

**12A, 350V and 400V, 0.380 Ohm,
N-Channel Power MOSFETs**

These are N-Channel enhancement mode silicon gate power field effect transistors 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.

Formerly developmental type TA17434.

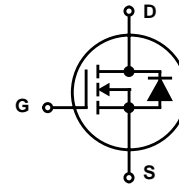
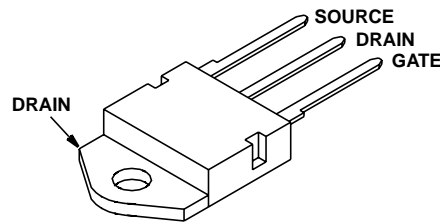
Ordering Information

PART NUMBER	PACKAGE	BRAND
RFH12N35	TO-218AC	RFH12N35
RFH12N40	TO-218AC	RFH12N40

NOTE: When ordering, use the entire part number.

Features

- 12A, 350V and 400V
- $r_{DS(ON)} = 0.380\Omega$
- Related Literature
 - TB334 "Guidelines for Soldering Surface Mount Components to PC Boards"

Symbol

Packaging
JEDEC TO-218AC


RFH12N35, RFH12N40

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

	RFH12N35	RFH12N40	UNITS	
Drain to Source Voltage (Note 1)	V_{DS}	350	400	V
Drain to Gate Voltage ($R_{GS} = 20\text{k}\Omega$) (Note 1)	V_{DGR}	350	400	V
Continuous Drain Current	I_D	12	12	A
Pulsed Drain Current (Note 3)	I_{DM}	24	24	A
Gate to Source Voltage	V_{GS}	± 20	± 20	V
Maximum Power Dissipation	P_D	150	150	W
Linear Derating Factor		1.2	1.2	$W/^\circ\text{C}$
Operating and Storage Temperature	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ\text{C}$
Maximum Temperature for Soldering				
Leads at 0.063in (1.6mm) from Case for 10s	T_L	300	300	$^\circ\text{C}$
Package Body for 10s, See Techbrief 334	T_{pkg}	260	260	$^\circ\text{C}$

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

- $T_J = 25^\circ\text{C}$ to 125°C .

Electrical Specifications $T_C = 25^\circ\text{C}$, Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS	
Drain to Source Breakdown Voltage	BV_{DSS}	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	RFH12N35	350	-	-	V
			RFH12N40	400	-	-	V
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$, (Figure 8)	2	-	4	V	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = \text{Rated } BV_{DSS}, V_{GS} = 0\text{V}$	-	-	1	μA	
		$V_{DS} = 0.8 \times \text{Rated } BV_{DSS}, V_{GS} = 0\text{V}, T_C = 125^\circ\text{C}$	-	-	25	μA	
Gate to Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$	-	-	± 100	nA	
Drain to Source On Resistance (Note 2)	$r_{DS(ON)}$	$I_D = 12\text{A}, V_{GS} = 10\text{V}$, (Figures 6, 7)	-	-	0.380	Ω	
Drain to Source On Voltage (Note 2)	$V_{DS(ON)}$	$I_D = 12\text{A}, V_{GS} = 10\text{V}$	-	-	4.56	V	
Turn-On Delay Time	$t_{d(ON)}$	$I_D \approx 6\text{A}, V_{DD} = 200\text{V}, R_G = 50\Omega, V_{GS} = 10\text{V}, R_L = 33\Omega$ (Figures 10, 11, 12)	-	30	50	ns	
Rise Time	t_r		-	105	150	ns	
Turn-Off Delay Time	$t_{d(OFF)}$		-	480	750	ns	
Fall Time	t_f		-	140	200	ns	
Input Capacitance	C_{ISS}	$V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$, (Figure 9)	-	-	3000	pF	
Output Capacitance	C_{OSS}		-	-	900	pF	
Reverse-Transfer Capacitance	C_{RSS}		-	-	400	pF	
Thermal Resistance Junction-to-Case	$R_{\theta JC}$	RFH12N35, RFH12N40	-	-	0.83	$^\circ\text{C/W}$	

Source to Drain Diode Specifications

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Source to Drain Diode Voltage (Note 2)	V_{SD}	$I_{SD} = 6\text{A}$	-	-	1.4	V
Diode Reverse Recovery Time	t_{rr}	$I_{SD} = 4\text{A}, dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	950	-	ns

NOTES:

- Pulse test: pulse width $\leq 300\mu\text{s}$, duty cycle $\leq 2\%$.
- Repetitive rating: pulse width is limited by maximum junction temperature.

