

January 1993

Features

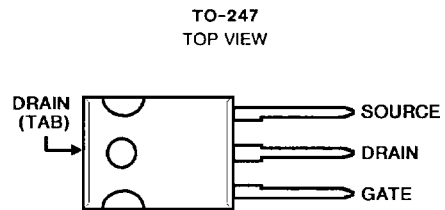
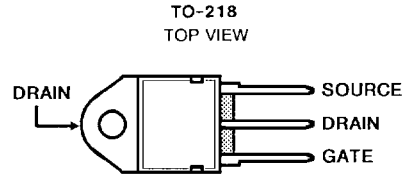
- 75A, 50V
- $r_{DS(on)} = 0.008\Omega$
- Electrostatic Discharge Rated
- UIS SOA Rating Curve (Single Pulse)
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- +175°C Operating Temperature
- Temperature Compensated SPICE Model Provided

Description

The RFG75N05E and RFH75N05E n-channel ESD rated power MOSFET's are manufactured using the MegaFET process. This process, which uses feature sizes approaching those of LSI integrated circuits, gives optimum utilization of silicon, resulting in outstanding performance. They were designed for use in applications such as switching regulators, switching converters, motor drivers, relay drivers and emitter switches for bipolar transistors. These transistors can be operated directly from integrated circuits.

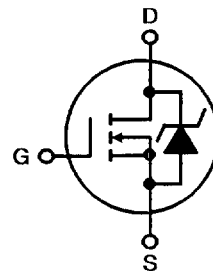
The RFG75N05E is supplied in the TO-247 style (3 lead) plastic package and the RFH75N05E is supplied in the TO-218 (3 lead) plastic package.

Package



Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



Absolute Maximum Ratings ($T_C = +25^\circ\text{C}$), Unless Otherwise Specified

	RFG75N05E RFH75N05E	UNITS
Drain-Source Voltage	50	V
Drain-Gate Voltage ($R_{GS} = 1\text{ M}\Omega$)	50	V
Continuous Drain Current	75*	A
Pulsed Drain Current	200	A
Gate-Source Voltage	± 20	V
Maximum Power Dissipation		
$T_C = +25^\circ\text{C}$	240	W
Derated Above $+25^\circ\text{C}$	1.6	W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	-55 to +175	$^\circ\text{C}$
Electrostatic Discharge Rating		
MIL-STD-883, Category B(2)	2	kV
Single-Pulse Avalanche Rating		
* I_D Current Limited by Package	Refer to UIS SOA Curves	

Specifications RFG75N05E RFH75N05E

Electrical Characteristics At Case Temperature (T_C) = +25°C, Unless Otherwise Specified

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	LIMITS			UNITS	
			MIN	TYP	MAX		
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D = 0.25mA, V_{GS} = 0V$	50	-	-	V	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$ $I_D = 0.25mA$	2	-	4	V	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40V, V_{GS} = 0V$	-	-	1	μA	
		$T_C = +150^\circ C$	-	-	50	μA	
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20V$	-	-	100	nA	
On Resistance	$r_{DS(on)}$	$I_D = 75A, V_{GS} = 10V$	-	-	0.008	Ω	
Turn-On Time	$t_{(on)}$	$V_{DD} = 25V, I_D = 37.5A$	-	-	125	ns	
Turn-On Delay Time	$t_{d(on)}$	$R_L = 0.67\Omega$	-	17	-	ns	
Rise Time	t_r	$I_{G1} = I_{G2} = 3A$	-	75	-	ns	
Turn-Off Delay Time	$t_{d(off)}$	$V_{GS(clamp)} = +10V, -0.6V$	-	70	-	ns	
Fall Time	t_f		-	17	-	ns	
Turn-Off Time	$t_{(off)}$		-	-	125	ns	
Total Gate Charge	$Q_g(tot)$	$V_{GS} = 0, 20V$	$V_{DD} = 40V$	-	-	400	nC
Gate Charge at 10V	$Q_g(10)$	$V_{GS} = 0, 10V$	$I_D = 75A$	-	-	220	nC
Threshold Gate Charge	$Q_g(th)$	$V_{GS} = 0, 2V$	$R_L = 0.53\Omega$	-	-	15	nC
Plateau Voltage	$V_{(plateau)}$	$I_D = 75A, V_{DS} = 15V$		-	-	7.5	V
Turn-Off Energy Loss per Cycle	E_{off}	$V_{DD} = 25V, I_D = 37.5A, I_{G1} = I_{G2} = 3A$ $V_{GS(clamp)} = +10V, -0.6V, L = 0.2\mu H,$ $R_L = 0.67\Omega$		-	-	300	μJ
Thermal Resistance Junction to Case	$R_{\theta JC}$			-	-	0.625	$^\circ C/W$
Thermal Resistance Diode Junction to Ambient	$R_{\theta JA}$			-	-	80	$^\circ C/W$

