

# RFM15N05L/06L RFP15N05L/06L

N-Channel Logic Level  
Power Field-Effect Transistors (L<sup>2</sup>FET)

August 1991

### Features

- 15A, 50V and 60V
- $r_{DS(ON)} = 0.14\Omega$
- Design Optimized for 5V Gate Drives
- Can be Driven Directly from QMOS, NMOS, TTL Circuits
- Compatible with Automotive Drive Requirements
- SOA is Power-Dissipation Limited
- Nanosecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device

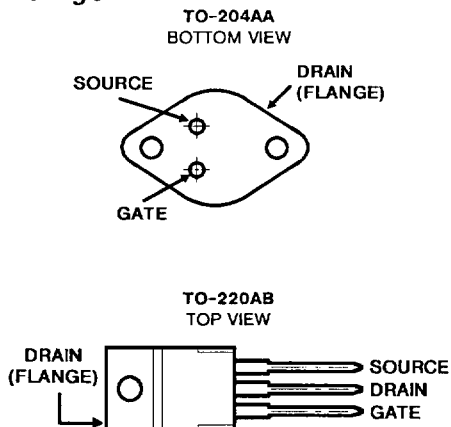
### Description

The RFM15N05L and RFM15N06L and the RFP15N05L and RFP15N06L are N-channel enhancement-mode silicon-gate power field-effect transistors specifically designed for applications such as switching regulators, switching converters, motor drivers, relay drivers and drivers for high-power bipolar switching transistors requiring high speed and low gate-drive power. These types can be operated directly from integrated circuits.

The RFM series types are supplied in the JEDEC TO-204AA steel package and the RFP series types in the JEDEC TO-220AB plastic package.

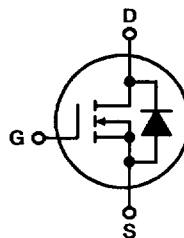
Because of space limitations branding (marking) on type RFP15N05L is F15N05L and on type RFP15N06L is F15N06L.

### Package



### Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



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

	RFM15N05L	RFM15N06L	RFP15N05L	RFP15N06L	UNITS
Drain-Source Voltage ..... $V_{DS}$	50	60	50	60	V
Drain-Gate Voltage ( $R_{GS} = 1M\Omega$ ) ..... $V_{DGR}$	50	60	50	60	V
Continuous Drain Current					
RMS Continuous ..... $I_D$	15	15	15	15	A
Pulsed Drain Current ..... $I_{DM}$	40	40	40	40	A
Gate-Source Voltage ..... $V_{GS}$	$\pm 10$	$\pm 10$	$\pm 10$	$\pm 10$	V
Maximum Power Dissipation					
$T_C = +25^\circ\text{C}$ ..... $P_D$	75	75	60	60	W
Above $T_C = +25^\circ\text{C}$ , Derate Linearly .....	0.6	0.6	0.48	0.48	W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range ..... $T_J, T_{STG}$	-55 to +150	-55 to +150	-55 to +150	-55 to +150	$^\circ\text{C}$

**Specifications RFM15N05L, RFM15N06L, RFP15N05L, RFP15N06L**

**ELECTRICAL CHARACTERISTICS, At Case Temperature ( $T_C = 25^\circ\text{C}$ ) unless otherwise specified**

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM15N05L RFP15N05L		RFM15N06L RFP15N06L		
			MIN.	MAX.	MIN.	MAX.	
Drain-Source Breakdown Voltage	$BV_{DSS}$	$I_D = 1\text{ mA}$ $V_{GS} = 0$	50	—	60	—	V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$ $I_D = 1\text{ mA}$	1	2	1	2	V
Zero-Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 40\text{ V}$	—	1	—	—	$\mu\text{A}$
		$V_{DS} = 50\text{ V}$	—	—	—	1	
		$T_C = 125^\circ\text{C}$ $V_{DS} = 40\text{ V}$ $V_{DS} = 50\text{ V}$	—	50	—	—	
Gate-Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 10\text{ V}$ $V_{DS} = 0$	—	100	—	100	nA
Drain-Source On Voltage	$V_{DS(on)}^a$	$I_D = 7.5\text{ A}$ $V_{GS} = 5\text{ V}$	—	1.05	—	1.05	V
		$I_D = 15\text{ A}$ $V_{GS} = 5\text{ V}$	—	3.0	—	3.0	
Static Drain-Source On Resistance	$r_{DS(on)}^a$	$I_D = 7.5\text{ A}$ $V_{GS} = 5\text{ V}$	—	0.14	—	0.14	$\Omega$
Forward Transconductance	$g_{fs}^a$	$V_{DS} = 10\text{ V}$ $I_D = 7.5\text{ A}$	4.0	—	4.0	—	mho
Input Capacitance	$C_{iss}$	$V_{DS} = 25\text{ V}$	—	900	—	900	pF
Output Capacitance	$C_{oss}$	$V_{GS} = 0\text{ V}$	—	450	—	450	
Reverse-Transfer Capacitance	$C_{rss}$	$f = 1\text{ MHz}$	—	200	—	200	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 30\text{ V}$ $I_D = 7.5\text{ A}$ $R_{gen} = \infty$ $R_{gs} = 6.25\ \Omega$ $V_{GS} = 5\text{ V}$	16(typ)	40	16(typ)	40	ns
Rise Time	$t_r$		250(typ)	325	250(typ)	325	
Turn-Off Delay Time	$t_{d(off)}$		200(typ)	325	200(typ)	325	
Fall Time	$t_f$		225(typ)	325	225(typ)	325	
Thermal Resistance Junction-to-Case	$R\theta_{JC}$	RFM15N05L, RFM15N06L	—	1.67	—	1.67	$^\circ\text{C/W}$
		RFP15N05L, RFP15N06L	—	2.083	—	2.083	

