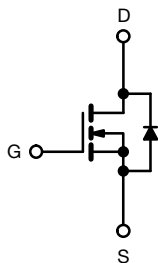
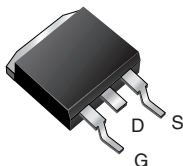


Power MOSFET

SMD-220


N-Channel MOSFET

FEATURES

- Surface-mount
- Available in tape and reel
- Dynamic dV/dt rating
- Repetitive avalanche rated
- Fast switching
- Ease of paralleling
- Simple drive requirements
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS*
Available
HALOGEN
FREE
Available

Note

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

DESCRIPTION

Third generation power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The D²PAK (TO-263) is a surface-mount power package capable of accommodating die size up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D²PAK (TO-263) is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0 W in a typical surface mount application.

PRODUCT SUMMARY

V _{DS} (V)	400	
R _{DS(on)} (Ω)	V _{GS} = 10 V	1.0
Q _g max. (nC)	38	
Q _{gs} (nC)	5.7	
Q _{gd} (nC)	22	
Configuration	Single	

ORDERING INFORMATION

Package	D ² PAK (TO-263)	D ² PAK (TO-263)	D ² PAK (TO-263)
Lead (Pb)-free and Halogen-free	SiHF730S-GE3	SiHF730STRL-GE3 ^a	SiHF730STRR-GE3 ^a
Lead (Pb)-free	IRF730SPbF	IRF730STRLPbF ^a	IRF730STRRPbF

Note

a. See device orientation

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

PARAMETER	SYMBOL	LIMIT	UNIT
Drain-Source Voltage	V _{DS}	400	V
Gate-Source Voltage	V _{GS}	± 20	
Continuous Drain Current	V _{GS} at 10 V	T _C = 25 °C	A
		T _C = 100 °C	
Pulsed Drain Current ^a	I _{DM}	22	
Linear Derating Factor		0.59	W/°C
Linear Derating Factor (PCB mount) ^e		0.025	
Single Pulse Avalanche Energy ^b	E _{AS}	290	mJ
Avalanche Current ^a	I _{AR}	5.5	A
Repetitive Avalanche Energy ^a	E _{AR}	7.4	mJ
Maximum Power Dissipation	P _D	T _C = 25 °C	W
Maximum Power Dissipation (PCB mount) ^e		T _A = 25 °C	
Peak Diode Recovery dV/dt ^c	dV/dt	4.0	V/ns
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-55 to +150	°C
Soldering Recommendations (Peak temperature) ^d	For 10 s	300	

Notes

- Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- V_{DD} = 50 V, starting T_J = 25 °C, L = 16 mH, R_g = 25 Ω, I_{AS} = 5.5 A (see fig. 12)
- I_{SD} ≤ 5.5 A, dI/dt ≤ 90 A/μs, V_{DD} ≤ V_{DS}, T_J ≤ 150 °C
- 1.6 mm from case
- When mounted on 1" square PCB (FR-4 or G-10 material)

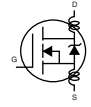
**THERMAL RESISTANCE RATINGS**

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum Junction-to-Ambient	R_{thJA}	-	62	°C/W
Maximum Junction-to-Ambient (PCB mount) ^a	R_{thJA}	-	40	
Maximum Junction-to-Case (Drain)	R_{thJC}	-	1.7	

