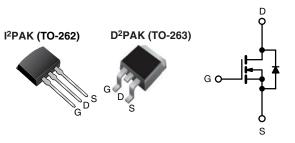
www.vishay.com

Vishay Siliconix

Power MOSFET



N-Channel MOSFET

PRODUCT SUMMARY					
V _{DS} (V)	60				
R _{DS(on)} (Ω)	V _{GS} = 10 V	0.028			
Q _g (Max.) (nC)	67				
Q _{gs} (nC)	18				
Q _{gd} (nC)	25				
Configuration	Single				

FEATURES

- · Advanced process technology
- Surface-mount (IRFZ44S, SiHFZ44S)
- Low-profile through-hole (IRFZ44L, SiHFZ44L)
- 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 extermely 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 extermely efficient reliabel deviece for use in a wide variety of applications.

The D²PAK is a surface-mount power package capable of accommodating die sizes up to HEX-4. It provides the highest power capability and 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.

The through-hole version (IRFZ44L, SiHFZ44L) is available for low profile applications.

ORDERING INFORMATION						
Package	D ² PAK (TO-263)	D ² PAK (TO-263)	D ² PAK (TO-263)	I ² PAK (TO-262)		
Lead (Pb)-free and Halogen-free	SiHFZ44S-GE3	SiHFZ44STRR-GE3 ^a	SiHFZ44STRL-GE3a	SIHFZ44L-GE3		
Lead (Pb)-free	IRFZ44SPbF	=	IRFZ44STRLPbFa	IRFZ44LPbF		

Note

a. See device orientation

ABSOLUTE MAXIMUM RATINGS	$G(T_C = 25 \degree C)$	C, unle	ss otherwis	se noted)		
PARAMETER				SYMBOL	LIMIT	UNIT
Drain-Source Vol	tage ^f			V_{DS}	60	V
Gate-Source Volt	tage ^f			V _{GS}	± 20	7 °
Continuous Drain Current ^e	V _{GS} at	10.1/	T _C = 25 °C	I-	50	
Continuous Drain Current	VGS at	10 4	T _C = 100 °C	I _D	36	Α
Pulsed Drain Current ^{a, e}				I _{DM}	200	
Linear Derating Factor					1.0	W/°C
Single Pulse Avalanch	e Energy ^b			E _{AS}	100	mJ
Maximum Power Dissipation $ T_A = 25 ^{\circ}\text{C} $ $ T_C = 25 ^{\circ}\text{C} $		5 °C		3.7	W	
				P_{D}	150	
Peak Diode Recovery dV/dt ^{c, f}			dV/dt	4.5	V/ns	
Operating Junction and Storage Temperature Range			T _J , T _{stq}	- 55 to + 175	°C	
Soldering Recommendations (Peak Temperati	ure ^d)	for 1	0 s		300	7

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 = 44 μ H, R_g = 25 Ω , I_{AS} = 51 A (see fig. 12)
- c. $I_{SD} \le 51$ A, $dI/dt \le 250$ A/ μ s, $V_{DD} \le V_{DS}$, $T_J \le 175$ °C
- d. 1.6 mm from case
- e. Calculated continuous current based on maximum allowable junction temperature
- f. Uses IRFZ44, SiHFZ44 data and test conditions