Typical Performance Curves Unless Otherwise Specified

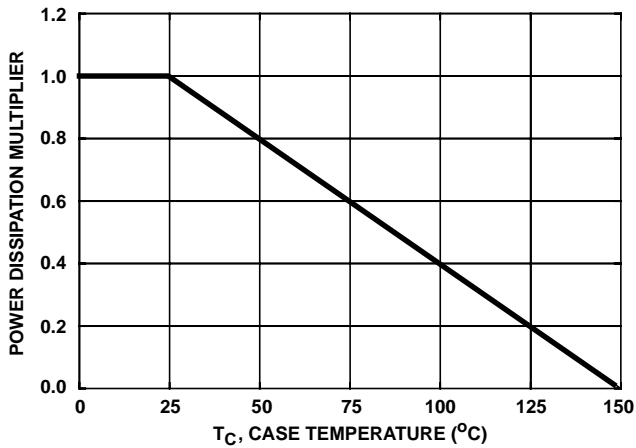


FIGURE 1. NORMALIZED POWER DISSIPATION vs CASE TEMPERATURE

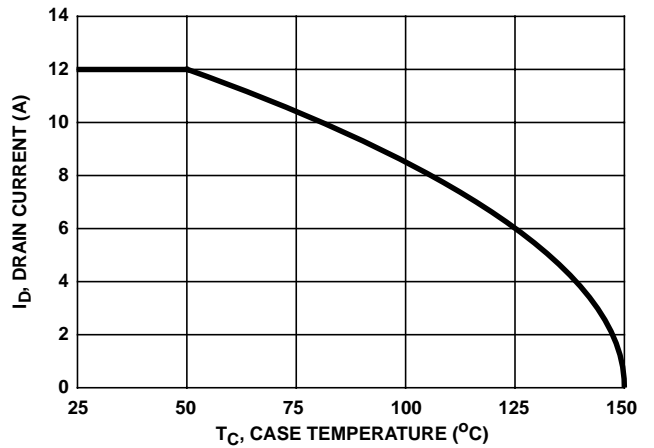


FIGURE 2. MAXIMUM CONTINUOUS DRAIN CURRENT vs CASE TEMPERATURE

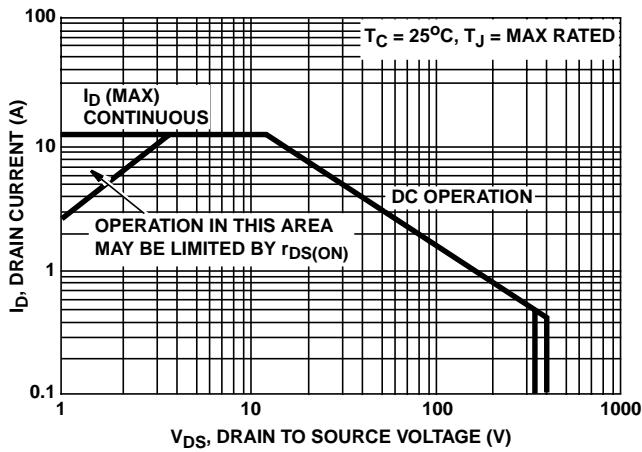


FIGURE 3. FORWARD BIAS SAFE OPERATING AREA

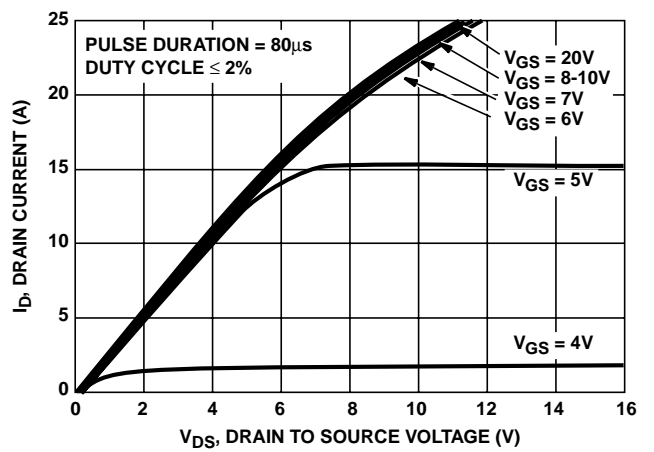