Note

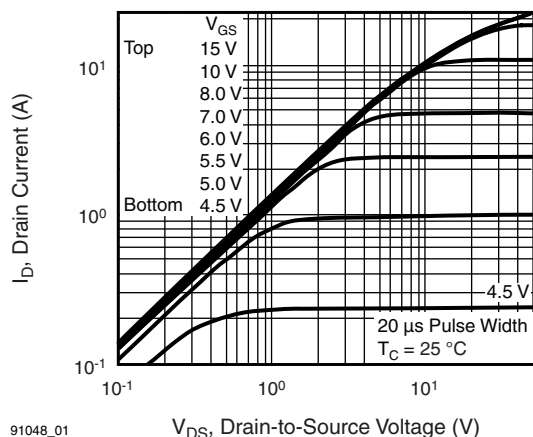
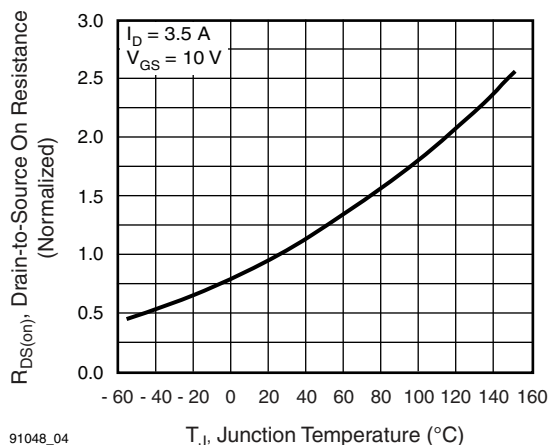
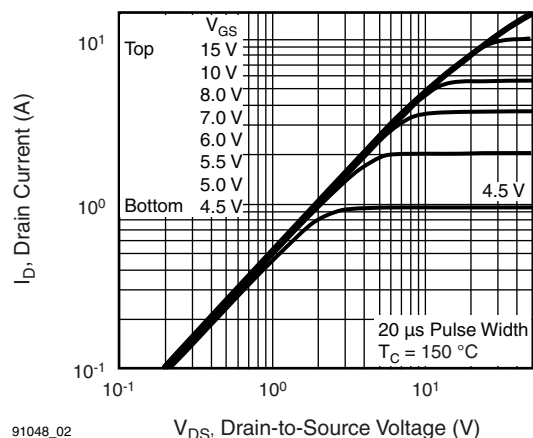
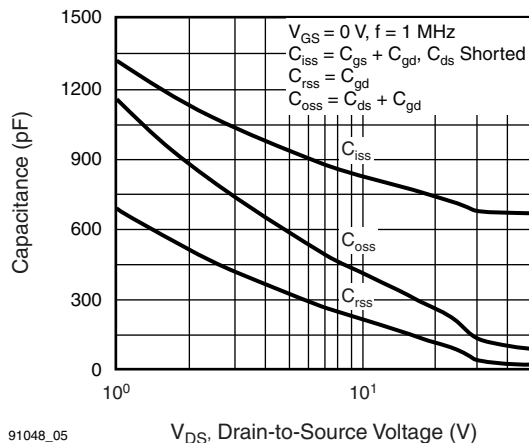
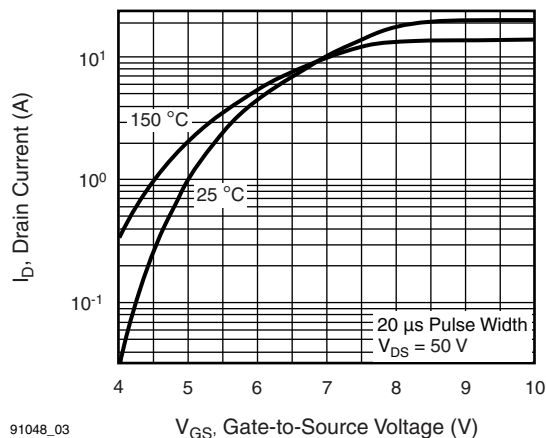
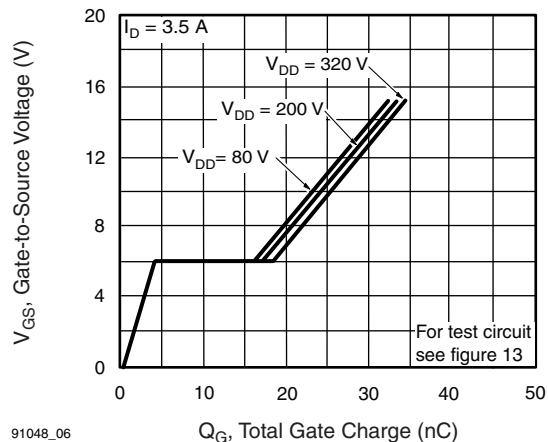
a. When mounted on 1" square PCB (FR-4 or G-10 material)

