

May 1992

Features

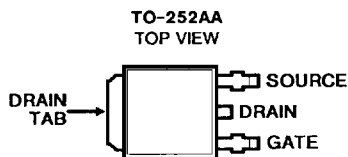
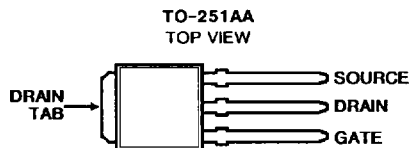
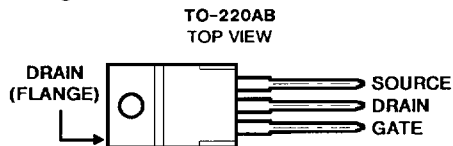
- -15A, -50V
- $r_{DS(on)} = 0.150 \Omega$
- UIS SOA Rating Curve (Single Pulse)
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance

Description

The RFD15P05, RFD15P05SM and RFP15P05 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.

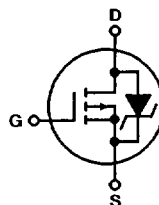
The RFD15P05 is supplied in the JEDEC TO-251AA plastic package and the RFD15P05SM in the TO-252AA plastic package. The RFP15P05 is supplied in the JEDEC TO-220AB plastic package.

Packages



Terminal Diagram

P-CHANNEL ENHANCEMENT MODE



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

Drain-Source Voltage, V_{DS}	-50V
Drain-Gate Voltage, ($R_{GS} = 1\text{M}\Omega$), V_{DGR}	-50V
Gate-Source Voltage, V_{GS}	$\pm 20\text{V}$
Drain Current:	
RMS Continuous, I_D	-15A
Pulsed, I_{DM}	-40A
Avalanche Current, I_{AS}	See Figure 2
Power Dissipation, P_D :	
$T_C = +25^\circ\text{C}$	80W
Derate Above $T_C = +25^\circ\text{C}$	0.533W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range, T_J, T_{STG}	-55°C to $+175^\circ\text{C}$

Specifications RFD15P05, RFD15P05SM, RFP15P05

Electrical Characteristics ($T_C = +25^{\circ}\text{C}$) Unless Otherwise Specified

CHARACTERISTICS	SYMBOLS	TEST CONDITIONS	LIMITS		UNITS	
			MIN	MAX.		
Drain-Source Breakdown Voltage	BV_{DSS}	$I_D = 0.25 \text{ mA}, V_{GS} = 0\text{V}$	-50	-	V	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = 0.25 \text{ mA}$	-2	-4	V	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -40\text{V}, V_{GS} = 0\text{V}$	-	1	μA	
		$T_C = 150^{\circ}\text{C}$	-	50	μA	
Gate-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	100	nA	
Static Drain-Source on Resistance	$r_{DS(on)}$	$I_D = 15\text{A}, V_{GS} = -10\text{V}$	-	0.150	Ω	
Turn-On Time	$t_{(on)}$	$V_{DD} = -25\text{V}, I_D = 7.5\text{A}$ $I_{g1} = I_{g2} = 0.4\text{A}$ $V_{GS}(\text{clamp}): -10\text{V}, +0.6\text{V}$ $R_L = 3.3\Omega$ (See Figure 12)	-	60	ns	
Turn-On Delay Time	$t_{d(on)}$		-	16 (typ)	ns	
Rise Time	t_r		-	30 (typ)	ns	
Turn-Off Delay Time	$t_{d(off)}$		-	50 (typ)	ns	
Fall Time	t_f		-	20 (typ)	ns	
Turn-Off Time	$t_{(off)}$		-	100	ns	
Total Gate Charge	$Q_{g(\text{total})}$	$V_{GS} = 0 \text{ to } -20\text{V}$	$V_{DD} = -40\text{V}$ $I_D = 15\text{A}$ $R_L = 2.67\Omega$	-	150	nC
Gate Charge at -10V	$Q_{g(-10\text{V})}$	$V_{GS} = 0 \text{ to } -10\text{V}$		-	75	nC
Threshold Gate Charge	$Q_{g(th)}$	$V_{GS} = 0 \text{ to } -2\text{V}$		-	3.5	nC
Plateau Voltage	$V_{(\text{plateau})}$	$I_D = 15\text{A}, V_{DS} = -15\text{V}$	-	-8	V	
Turn-Off Energy Loss per Cycle	E_{off}	$V_{DD} = -25\text{V}, I_D = 7.5\text{A}, R_L = 3.33\Omega$ $L = 0.2\mu\text{H}, I_{g1} = I_{g2} = 0.4\text{A}$ $V_{GS}(\text{clamp}): -10\text{V}, +0.6\text{V}$	-	17	μJ	
Thermal Resistance, Junction to Case	$R_{\theta JC}$	TO-220AB, TO-251AA, TO-252AA	-	1.875	$^{\circ}\text{C/W}$	
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	TO-251AA, TO-252AA	-	100	$^{\circ}\text{C/W}$	
		TO-220AB	-	80	$^{\circ}\text{C/W}$	

