HARRIS

# RFG30P05
# RFP30P05

## P-Channel Enhancement Mode Power Field Effect Transistors (MegaFETs)

August 1991

### Features

- -30A, -50V
- $r_{DS(on)} = 0.065\ \Omega$
- UIS SOA Rating Curve (Single Pulse)
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- 175°C Operating Temperature

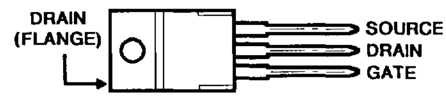
### Description

The RFG30P05 and RFP30P05 p-channel power MOSFETs 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.

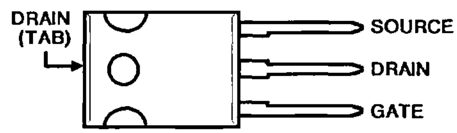
The RFG30P05 is supplied in the JEDEC TO-247 plastic package and the RFP30P05 in the TO-220AB plastic package.

### Packages

TO-220AB
TOP VIEW

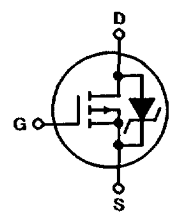



TO-247
TOP VIEW




### Terminal Diagram

P-CHANNEL ENHANCEMENT MODE

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P-CHANNEL POWER MOSFETs

**Absolute Maximum Ratings** ($T_C$ = 25°C), Unless Otherwise Specified

| | |
|---|---|
| Drain-Source Voltage, $V_{DSS}$ | -50V |
| Drain-Gate Voltage, ($R_{GS}$ = 1mΩ), $V_{DGR}$ | -50V |
| Gate-Source Voltage, $V_{GS}$ | ±20V |
| Drain Current: | |
| RMS Continuous, $I_D$ | -30A |
| Pulsed, $I_{DM}$ | -75A |
| Single Pulse Avalanche Rating, Refer to UIS SOA Curve | |
| Power Dissipation, $P_D$: | |
| $T_C$ = +25°C | 120W |
| Derate Above $T_C$ = +25°C | 0.8W/°C |
| Operating and Storage Junction Temperature Range, $T_J$, $T_{STG}$ | -55 to +175°C |

CAUTION: These devices are sensitive to electrostatic discharge. Proper I.C. handling procdures should be followed.



File Number **2436**

**Electrical Characteristics** ($T_C$ = +25°C) Unless Otherwise Specified

| CHARACTERISTICS | SYMBOLS | TEST CONDITIONS | | LIMITS MIN | LIMITS MAX. | UNITS |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $I_D$ = 0.25 mA, $V_{GS}$ = 0V | | -50 | - | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = 0.25 mA | | 2 | 4 | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = -40V, $V_{GS}$ = 0V | | - | 1 | µA |
| | | $T_C$ = 150°C | | | 50 | µA |
| Gate-Source Leakage Current | $I_{GSS}$ | $V_{GS}$ = ± 20V | | - | 100 | nA |
| Static Drain-Source on Resistance | $r_{DS(on)}$ | $I_D$ = 30A, $V_{GS}$ = -10V | | - | 0.0.65 | Ω |
| Turn-On Time | $t_{(on)}$ | $V_{DD}$ = -25V, $I_D$ = 15A<br>Ig1 = Ig2 = 0.8A<br>$V_{GS (clamp)}$: -10V, +0.6V<br>$R_L$ = 1.67Ω | | - | 80 | ns |
| Turn-On Delay Time | $t_{d(on)}$ | | | 15 (typ) | - | ns |
| Rise Time | $t_r$ | | | 23 (typ) | - | ns |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 28 (typ) | - | ns |
| Fall Time | $t_f$ | | | 18 (typ) | - | ns |
| Turn-Off Time | $t_{(off)}$ | | | - | 100 | ns |
| Total Gate Charge | $Q_{g(total)}$ | $V_{GS}$ = 0 to -20V | $V_{DD}$ = -40V | - | 200 | nC |
| Gate Charge at -10V | $Q_{g(-10V)}$ | $V_{GS}$ = 0 to -10V | $I_D$ = 40A | - | 100 | nC |
| Threshold Gate Charge | $Q_{g(th)}$ | $V_{GS}$ = 0 to -2V | $R_L$ = 1.33Ω | - | 2 | nC |
| Plateau Voltage | $V_{(plateau)}$ | $I_D$ = 30A, $V_{DS}$ = -15V | | - | -8 | V |
| Turn-Off Energy Loss per Cycle | $E_{off}$ | $V_{DD}$ = -25V, $I_D$ = 15A, $R_L$ = 1.67Ω<br>L = 0.2µH, Ig1 = Ig2 = 0.8A<br>$V_{GS (clamp)}$: -10V, +0.6V | | - | 75 | µJ |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | | | - | 1.25 | °C/W |
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | | | - | 80 | °C/W |

