

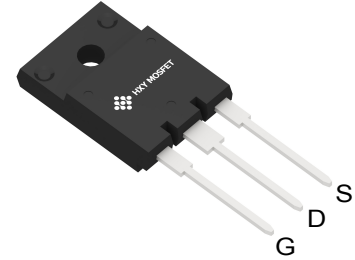


Features

- Low on-resistance
- Fast switching speed
- Long creepage distance
- Simple to drive
- Pb-free lead plating; RoHS compliant

Applications

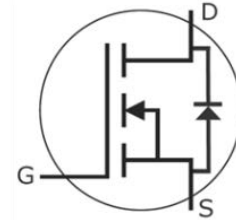
- Auxiliay power supplies
- Switch mode power supplies



TO-3PF



Ordering Part Number	Package	Brand
NDTL03N150CG	TO-3PF	HXY MOSFET



Absolute Maximum Ratings ($T_c = 25^\circ\text{C}$ unless otherwise specified)

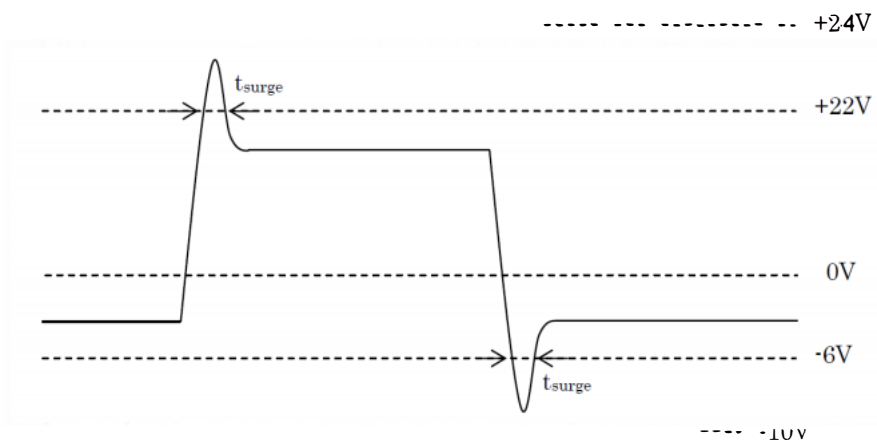
Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	1500	V
Continuous drain current	$T_c = 25^\circ\text{C}$	I_D^{*1}	3.7	A
	$T_c = 100^\circ\text{C}$	I_D^{*1}	2.6	A
Pulsed drain current		$I_{D,pulse}^{*2}$	9.2	A
Gate - Source voltage (DC)		V_{GSS}	-4 to 20	V
Gate - Source surge voltage ($t_{surge} < 300\text{nsec}$)		$V_{GSS,surge}^{*3}$	-10 to 22	V
Power dissipation ($T_c = 25^\circ\text{C}$)		P_D	35	W
Virtual Junction temperature		T_{vj}	175	$^\circ\text{C}$
Range of storage temperature		T_{stg}	-55 to +175	$^\circ\text{C}$



Electrical Characteristics ($T_c=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain-Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=1mA$	1500			V
Zero gate voltage drain current	I_{DSS}	$V_{DS}=1500V, V_{GS}=0V$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$		0.1 0.2	10	μA
Gate-Source leakage current	I_{GSS+}	$V_{GS}=+20V, V_{DS}=0V$			100	nA
Gate- Source leakage current	I_{GSS-}	$V_{GS}=-4V, V_{DS}=0V$			-100	nA
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_o=0.41mA$	1.8	2.8	4.0	V

- *1 Limited by maximum T_{vj} and for Max. R_{thJC}
- *2 $PW \leq 10\mu s$, Duty cycles $\leq 1\%$
- *3 Example of acceptable V_{GS} waveform



- *4 Pulsed



Electrical Characteristics ($T_c=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Static drain - source on - state resistance	$R_{DS(on)}^{*4}$	$V_{GS} = 18\text{V}, I_D = 1.1\text{A}$				Ω
		$T_{vj} = 25^\circ\text{C}$	-	1.15	1.50	
		$T_{vj} = 125^\circ\text{C}$	-	1.71	-	
Gate input resistance	R_G	$f = 1\text{MHz}$, open drain	-	64	-	Ω
Transconductance	g_{fs}^{*4}	$V_{DS} = 10\text{V}, I_D = 1.1\text{A}$	-	0.4	-	S
Input capacitance	C_{iss}	$V_{GS} = 0\text{V}$	-	184	-	pF
Output capacitance	C_{oss}	$V_{DS} = 800\text{V}$	-	16	-	
Reverse transfer capacitance	C_{rss}	$f = 1\text{MHz}$	-	6	-	
Effective output capacitance, energy related	$C_{o(er)}$	$V_{GS} = 0\text{V}$ $V_{DS} = 0\text{V to } 800\text{V}$	-	17	-	pF
Turn - on delay time	$t_{d(on)}^{*4}$	$V_{DD} = 500\text{V}, I_D = 1.1\text{A}$	-	16	-	ns
Rise time	t_r^{*4}	$V_{GS} = 18\text{V}/0\text{V}$	-	21	-	
Turn - off delay time	$t_{d(off)}^{*4}$	$R_L = 455\Omega$	-	35	-	
Fall time	t_f^{*4}	$R_G = 0\Omega$	-	74	-	
Turn - on switching loss	E_{on}^{*4}	$V_{DD} = 800\text{V}, I_D = 1.1\text{A}$ $V_{GS} = 18\text{V}/0\text{V}$ $R_G = 0\Omega, L = 2\text{mH}$	-	57	-	μJ
Turn - off switching loss	E_{off}^{*4}	* E_{on} includes diode reverse recovery	-	32	-	

Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R_{thJC}	-	3.32	4.32	K/W



Gate Charge Characteristics ($T_c=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g^{*4}	$V_{DD} = 500V$	-	14	-	nC
Gate - Source charge	Q_{gs}^{*4}	$I_D = 1A$	-	4	-	
Gate - Drain charge	Q_{gd}^{*4}	$V_{GS} = 18V$	-	5	-	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 500V, I_D = 1A$	-	10.5	-	V

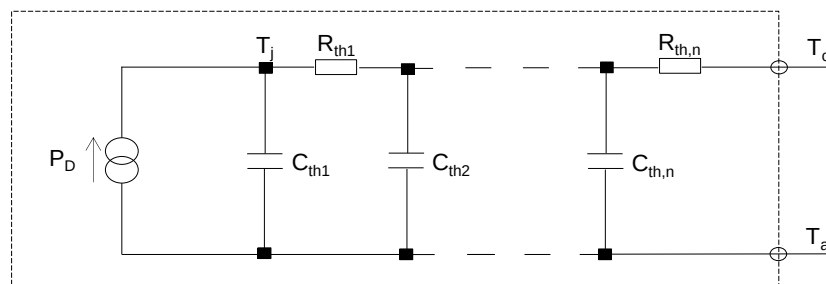
Body diode electrical Characteristics (Source-Drain) ($T_c=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S^{*1}	$T_c = 25^\circ\text{C}$	-	-	3.7	A
Inverse diode direct current, pulsed	I_{SM}^{*2}		-	-	9.2	A
Forward voltage	V_{SD}^{*4}	$V_{GS} = 0V, I_S = 1.1A$	-	4.3	-	V
Reverse recovery time	t_{rr}^{*4}	$I_F = 1.1A, V_R = 800V$ $di/dt = 300A/\mu s$	-	21	-	ns
Reverse recovery charge	Q_{rr}^{*4}		-	13	-	nC
Peak reverse recovery current	I_{rrm}^{*4}		-	1.1	-	A

Typical Transient Thermal Characteristics

Symbol	Value	Unit
R_{th1}	816m	K/W
R_{th2}	1939m	
R_{th3}	567m	

Symbol	Value	Unit
C_{th1}	127 μ	Ws/K
C_{th2}	1.64m	
C_{th3}	64.5m	





Typical Performance

Fig.1 Power Dissipation Derating Curve

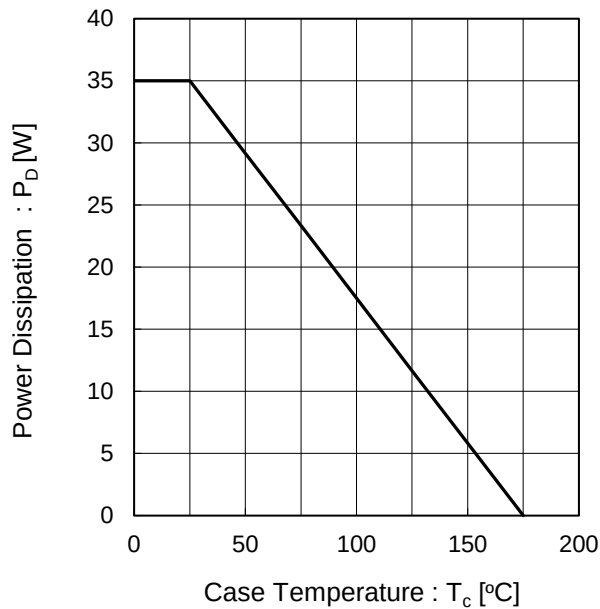


Fig.2 Maximum Safe Operating Area

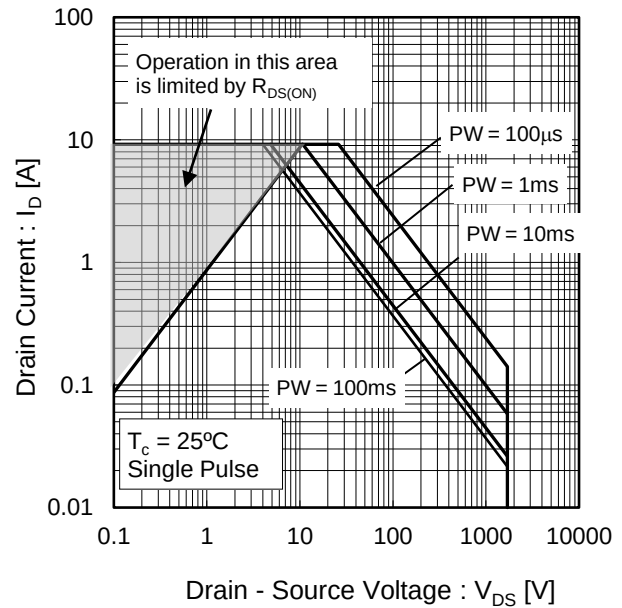
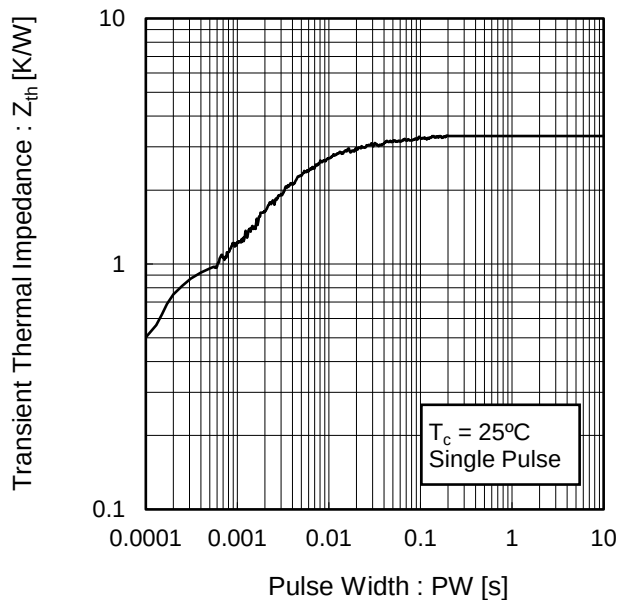