5
P-CHANNEL
POWER MOSFETs

Source-Drain Diode Ratings and Characteristics

CHARACTERISTICS	SYMBOLS	TEST CONDITIONS	LIMITS		UNITS
			MIN	MAX.	
Diode Forward Voltage	V_{SD}	$I_{SD} = 15\text{A}$	-	1.5	V
Reverse Recovery Time	t_{rr}	$I_{SD} = 15\text{A}, dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	125	ns

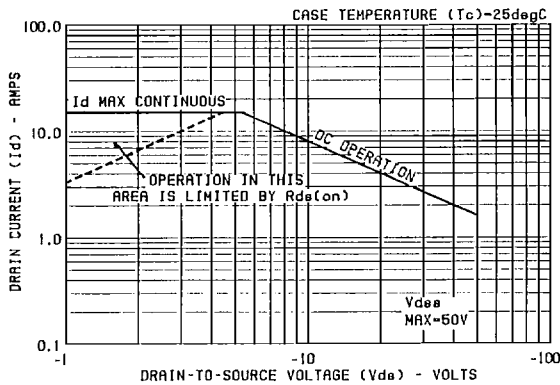


Figure 1 - Safe operating area curve. (Curves must be derated linearly with increase in temperature.)

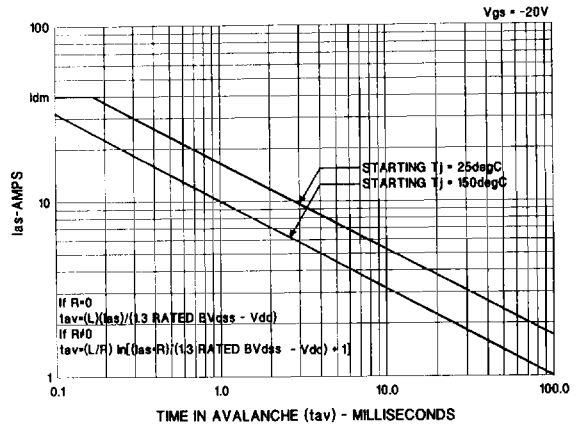


Figure 2 - Unclamped inductive-switching safe-operating-area curve. (Single pulse UIS SOA). See Figure 13 for test circuit.

RFD15P05, RFD15P05SM, RFP15P05

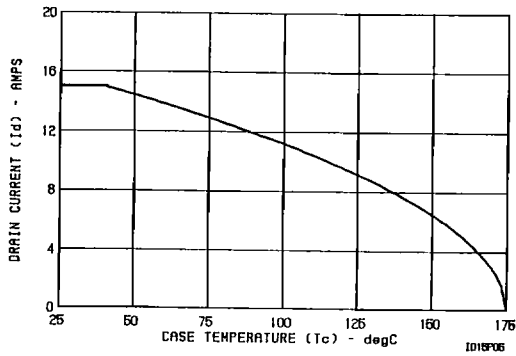


Figure 3 - Maximum continuous drain current vs. temperature.