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**SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS**

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS				UNITS
			RFM15N05L RFP15N05L		RFM15N06L RFP15N06L		
			MIN.	MAX.	MIN.	MAX.	
Diode Forward Voltage	$V_{SD}^a$	$I_{SD} = 7.5\text{ A}$	—	1.4	—	1.4	V
Reverse Recovery Time	$t_{rr}$	$I_F = 4\text{ A}$ , $dI_F/dt = 100\text{ A}/\mu\text{s}$	225 (typ.)		225 (typ.)		ns

<sup>a</sup> Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle = 2%.

**RFM15N05L, RFM15N06L, RFP15N05L, RFP15N06L**

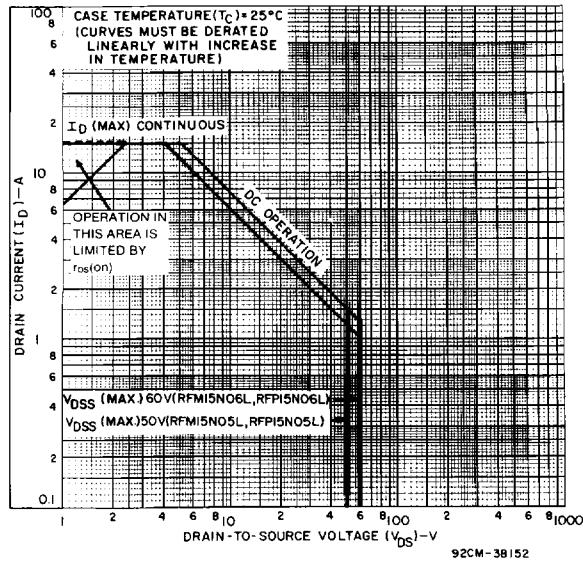


Fig. 1 - Maximum safe operating areas for all types.

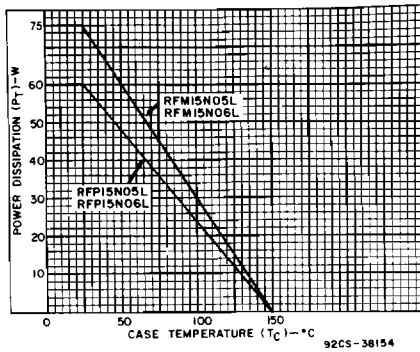


Fig. 2 - Power dissipation vs. case temperature derating curve for all types.

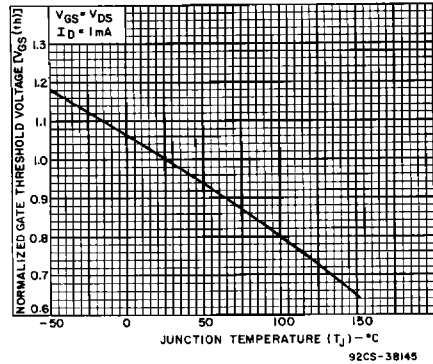


Fig. 3 - Typical normalized gate threshold voltage as a function of junction temperature for all types.

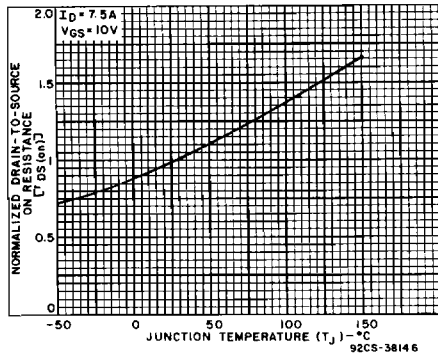


Fig. 4 - Normalized drain-to-source on resistance vs. junction temperature for all types.