IRFZ44S, IRFZ44L, SiHFZ44S, SiHFZ44L

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	R _{thJC}	-	1.0			

Note

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

PARAMETER	SYMBOL	TES	MIN.	TYP.	MAX.	UNIT	
Static							
Drain-Source Breakdown Voltage	V _{DS}	$V_{GS} = 0$, $I_D = 250 \mu A$		60	-	-	V
V _{DS} Temperature Coefficient	$\Delta V_{DS}/T_{J}$	Reference	e to 25 °C, I _D = 1 mA	-	0.06	-	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		V _{DS} :	= 60 V, V _{GS} = 0 V	-	-	25	
zero date voltage brain current	I _{DSS}	$V_{DS} = 48 V_{s}$	V _{GS} = 0 V, T _J = 150 °C	-	-	250	μA
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} = 10 V	I _D = 31 A ^b	-	-	0.028	Ω
Forward Transconductance	9 _{fs}	V _{DS} =	= 25 V, I _D = 31 A ^b	15	-	-	S
Dynamic							
Input Capacitance	C _{iss}	V _{GS} = 0 V,		-	1900	-	
Output Capacitance	Coss		$V_{DS} = 25 \text{ V},$	-	920	-	pF
Reverse Transfer Capacitance	C _{rss}	f = 1.0 MHz, see fig. 5 ^d		-	170	-	
Total Gate Charge	Q_g			-	-	67	nC
Gate-Source Charge	Q _{gs}	V _{GS} = 10 V	$V_{GS} = 10 \text{ V}$ $I_D = 51 \text{ A}, V_{DS} = 48 \text{ V},$ see fig. 6 and 13 ^b		-	18	
Gate-Drain Charge	Q_{gd}	1		-	-	25	
Turn-On Delay Time	t _{d(on)}	V _{DD} = 30 V, I _D = 51 A,		-	14	-	
Rise Time	t _r			-	110	-	
Turn-Off Delay Time	t _{d(off)}	$R_g = 9$	see fig. 10^{b} s.1 Ω , R_{D} = 0,55 Ω ,	-	45	-	ns
Fall Time	t _f			-	92	-	1
Internal Source Inductance	L _S	Between lead	, and center of die contact	-	7.5	-	nΗ
Drain-Source Body Diode Characteristic	s						
Continuous Source-Drain Diode Current	I _S	showing	MOSFET symbol showing the		i	50 ^d	A
Pulsed Diode Forward Current ^a	I _{SM}	integral reverse p - n junction diode		-	_	200	
Body Diode Voltage	V_{SD}	T _J = 25 °C	S_{s} , $I_{S} = 51 \text{ A}$, $V_{GS} = 0 \text{ V}^{b}$	-	-	2.5	V
Body Diode Reverse Recovery Time	t _{rr}	T 25 °C !-	- 51 A dl/dt - 100 A/ucb. d	-	120	180	ns
Body Diode Reverse Recovery Charge	Q _{rr}	$T_J = 25 ^{\circ}\text{C}, I_F = 51 \text{A}, dI/dt = 100 \text{A/}\mu\text{s}^{\text{b}, d}$		-	530	800	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L _S and L				12)	

Notes

- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
- b. Pulse width $\leq 300~\mu s;$ duty cycle $\leq 2~\%$
- c. Uses IRFZ44, SiHFZ44 data and test conditions
- d. Calculated continuous current based on maximum allowable junction temperature

