Description

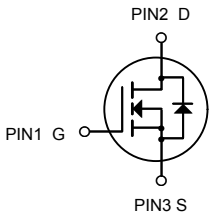
The HIRFP450APBF uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

TO-247S

General Features

V_{DS} = 500V I_D = 14A

$R_{DS(ON)}$ < 0.5Ω@ V_{GS}=10V



N-Channel MOSFET

Application

Battery protection

Load switch

Uninterruptible power supply

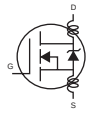
Package Marking and Ordering Information

Product ID	Pack	Brand	Qty(PCS)
HIRFP450APBF	TO-247S	HXY MOSFET	30

Absolute Maximum Ratings Tc=25℃ unless otherwise noted

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	500	V
V_{GS}	Gate-Source Voltage	±20	V
I_D@T_C=25℃	Continuous Drain Current, V_{GS} @ 10V[1]	14	A
I_D@T_C=100℃	Continuous Drain Current, V_{GS} @ 10V[1]	8.7	A
I_{DM}	Pulsed Drain Current[2]	56	A
EAS	Single Pulse Avalanche Energy[3]	760	mJ
I_{AS}	Avalanche Current	8.7	A
P_D@T_C=25℃	Total Power Dissipation[4]	190	W
T_{STG}	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃
R_{thJA}	Maximum Junction-to-Ambient	40	℃/W
R_{thJC}	Maximum Junction-to-Case (Drain)	0.65	℃/W

Electrical Characteristics (TA=25℃unless otherwise noted)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	V_{DS}	V_{GS} = 0 V, I_D = 250 µA	500	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to 25 °C, I_D = 1 mA	-	0.63	-	V/°C
Gate-Source Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 µA	2.0	-	4.0	V
Gate-Source Leakage	I_{GSS}	V_{GS} = ± 20 V	-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 500 V, V_{GS} = 0 V	-	-	25	µA
		V_{DS} = 400 V, V_{GS} = 0 V, T_J = 125 °C	-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 10 V; I_D = 8.4A[b]	-	0.43	0.5	Ω
Forward Transconductance	g_{fs}	V_{DS} = 50 V, I_D = 8.4 A[b]	9.3	-	-	S
Dynamic						
Input Capacitance	C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1.0 MHz, see fig. 5	-	2600	-	pF
Output Capacitance	C_{oss}		-	720	-	
Reverse Transfer Capacitance	C_{rss}		-	340	-	
Total Gate Charge	Q_g	V_{GS} = 10 V; I_D = 14 A, V_{DS} = 400 V, see fig. 6 and 13[b]	-	-	150	nC
Gate-Source Charge	Q_{gs}		-	-	20	
Gate-Drain Charge	Q_{gd}		-	-	80	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 250 V, I_D = 14 A, R_G = 6.2 Ω, R_D = 17 Ω, see fig. 10[b]	-	17	-	ns
Rise Time	t_r		-	47	-	
Turn-Off Delay Time	$t_{d(off)}$		-	92	-	
Fall Time	t_f		-	44	-	
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact 	-	5.0	-	nH
Internal Source Inductance	L_S		-	13	-	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 	-	-	14	A
Pulsed Diode Forward Current[a]	I_{SM}		-	-	56	
Body Diode Voltage	V_{SD}	T_J = 25 °C, I_S = 14 A, V_{GS} = 0 V[b]	-	-	1.4	V
Body Diode Reverse Recovery Time	t_{rr}	T_J = 25 °C, I_F = 14 A, dI/dt = 100 A/µs[b]	-	540	810	ns
Body Diode Reverse Recovery Charge	Q_{rr}		-	4.8	7.2	µC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)				

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).

b. Pulse width ≤ 300 µs; duty cycle ≤ 2 %.