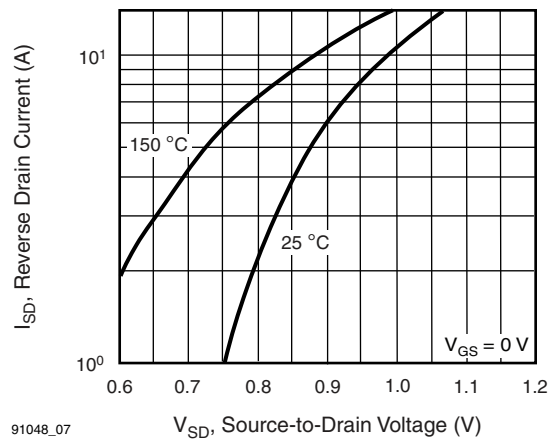
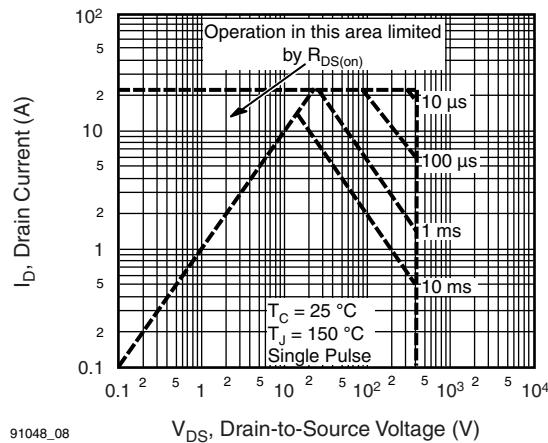
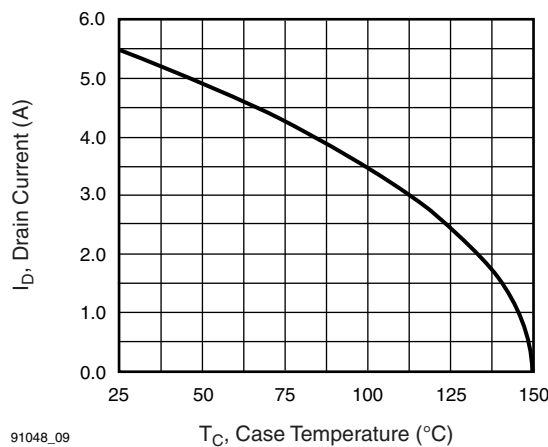
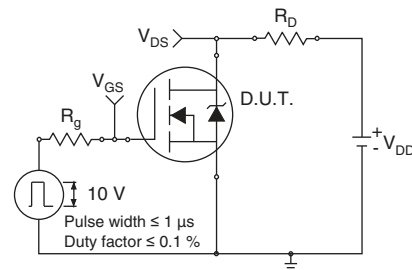
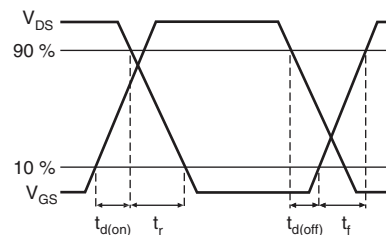
SPECIFICATIONS ($T_J = 25\text{ °C}$, unless otherwise noted)