www.vishay.com

Vishay Siliconix

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

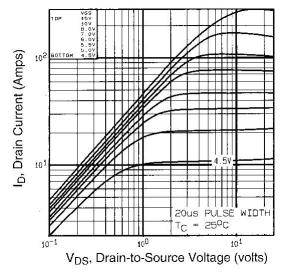


Fig. 1 - Typical Output Characteristics

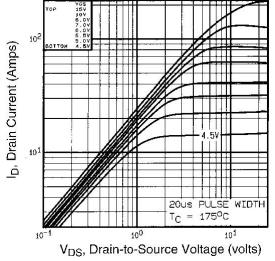


Fig. 1 - Typical Output Characteristics

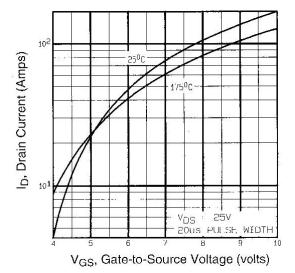


Fig. 2 - Typical Transfer Characteristics

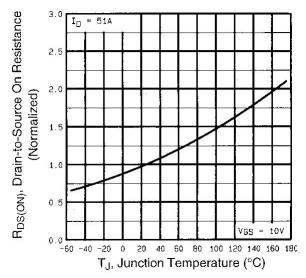


Fig. 3 - Normalized On-Resistance vs. Temperature

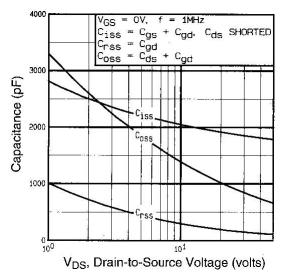


Fig. 4 - Typical Capacitance vs. Drain-to-Source Voltage

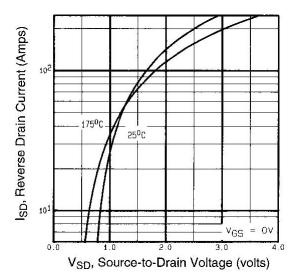


Fig. 6 - Typical Source-Drain Diode Forward Voltage

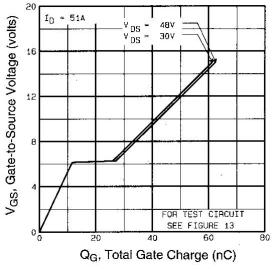


Fig. 5 - Typical Gate Charge vs. Gate-to-Source Voltage

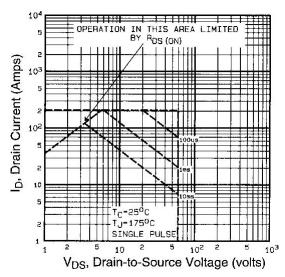


Fig. 7 - Maximum Safe Operating Area

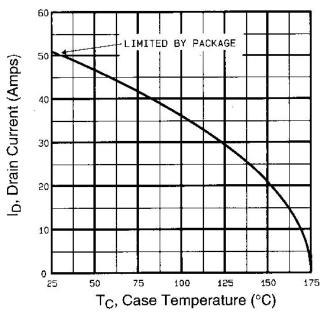


Fig. 8 - Maximum Drain Current vs. Case Temperature

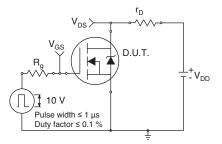


Fig. 2a - Switching Time Test Circuit

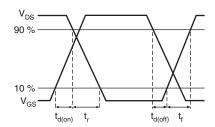


Fig. 10b - Switching Time Waveforms

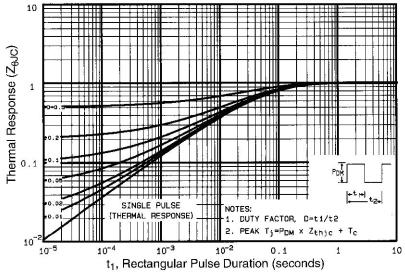
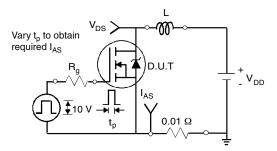
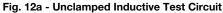


Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case





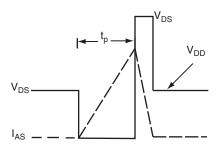


Fig. 12b - Unclamped Inductive Waveforms

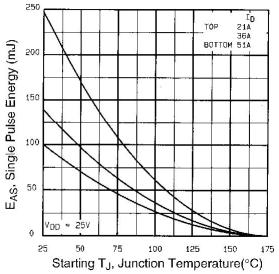


Fig. 12c - Maximum Avalanche Energy vs. Drain Current

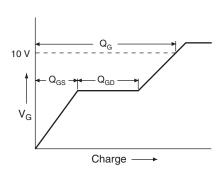


Fig. 13a - Basic Gate Charge Waveform

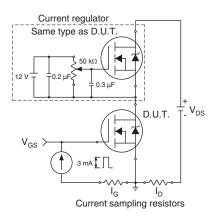
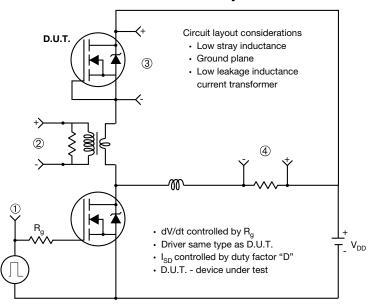


