



Description

The IPD50N04S410ATMA1 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.



General Features

$V_{DS} = 40V$ $I_D = 60A$

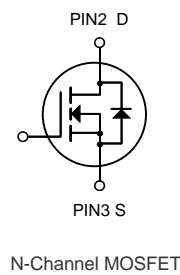
$R_{DS(ON)} < 10m\Omega$ @ $V_{GS}=10V$

Application

Battery protection

Load switch

Uninterruptible power supply



Ordering Information

Product ID	Pack	Brand	Qty(PCS)
IPD50N04S410ATMA1	TO252-2L	HXY MOSFET	2500

Absolute Maximum Ratings ($T_C=25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	60	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	40	A
I_{DM}	Pulsed Drain Current ²	160	A
EAS	Single Pulse Avalanche Energy ³	46.1	mJ
I_{AS}	Avalanche Current	28	A
$P_D@T_C=25^\circ C$	Total Power Dissipation ⁴	34.6	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$
$R_{\theta JA}$	Thermal Resistance Junction-ambient (Steady State) ¹	62	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	3.8	$^\circ C/W$



Electrical Characteristics (T_J=25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
V _{(BR)DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250μA	40	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =40V, V _{GS} =0V,	-	-	1.0	μA
I _{GSS}	Gate to Body Leakage Current	V _{DS} =0V, V _{GS} =±20V	-	-	±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	1.0	1.5	2.5	V
R _{DS(on)}	Static Drain-Source on-Resistance <small>note3</small>	V _{GS} =10V, I _D =30A	-	7.7	10	mΩ
		V _{GS} =4.5V, I _D =20A	-	10	14	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =20V, V _{GS} =0V, f=1.0MHz	-	1639	-	pF
C _{oss}	Output Capacitance		-	148	-	pF
C _{rss}	Reverse Transfer Capacitance		-	122	-	pF
Q _g	Total Gate Charge	V _{DS} =20V, I _D =15A, V _{GS} =4.5V	-	16	-	nC
Q _{gs}	Gate-Source Charge		-	5	-	nC
Q _{gd}	Gate-Drain("Miller") Charge		-	7	-	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DS} =20V, I _D =1A, R _{GEN} =6.2Ω, V _{GS} =10V	-	10	-	ns
t _r	Turn-on Rise Time		-	6	-	ns
t _{d(off)}	Turn-off Delay Time		-	50	-	ns
t _f	Turn-off Fall Time		-	26	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	60	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	160	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} =0V, I _S =30A	-	-	1.2	V
t _{rr}	Body Diode Reverse Recovery Time	I _F =5A, di/dt=100A/μs	-	13	-	ns
Q _{rr}	Body Diode Reverse Recovery Charge		-	7	-	nC

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition: T_J=25°C, V_{GS}=20V, R_G=25Ω, L=0.5mH, I_{AS}=13A