FIGURE 4. SATURATION CHARACTERISTICS

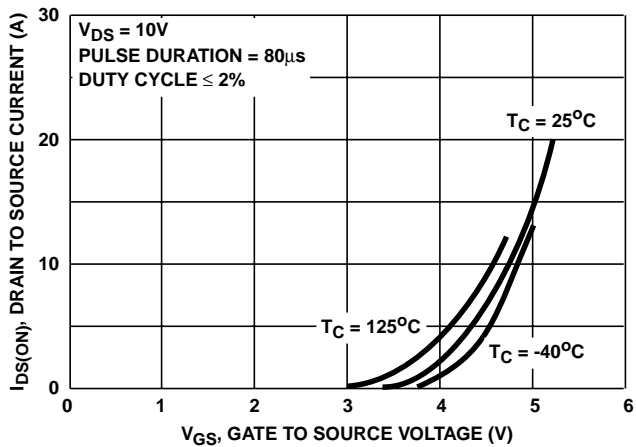


FIGURE 5. TRANSFER CHARACTERISTICS

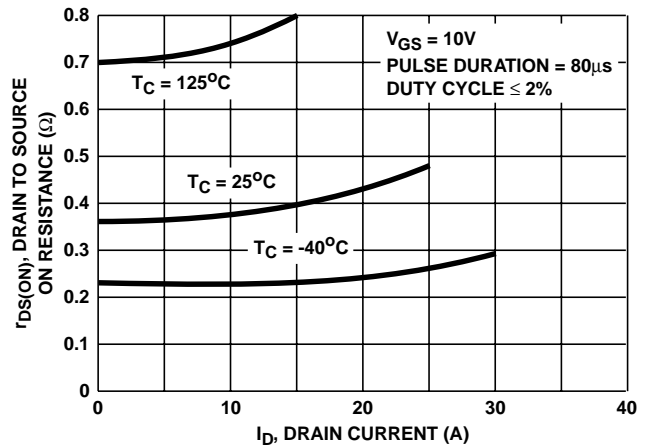


FIGURE 6. DRAIN TO SOURCE ON RESISTANCE vs GATE VOLTAGE AND DRAIN CURRENT

Typical Performance Curves Unless Otherwise Specified (Continued)

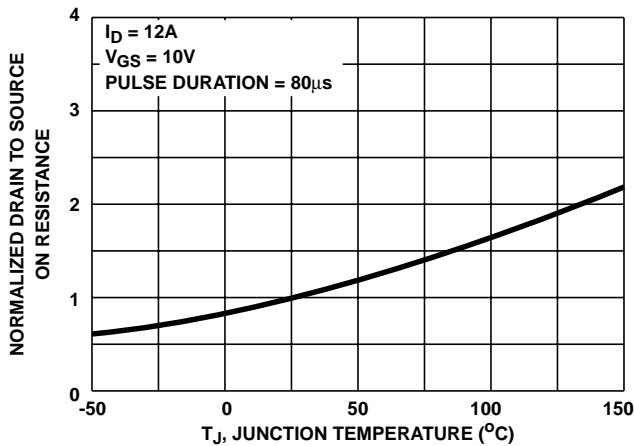


FIGURE 7. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs JUNCTION TEMPERATURE