Typical Characteristics Ta = 25 °C, unless otherwise noted

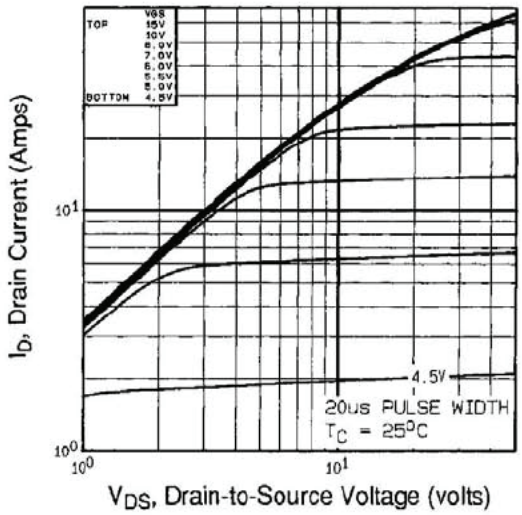


Fig. 1 - Typical Output Characteristics, T_C = 25 °C

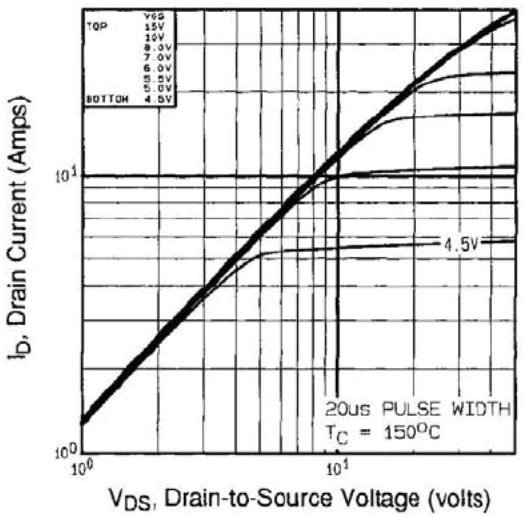


Fig. 2 - Typical Output Characteristics, T_C = 150 °C

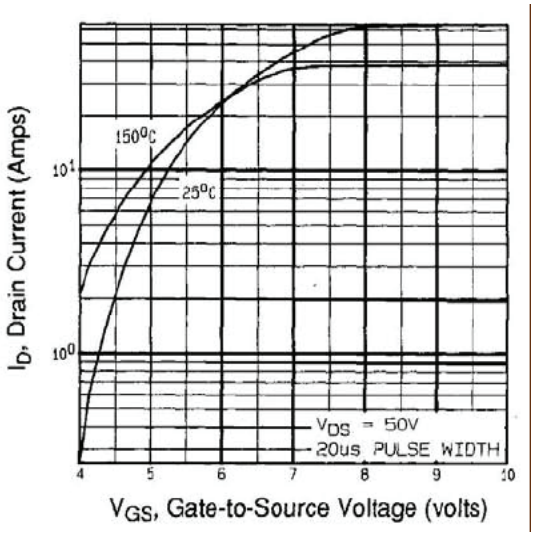


Fig. 3 - Typical Transfer Characteristics

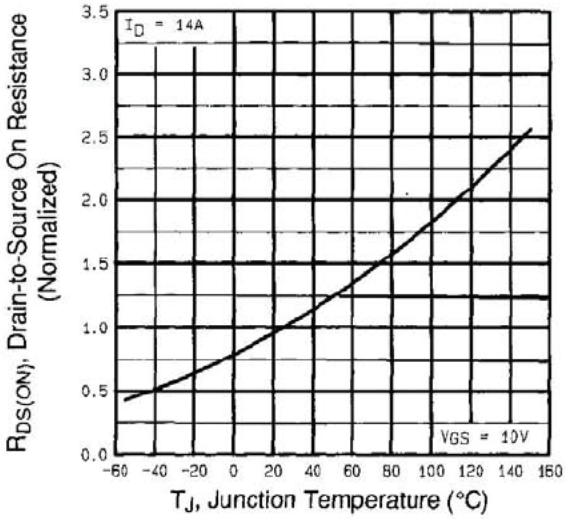


Fig. 4 - Normalized On-Resistance vs. Temperature

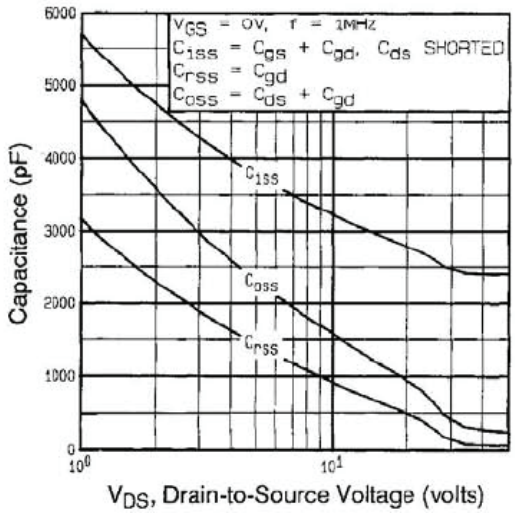


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

