RFL1N12L
RFL1N15L

N-Channel Logic Level Power Field-Effect Transistors (L^2FET)

August 1991

Features

- 1A, 120V and 150V
- $r_{DS(ON)} = 1.9\Omega$
- 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
- Nanoscecond Switching Speeds
- Linear Transfer Characteristics
- High Input Impedance
- Majority Carrier Device

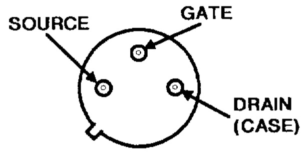
Description

The RFL1N12L and RFL1N15L are N-channel enhancement-mode silicon-gate power field-effect transistors specifically designed for use with logic level (5V) driving sources in applications such as programmable controllers, automotive switching, and solenoid drivers. This performance is accomplished through a special gate oxide design which provides full rated conduction at gate biases in the 3V - 5V range, thereby facilitating true on-off power control directly from logic circuit supply voltages.

The RFL series types are supplied in the JEDEC TO-205AF metal package.

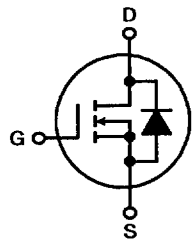
Package

TO-205AF
BOTTOM VIEW



Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



Absolute Maximum Ratings (T_C = +25°C) Unless Otherwise Specified

		RFL1N12L	RFL1N15L	UNITS
Drain-Source Voltage	V_{DS}	120	150	V
Drain-Gate Voltage (R_{GS} = 1MΩ)	V_{DGR}	120	150	V
Continuous Drain Current				
RMS Continuous	I_D	1	1	A
Pulsed Drain Current	I_{DM}	5	5	A
Gate-Source Voltage	V_{GS}	±10	±10	V
Maximum Power Dissipation				
T_C = +25°C	P_D	8.33	8.33	W
Above T_C = +25°C, Derate Linearly		0.0667	0.0667	W/°C
Operating and Storage Junction Temperature Range	TJ, TSTG	-55 to +150	-55 to +150	°C

6 LOGIC LEVEL POWER MOSFETs

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

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

CHARACTERISTIC	SYMBOLS	TEST CONDITIONS	LIMITS				UNITS
			RFL1N12L		RFL1N15L		
			MIN	MAX	MIN	MAX	
Drain-Source Breakdown Voltage	BV_{DSS}	I_D = 1mA, V_{GS} = 0	120	-	150	-	V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$, I_D = 2mA	1	2	1	2	V
Zero-Gate Voltage Drain Current	I_{DSS}	V_{DS} = 100V	-	1	-	-	µA
		V_{DS} = 120V	-	-	-	1	µA
		T_C = +125°C, V_{DS} = 100V	-	50	-	-	µA
		V_{DS} = 120V	-	-	-	50	mA
Gate-Source Leakage Current	I_{GSS}	V_{GS} = ±10V, V_{DS} = 0	-	100	-	100	nA
Drain-Source On-Voltage	$V_{DS(on)}$*	I_D = 1A, V_{GS} = 5V	-	1.9	-	1.9	V
		I_D = 2A, V_{GS} = 5V	-	4.6	-	4.6	V
Static Drain-Source On Resistance	$r_{DS(on)}$*	I_D = 1A, V_{GS} = 5V	-	1.9	-	1.9	Ω
Forward Transconductance	g_{fs}*	I_D = 1A, V_{DS} = 10V	800	-	800	-	S (℧)
Input Capacitance	C_{ISS}	V_{GS} = 0V, V_{DS} = 25V, f = 1MHz	-	200	-	200	pF
Output Capacitance	C_{OSS}		-	80	-	80	pF
Reverse Transfer Capacitance	C_{RSS}		-	35	-	35	pF
Turn-On Delay Time	$t_{d(on)}$	I_D = 1A, V_{DD} = 75V, R_{GEN} = ∞, R_{GS} = 6.25Ω, V_{GS} = 5V	10 (typ)	25	10 (typ)	25	ns
Rise Time	t_r		10 (typ)	45	10 (typ)	45	ns
Turn-Off Delay Time	$t_{d(off)}$		24 (typ)	45	24 (typ)	45	ns
Fall Time	t_f		30 (typ)	50	30 (typ)	50	ns
Thermal Resistance Junction-to-Case	$R_{\theta JC}$		-	15	-	15	°C/W

* Pulsed: Pulse duration = 300µs max., duty cycle = 2%.