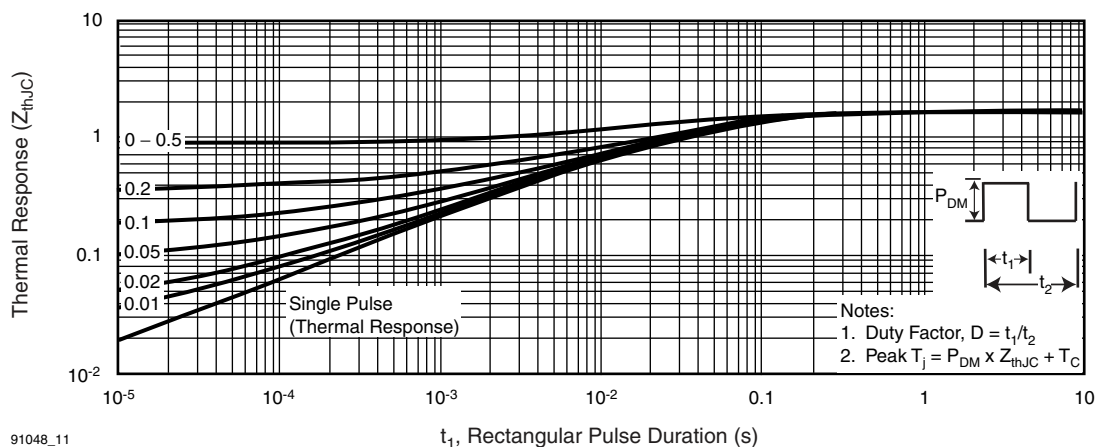
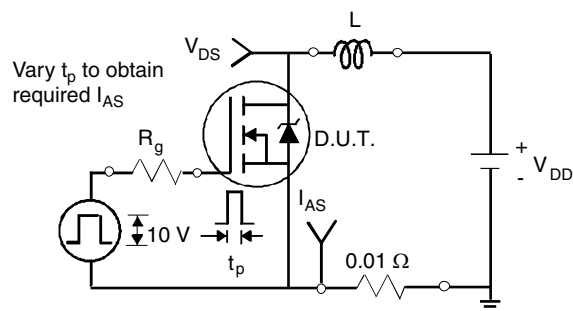
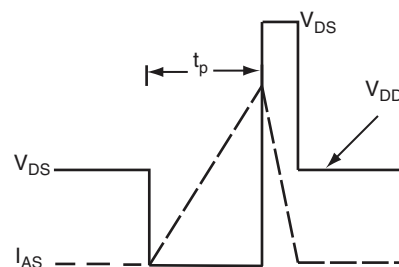
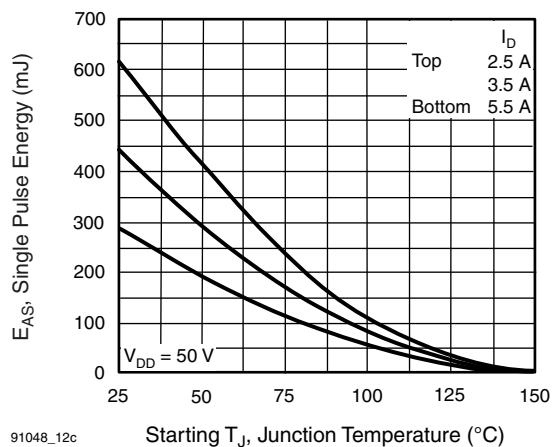
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-Source Breakdown Voltage	V_{DS}	$V_{GS} = 0, I_D = 250\text{ }\mu\text{A}$		400	-	-	V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^{\circ}\text{C}, I_D = 1\text{ mA}$		-	0.54	-	V/ $^{\circ}\text{C}$
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		2.0	-	4.0	V
Gate-Source Leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}$		-	-	25	μA
		$V_{DS} = 320\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^{\circ}\text{C}$		-	-	250	
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 3.3\text{ A}^b$	-	-	1.0	Ω
Forward Transconductance	g_{fs}	$V_{DS} = 50\text{ V}, I_D = 3.3\text{ A}^b$		2.9	-	-	S
Dynamic							
Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V},$ $V_{DS} = 25\text{ V},$ $f = 1.0\text{ MHz},$ see fig. 5		-	700	-	pF
Output Capacitance	C_{oss}			-	170	-	
Reverse Transfer Capacitance	C_{rss}			-	64	-	
Total Gate Charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 3.5\text{ A}, V_{DS} = 320\text{ V},$ see fig. 6 and 13 ^b	-	-	38	nC
Gate-Source Charge	Q_{gs}			-	-	5.7	
Gate-Drain Charge	Q_{gd}			-	-	22	
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 200\text{ V}, I_D = 3.5\text{ A},$ $R_g = 12\text{ }\Omega, R_D = 57\text{ }\Omega,$ see fig. 10 ^b		-	10	-	ns
Rise Time	t_r			-	15	-	
Turn-Off Delay Time	$t_{d(off)}$			-	38	-	
Fall Time	t_f			-	14	-	
Gate Input Resistance	R_g	$f = 1\text{ MHz},$ open drain		0.6	-	2.3	Ω
Internal Drain Inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact 		-	4.5	-	nH
Internal Source Inductance	L_S			-	7.5	-	
Drain-Source Body Diode Characteristics							
Continuous Source-Drain Diode Current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	5.5	A
Pulsed Diode Forward Current ^a	I_{SM}			-	-	22	
Body Diode Voltage	V_{SD}	$T_J = 25\text{ }^{\circ}\text{C}, I_S = 5.5\text{ A}, V_{GS} = 0\text{ V}^b$		-	-	1.6	V
Body Diode Reverse Recovery Time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}, I_F = 3.5\text{ A}, dI/dt = 100\text{ A}/\mu\text{s}^b$		-	270	530	ns
Body Diode Reverse Recovery Charge	Q_{rr}			-	1.8	2.2	μC
Forward Turn-On Time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