3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%



Typical Performance Characteristics

Figure 1: Output Characteristics

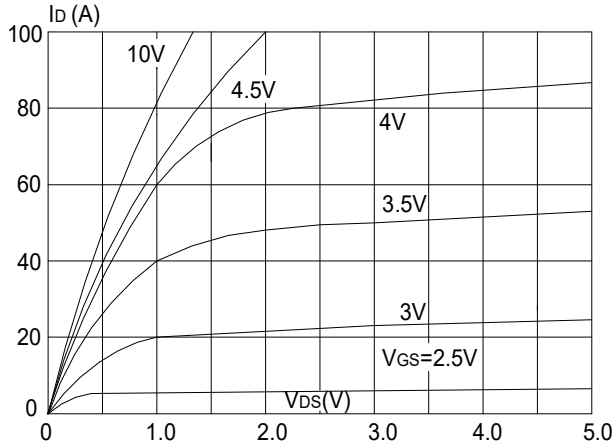


Figure 2: Typical Transfer Characteristics

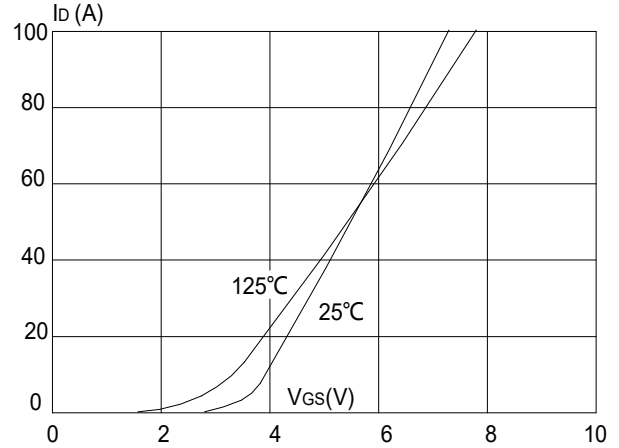


Figure 3: On-resistance vs. Drain Current

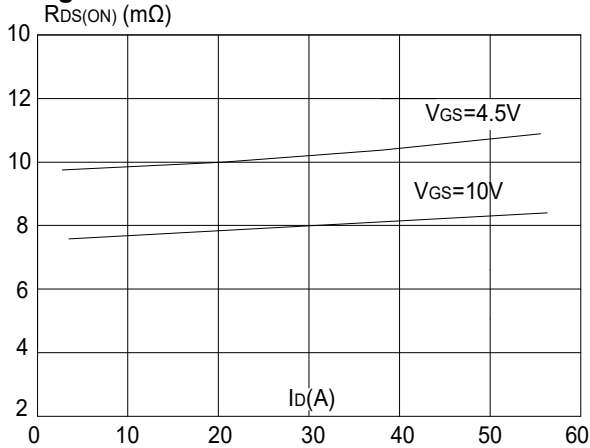


Figure 4: Body Diode Characteristics

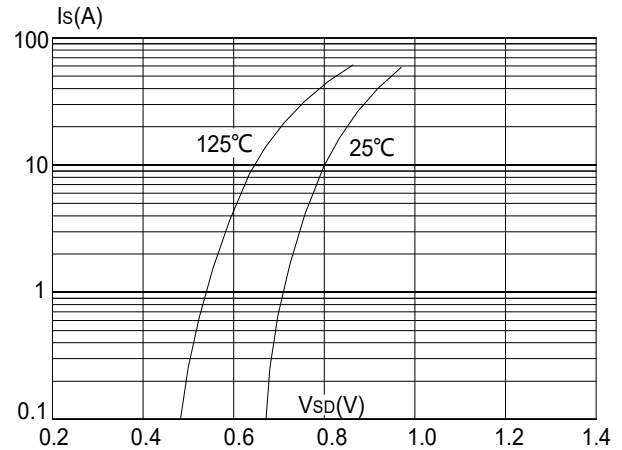


Figure 5: Gate Charge Characteristics

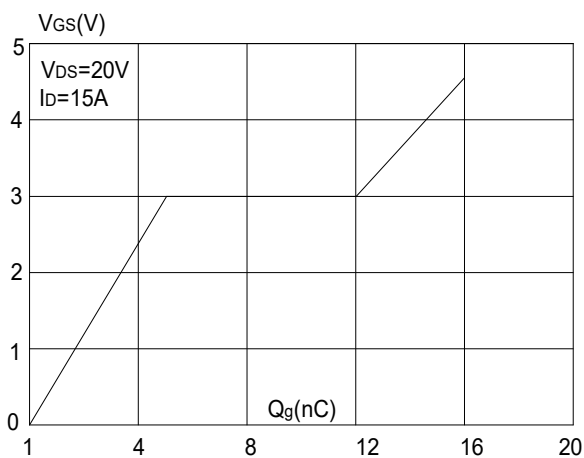