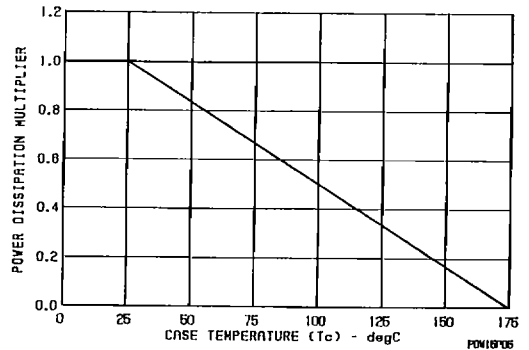


Figure 4 - Normalized power dissipation vs temperature derating curve.

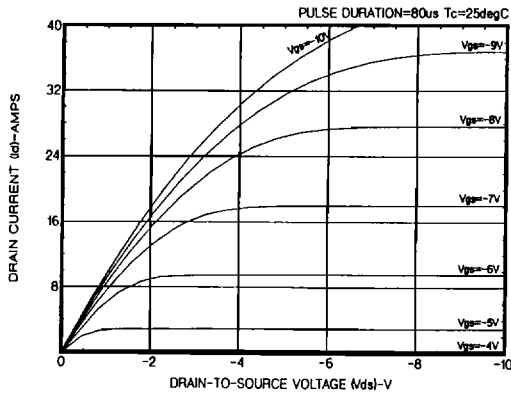


Figure 5 - Typical saturation characteristics.

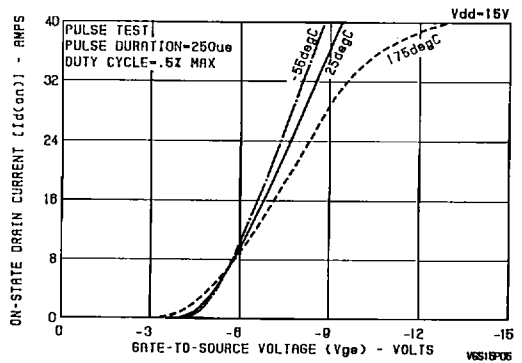


Figure 6 - Typical transfer characteristics.

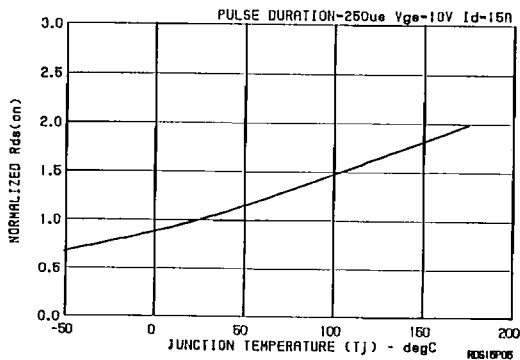


Figure 7 - Normalized $rDS(on)$ vs junction temperature.

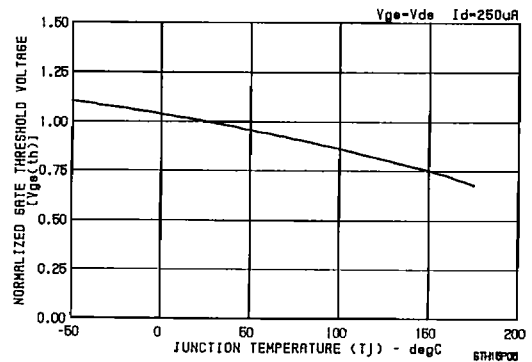


Figure 8 - Normalized gate threshold voltage.

RFD15P05, RFD15P05SM, RFP15P05

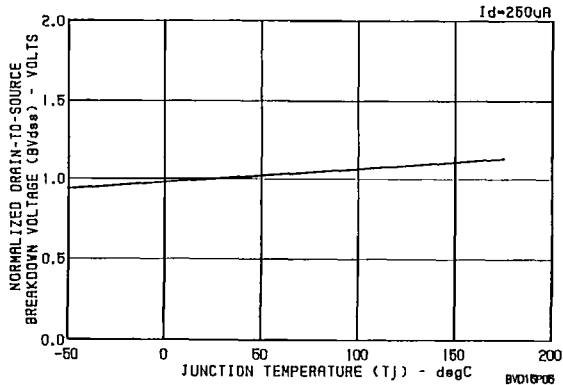


Figure 9 - Normalized drain source breakdown voltage vs temperature.