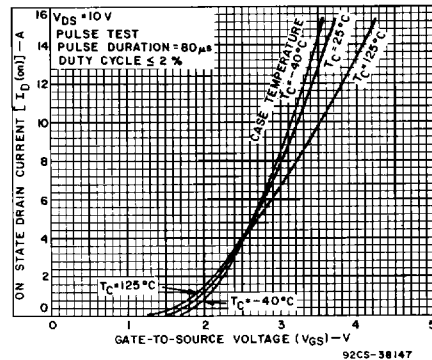


Fig. 5 - Typical transfer characteristics for all types.

**RFM15N05L, RFM15N06L, RFP15N05L, RFP15N06L**

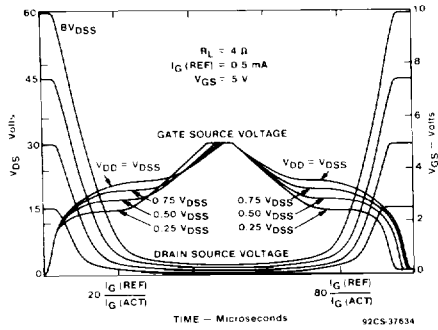


Fig. 6 - Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN7254 and AN-7260.

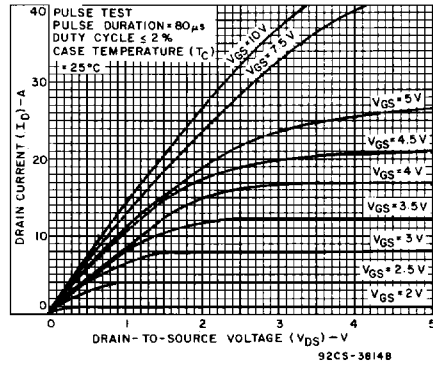


Fig. 7 - Typical saturation characteristics for all types.

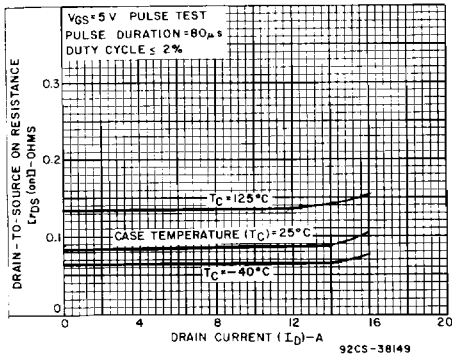


Fig. 8 - Typical drain-to-source on resistance as a function of drain current for all types.

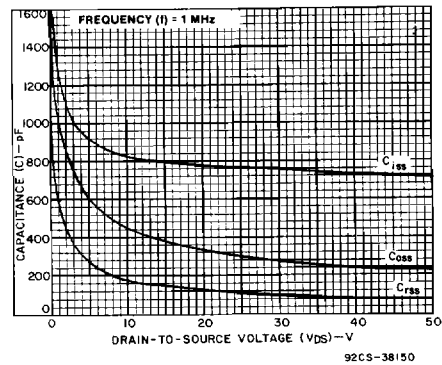


Fig. 9 - Capacitance as a function of drain-to-source voltage for all types.

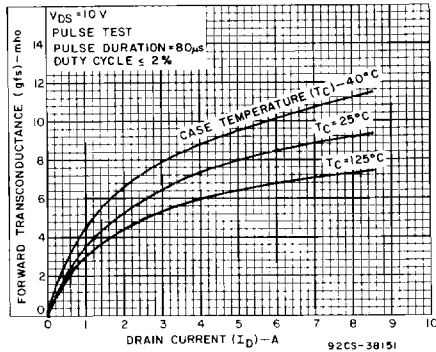


Fig. 10 - Typical forward transconductance as a function of drain current for all types.

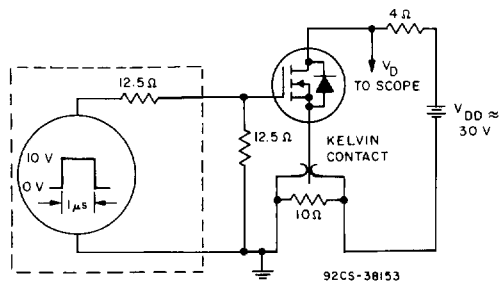


Fig. 11 - Switching Time Test Circuit.

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