss}	Input Capacitance	$V_{DS} = 5.5\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$		552	630	pF
C_{oss}	Output Capacitance			689	787	pF
C_{rss}	Reverse Transfer Capacitance			175	201	pF
C_{iss}	Input Capacitance	$V_{DS} = 0\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{MHz}$		606	663	pF
C_{oss}	Output Capacitance			970	1206	pF
C_{rss}	Reverse Transfer Capacitance			218	268	pF
R_g	Gate Resistance	$V_{DS} = 0\text{V}$, $f = 1\text{MHz}$		0.6		Ω
Q_g	Total Gate Charge	$V_{GS} = 3.5\text{V}$, $I_D = 6\text{A}$, $V_{DS} = 4.4\text{V}$		3.5	4.0	nC
Q_{gs}	Gate-to-Source Charge			0.5	1.0	nC
Q_{gd}	Gate-to-Drain Charge			0.8	1.3	nC
Q_g	Total Gate Charge	$V_{GS} = 4.5\text{V}$, $I_D = 6\text{A}$, $V_{DS} = 4.4\text{V}$		4.4	4.7	
t_{rr}	Source-to-Drain Reverse Recovery Time	$I_S = 3\text{A}$, $di/dt = 33\text{A}/\mu\text{s}$		59		ns
V_{SD}	Diode Forward Voltage	$I_S = 3\text{A}$, $V_{GS} = 0\text{V}$		0.69	1.00	V

NOTE:

- Compliance to datasheet limits is assured by one or more methods: production test, characterization and/or design.

