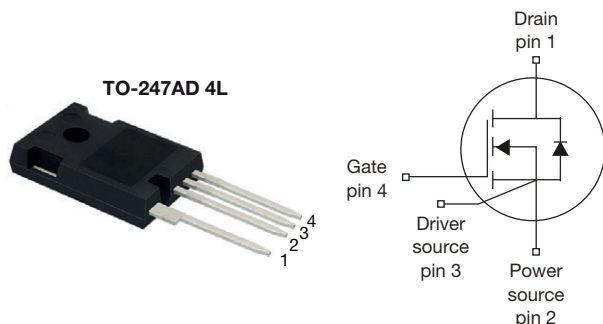


SF Series Power MOSFET With Fast Body Diode



RoHS
COMPLIANT
HALOGEN
FREE

FEATURES

- Latest generation SF series technology
- Low figure of merit (FOM) $R_{DS(on)} \times Q_g$
- Low effective capacitance ($C_{o(er)}$)
- Reduced switching and conduction losses
- Avalanche energy rated (UIS)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
 - High-intensity discharge (HID)
 - Fluorescent ballast lighting
- Industrial
 - Welding
 - Induction heating
 - Motor drives
 - Battery chargers
 - Solar (PV inverters)

PRODUCT SUMMARY

V_{DS} (V) at T_J max.	700	
$R_{DS(on)}$ typ. (Ω) at 25 °C	$V_{GS} = 10$ V	0.045
Q_g max. (nC)	212	
Q_{gs} (nC)	46	
Q_{gd} (nC)	58	
Configuration	Single	

ORDERING INFORMATION

Package	TO-247AD 4L
Lead (Pb)-free and halogen-free	SiHL050N65SF-GE3

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-source voltage			V_{DS}	650	V
Gate-source voltage			V_{GS}	± 20	
Continuous drain current ($T_J = 150\text{ }^{\circ}\text{C}$)	V_{GS} at 10 V	$T_C = 25\text{ }^{\circ}\text{C}$	I_D	64	A
		$T_C = 100\text{ }^{\circ}\text{C}$		40	
Pulsed drain current ^a			I_{DM}	176	
Linear derating factor				4.17	W/°C
Single pulse avalanche energy ^b			E_{AS}	793	mJ
Maximum power dissipation			P_D	520	W
Operating junction and storage temperature range			T_J, T_{stg}	-55 to +150	°C
Drain-source voltage slope		$T_J = 125\text{ }^{\circ}\text{C}$	dv/dt	100	V/ns
Reverse diode dv/dt ^d				100	

Notes

- Repetitive rating; pulse width limited by maximum junction temperature
- $V_{DD} = 120$ V, starting $T_J = 25$ °C, $L = 28.2$ mH, $R_g = 25$ Ω , $I_{AS} = 7.5$ A
- 1.6 mm from case
- $I_{SD} \leq I_D$, di/dt = 850 A/ μ s, starting $T_J = 25$ °C

