

## Complementary PowerTrench Half-Bridge MOSFET

## KDS4501H

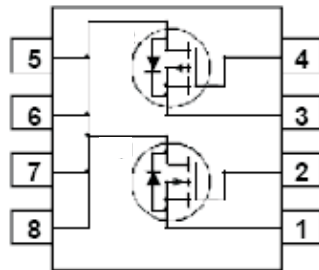
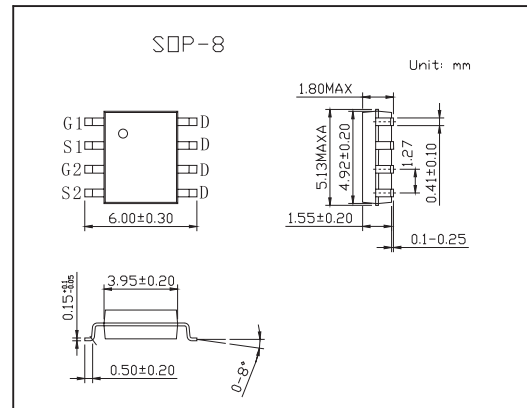
## ■ Features

## ● N-Channel

9.3 A, 30 V  $R_{DS(ON)} = 18\text{m}\Omega$  @  $V_{GS} = 10\text{V}$   
 $R_{DS(ON)} = 23\text{m}\Omega$  @  $V_{GS} = 4.5\text{V}$

## ● P-Channel

-5.6 A, -20 V  $R_{DS(ON)} = 46\text{m}\Omega$  @  $V_{GS} = -4.5\text{V}$   
 $R_{DS(ON)} = 63\text{m}\Omega$  @  $V_{GS} = -2.5\text{V}$

■ Absolute Maximum Ratings  $T_a = 25^\circ\text{C}$ 

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain to Source Voltage	$V_{DS}$	30	-20	V
Gate to Source Voltage	$V_{GS}$	$\pm 20$	$\pm 8$	V
Drain Current Continuous (Note 1a)	$I_D$	9.3	-5.6	A
Drain Current Pulsed		20	-20	A
Power Dissipation for Single Operation (Note 1a)	$P_D$	2.5		W
(Note 1b)		1.2		
(Note 1c)		1		
Operating and Storage Temperature	$T_J, T_{STG}$	-55 to 150		$^\circ\text{C}$
Thermal Resistance Junction to Ambient (Note 1a)	$R_{\theta JA}$	50		$^\circ\text{C/W}$
Thermal Resistance Junction to Case (Note 1)	$R_{\theta JC}$	25		$^\circ\text{C/W}$

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## ■ Electrical Characteristics Ta = 25°C

Parameter	Symbol	Testconditons	Min	Typ	Max	Unit	
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	N-Ch	30		V	
		V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	P-Ch	-20			
Breakdown Voltage Temperature Coefficient	$\frac{\Delta BV_{DSS}}{\Delta T_J}$	I <sub>D</sub> = 250 μA, Referenced to 25°C	N-Ch		24	mV/°C	
		I <sub>D</sub> = -250 μA, Referenced to 25°C	P-Ch		-13		
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 24V, V <sub>GS</sub> = 0 V	N-Ch		1	μA	
		V <sub>DS</sub> = -16 V, V <sub>GS</sub> = 0 V	P-Ch		-1		
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0 V	N-Ch		±100	nA	
		V <sub>GS</sub> = ±8 V, V <sub>DS</sub> = 0 V	P-Ch		±100		
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	N-Ch	1	1.6	3	V
		V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA	P-Ch	-0.4	-0.7	-1.5	
Gate Threshold Voltage Temperature Coefficient	$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	I <sub>D</sub> = 250 μA, Referenced to 25°C	N-Ch		-4	mV/°C	
		I <sub>D</sub> = -250 μA, Referenced to 25°C	P-Ch		3		
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 9.3A	N-Ch		14	18	mΩ
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 9.3 A, T <sub>J</sub> = 125°C			21	29	
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 7.6 A			17	23	
Static Drain-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -5.6 A	P-Ch		36	46	
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -5.6 A, T <sub>J</sub> = 125°C			49	80	
		V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -5.0A			47	63	
On-State Drain Current	I <sub>D(on)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 5V	N-Ch	20		A	
		V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -5V	P-Ch	-20			
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 5V, I <sub>D</sub> = 9.3A	N-Ch		28	S	
		V <sub>DS</sub> = 5V, I <sub>D</sub> = -5.6A	P-Ch		16		
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz	N-Ch		1958	pF	
			P-Ch		1312		
Output Capacitance	C <sub>oss</sub>		N-Ch		424	pF	
			P-Ch		240		
Reverse Transfer Capacitance	C <sub>rss</sub>		N-Ch		182	pF	
			P-Ch		106		
Turn-On Delay Time	t <sub>d(on)</sub>	N-Channel V <sub>DD</sub> = 15 V, I <sub>D</sub> = 1 A,	N-Ch		15	27	ns
			P-Ch		15	27	
Turn-On Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 6 Ω (Note 2)	N-Ch		5	10	ns
			P-Ch		15	27	
Turn-Off Delay Time	t <sub>d(off)</sub>	P-Channel V <sub>DD</sub> = -10 V, I <sub>D</sub> = -1 A,	N-Ch		38	61	ns
			P-Ch		40	64	
Turn-Off Fall Time	t <sub>f</sub>	V <sub>GS</sub> = -4.5 V, R <sub>GEN</sub> = 6 Ω (Note 2)	N-Ch		10	20	ns
			P-Ch		25	40	
Total Gate Charge	Q <sub>g</sub>	N-Channel V <sub>DS</sub> = 15V, I <sub>D</sub> = 9.3A, V <sub>GS</sub> = 4.5V (Note 2)	N-Ch		17	27	nC
			P-Ch		13	21	
Gate-Source Charge	Q <sub>gs</sub>	P-Channel	N-Ch		4	nC	
			P-Ch		2.5		
Gate-Drain Charge	Q <sub>gd</sub>	V <sub>DS</sub> = -15V, I <sub>D</sub> = -2.4A, V <sub>GS</sub> = -4.5V (Note 2)	N-Ch		5	nC	
			P-Ch		2.0		

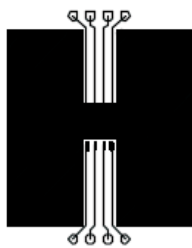
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## ■ Electrical Characteristics Ta = 25°C

Parameter	Symbol	Testconditons	Min	Typ	Max	Unit
Maximum Continuous Drain-Source Diode Forward Current	Is	N-Ch			2.1	A
		P-Ch			-2.1	
Drain-Source Diode Forward Voltage	VSD	VGS = 0 V, Is = 2.1A (Not 2)			1.2	V
		VGS = 0 V, Is = -2.1A (Not 2)			-1.2	

## Notes:

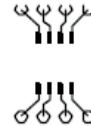
- $R_{\theta JA}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a) 50°C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b) 105°C/W when mounted on a 0.04 in<sup>2</sup> pad of 2 oz copper



c) 125°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

- Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%