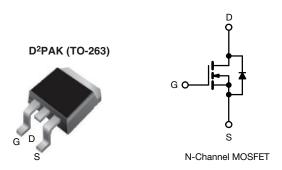
Vishay Siliconix

Power MOSFET

PRODUCT SUMMARY					
V _{DS} (V)	60				
$R_{DS(on)}(\Omega)$	V _{GS} = 10 V 0.10				
Q _g max. (nC)	25				
Q _{gs} (nC)	5.8				
Q _{gd} (nC)	11				
Configuration	Single				



FEATURES

- Advanced process technology
- Surface mount (IRFZ24S, SiHFZ24S)
- 175 °C operating temperature
- · Fast switching
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



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 utilize advanced processing techniques to achieve extremely low on-resistance per silicon area. This benefit, combined with the fast switching speed and ruggedized device design that power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in a wide variety of applications.

The D²PAK is a surface mount power package capable of accommodating die size up to HEX-4. It provides the highest power capability and the last lowest possible on-resistance in any existing surface mount package. The D²PAK 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.

ORDERING INFORMATION					
Package	D ² PAK (TO-263)	D ² PAK (TO-263)			
Lead (Pb)-free and Halogen-free	SiHFZ24S-GE3	SiHFZ24STRR-GE3			
Lead (Pb)-free	IRFZ24SPbF	IRFZ24STRRPbF			
	-	IRFZ24STRLPbF			

Note

a. See device orientation.

ABSOLUTE MAXIMUM RATINGS (T _C = 25 °C, unless otherwise noted)						
PARAMETER			SYMBOL	LIMIT	UNIT	
Drain-Source Voltage			V_{DS}	60	V	
Gate-Source Voltage			V_{GS}	± 20	V	
Continuous Drain Current	V at 10 V	$T_{\rm C} = 25 ^{\circ}{\rm C}$ $T_{\rm C} = 100 ^{\circ}{\rm C}$	1	17		
Continuous Drain Current	V _{GS} at 10 V	T _C = 100 °C		12	Α	
Pulsed Drain Current a, e			I _{DM}	68	1	
Linear Derating Factor				0.40	W/°C	
Single Pulse Avalanche Energy b, e			E _{AS}	100	mJ	
T _C = 25 °C		25 °C	P _D	60	W	
Maximum Power Dissipation	T _A =	T _A = 25 °C		3.7		
Peak Diode Recovery dV/dt c, e			dV/dt	4.5	V/ns	
Operating Junction and Storage Temperature Range			T _J , T _{stg}	-55 to +175	%0	
Soldering Recommendations (Peak temperature) d for 10 s				300	°C	

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b. V_{DD} = 25 V, starting T_J = 25 °C, L = 400 μ H, R_g = 25 Ω , I_{AS} = 17 A (see fig. 12).
- c. $I_{SD} \leq$ 17 A, $dI/dt \leq$ 140 A/µs, $V_{DD} \leq V_{DS}$, $T_{J} \leq$ 175 °C.
- d. 1.6 mm from case.
- e. Uses IRFZ24, SiHFZ24 data and test conditions.



Vishay Siliconix

THERMAL RESISTANCE RATINGS							
PARAMETER SYMBOL TYP. MAX. UNIT							
Maximum Junction-to-Ambient (PCB mounted, steady-state) ^a	R _{thJA}	-	40	°C/W			
Maximum Junction-to-Case (Drain)	R _{thJC}	-	2.5				