**THERMAL RESISTANCE RATINGS**

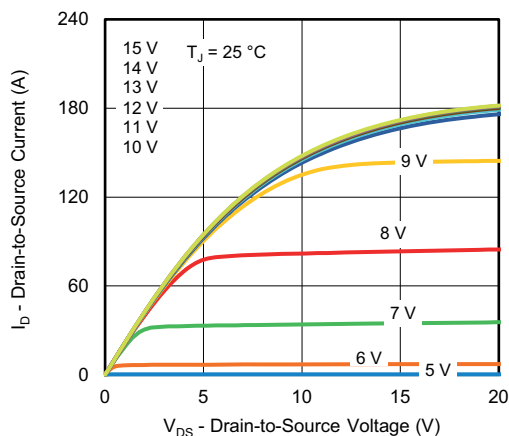
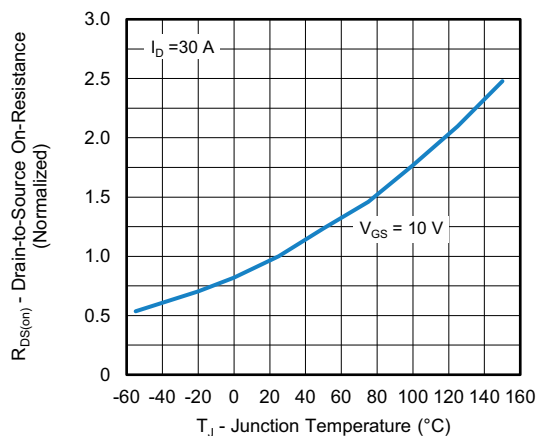
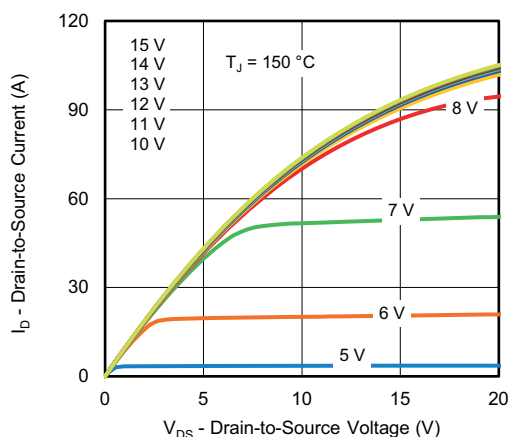
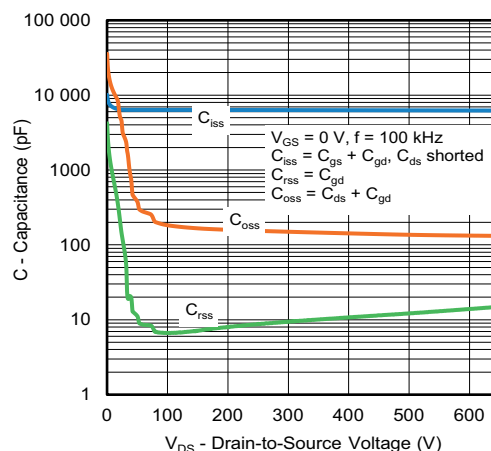
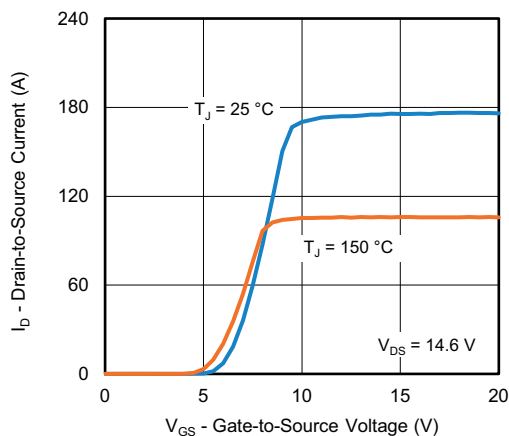
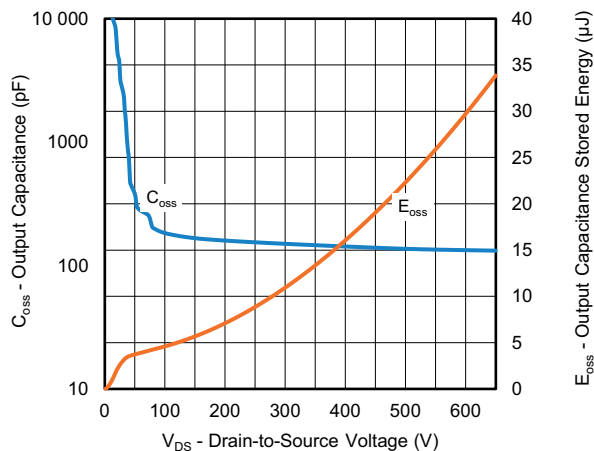
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	40	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	0.24	