Source-Drain Diode Ratings and Characteristics

CHARACTERISTICS	SYMBOLS	TEST CONDITIONS	LIMITS			UNITS
			MIN	TYP	MAX	
Forward Voltage	V_{SD}	$I_{SD} = 75A$	-	-	1.5	V
Reverse Recovery Time	t_{rr}	$I_f = 75A, di/dt = 100A/\mu s$	-	-	125	ns

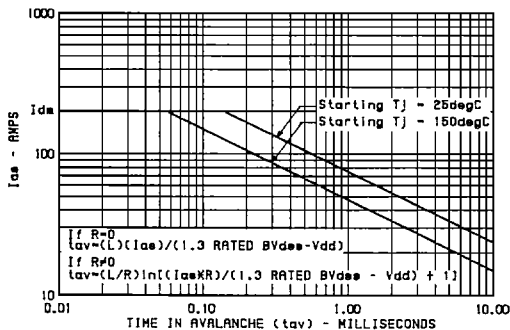


FIGURE 1. UNCLAMPED-INDUCTIVE-SWITCHING SOA (SINGLE PULSE UIS SOA)

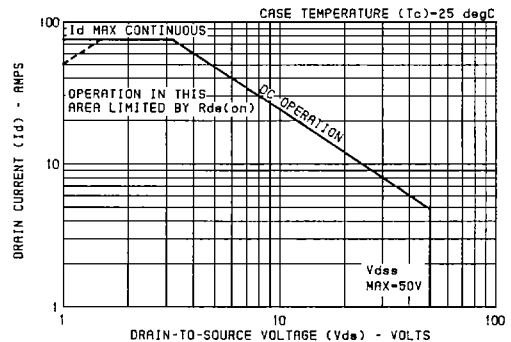


FIGURE 2. SAFE-OPERATING-AREA CURVE. (CURVES MUST BE DERATED LINEARLY WITH INCREASE IN CASE TEMPERATURE)