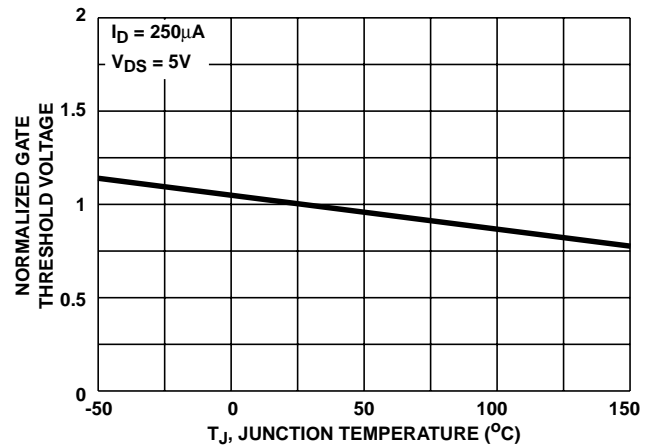


FIGURE 8. NORMALIZED GATE THRESHOLD VOLTAGE vs JUNCTION TEMPERATURE

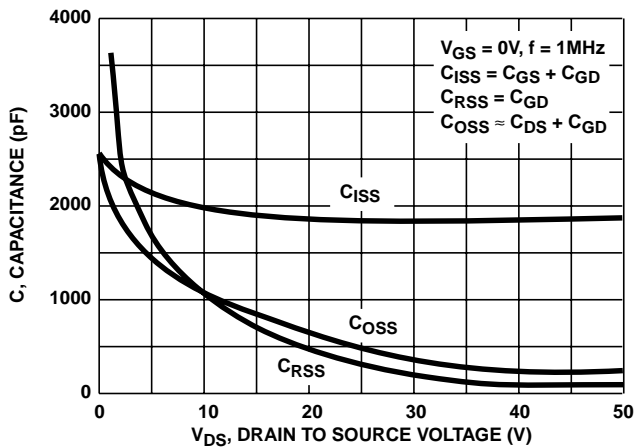
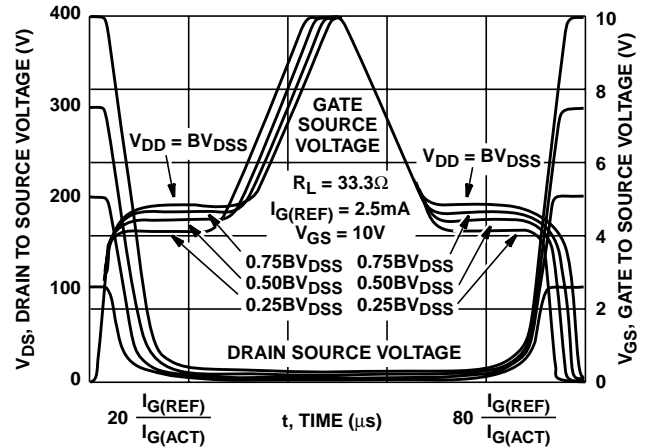


FIGURE 9. CAPACITANCE vs DRAIN TO SOURCE VOLTAGE



NOTE: Refer to Intersil Application Notes AN7254 and AN7260.