Fig. 13b - Gate Charge Test Circuit

Peak Diode Recovery dV/dt Test Circuit



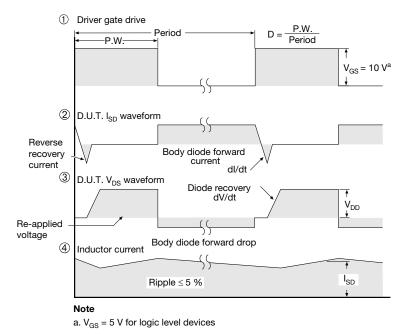


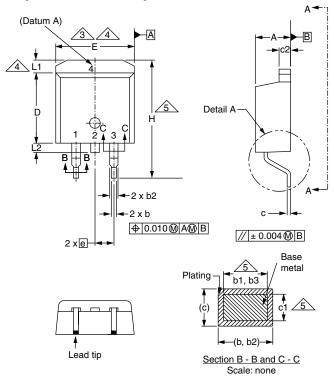
Fig. 14 - For N-Channel

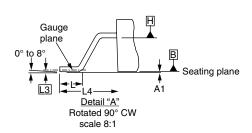
Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?91293.





TO-263AB (HIGH VOLTAGE)







	MILLIN	METERS	INC	HES
DIM.	MIN.	MAX.	MIN.	MAX.
Α	4.06	4.83	0.160	0.190
A1	0.00	0.25	0.000	0.010
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
С	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065
D	8.38	9.65	0.330	0.380

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

ECN: S-82110-Rev. A, 15-Sep-08

DWG: 5970

Notes

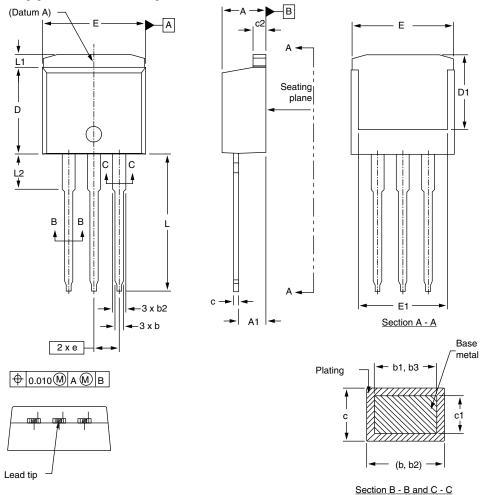
- 1. Dimensioning and tolerancing per ASME Y14.5M-1994.
- 2. Dimensions are shown in millimeters (inches).
- 3. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body at datum A.
- 4. Thermal PAD contour optional within dimension E, L1, D1 and E1.
- 5. Dimension b1 and c1 apply to base metal only.
- 6. Datum A and B to be determined at datum plane H.
- 7. Outline conforms to JEDEC outline to TO-263AB.

Document Number: 91364 www.vishay.com Revision: 15-Sep-08





I²PAK (TO-262) (HIGH VOLTAGE)



	MILLIMETERS		INC	HES
DIM.	MIN.	MAX.	MIN.	MAX.
Α	4.06	4.83	0.160	0.190
A1	2.03	3.02	0.080	0.119
b	0.51	0.99	0.020	0.039
b1	0.51	0.89	0.020	0.035
b2	1.14	1.78	0.045	0.070
b3	1.14	1.73	0.045	0.068
С	0.38	0.74	0.015	0.029
c1	0.38	0.58	0.015	0.023
c2	1.14	1.65	0.045	0.065

	MILLIN	METERS	INC	HES
DIM.	MIN.	MAX.	MIN.	MAX.
D	8.38	9.65	0.330	0.380
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
е	2.54	BSC	0.100 BSC	
L	13.46	14.10	0.530	0.555
L1	-	1.65	-	0.065
L2	3.56	3.71	0.140	0.146

Scale: None

ECN: S-82442-Rev. A, 27-Oct-08 DWG: 5977

- 1. Dimensioning and tolerancing per ASME Y14.5M-1994.
- 2. Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm per side. These dimensions are measured at the outmost extremes of the plastic body.
- 3. Thermal pad contour optional within dimension E, L1, D1, and E1.
- 4. Dimension b1 and c1 apply to base metal only.

Document Number: 91367 Revision: 27-Oct-08





RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads Dimensions in Inches/(mm)

Return to Index



Legal Disclaimer Notice

Vishay

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.