Fig.3 Typical Transient Thermal Impedance vs. Pulse Width





Electrical Characteristic Curves

Fig.4 Typical Output Characteristics(I)

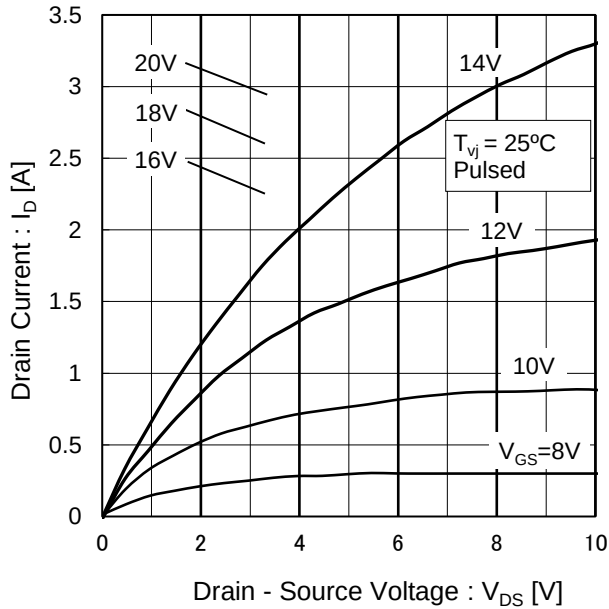


Fig.5 Typical Output Characteristics(II)

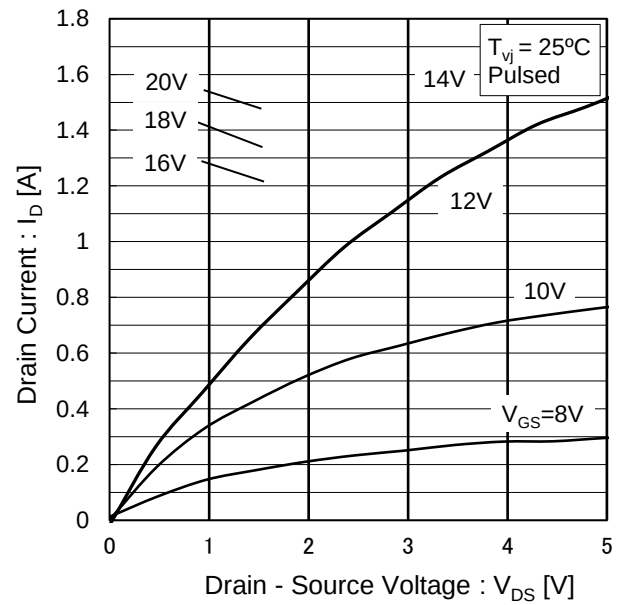


Fig.6 $T_{vj} = 150^\circ\text{C}$ Typical Output Characteristics(I)

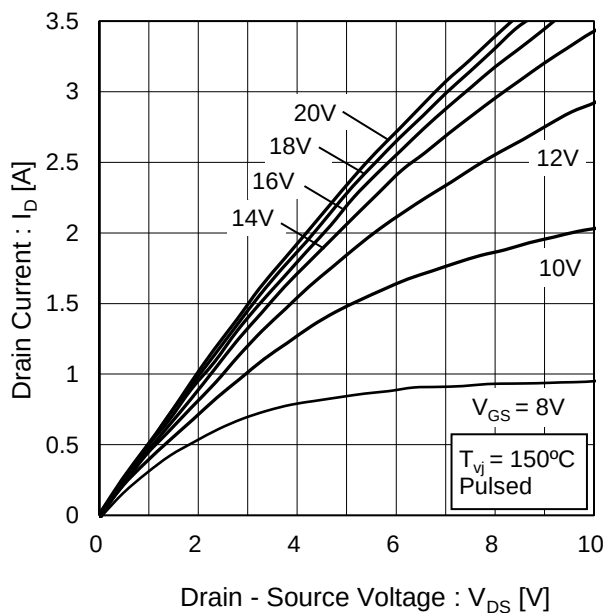


Fig.7 $T_{vj} = 150^\circ\text{C}$ Typical Output Characteristics(II)

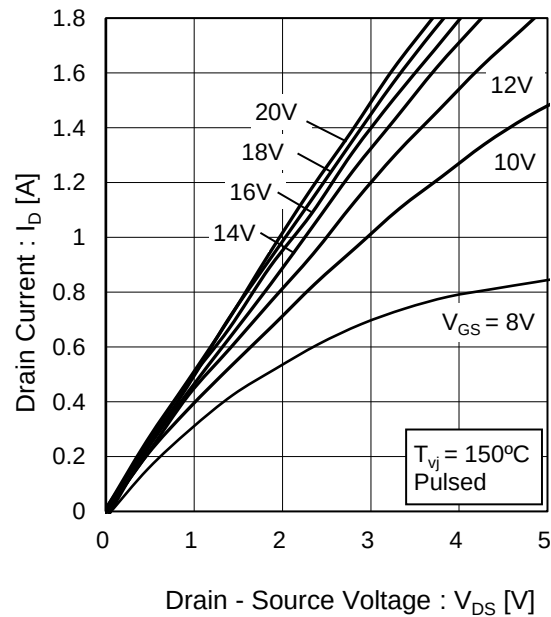




Fig.8 Typical Transfer Characteristics (I)