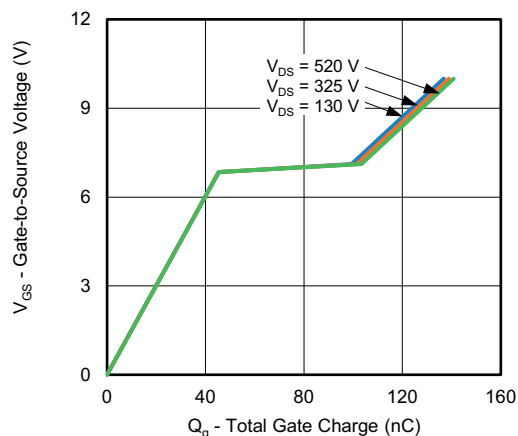
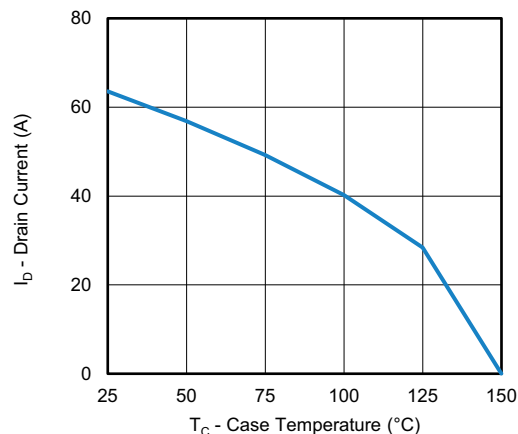
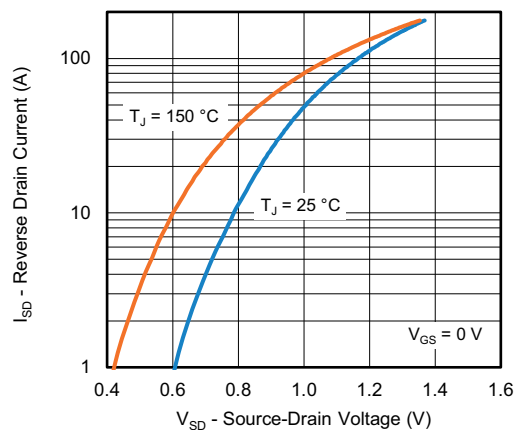
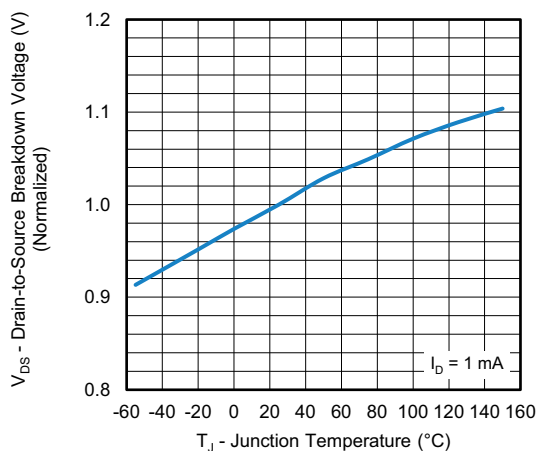
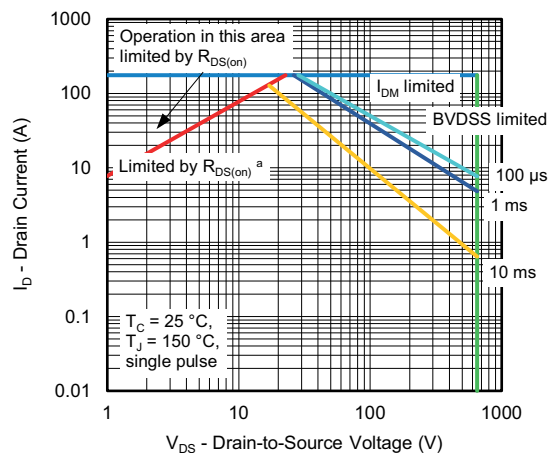
SPECIFICATIONS ($T_J = 25\text{ °C}$, unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$		650	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}$, $I_D = 1\text{ mA}$		-	0.63	-	V/ $^\circ\text{C}$
Gate-source threshold voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$		3.0	-	5.0	V
Gate-source leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 650\text{ V}$, $V_{GS} = 0\text{ V}$		-	-	1	μA
		$V_{DS} = 520\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$		-	-	2	mA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}$	-	0.045	0.052	Ω
Forward transconductance ^a	g_{fs}	$V_{DS} = 20\text{ V}$, $I_D = 30\text{ A}$		-	26	-	S
Dynamic							
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 100\text{ V}$, $f = 100\text{ KHz}$		-	6369	-	pF
Output capacitance	C_{oss}			-	184	-	
Reverse transfer capacitance	C_{rss}			-	7	-	
Effective output capacitance, energy related ^a	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 400\text{ V}$, $V_{GS} = 0\text{ V}$		-	201	-	
Effective output capacitance, time related ^b	$C_{o(tr)}$			-	944	-	
Total gate charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 30\text{ A}$, $V_{DS} = 520\text{ V}$	-	141	212	nC
Gate-source charge	Q_{gs}			-	46	-	
Gate-drain charge	Q_{gd}			-	67	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 520\text{ V}$, $I_D = 34\text{ A}$, $V_{GS} = 10\text{ V}$, $R_g = 10.1\text{ }\Omega$		-	62	93	ns
Rise time	t_r			-	81	120	
Turn-off delay time	$t_{d(off)}$			-	149	224	
Fall time	t_f			-	38	76	
Gate input resistance	R_g	$f = 1\text{ MHz}$, open drain		1.0	2.0	4.0	Ω
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	64	A
Pulsed diode forward current	I_{SM}			-	-	176	
Diode forward voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}$, $I_S = 30\text{ A}$, $V_{GS} = 0\text{ V}$		-	-	1.4	V
Reverse recovery time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}$, $I_F = I_S = 30\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_R = 400\text{ V}$		-	134	268	ns
Reverse recovery charge	Q_{rr}			-	0.6	1.2	μC
Reverse recovery current	I_{RRM}			-	9	-	A