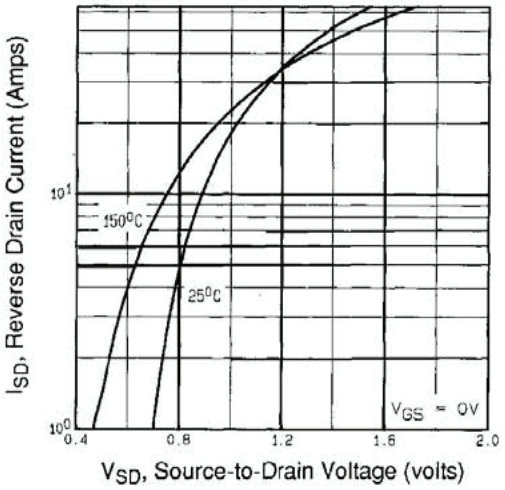


Fig. 7 - Typical Source-Drain Diode Forward Voltage

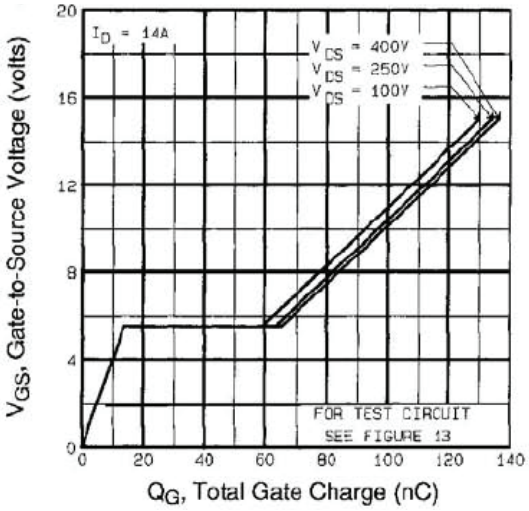


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

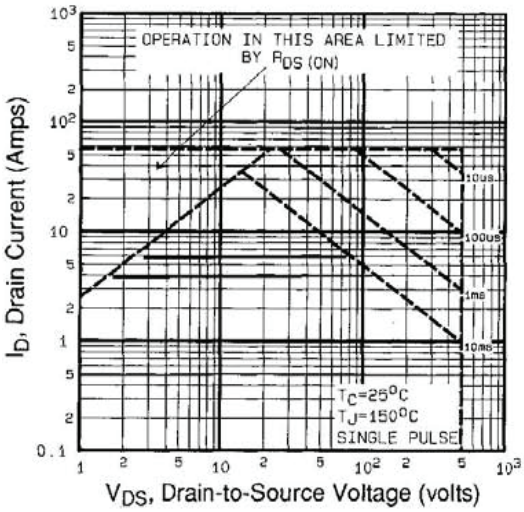


Fig. 8 - Maximum Safe Operating Area

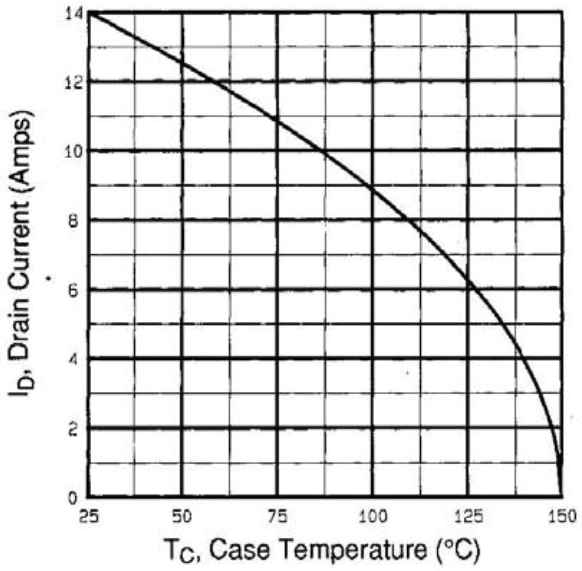


Fig. 9 - Maximum Drain Current vs. Case Temperature

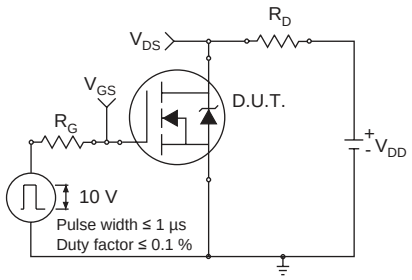


Fig. 10a - Switching Time Test Circuit

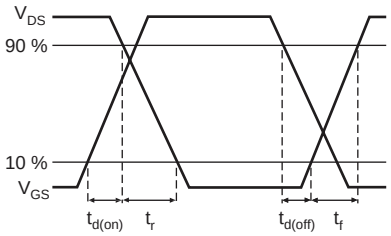