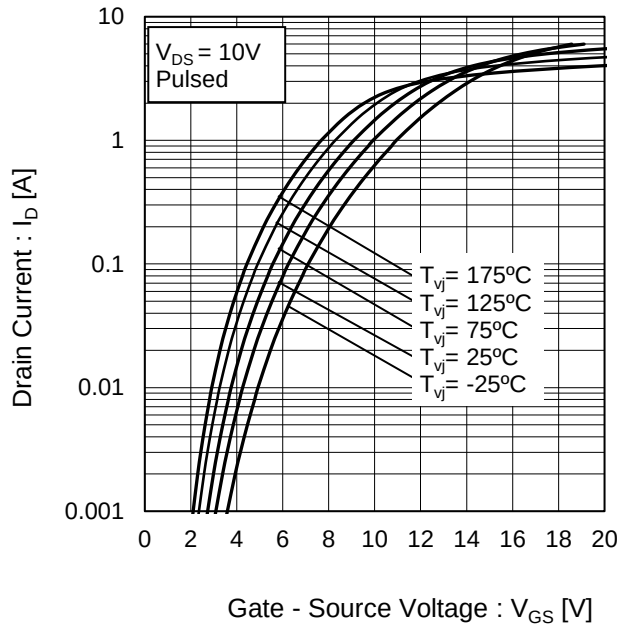


Fig.9 Typical Transfer Characteristics (II)