Performance Curves

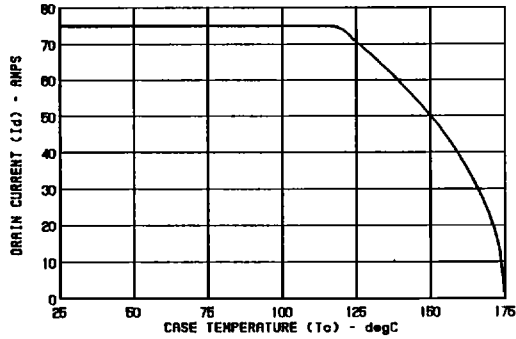


FIGURE 3. MAXIMUM CONTINUOUS DRAIN CURRENT VS. TEMPERATURE

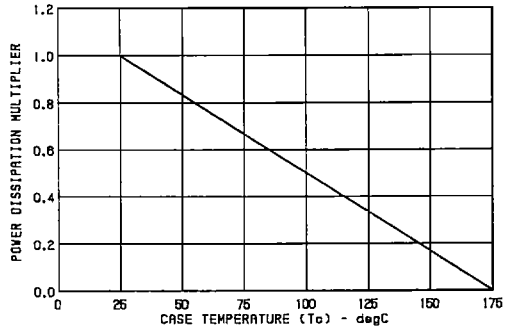


FIGURE 4. NORMALIZED POWER DISSIPATION VS. TEMPERATURE DERATING CURVE

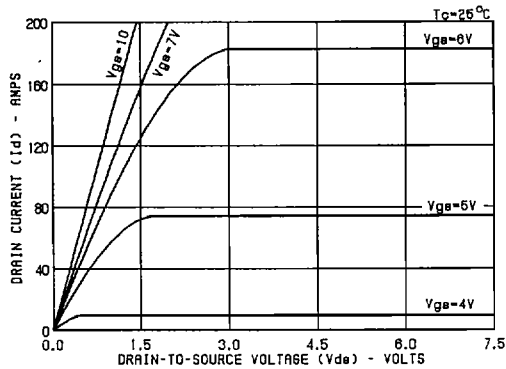


FIGURE 5. TYPICAL SATURATION CHARACTERISTICS

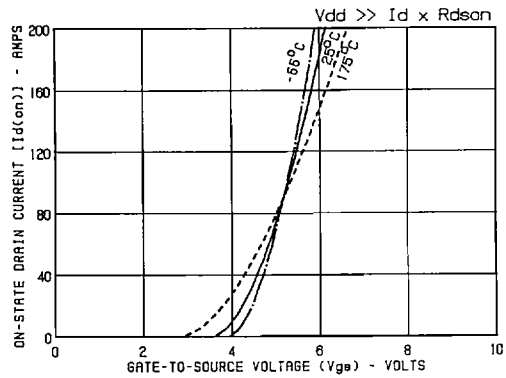


FIGURE 6. TYPICAL TRANSFER CHARACTERISTICS

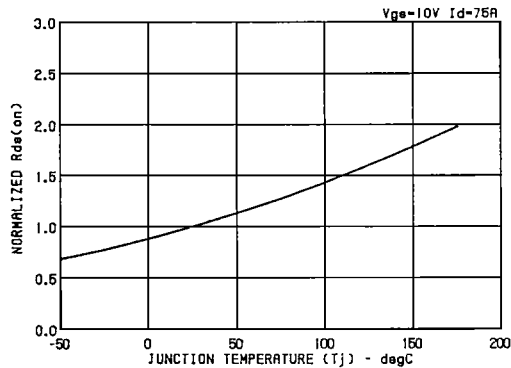


FIGURE 7. NORMALIZED $I_{DS(on)}$ VS. JUNCTION TEMPERATURE

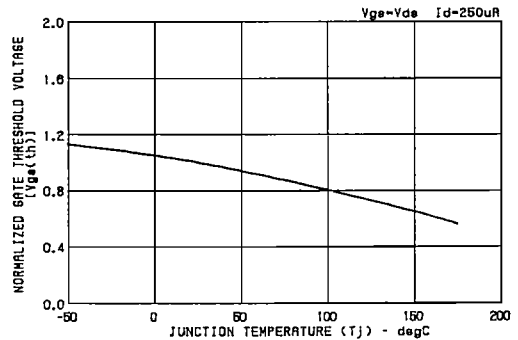


FIGURE 8. NORMALIZED GATE THRESHOLD VOLTAGE

Performance Curves (Continued)

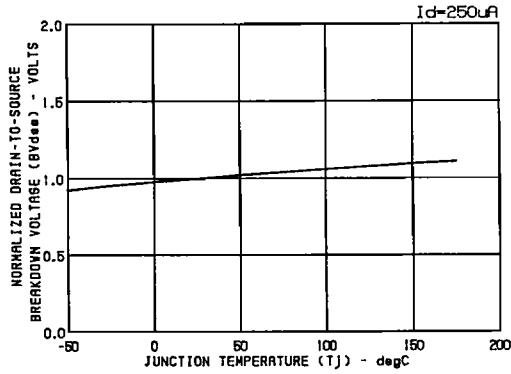


FIGURE 9. NORMALIZED DRAIN-TO-SOURCE BREAKDOWN VOLTAGE VS. TEMPERATURE

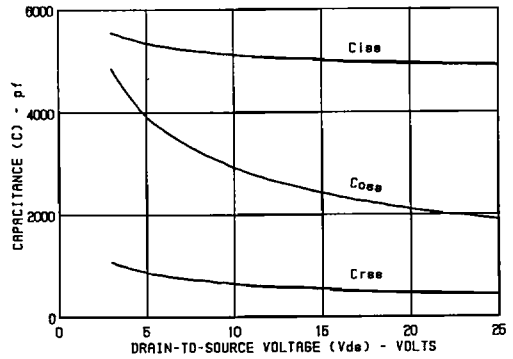


FIGURE 10. TYPICAL CAPACITANCE VS. VOLTAGE FOR ALL TYPES

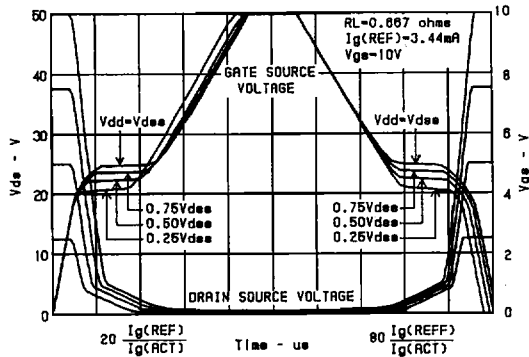


FIGURE 11. NORMALIZED SWITCHING WAVEFORMS FOR CONSTANT GATE-CURRENT. (REFER TO HARRIS APPLICATION NOTES AN-7254 AND AN-7260)