Source-Drain Diode Ratings and Characteristics

CHARACTERISTIC	SYMBOLS	TEST CONDITIONS	LIMITS				UNITS
			RFL1N12L		RFL1N15L		
			MIN	MAX	MIN	MAX	
Diode Forward Voltage	V_{SD}*	I_{SD} = -1A	-	1.4	-	1.4	V
Diode Reverse Recovery Time	t_{rr}	I_F = 2A, dI_F/dt = 50A/µs	150 (typ)	150 (typ)	150 (typ)	150 (typ)	ns

* Pulse Test: Width ≤ 300µs, Duty Cycle ≤ 2%.

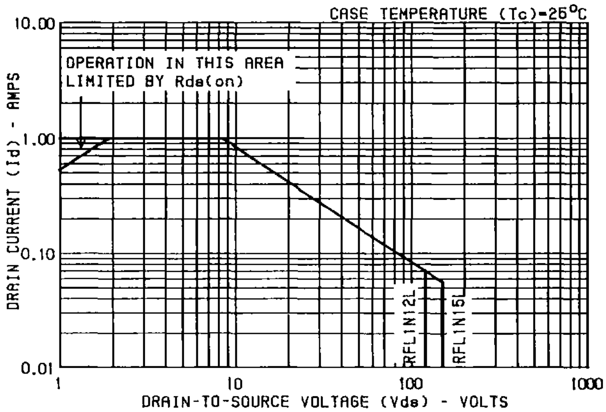


Fig. 1 — Maximum operating areas for all types.

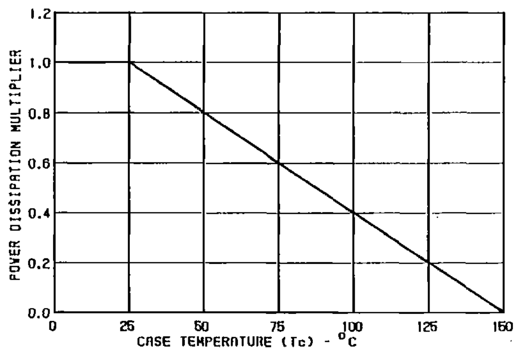


Fig. 2 — Power dissipation vs. case temperature derating curve for all types.

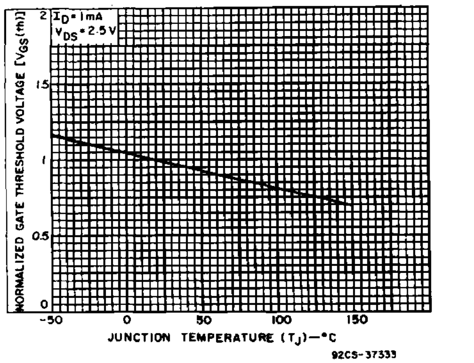


Fig. 3 — Typical normalized gate threshold voltage as a function of junction temperature for all types.

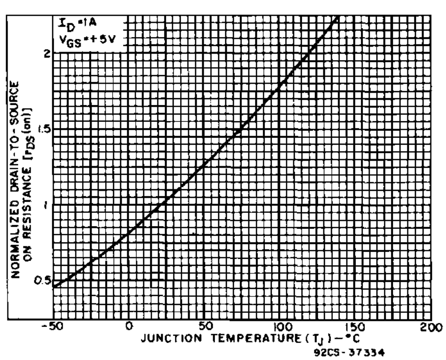


Fig. 4 — Normalized drain-to-source on resistance to junction temperature for all types.