**Source-Drain Diode Ratings and Characteristics**

| CHARACTERISTICS | SYMBOLS | TEST CONDITIONS | LIMITS MIN | LIMITS MAX. | UNITS |
|---|---|---|---|---|---|
| Diode Forward Voltage | $V_{SD}$ | $I_{SD}$ = 30A | - | 1.5 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_{SD}$ = 30A, $dI_{SD}/dt$ = 100A/µs | - | 150 | ns |

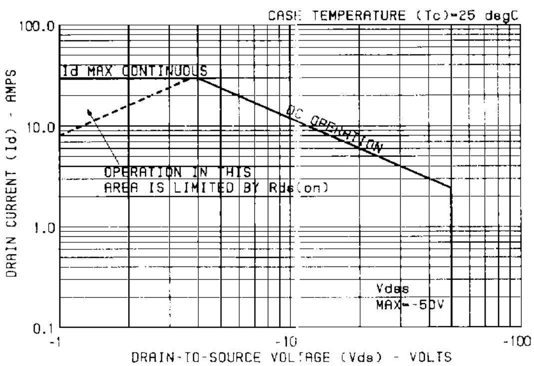



*Figure 1 - Safe operating area curve. (Curves must be derated linearly with increase in temperature.)*

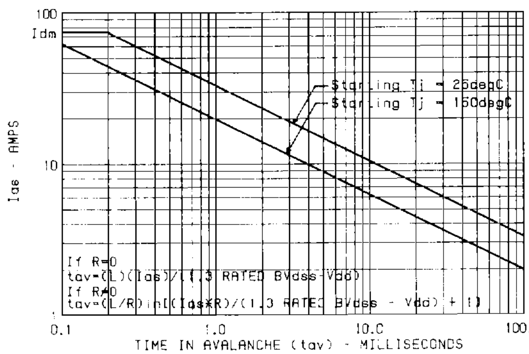



*Figure 2 - Unclamped inductive-switching safe-operating-area curve. (Single pulse UIS SOA). See Figure 13 for test circuit.*