Note

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

PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static					•		
Drain-Source Breakdown Voltage	V _{DS}	V _{GS}	= 0, I _D = 250 μA	60	-	-	V
V _{DS} Temperature Coefficient	$\Delta V_{DS}/T_{J}$	Reference	e to 25 °C, I _D = 1 mA ^c	-	0.061	-	V/°C
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} =	= V _{GS} , I _D = 250 μA	2.0	-	4.0	V
Gate-Source Leakage	I _{GSS}		V _{GS} = ± 20 V	-	-	± 100	nA
Zero Gate Voltage Drain Current	I	V _{DS}	= 60 V, V _{GS} = 0 V	-	-	25	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 48 \text{ V}$, V _{GS} = 0 V, T _J = 150 °C	-	-	250	μA
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 10 A ^b	-	-	0.10	Ω
Forward Transconductance	9 _{fs}	V _{DS} =	= 25 V, I _D = 10 A ^d	5.5	-	-	S
Dynamic							
Input Capacitance	C _{iss}		$V_{GS} = 0 V$,	-	640	-	
Output Capacitance	C _{oss}		$V_{DS} = 25 \text{ V},$		360	-	pF
Reverse Transfer Capacitance	C _{rss}	f = 1.0 MHz, see fig. 5 d		-	79	-	
Total Gate Charge	Qg			-	-	25	
Gate-Source Charge	Q _{gs}	$V_{GS} = 10 \text{ V}$ $I_D = 17 \text{ A}, V_{DS} = 48 \text{ V},$ see fig. 6 and 13 b, c		-	-	5.8	nC
Gate-Drain Charge	Q_{gd}			-	-	11	
Turn-On Delay Time	t _{d(on)}			-	13	-	
Rise Time	t _r	V_{DD}	= 30 V, I _D = 17 A,	-	58	-]
Turn-Off Delay Time	t _{d(off)}	$R_g = 18 \Omega$, $R_D = 1.7 \Omega$, see fig. 10 b, c Between lead, and center of die contact		-	25	-	ns
Fall Time	t _f			-	42	-	
Internal Source Inductance	L _S			-	7.5	-	nΗ
Drain-Source Body Diode Characteristic	s						
Continuous Source-Drain Diode Current	I _S	MOSFET symbol showing the integral reverse p - n junction diode		-	-	17	
Pulsed Diode Forward Current ^a	I _{SM}			-	-	68	A
Body Diode Voltage	V_{SD}	T _J = 25 °C, I _S = 17 A, V _{GS} = 0 V b		-	-	1.5	V
Body Diode Reverse Recovery Time	t _{rr}	$T_J = 25 \text{ °C}, I_F = 17 \text{ A, dl/dt} = 100 \text{ A/µs}^{\text{b, c}}$		-	88	180	ns
Body Diode Reverse Recovery Charge	Q _{rr}			-	0.29	0.64	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_C			L _D)		

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11).
- b. Pulse width ≤ 300 µs; duty cycle ≤ 2 %.
 c. Uses IRFZ24/SiHFZ24 data and test conditions.