Typical Performance Curves

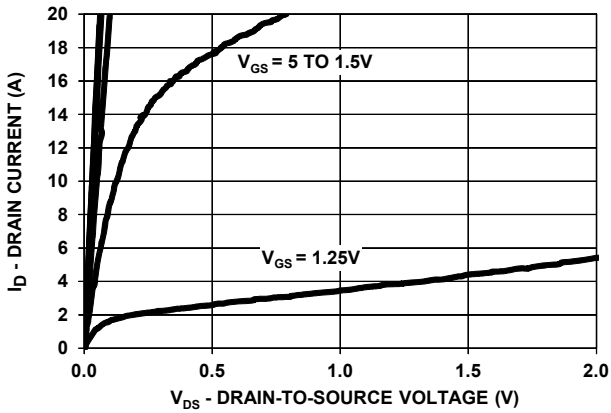


FIGURE 3. OUTPUT CHARACTERISTICS

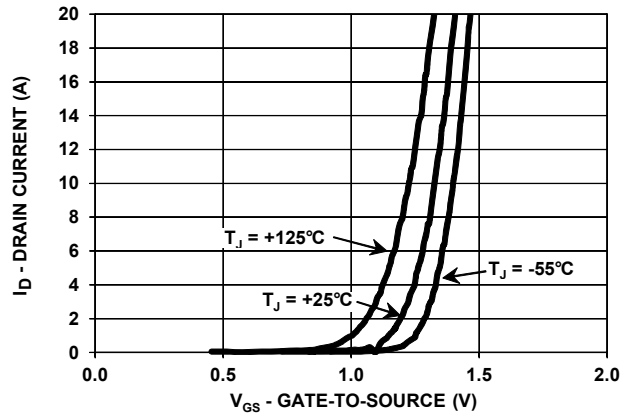


FIGURE 4. TRANSFER CHARACTERISTICS

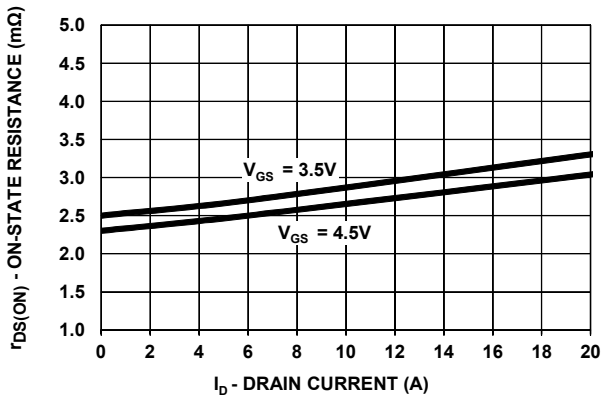


FIGURE 5. DRAIN-TO-SOURCE ON-STATE RESISTANCE vs DRAIN CURRENT

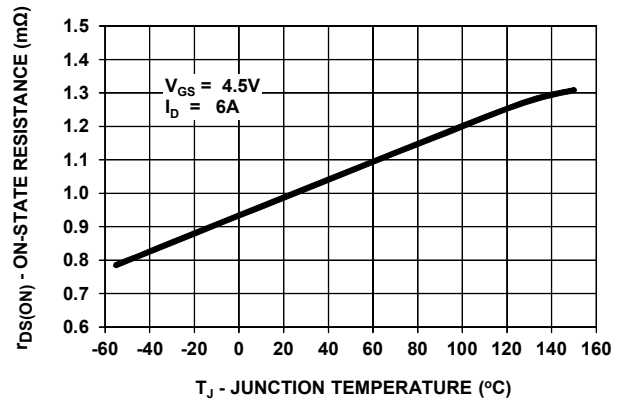


FIGURE 6. DRAIN-TO-SOURCE ON-STATE RESISTANCE vs JUNCTION TEMPERATURE

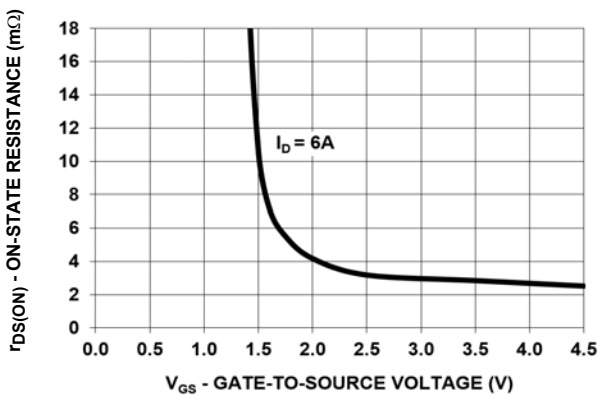


FIGURE 7. DRAIN-TO-SOURCE ON-STATE RESISTANCE vs GATE-TO-SOURCE VOLTAGE

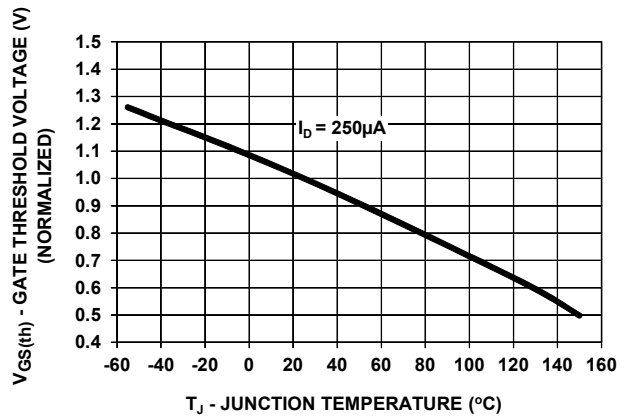


FIGURE 8. GATE THRESHOLD VOLTAGE vs JUNCTION TEMPERATURE

Typical Performance Curves (Continued)