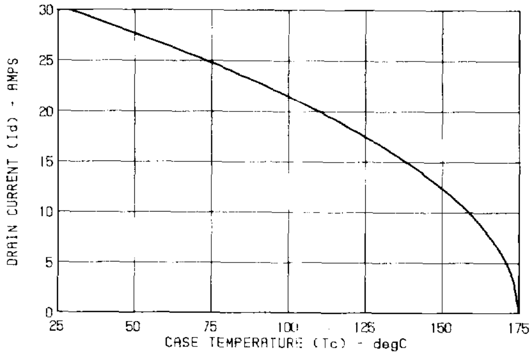



*Figure 3 – Maximum continuous drain current vs case temperature.*

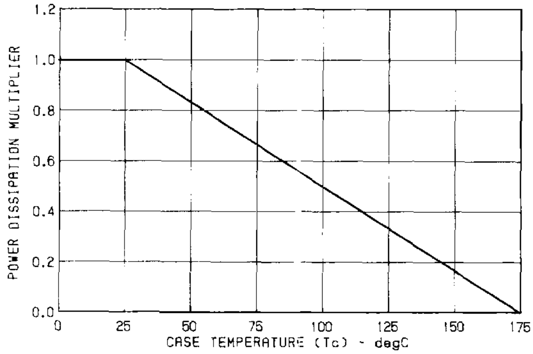



*Figure 4 – Normalized power dissipation vs case temperature.*

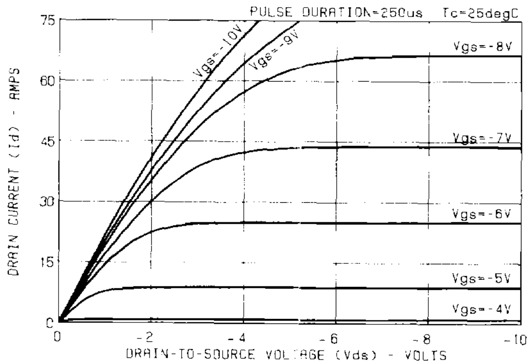



*Figure 5 – Typical saturation characteristics.*

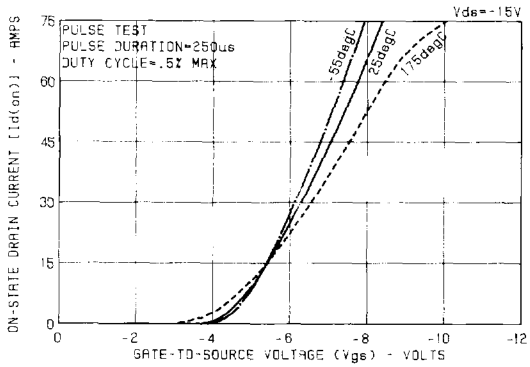



*Figure 6 – Typical transfer characteristics.*

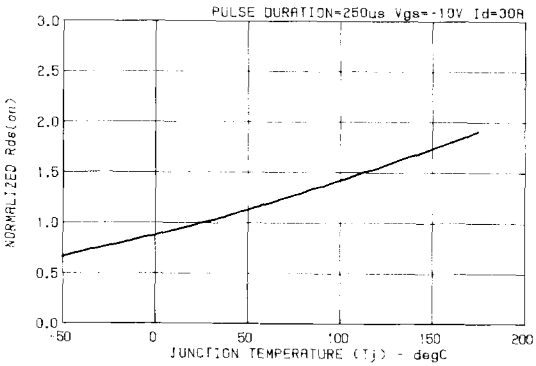



*Figure 7 – Normalized on-state resistance vs junction temperature.*

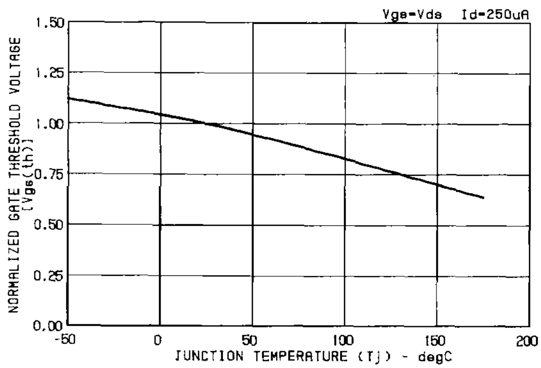



*Figure 8 – Normalized gate threshold voltage vs junction temperature.*