FIGURE 10. NORMALIZED SWITCHING WAVEFORMS FOR CONSTANT GATE CURRENT

Test Circuits and Waveforms

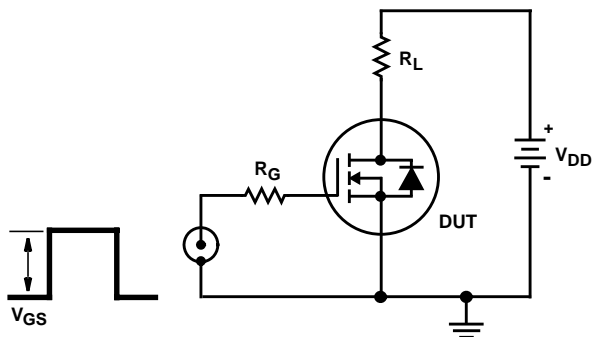


FIGURE 11. SWITCHING TIME TEST CIRCUIT

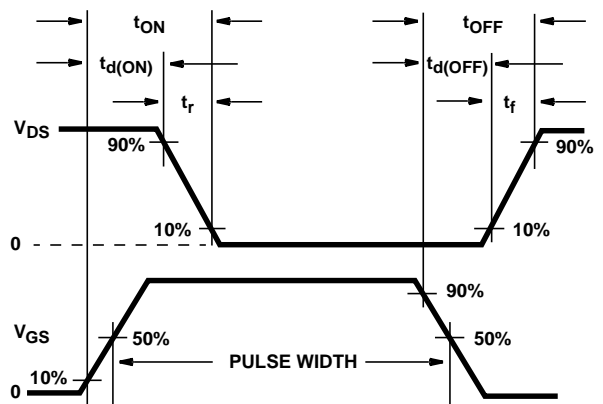


FIGURE 12. RESISTIVE SWITCHING WAVEFORMS

Test Circuits and Waveforms (Continued)

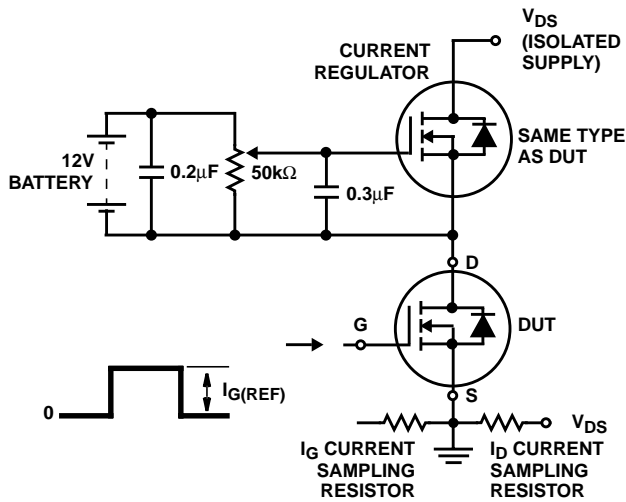


FIGURE 13. GATE CHARGE TEST CIRCUIT

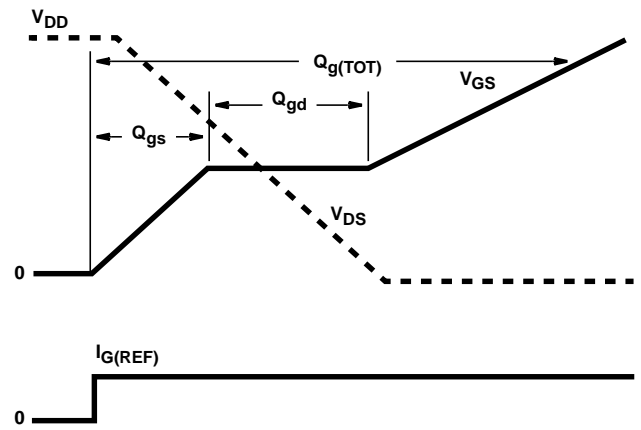


FIGURE 14. GATE CHARGE WAVEFORMS

All Intersil semiconductor products are manufactured, assembled and tested under **ISO9000** quality systems certification.

Intersil semiconductor products are sold by description only. Intersil Corporation reserves the right to make changes in circuit design and/or specifications at any time without notice. Accordingly, the reader is cautioned to verify that data sheets are current before placing orders. Information furnished by Intersil is believed to be accurate and reliable. However, no responsibility is assumed by Intersil or its subsidiaries for its use; nor for any infringements of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Intersil or its subsidiaries.

For information regarding Intersil Corporation and its products, see web site <http://www.intersil.com>

Sales Office Headquarters

NORTH AMERICA

Intersil Corporation
 P. O. Box 883, Mail Stop 53-204
 Melbourne, FL 32902
 TEL: (407) 724-7000
 FAX: (407) 724-7240

EUROPE

Intersil SA
 Mercure Center
 100, Rue de la Fusee
 1130 Brussels, Belgium
 TEL: (32) 2.724.2111
 FAX: (32) 2.724.22.05

ASIA

Intersil (Taiwan) Ltd.
 7F-6, No. 101 Fu Hsing North Road
 Taipei, Taiwan
 Republic of China
 TEL: (886) 2 2716 9310
 FAX: (886) 2 2715 3029