Figure 6: Capacitance Characteristics

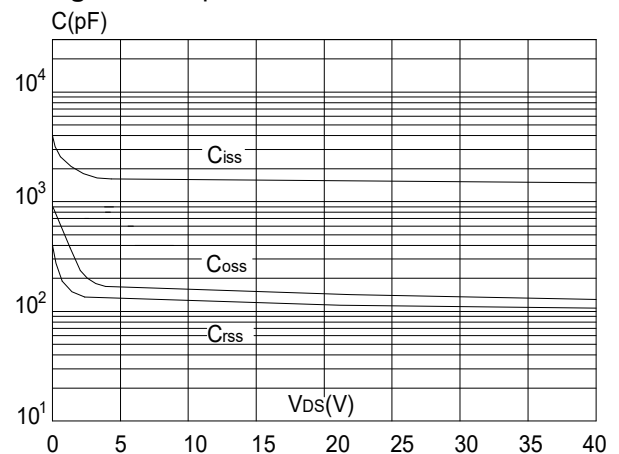




Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

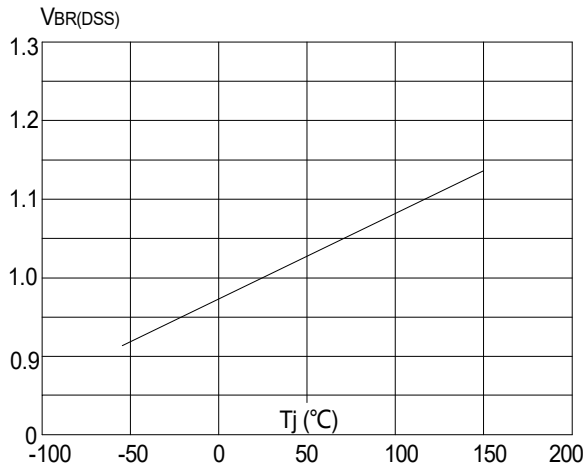


Figure 8: Normalized on Resistance vs. Junction Temperature

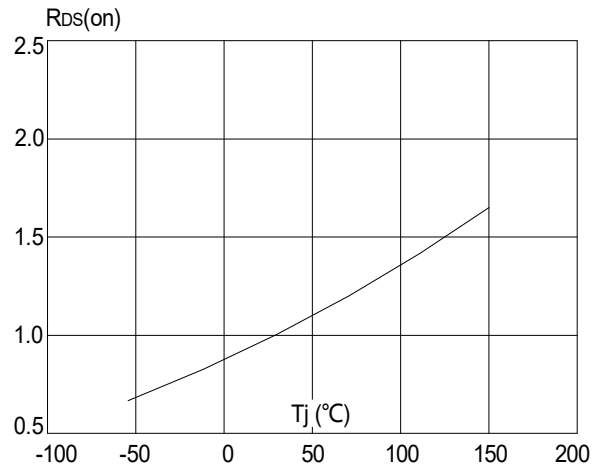


Figure 9: Maximum Safe Operating Area

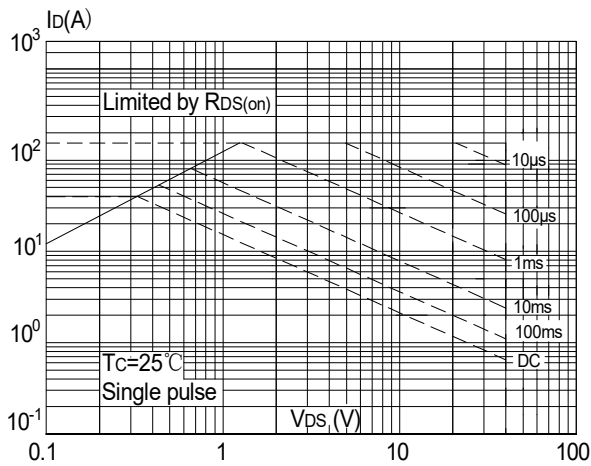


Figure 10: Maximum Continuous Drain Current vs. Case Temperature

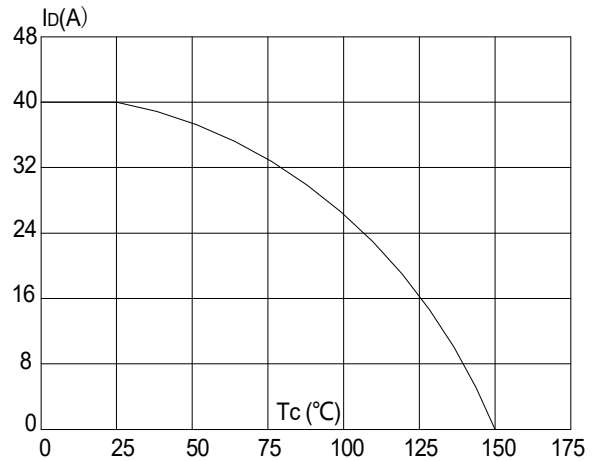
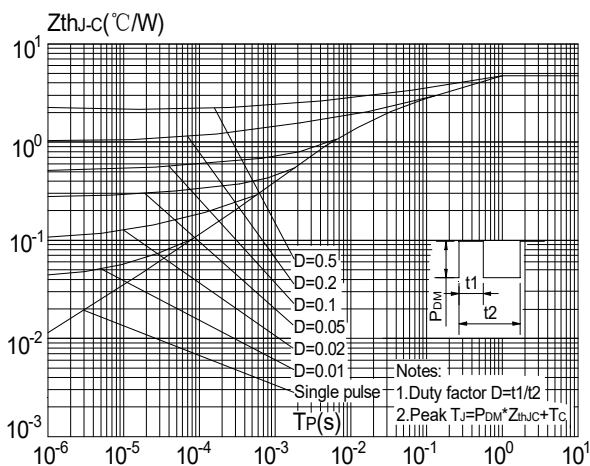