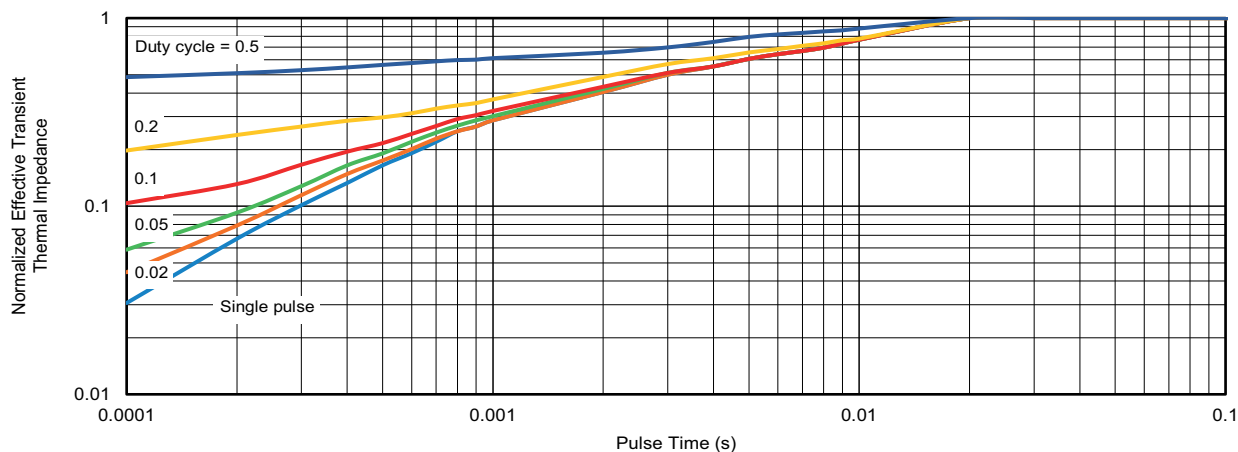
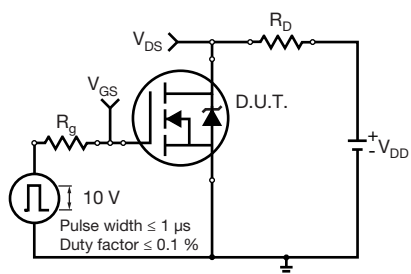
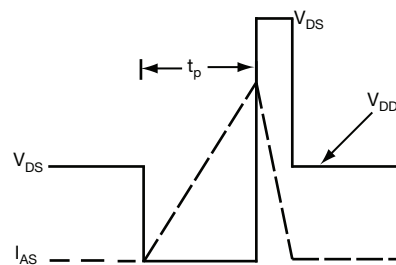
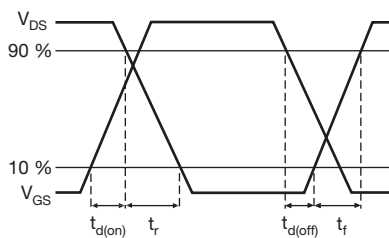
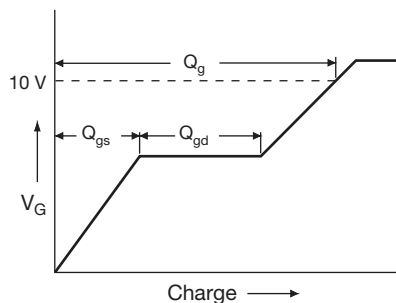
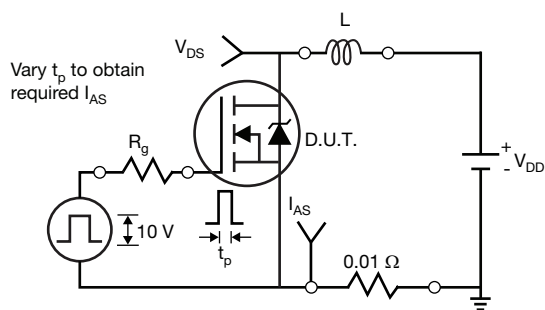
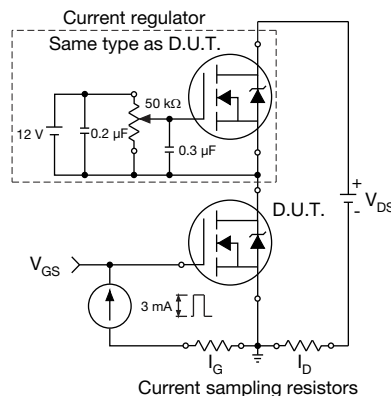
Notes

