RFB18N10CS

Current Sensing N-Channel Enhancement-Mode Power Field-Effect Transistor

April 1993

Features

- 18A, 100V
- $r_{DS(ON)}$ 0.1Ω
- Built-In Current Sensing Ratio .... 1350 to 1650
- UIS SOA Rating Curve (Single Pulse)
- -55°C to +175°C Operating and Storage Temperature

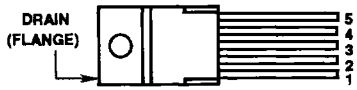
Description

The RFB18N10CS is an n-channel enhancement-mode silicon-gate power field-effect transistors which have a built-in current sensing function. The current sense lead provides an accurate fraction of the drain current that can be used as a feedback signal for control and/or protection. These devices can be repeatedly and economically produced on the standard PowerMOS production line.

Because of space limitations, branding (marking) on type RFB18N10CS is F18N10CS.

Package

TS-001AA
TOP VIEW

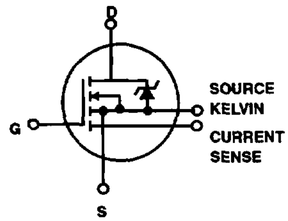


TERMINAL CONNECTIONS

1 - Gate
2 - Current Sense
3 - Drain
4 - Source Kelvin
5 - Source

Terminal Diagram

N-CHANNEL ENHANCEMENT MODE



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

		RFB18N10CS	UNITS
Drain-Source Voltage	V_{DSS}	100	V
Drain-Gate Voltage	V_{DGR}	100	V
Gate-Source Voltage	V_{GS}	±20	V
Continuous Drain Current			
RMS Continuous	I_D	18	A
Pulsed Drain Current	I_{DM}	56	A
Single Pulse Avalance Rating, Refer to UIS SOA Curve (Figure 10)			
Power Dissipation			
T_C = +25°C	P_D	79	W
Above T_C = +25°C, Derate Linearly		0.53	W/°C
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-55 to +175	°C

CAUTION: These devices are sensitive to electrostatic discharge. Users should follow proper I.C. Handling Procedures.

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

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	LIMITS MIN	LIMITS MAX	UNITS
Drain-Source Breakdown Voltage	BV_{DSS}	I_D = 0.25mA, V_{GS} = 0V	100	-	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_{GS} = 0			
		V_{DS} = 100V, T_C = 25°C	-	250	µA
		V_{DS} = 80V, T_C = 175°C	-	1000	µA
Gate-Source Leakage Current	I_{GSS}	V_{GS} = ±20V, V_{DS} = 0V	-	±500	nA
Static Drain-Source On Resistance	$r_{DS(ON)}$	I_D = 9A, V_{GS} = 10V	-	0.10	Ω
Forward Transconductance	gfs	I_D = 9A, V_{DS} = 15V	4.7	-	S(℧)
Current Sensing Ratio	r	I_D = 14A, V_{GS} = 10V	1350	1650	
Turn-On Delay Time	$t_{D(ON)}$	V_{DS} = 50V	-	14	ns
Rise Time	t_R	I_D = 14A	-	63	ns
Turn-Off Delay Time	$t_{D(OFF)}$	V_{GS} = 10V	-	33	ns
Fall Time	t_F	R_{GS} = 12Ω	-	38	ns
Total Gate Charge	$Q_{G(TOTAL)}$	I_D = 14A, V_{DS} = 80V, V_{GS} = 10V	-	20	nC
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$		-	1.9	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$		-	75	°C/W

Source-Drain Diode Ratings and Characteristics

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	LIMITS MIN	LIMITS MAX	UNITS
Diode Forward Voltage	V_{SD}	I_{SD} = 14A	-	1.5	V
Reverse Recovery Time	t_{RR}	I_{SD} = 14A, dI_{SD}/dt = 100A/µs	-	310	ns