Fig. 10b - Switching Time Waveforms

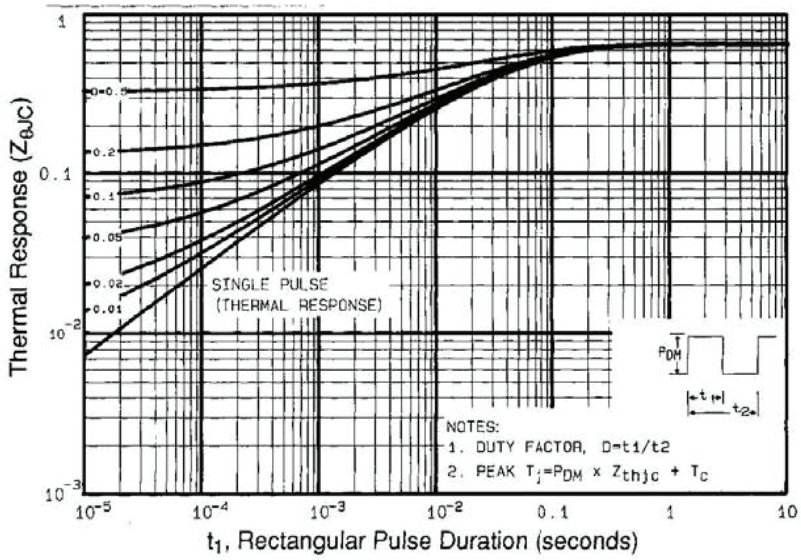


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

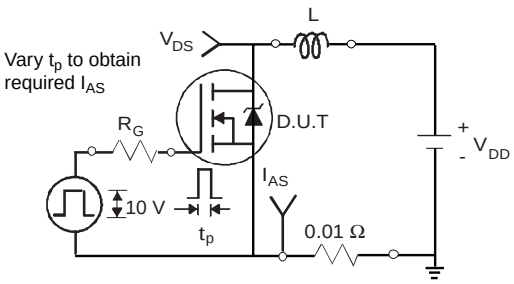


Fig. 12a - Unclamped Inductive Test Circuit

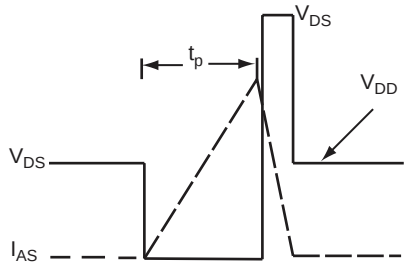


Fig. 12b - Unclamped Inductive Waveforms

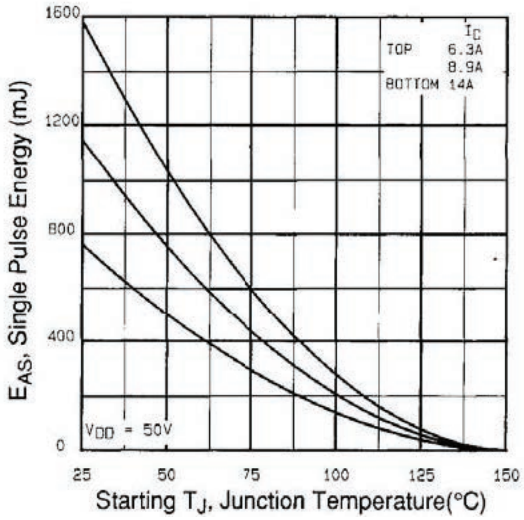


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

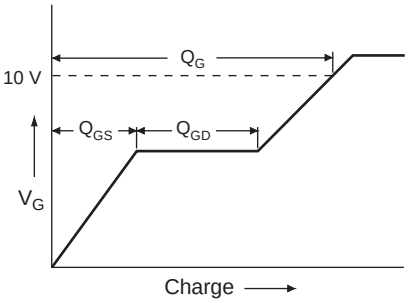


Fig. 13a - Basic Gate Charge Waveform

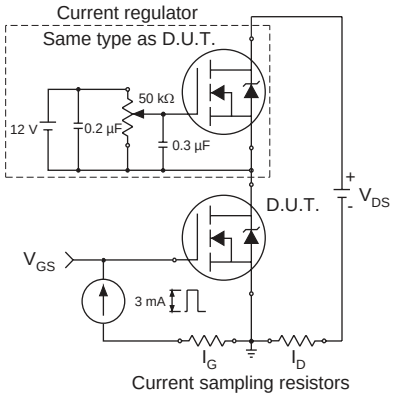