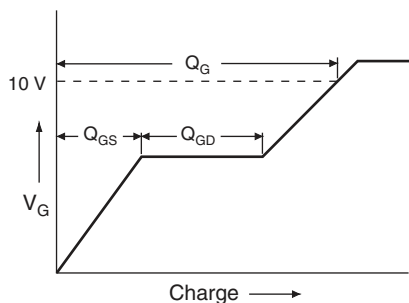
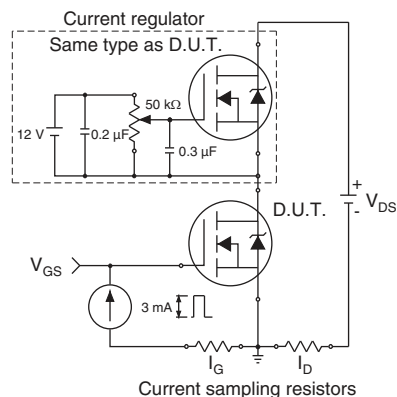
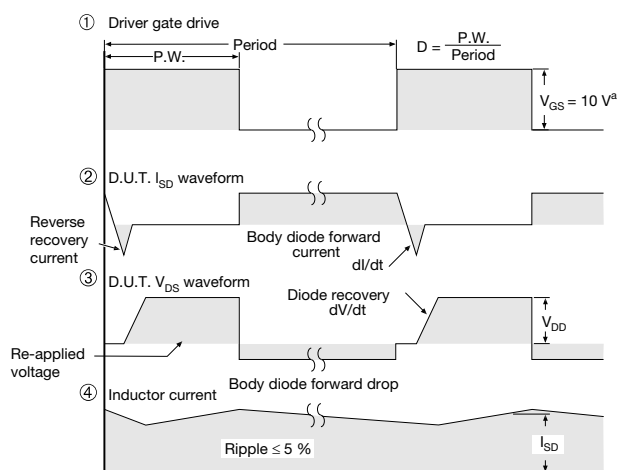
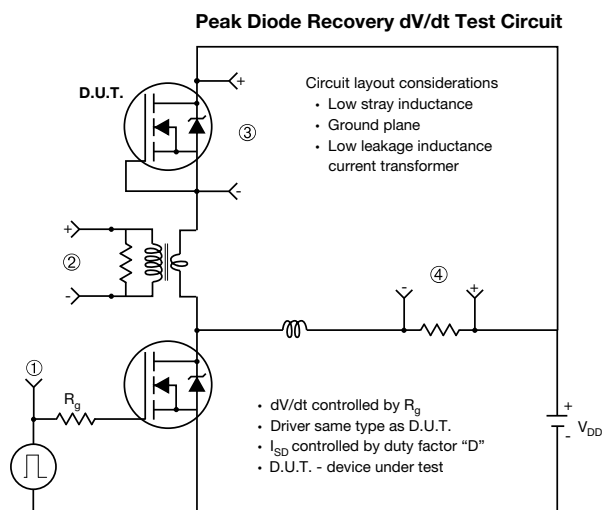
Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
b. Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$

Fig. 4 - Normalized On-Resistance vs. Temperature

Fig. 2 - Typical Output Characteristics, $T_C = 150^\circ\text{C}$

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

Fig. 3 - Typical Transfer Characteristics

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


Fig. 7 - Typical Source-Drain Diode Forward 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


Note
a. $V_{GS} = 5\text{ V}$ for logic level devices

Fig. 14 - For N-Channel

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	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	-	1.65	-	0.066
L2	-	1.78	-	0.070
L3	0.25 BSC		0.010 BSC	
L4	4.78	5.28	0.188	0.208

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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