60V Complementary PowerTrench MOSFET

KDS4559

■ Features

● N-Channel

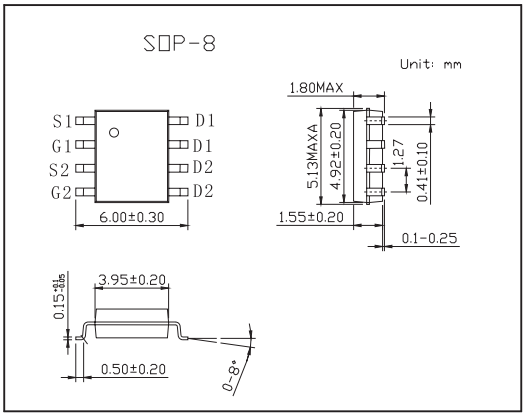
4.5 A, 60 V $R_{DS(ON)}$ = 55mΩ @ V_{GS} = 10 V

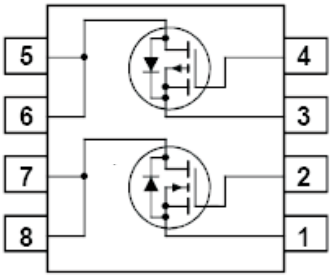
$R_{DS(ON)}$ = 75mΩ @ V_{GS} =4.5V

● P-Channel

-3.5 A, -60 V $R_{DS(ON)}$ = 105 mΩ @ VGS =- 10 V

$R_{DS(ON)}$ = 135 mΩ @ V_{GS} =-4.5V





■ Absolute Maximum Ratings Ta = 25℃

Parameter	Symbol	N-Channel	P- Channel	Unit
Drain to Source Voltage	V_{DSS}	60	-60	V
Gate to Source Voltage	V_{GS}	±20	±20	V
Drain Current Continuous (Note 1a)	I_D	4.5	-3.5	A
Drain Current Pulsed		20	-20	A
Power Dissipation for Single Operation	P_D	2		W
Power Dissipation for Single Operation (Note 1a)	P_D	1.6		W
(Note 1b)		1.2		
(Note 1c)		1		
Operating and Storage Temperature	T_J, T_{STG}	-55 to 175		℃
Thermal Resistance Junction to Ambient (Note 1a)	$R_{\theta JA}$	78		℃/W
Thermal Resistance Junction to Case (Note 1)	$R_{\theta JC}$	40		℃/W

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■ Electrical Characteristics Ta = 25℃

Parameter	Symbol	Testconditons		Min	Typ	Max	Unit
Single Pulse Drain-Source Avalanche Energy	W_{DSS}	V_{DD} = 30 V, I_D = 4.5 A	N-Ch			90	mJ
Maximum Drain-Source Avalanche Current	I_{AR}		N-Ch			4.5	A
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} = 0 V, I_D = 250 μA	N-Ch	60			V
		V_{GS} = 0 V, I_D = -250 μA	P-Ch	-60			
Breakdown Voltage Temperature Coefficient	$\frac{\Delta BV_{DSS}}{\Delta T_J}$	I_D = 250 μA, Referenced to 25℃	N-Ch		58		mV/℃
		I_D = -250 μA, Referenced to 25℃	P-Ch		-49		
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 48V, V_{GS} = 0 V	N-Ch			1	μA
		V_{DS} = -48 V, V_{GS} = 0 V	P-Ch			-1	
Gate-Body Leakage	I_{GSS}	V_{GS} = ±20V, V_{DS} = 0 V	N-Ch			±100	nA
		V_{GS} = ±20 V, V_{DS} = 0 V	P-Ch			±100	
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250 μA	N-Ch	1	2.2	3	V
		V_{DS} = V_{GS}, I_D = -250 μA	P-Ch	-1	-1.6	-3	
Gate Threshold Voltage Temperature Coefficient	$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	I_D = 250 μA, Referenced to 25℃	N-Ch		-5.5		mV/℃
		I_D = -250 μA, Referenced to 25℃	P-Ch		4		
Static Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D =4.5A	N-Ch		42	55	mΩ
		V_{GS} = 10 V, I_D = 4.5 A,T_J = 125℃			72	94	
		V_{GS} = 4.5 V, I_D =4 A			55	75	
Static Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = -10 V, I_D =-3.5 A	P-Ch		82	105	
		V_{GS} = -10 V, I_D =-3.5 A,TJ = 125℃			130	190	
		V_{GS} = -4.5 V, I_D =-3.1A			105	135	
On-State Drain Current	$I_{D(on)}$	V_{GS} = 10 V, V_{DS} = 5V	N-Ch	20			A
		V_{GS} = -10 V, V_{DS} = -5V	P-Ch	-20			
Forward Transconductance	g_{FS}	V_{DS} = 10V, I_D = 4.5A	N-Ch		14		S
		V_{DS} = -5V, I_D = -3.5A	P-Ch		9		
Input Capacitance	C_{iss}	N-Channel	N-Ch		650		pF
		V_{DS} = 25 V, V_{GS} = 0 V,f = 1.0 MHz	P-Ch		759		
Output Capacitance	C_{oss}		N-Ch		80		pF
		P-Channel	P-Ch		90		
Reverse Transfer Capacitance	C_{rss}	V_{DS} = -30 V, V_{GS} = 0 V,f = 1.0 MHz	N-Ch		35		pF
			P-Ch		39		
Turn-On Delay Time	$t_{d(on)}$	N-Channel	N-Ch		11	20	ns
		V_{DD} = 30 V, I_D = 1 A,	P-Ch		7	14	
Turn-On Rise Time	tr	V_{GS} = 10 V, R_{GEN} = 6 Ω (Note 2)	N-Ch		8	18	ns
			P-Ch		10	20	
Turn-Off Delay Time	$t_{d(off)}$	P-Channel	N-Ch		19	35	ns
		V_{DD} = -30 V, I_D = -1 A,	P-Ch		19	34	
Turn-Off Fall Time	t_f	V_{GS} = -10 V, R_{GEN} = 6 Ω (Note 2)	N-Ch		6	15	ns
			P-Ch		12	22	
Total Gate Charge	Q_g	N-Channel	N-Ch		12.5	18	nC
		V_{DS} =30V,I_D=4.5A,V_{GS}=10V	P-Ch		15	21	
Gate-Source Charge	Q_{gs}	(Note 2)	N-Ch		2.4		nC
		P-Channel	P-Ch		2.5		
Gate-Drain Charge	Q_{gd}	V_{DS}=-30V,I_D=-3.5A,V_{GS}=-10V	N-Ch		2.6		nC
		(Note 2)	P-Ch		3.0		

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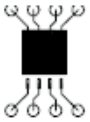
Parameter	Symbol	Testconditons		Min	Typ	Max	Unit
Maximum Continuous Drain-Source Diode Forward Current	Is		N-Ch			1.3	A
			P-Ch			-1.3	
Drain-Source Diode Forward Voltage	VSD	VGS = 0 V, Is = 1.3A (Not 2)	N-Ch		0.8	1.2	V
		VGS = 0 V, Is = -1.3A (Not 2)	P-Ch		-0.8	-1.2	

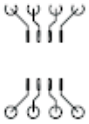
Notes:

1. $R_{\theta JA}$ 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) 78°C/W when mounted on a 0.5 in^2 pad of 2 oz copper



b) 125°C/W when mounted on a .02 in^2 pad of 2 oz copper



c) 135°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

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