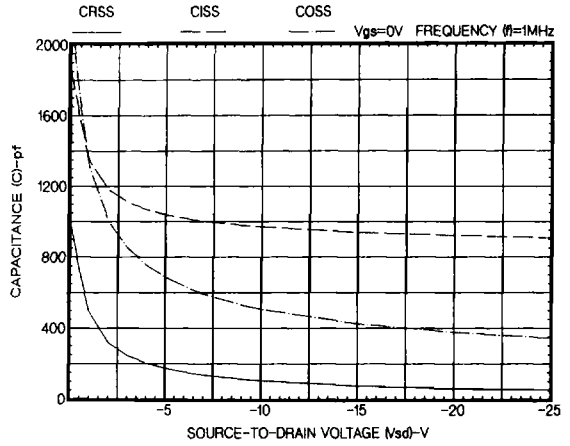


Figure 10 - Typical capacitance vs voltage.

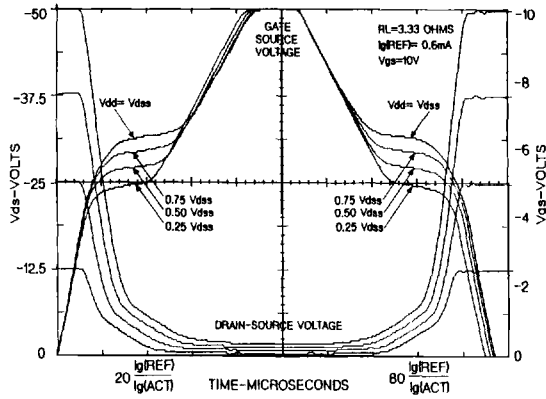


Fig. 11 - Normalized switching waveforms for constant gate current. Refer to Harris application notes AN-7254 and AN-7260.

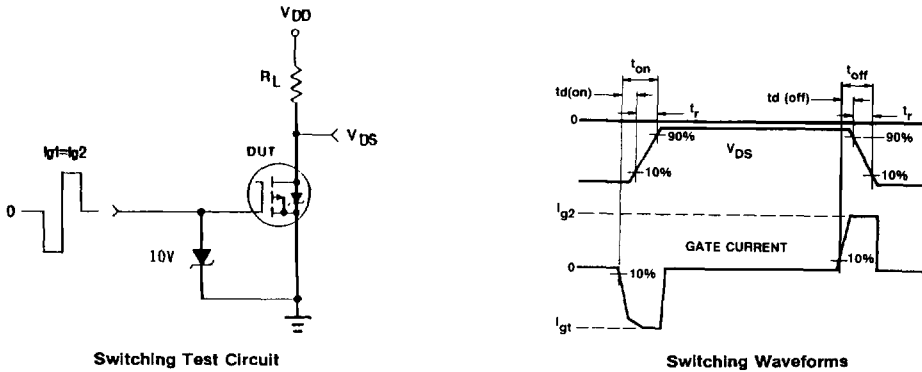


Figure 12 - Resistive switching.

5
P-CHANNEL
POWER MOSFETS

RFD15P05, RFD15P05SM, RFP15P05

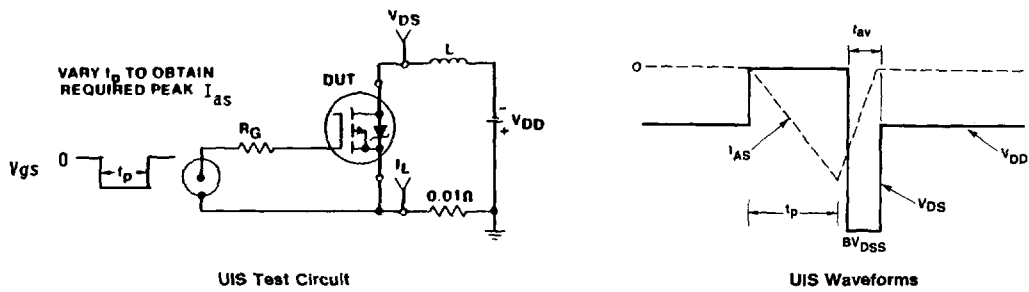


Figure 13 - Unclamped-inductive-switching test.