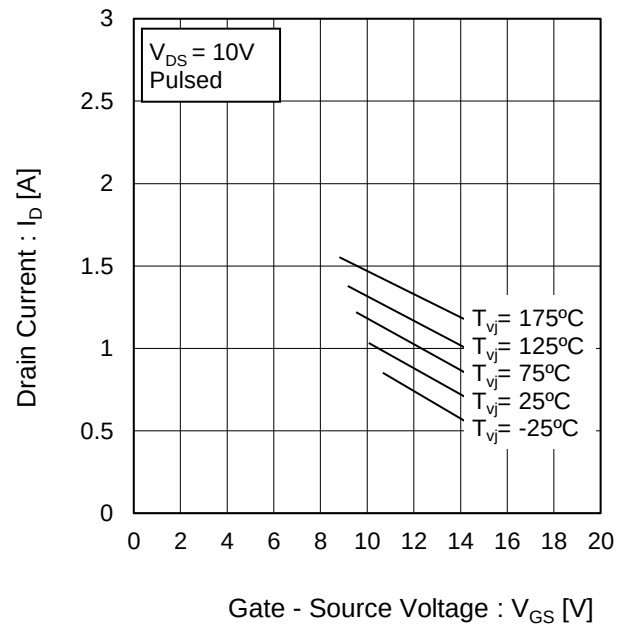


Fig.10 Gate Threshold Voltage vs. Virtual Junction Temperature

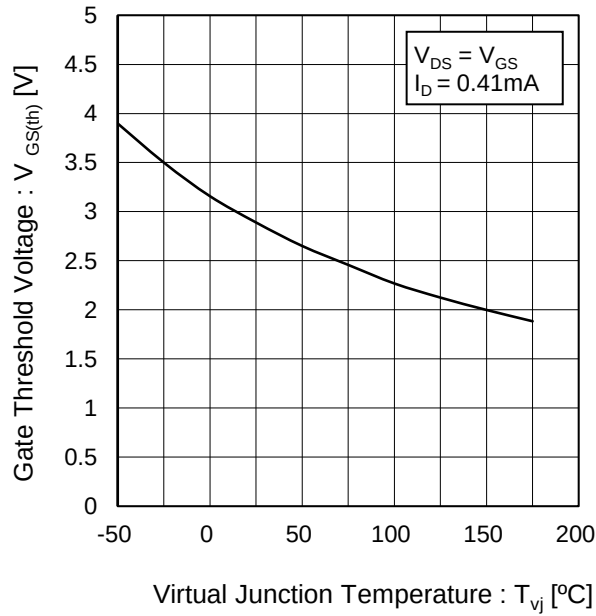


Fig.11 Transconductance vs. Drain Current

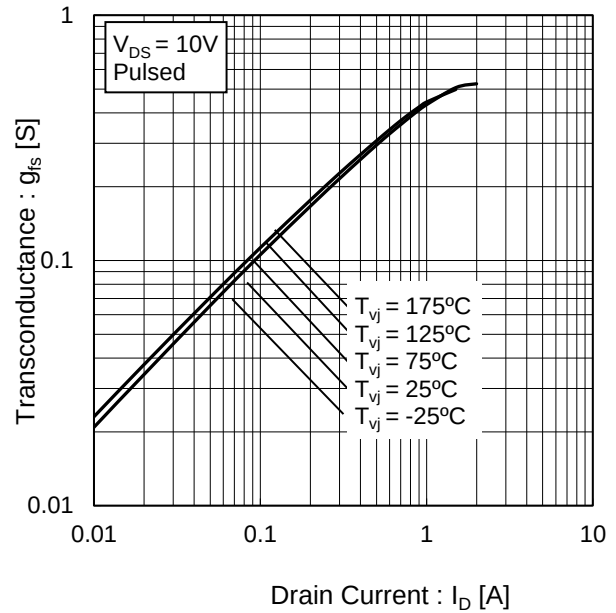




Fig.12 Static Drain - Source On - State
Resistance vs. Gate - Source Voltage

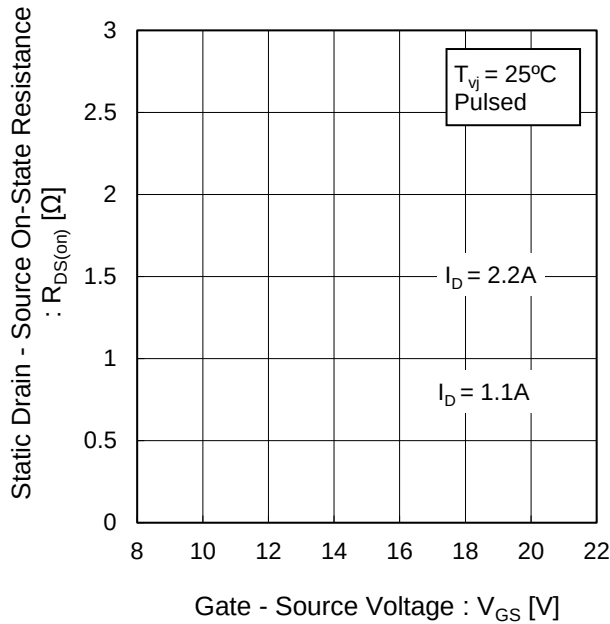


Fig.13 Static Drain - Source On - State
Resistance vs. Virtual Junction
Temperature