Typical Performance Curves

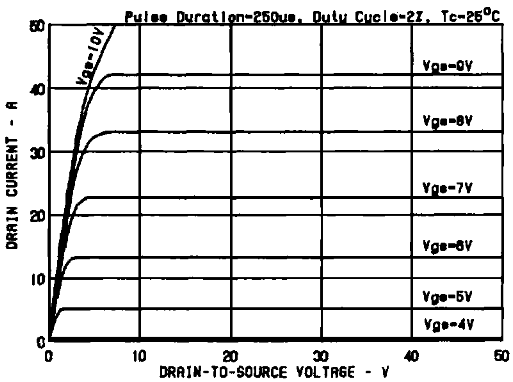


FIGURE 1. TYPICAL OUTPUT CHARACTERISTICS

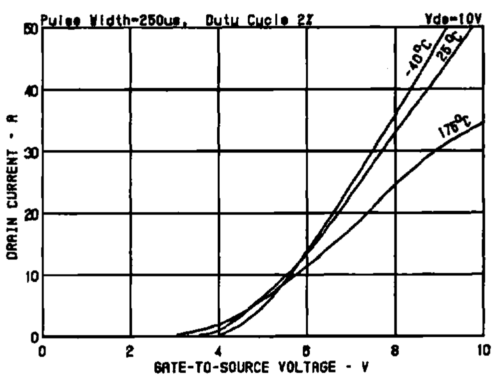


FIGURE 2. TYPICAL TRANSFER CHARACTERISTICS

Typical Performance Curves (Continued)

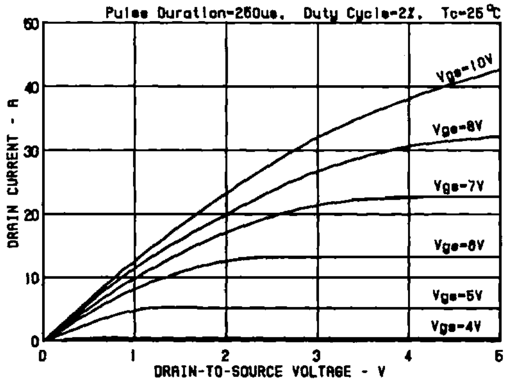


FIGURE 3. TYPICAL SATURATION CHARACTERISTICS

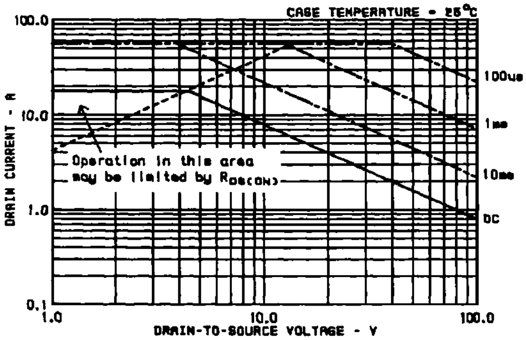


FIGURE 4. MAXIMUM SAFE OPERATING AREAS (CURVES MUST BE DERATED LINEARITY WITH INCREASE IN CASE TEMPERATURE)

