



Features

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low On-Resistance
- Avalanche Ruggednes

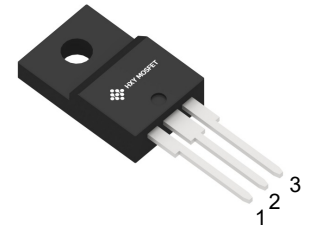
Applications

- Solar Inverters
- Switch Mode Power Supplies
- Battery Chargers
- High Voltage DC/DC Converters

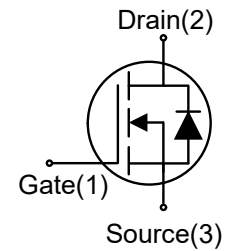


Package Marking and Ordering Information

Ordering Part Number	Package	Brand
SIHA21N80AEF-GE3	TO-220F	HXY MOSFET



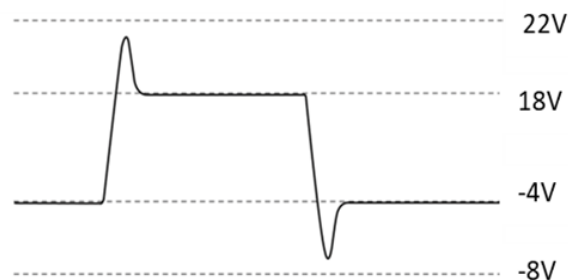
TO-220F



Maximum Ratings (T_c = 25°C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions
V _{DSmax}	Drain - Source Voltage	650	V	
V _{GSmax}	Gate - Source Voltage (dynamic)	-8/+22	V	
V _{GS}	Gate - Source Voltage	-4/+18	V	
I _D	Continuous Drain Current	24	A	T _C = 25°C
		13		T _C = 125°C
I _{D(pulse)}	Pulsed Drain Current	50	A	Pulse width t _p limited by T _{jmax}
P _D	Power Dissipation	95	W	T _C = 25°C
T _J , T _{stg}	Operating Junction and Storage Temperature	-55 to +175	°C	
I _S	Source current(Body Diode)	24	A	T _C = 25°C
		13		T _C = 125°C
E _{AS}	Avalanche energy, single pulse	265	mJ	L=10mH

•Example of acceptable V_{GS} waveform





Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless other wise specified)

Symbol	Parameter	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristics						
V _{(BR)DSS}	Drain-source breakdown voltage	650	-	-	V	V _{GS} =0V, I _D =100uA
V _{GS(th)}	Gate threshold voltage	2	3	4	V	V _{DS} =V _{GS} , I _D =2mA
I _{DSS}	Zero gate voltage drain current	-	1	5	μA	V _{DS} =650V, V _{GS} =0V T _C =25°C T _C =175°C
I _{GSS}	Gate-source leakage current	-		100	nA	V _{GS} =18V, V _{DS} =0V
R _{DS(on)}	Drain-source on-state resistance	-	110	140	mΩ	V _{GS} =18V, I _D =7A, T _J =25°C T _J =175°C
R _{DS(on)}	Drain-source on-state resistance	-	145	200	mΩ	V _{GS} =15V, I _D =7A, T _J =25°C T _J =175°C
Dynamic Characteristics						
C _{iss}	Input Capacitance	-	508.0	-	pF	V _{DS} = 400V V _{GS} = 0V T _J = 25°C V _{AC} =25mV f = 1MHz
C _{oss}	Output Capacitance	-	33.0	-		
C _{rss}	Reverse Transfer Capacitance	-	3.2	-		
Q _G	Gate Total Charge		30.5	-	nC	V _{DS} = 400V V _{GS} = 0/+18V I _D = 7A I _G =10mA
Q _{gs}	Gate-Source charge	-	2.55	-		
Q _{gd}	Gate-Drain charge	-	7.9	-		
E _{ON}	Turn-On Switching Energy	-	101	-	uJ	V _{DD} = 400V V _{GS} = -4/+18V I _D = 7A R _G = 5Ω L = 1mH T _J = 25°C
E _{OFF}	Turn-Off Switching Energy	-	23	-		
t _{d(on)}	Turn-on delay time	-	6.5	-	ns	
t _r	Rise time	-	3.1	-		
t _{d(off)}	Turn-off delay time	-	29.5	-		
t _f	Fall time	-	18.5	-		
R _G	Gate resistance	-	3.0	-	Ω	V _{AC} = 25mV, f=1MHz