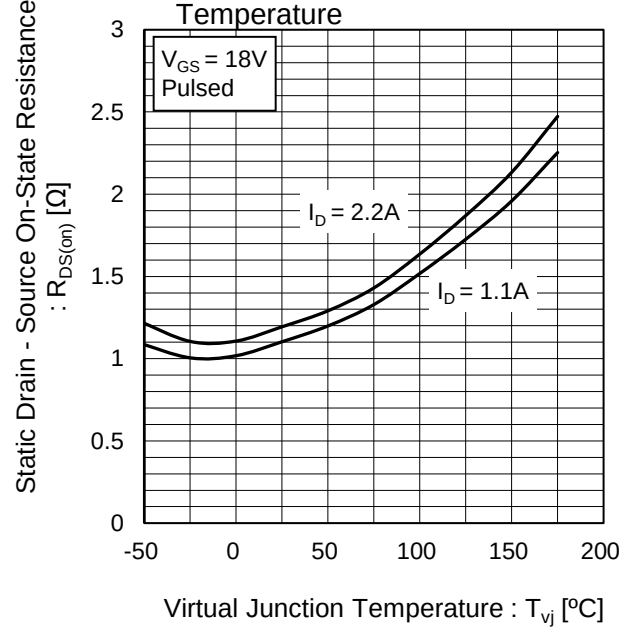


Fig.14 Static Drain - Source On - State
Resistance vs. Drain Current

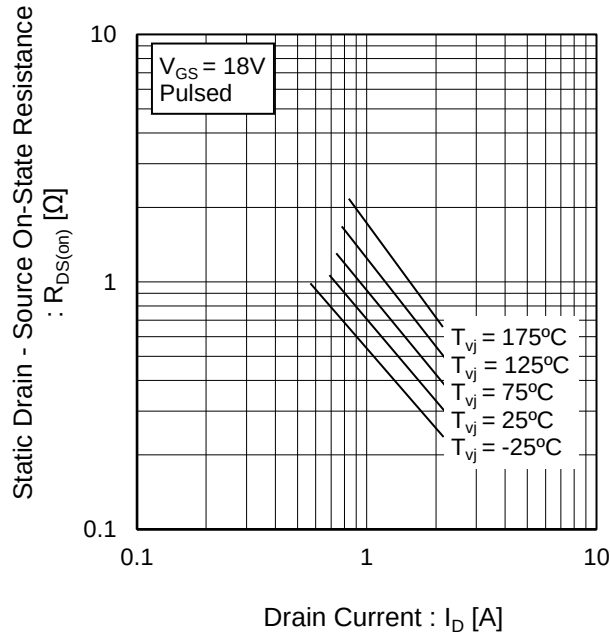


Fig.15 Typical Capacitance
vs. Drain - Source Voltage

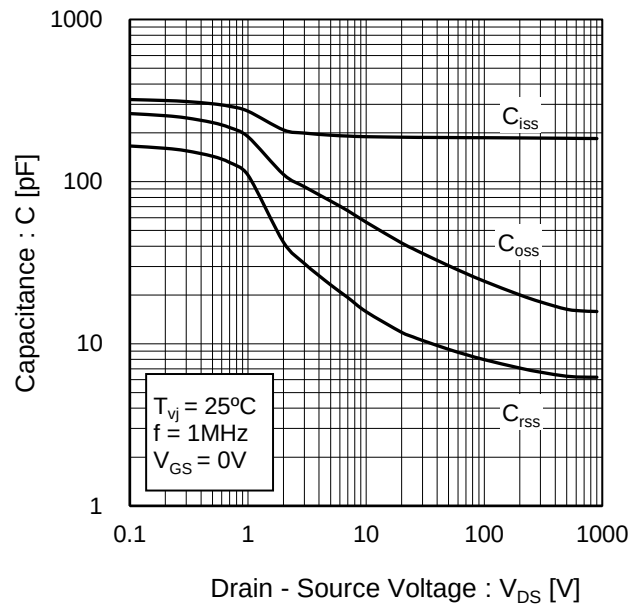




Fig.16 Coss Stored Energy

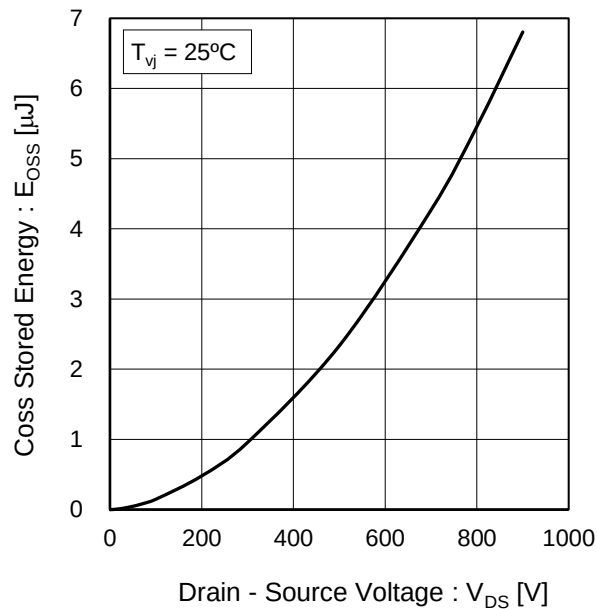


Fig.17 Switching Characteristics

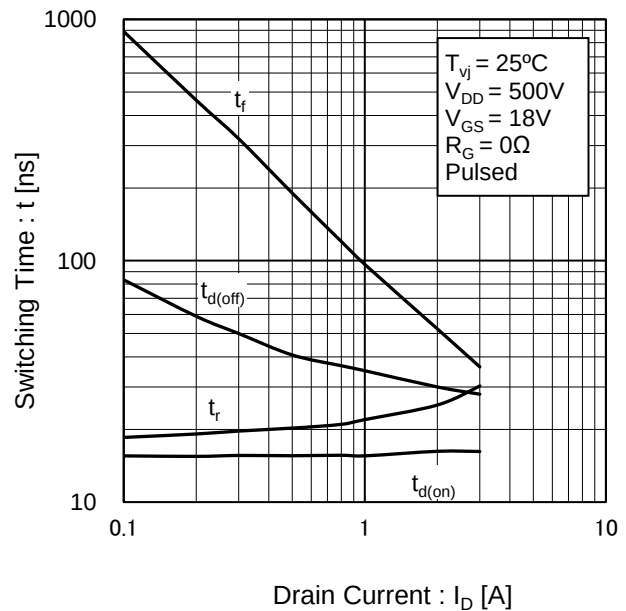


Fig.18 Dynamic Input Characteristics

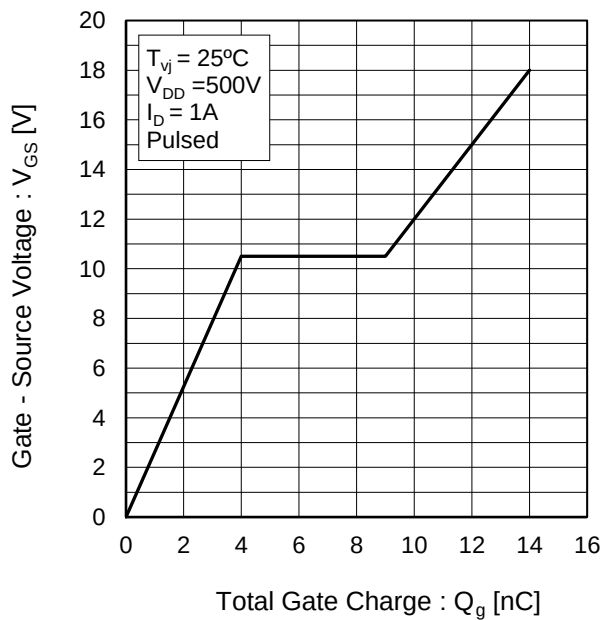