- a. $C_{oss(er)}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 V to 400 V
b. $C_{oss(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 V to 400 V

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Fig. 1 - Typical Output Characteristics

Fig. 4 - Normalized On-Resistance vs. Temperature

Fig. 2 - Typical Output Characteristics

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

Fig. 3 - Typical Transfer Characteristics

Fig. 6 - C_{oss} and E_{oss} vs. V_{DS}


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

Fig. 10 - Maximum Drain Current vs. Case Temperature

Fig. 8 - Typical Source-Drain Diode Forward Voltage

Fig. 11 - Temperature vs. Drain-to-Source Voltage

Fig. 9 - Maximum Safe Operating Area
Note

a. $V_{GS} >$ minimum V_{GS} at which $R_{DS(on)}$ is specified


Fig. 12 - Normalized Transient Thermal Impedance, Junction-to-Case

Fig. 13 - Switching Time Test Circuit

Fig. 16 - Unclamped Inductive Waveforms

Fig. 14 - Switching Time Waveforms

Fig. 17 - Basic Gate Charge Waveform

Fig. 15 - Unclamped Inductive Test Circuit

Fig. 18 - Gate Charge Test Circuit

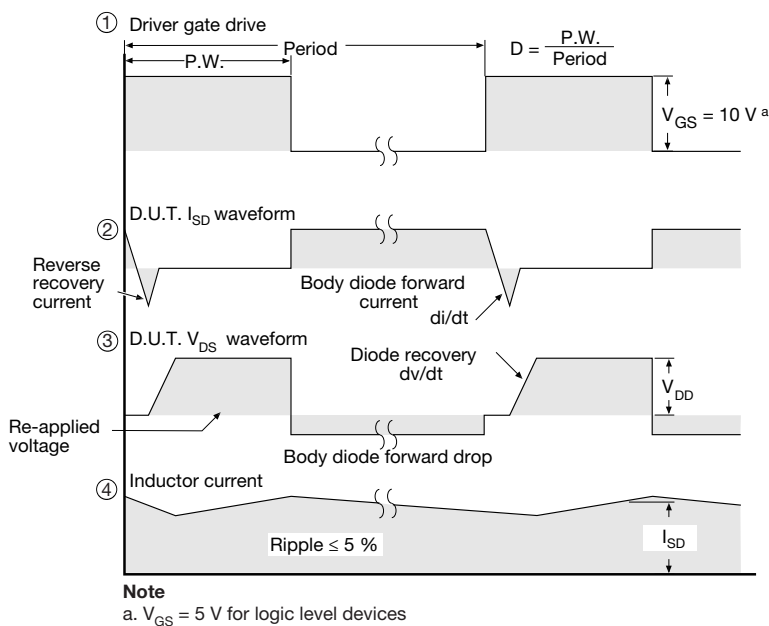


Fig. 19 - For N-Channel

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