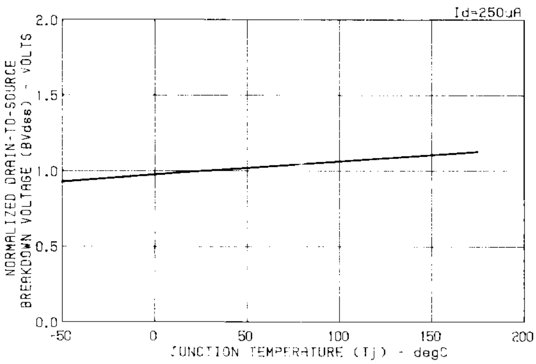



*Figure 9 – Normalized drain source breakdown voltage vs junction temperature.*

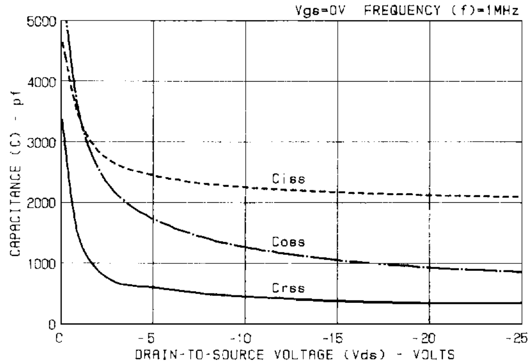



*Figure 10 – Typical capacitance vs voltage.*

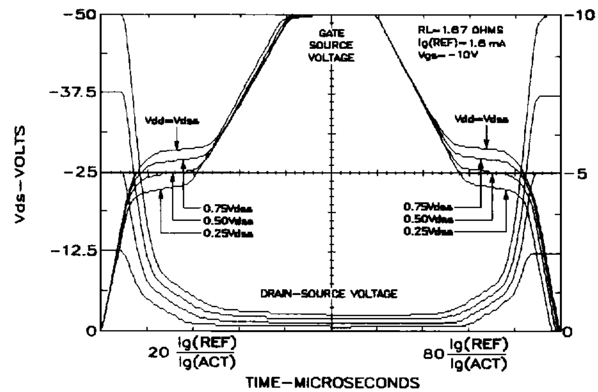
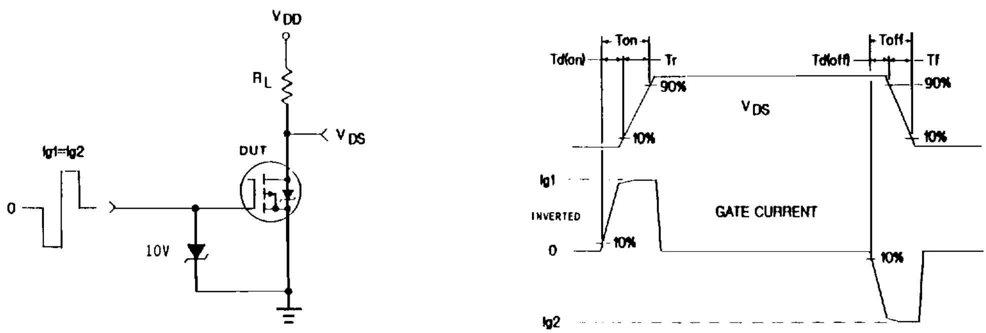



*Figure 11 – Normalized switching waveforms for constant gate current. (Refer to application notes AN-7254 and AN-7260.)*




**Switching Test Circuit** **Switching Waveforms**

*Figure 12 – Resistive switching.*

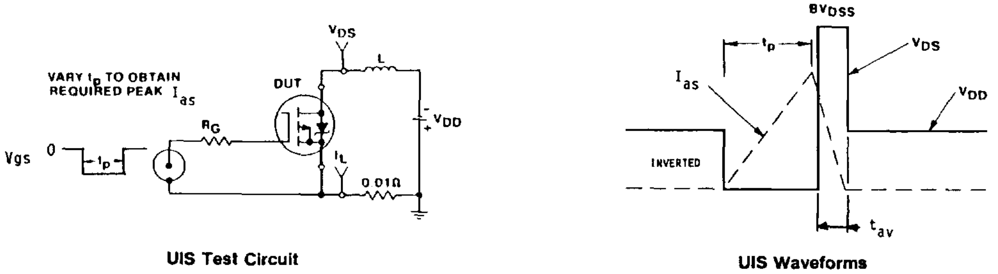



*Figure 13 - Unclamped-inductive-switching test.*