Fig.19 Typical Switching Loss vs. Drain-Source Voltage

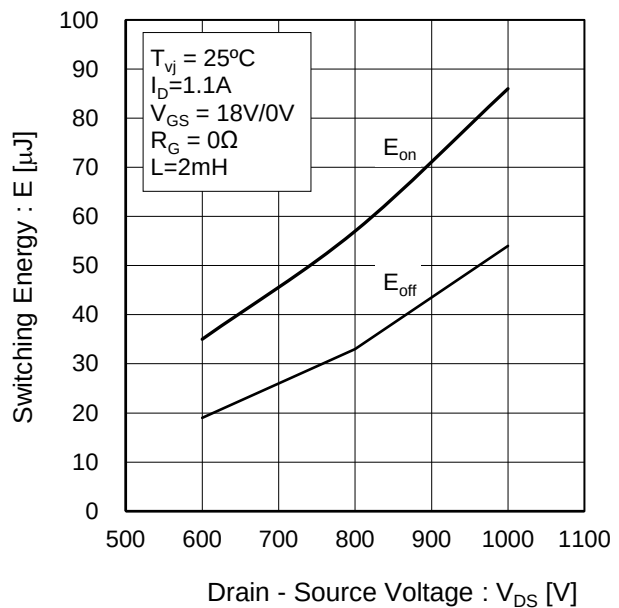




Fig.20 Typical Switching Loss
vs. Drain Current

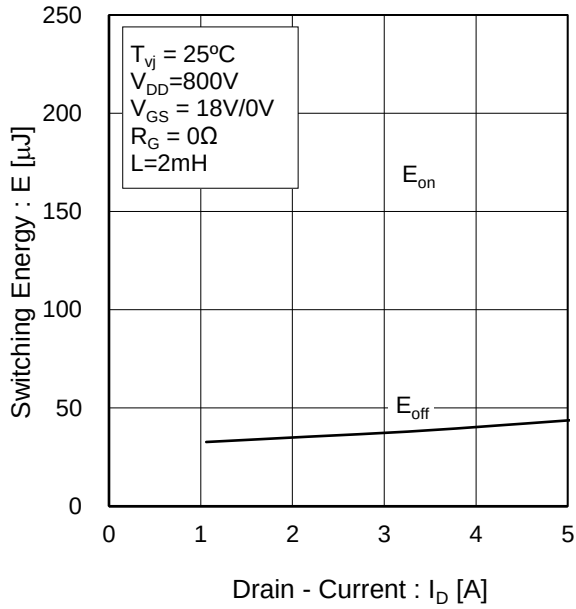


Fig.21 Typical Switching Loss
vs. External Gate Resistance

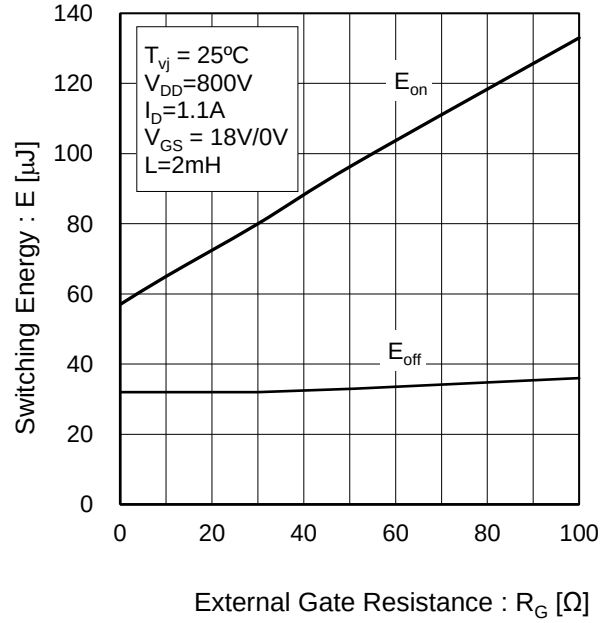


Fig.22 Inverse Diode Forward Current
vs. Source - Drain Voltage

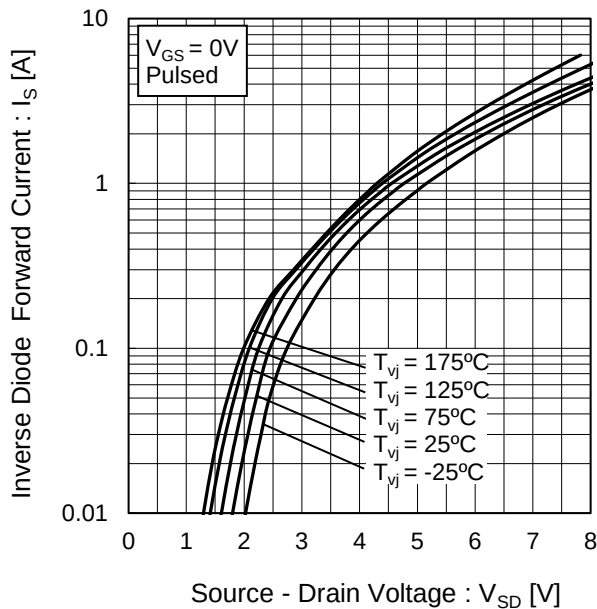
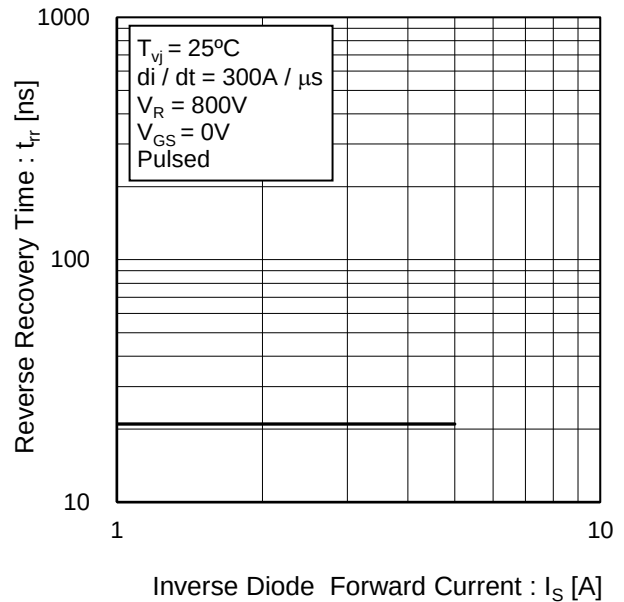