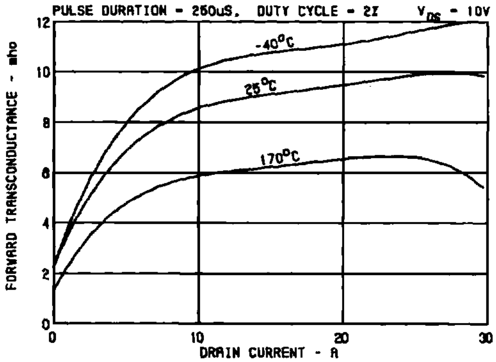


FIGURE 5. TYPICAL TRANSCONDUCTANCE vs DRAIN CURRENT

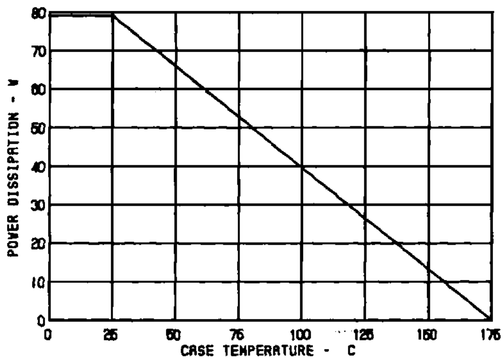


FIGURE 6. POWER DISSIPATION vs CASE TEMPERATURE DERATING CURVE

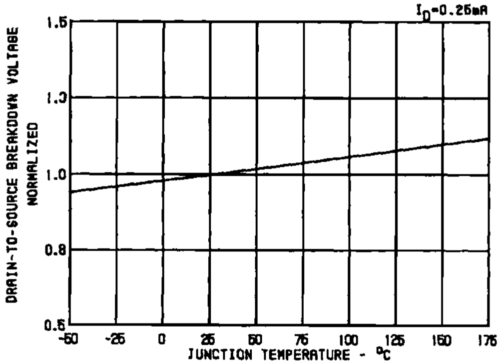


FIGURE 7. NORMALIZED BREAKDOWN VOLTAGE vs TEMPERATURE

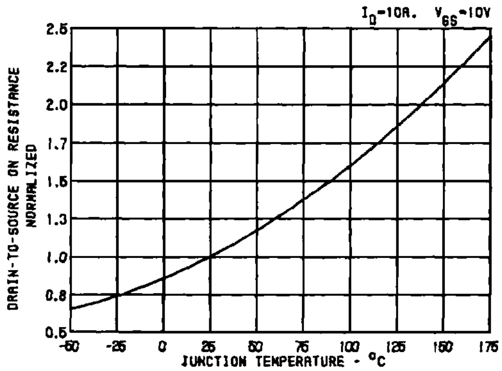


FIGURE 8. NORMALIZED ON-RESISTANCE vs TEMPERATURE

Typical Performance Curves (Continued)

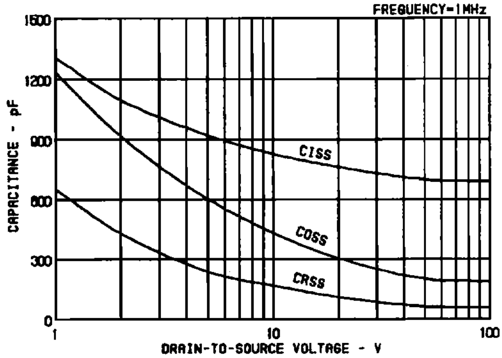


FIGURE 9. TYPICAL CAPACITANCE vs DRAIN-TO-SOURCE VOLTAGE

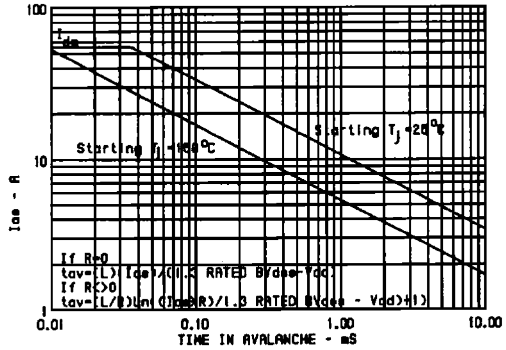


FIGURE 10. UNCLAMPED-INDUCTIVE SWITCHING SAFE OPERATING AREA

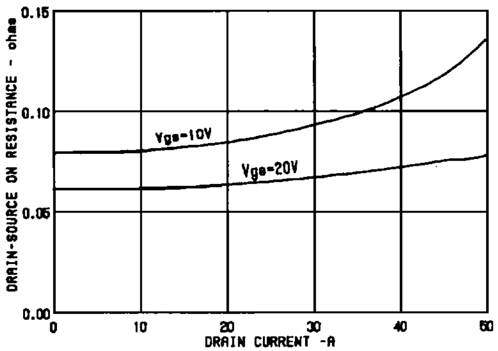


FIGURE 11. TYPICAL ON-RESISTANCE vs DRAIN CURRENT

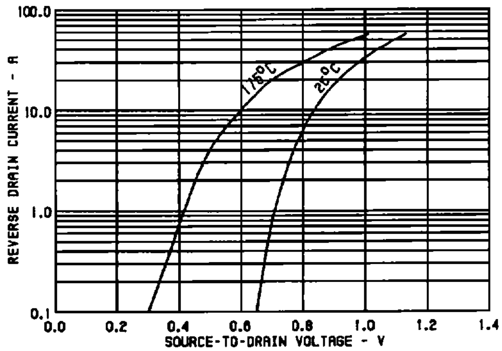


FIGURE 12. TYPICAL SOURCE-DRAIN-DIODE FORWARD VOLTAGE.

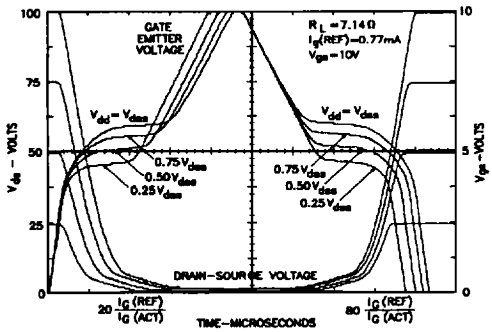


FIGURE 13. NORMALIZED SWITCHING WAVEFORMS FOR CONSTANT GATE-CURRENT (REFER TO HARRIS APPLICATION NOTES AN7254 AND AN7260)