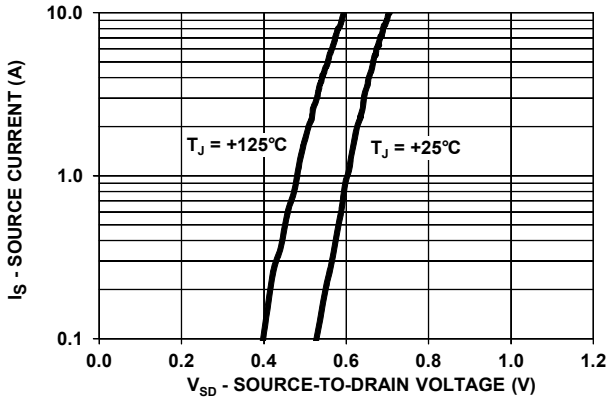


FIGURE 9. SOURCE-TO-DRAIN DIODE FORWARD VOLTAGE

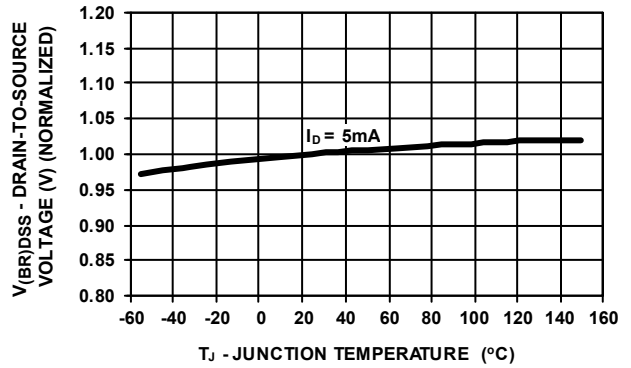


FIGURE 10. DRAIN-TO-SOURCE BREAKDOWN VOLTAGE vs JUNCTION TEMPERATURE

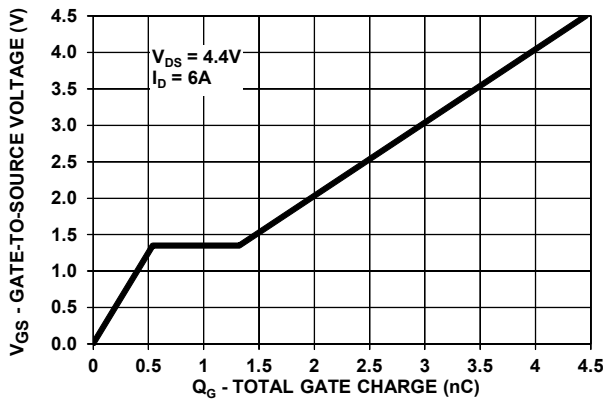


FIGURE 11. GATE CHARGE

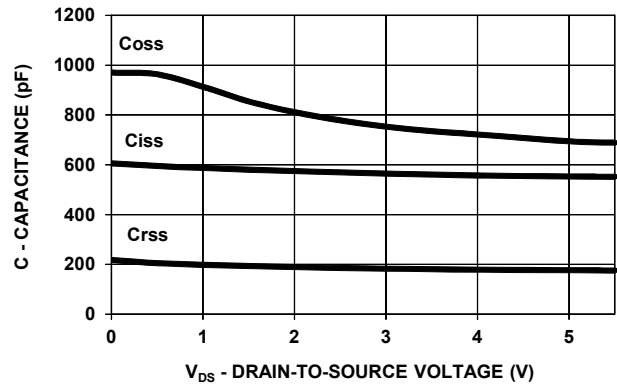


FIGURE 12. CAPACITANCE

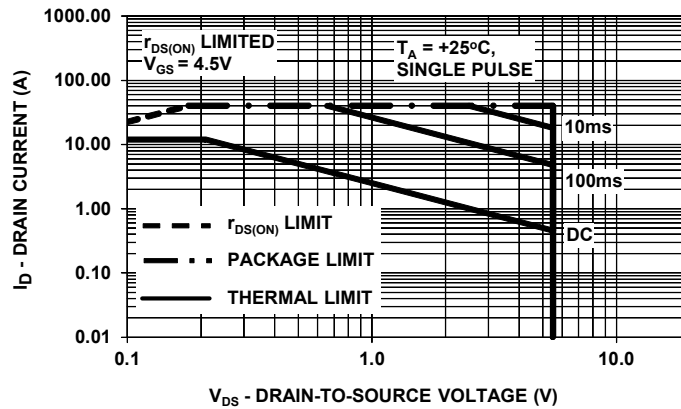


FIGURE 13. MAXIMUM RATED FORWARD BIASED SAFE OPERATING AREA (IN PARALLEL)

Typical Performance Curves (Continued)

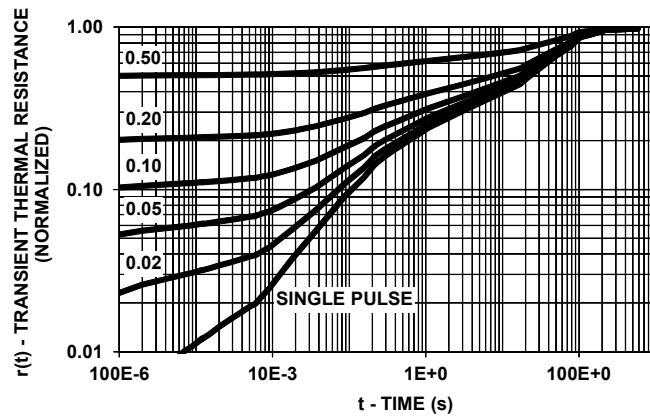


FIGURE 14. TRANSIENT THERMAL RESPONSE, JUNCTION-TO-AMBIENT (IN PARALLEL)

Revision History

The revision history provided is for informational purposes only and is believed to be accurate, but not warranted. Please go to the web to make sure that you have the latest revision.

DATE	REVISION	CHANGE
December 18, 2015	FN8788.1	Added "Note 1. $T_j = +25^\circ\text{C}$ unless otherwise noted." to Abs Max on page 3.
October 30, 2015	FN8788.0	Initial release

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Dimensional Outline and Pad Layout

Side View



Pad-up View