Fig.23 Reverse Recovery Time
vs. Inverse Diode Forward Current





Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

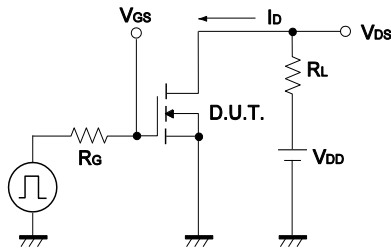


Fig.1-2 Switching Waveforms

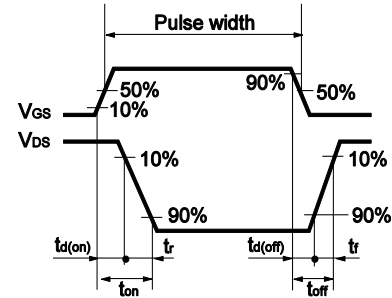


Fig.2-1 Gate Charge Measurement Circuit

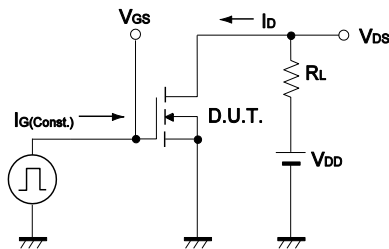


Fig.2-2 Gate Charge Waveform

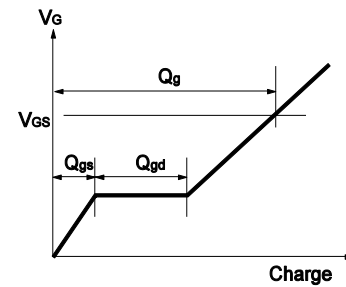


Fig.3-1 Switching Energy Measurement Circuit

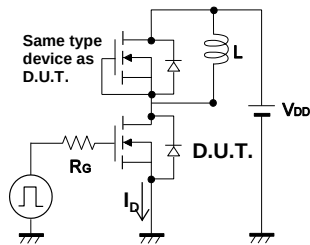


Fig.3-2 Switching Waveforms

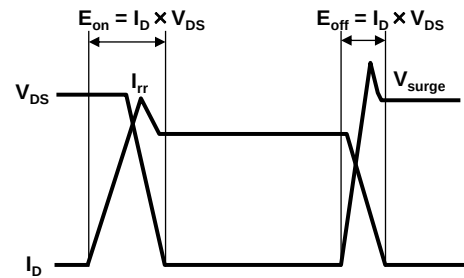


Fig.4-1 Reverse Recovery Time Measurement Circuit

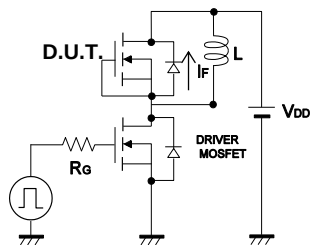
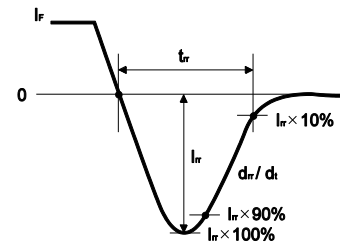


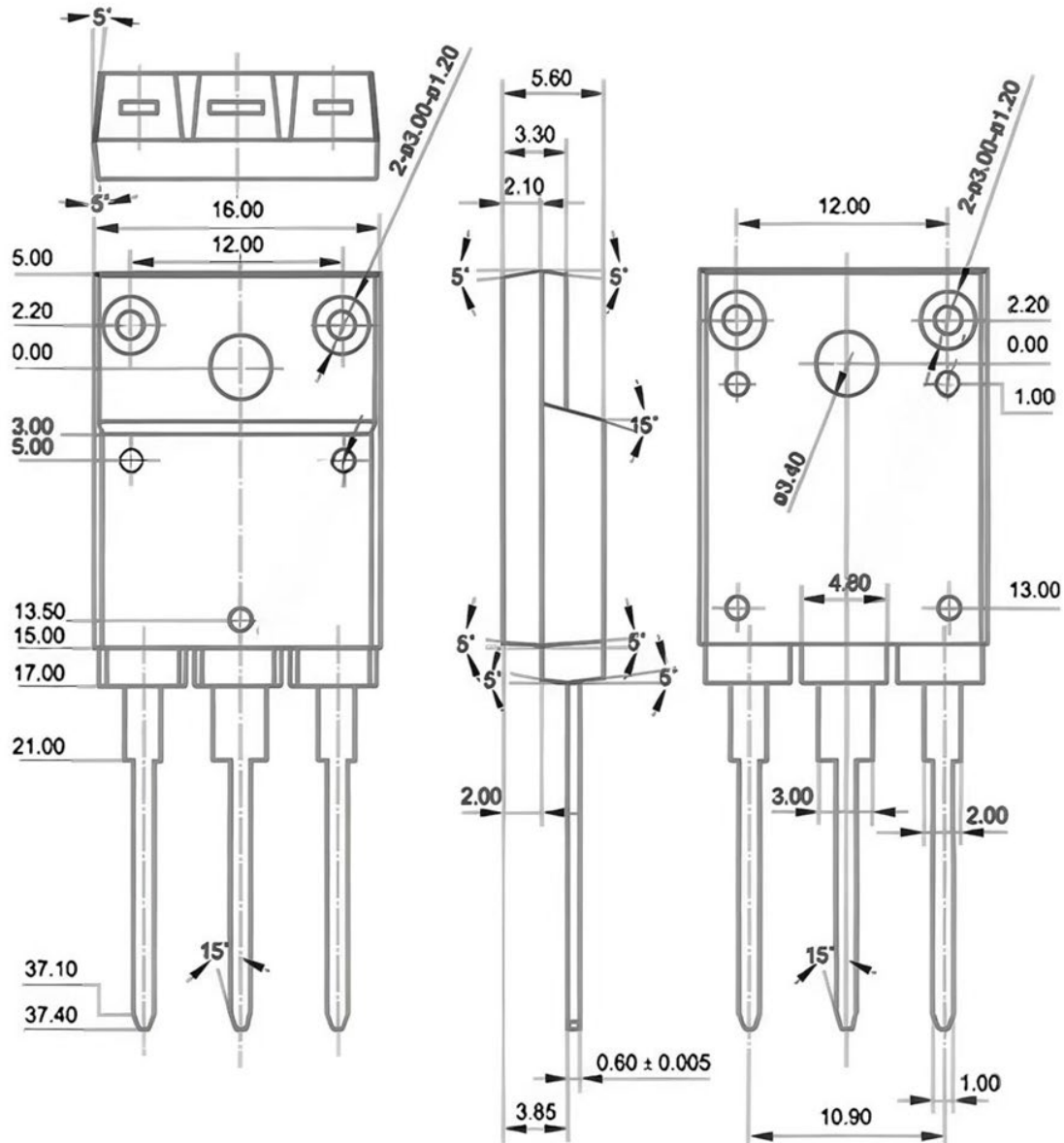
Fig.4-2 Reverse Recovery Waveform





Package Dimensions

Package TO-3PF





Attention

- Any and all HUA XUAN YANG ELECTRONICS products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your HUA XUAN YANG ELECTRONICS representative nearest you before using any HUA XUAN YANG ELECTRONICS products described or contained herein in such applications.
- HUA XUAN YANG ELECTRONICS assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all HUA XUAN YANG ELECTRONICS products described or contained herein.
- Specifications of any and all HUA XUAN YANG ELECTRONICS products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- HUA XUAN YANG ELECTRONICS CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all HUA XUAN YANG ELECTRONICS products(including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of HUA XUAN YANG ELECTRONICS CO.,LTD.
- Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. HUA XUAN YANG ELECTRONICS believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the HUA XUAN YANG ELECTRONICS product that you intend to use.