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

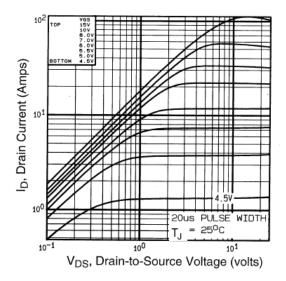


Fig. 1 - Typical Output Characteristics, T_C = 25 °C

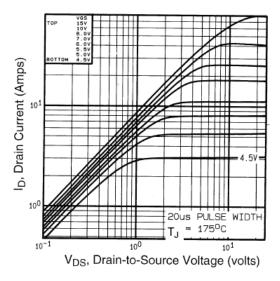


Fig. 2 - Typical Output Characteristics, T_C = 175 °C

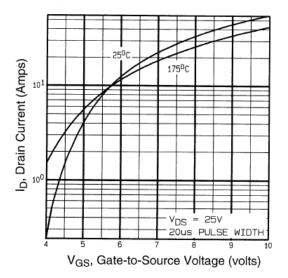


Fig. 3 - Typical Transfer Characteristics

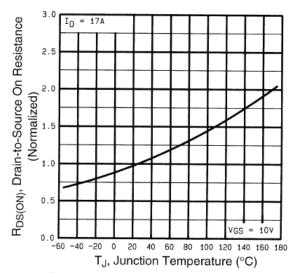


Fig. 4 - Normalized On-Resistance vs. Temperature



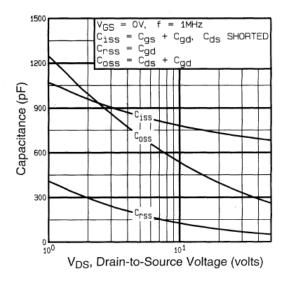


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

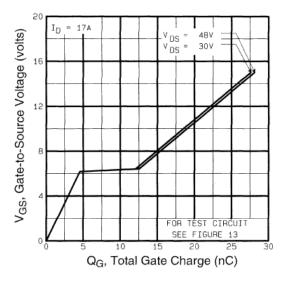


Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage

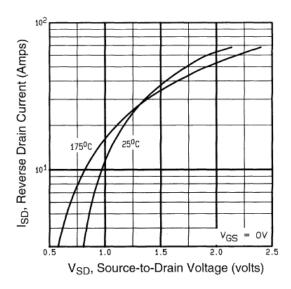


Fig. 7 - Typical Source-Drain Diode Forward Voltage

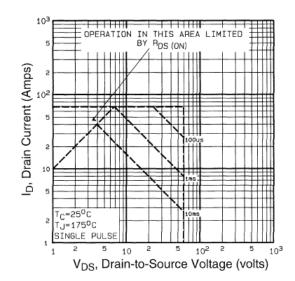


Fig. 8 - Maximum Safe Operating Area



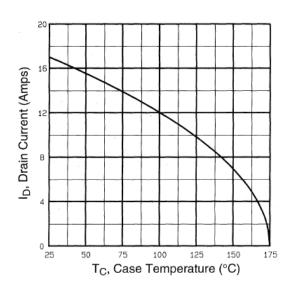


Fig. 9 - Maximum Drain Current vs. Case Temperature

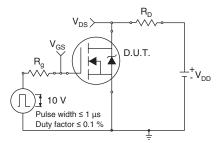


Fig. 10a - Switching Time Test Circuit

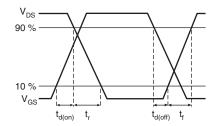


Fig. 10b - Switching Time Waveforms

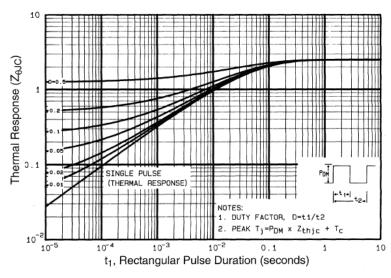


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case

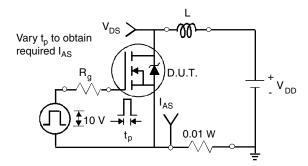


Fig. 12a - Unclamped Inductive Test Circuit

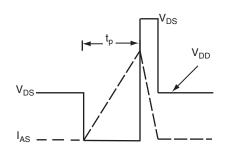


Fig. 12b - Unclamped Inductive Waveforms

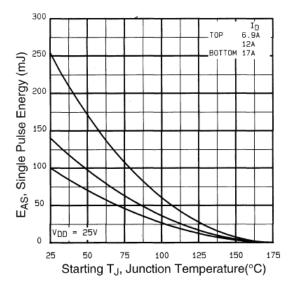


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

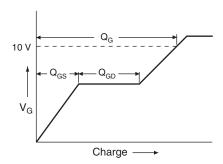


Fig. 13a - Basic Gate Charge Waveform

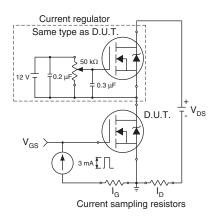
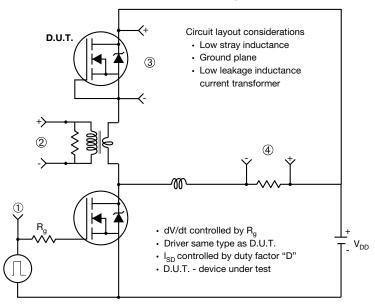


Fig. 13b - Gate Charge Test Circuit



Peak Diode Recovery dV/dt Test Circuit



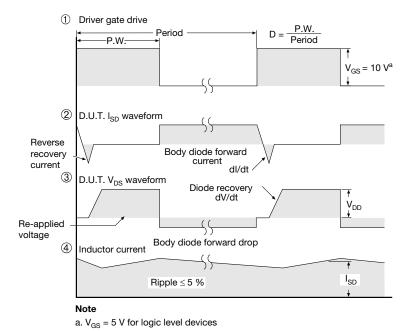


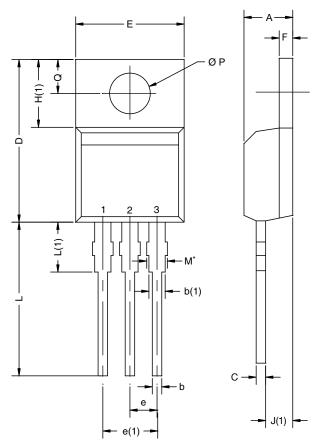
Fig. 14 - For N-Channel

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TO-220AB



		D2

	MILLIN	IETERS	INCHES		
DIM.	MIN.	MAX.	MIN.	MAX.	
А	4.25	4.65	0.167	0.183	
b	0.69	1.01	0.027	0.040	
b(1)	1.20	1.73	0.047	0.068	
С	0.36	0.61	0.014	0.024	
D	14.85	15.49	0.585	0.610	
D2	12.19	12.70	0.480	0.500	
Е	10.04	10.51	0.395	0.414	
е	2.41	2.67	0.095	0.105	
e(1)	4.88	5.28	0.192	0.208	
F	1.14	1.40	0.045	0.055	
H(1)	6.09	6.48	0.240	0.255	
J(1)	2.41	2.92	0.095	0.115	
L	13.35	14.02	0.526	0.552	
L(1)	3.32	3.82	0.131	0.150	
ØΡ	3.54	3.94	0.139	0.155	
Q	2.60	3.00	0.102	0.118	
ECN: T14-0413-Rev. P, 16-Jun-14 DWG: 5471					

Note

 * M = 1.32 mm to 1.62 mm (dimension including protrusion) Heatsink hole for HVM



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