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Case





Test Circuit

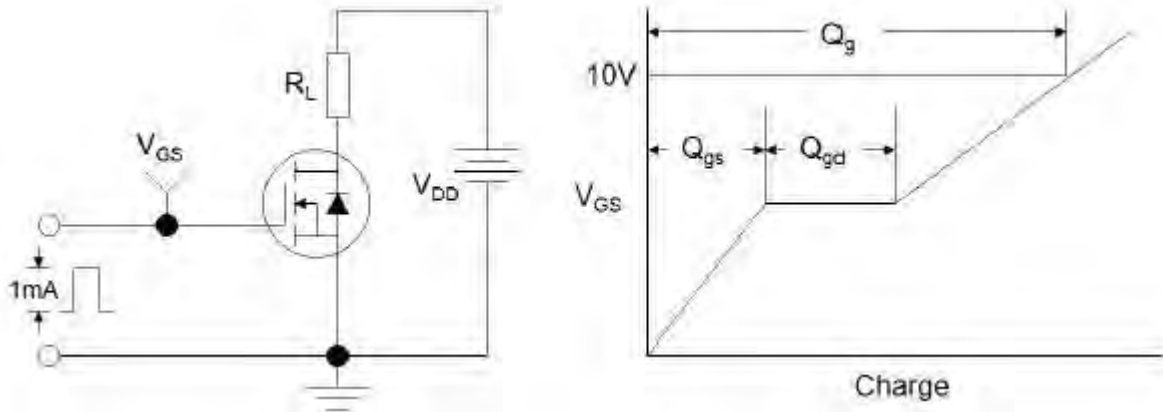


Figure1:Gate Charge Test Circuit & Waveform

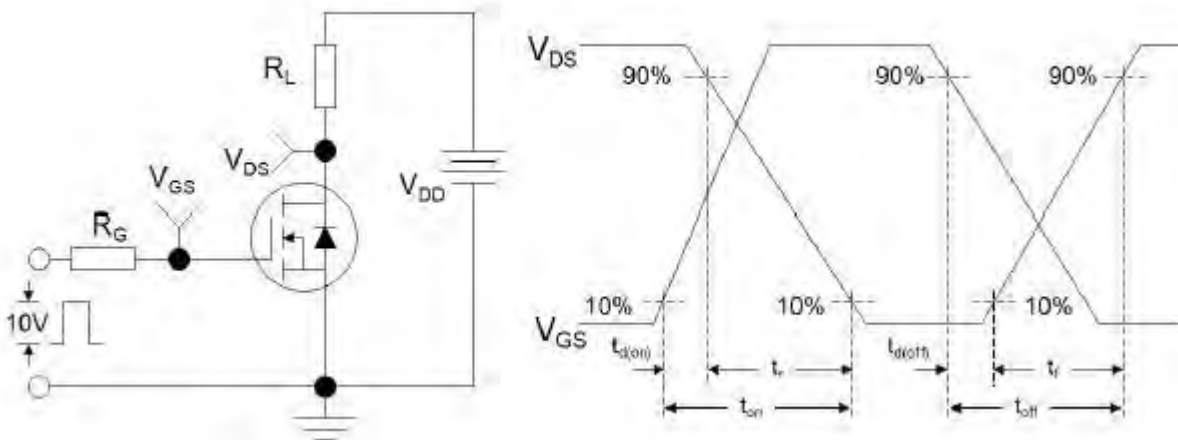


Figure 2: Resistive Switching Test Circuit & Waveforms

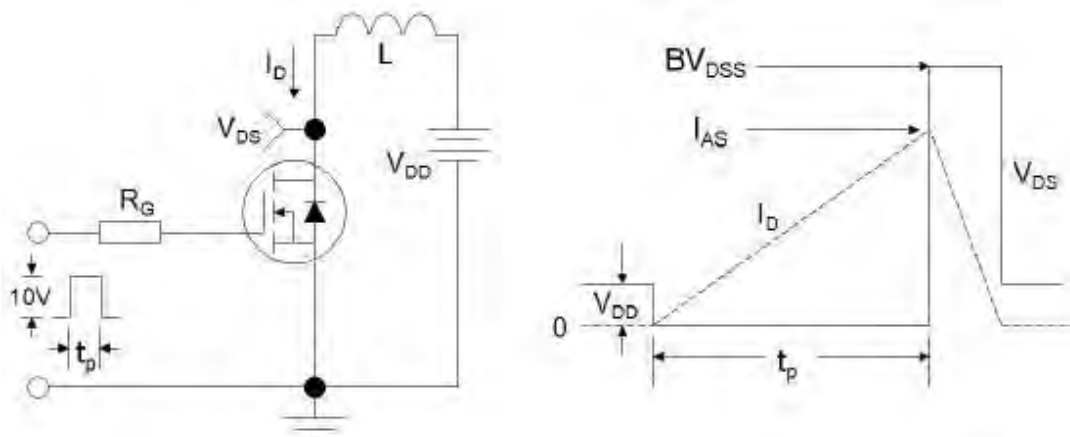