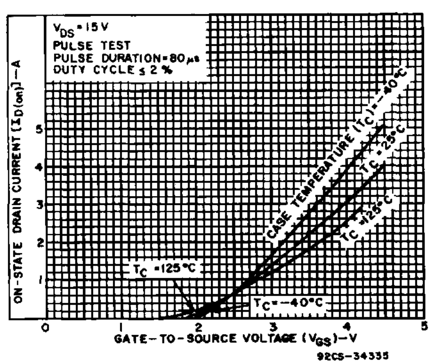


Fig. 5 — Typical transfer characteristics for all types.

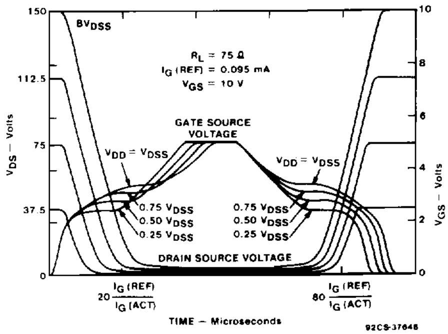


Fig. 6 - Normalized switching waveforms for constant gate-current. Refer to Harris application notes AN-7254 and AN-7260.

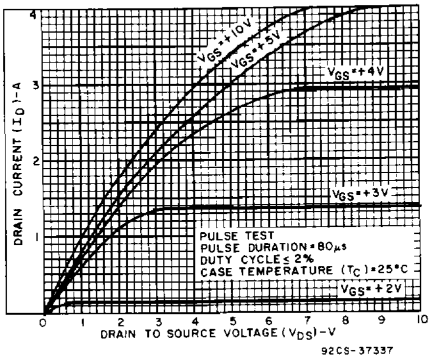


Fig. 7 — Typical saturation characteristics for all types.

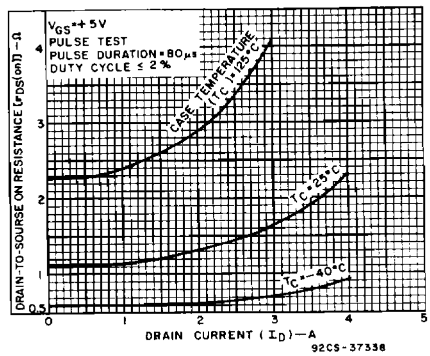


Fig. 8 — Typical drain-to-source on resistance as a function of drain current for all types.

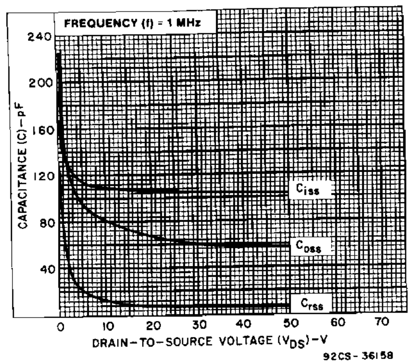


Fig. 9 — Capacitance as a function of drain-to-source voltage for all types.

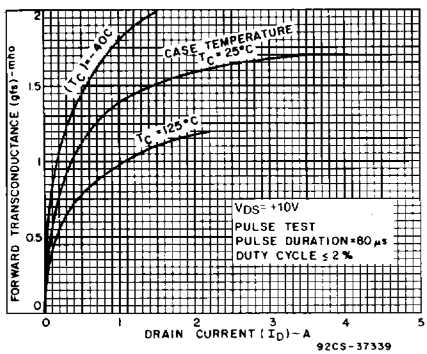


Fig. 10 — Typical forward transconductance as a function of drain current for all types.

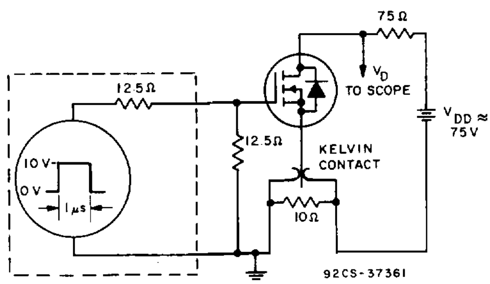


Fig. 11 — Switching Time Test Circuit.