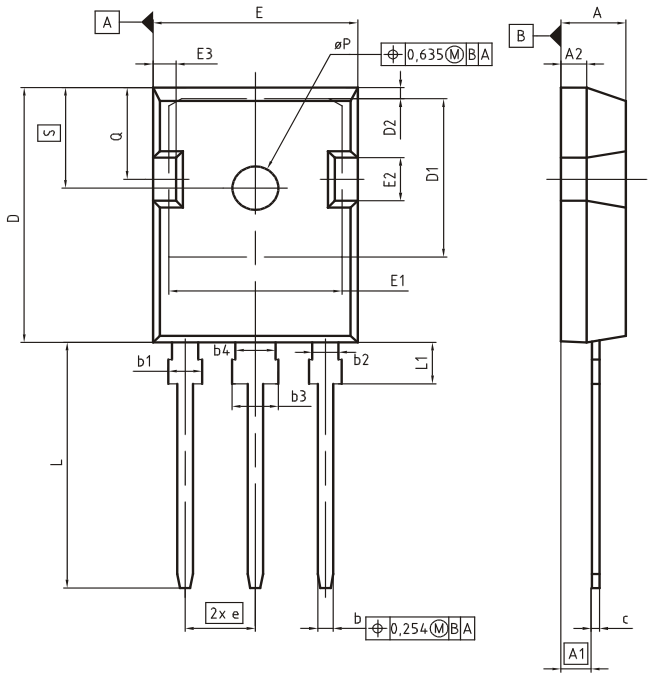


Fig. 13b - Gate Charge Test Circuit

TO-247S Package Information



DIM	MILLIMETERS	
	MIN	MAX
A	4.83	5.21
A1	2.27	2.54
A2	1.85	2.16
b	1.07	1.33
b1	1.90	2.41
b2	1.90	2.16
b3	2.87	3.38
b4	2.87	3.13
c	0.55	0.68
D	20.80	21.10
D1	16.25	17.65
D2	0.95	1.35
E	15.70	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	2.60
e	5.44 (BSC)	
N	3	
L	19.80	20.32
L1	4.10	4.47
øP	3.50	3.70
Q	5.49	6.00
S	6.04	6.30

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