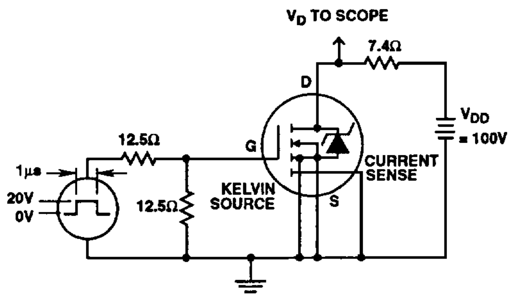


FIGURE 14. SWITCHING TIME TEST CIRCUIT

Typical Performance Curves (Continued)

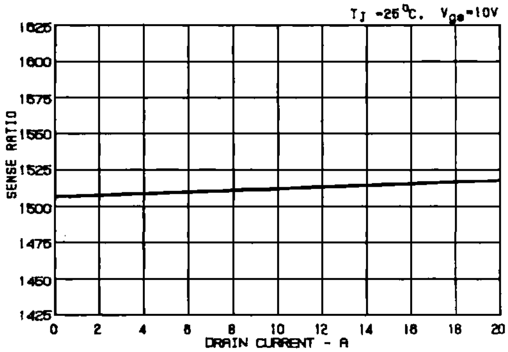


FIGURE 15. CURRENT SENSE RATIO vs DRAIN CURRENT

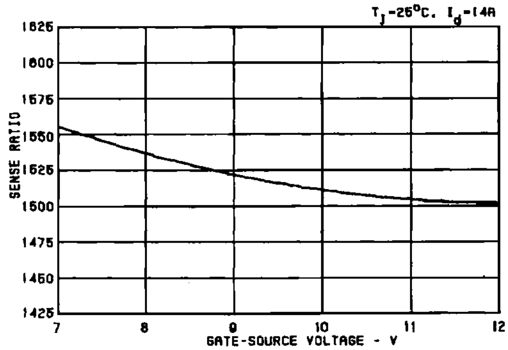


FIGURE 16. CURRENT SENSE RATIO vs GATE VOLTAGE

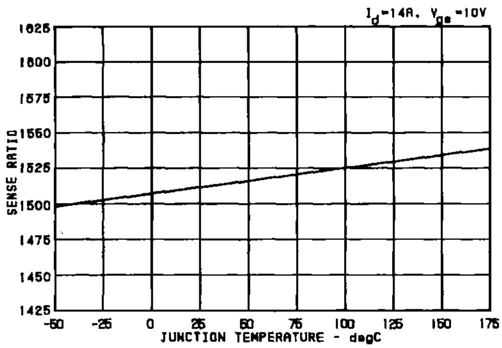


FIGURE 17. CURRENT SENSE RATIO vs JUNCTION TEMPERATURE

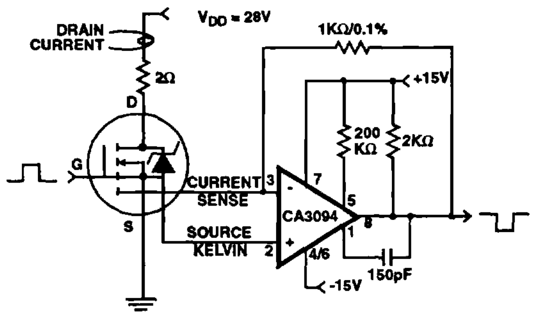


FIGURE 18. CURRENT SENSE RATIO TEST CIRCUIT

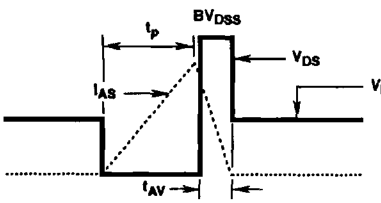


FIGURE 19. UIS WAVEFORMS

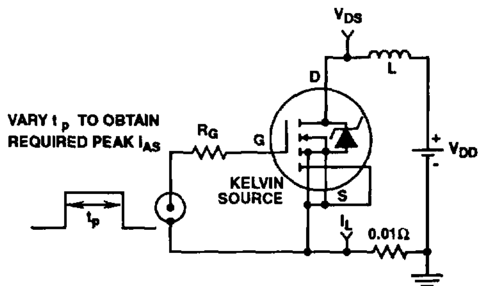


FIGURE 20. UIS TEST CIRCUIT