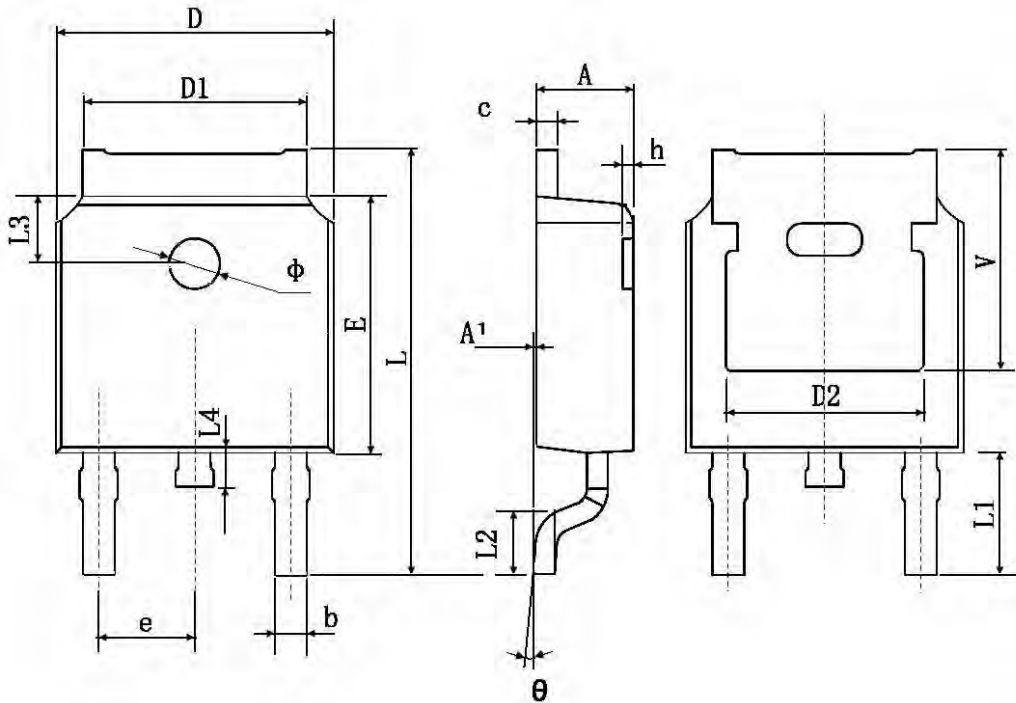


Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms



TO-252 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	0.483 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	



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