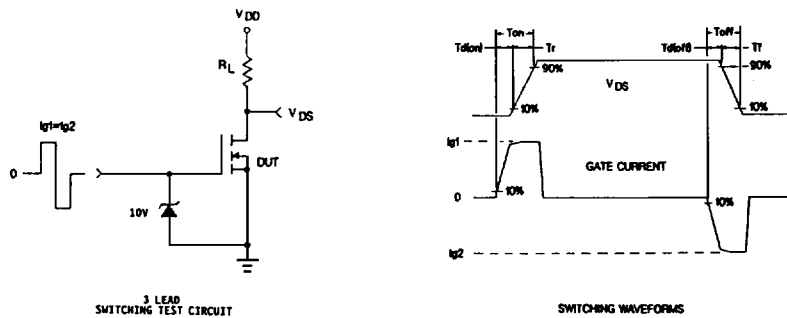


FIGURE 12. RESISTIVE SWITCHING

Performance Curves (Continued)

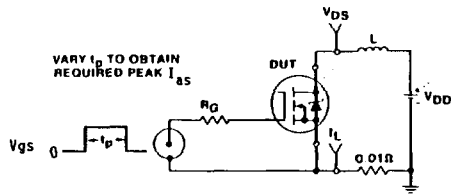


FIGURE 13. UNCLAMPED ENERGY TEST CIRCUIT

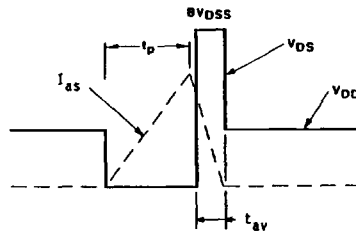


FIGURE 14. UNCLAMPED ENERGY WAVEFORMS

Spice Model

.SUBCKT RFH75N05 2 1 3 ; rev 10/30/90

*Nominal Temperature = 25°C

CchargeA 12 8 8.98e-9

CchargeB 15 14 8.81e-9

Cin 6 8 4.48e-9

Depletion_cap 10 5 DPLCAPMOD

Dbody 7 5 DBODYMOD

Dbreak 5 11 DBREAKMOD

Egs 14 8 5 8 1

Esg 13 8 6 8 1

Esg 6 10 6 8 1

Ebreak 11 7 17 18 58.4

Evto 20 6 18 8 1

lpos 8 17 1

Ldrain 2 5 e-10

Lgate 1 9 5e-9

Lsource 3 7 3e-9

Mos 16 6 8 8 MOSMOD

Rbreak 17 18 RBREAKMOD 1

Rdrain 5 16 RSOURCEMOD 3.07e-3

Rgate 9 20 1.2

Rin 6 8 1e9

Rsource 8 7 RSOURCEMOD 2e-3

Rvto 18 19 RVTONEGMOD 1

S1a 6 12 13 8 S1AMOD

S1b 13 12 13 8 S1BMOD

S2a 6 15 14 13 S2AMOD

S2b 13 15 14 13 S2BMOD

Vbat 8 19 DC 1

.MODEL S1AMOD VSWITCH (RON=1e-5 ROFF=0.1 VON=-2.48 VOFF=-0.48)

.MODEL S1BMOD VSWITCH (RON=1e-5 ROFF=0.1 VON=-0.48 VOFF=-2.48)

.MODEL S2AMOD VSWITCH (RON=1e-5 ROFF=0.1 VON=-2.25 VOFF=2.75)

.MODEL S2BMOD VSWITCH (RON=1e-5 ROFF=0.1 VON=2.75 VOFF=-2.25)

.MODEL DBODYMOD D (IS=2.23e-12 RS=249e-3 TRS1=2.5e-3 CJO=7.55e-9 TT=4e-8)

.MODEL DBREAKMOD D (RS=8e-2 TRS1=2.5e-3)

.MODEL DPLCAPMOD D (IS=1e-30 N=10 CJO=2.14e-9)

.MODEL RBREAKMOD RES (TC1=9.5e-4 TC2=-1.17e-6)

.MODEL RSOURCEMOD RES (TC1=5.2e-3 TC2=1.37e-5)

.MODEL RVTONEGMOD RES (TC1=-3.78e-3 TC2=-7.51e-7)

.MODEL MOSMOD NMOS (VTO=3.48 N=10 IS=1e-30 KP=78.5 TOX=1 L=1u W1u)

.ENDS