Body Diode Characteristics

V_{SD}	Body Diode Forward Voltage	-	4.2	-	V	$V_{GS}=-4V, I_{SD}=3.5A,$ $T_J=25^{\circ}C$
		-	3.8	-		$V_{GS}=-4V, I_{SD}=3.5A,$ $T_J=175^{\circ}C$
t_{rr}	Reverse Recovery Time	-	42.2	-	ns	$V_R = 600V$ $I_D = 7A$ $di/dt = 1000A/\mu S$ $V_{GS} = -4V$ $T_J = 25^{\circ}C$
Q_{rr}	Reverse Recovery Charge	-	66	-	nC	
E_{REC}	Reverse Recovery Energy	-	14.74	-	uJ	
I_{rrm}	Peak Reverse Recovery Current	-	4.67	-	A	
t_A	Charge Time	-	20.8	-	ns	
t_B	DisCharge Time	-	21.4	-	ns	

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions
R_{thJC}	Thermal Resistance from Junction to Case	1.55	$^{\circ}C/W$	
R_{thJA}	Thermal Resistance From Junction to Ambient	40		



Typical Performance

Fig 1. Output Characteristics ($T_J = -55^\circ\text{C}$)

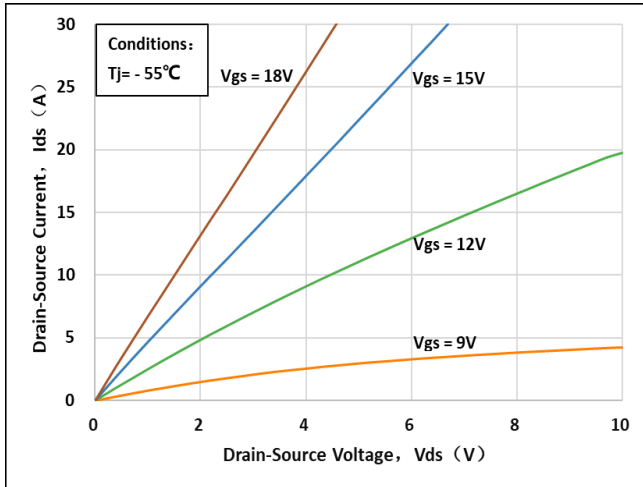


Fig 2. Output Characteristics ($T_J = 25^\circ\text{C}$)

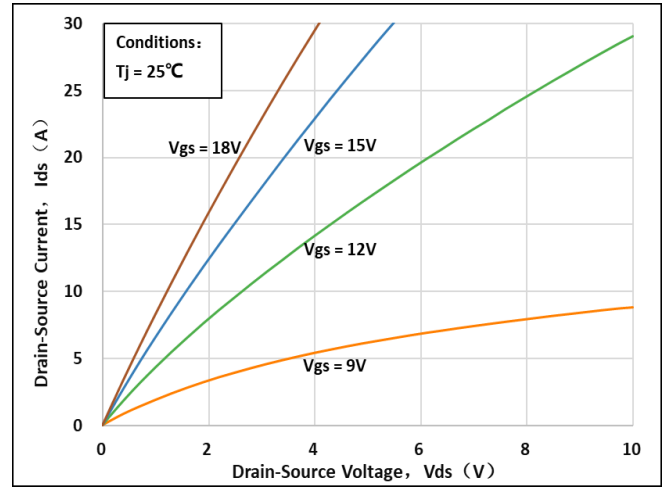


Fig 3. Output Characteristics ($T_J = 175^\circ\text{C}$)

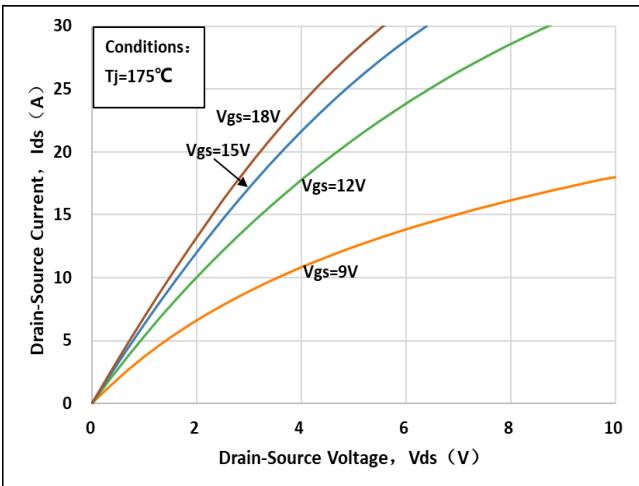


Fig 4: $R_{DS(on)}$ Vs I_{DS} Characteristics

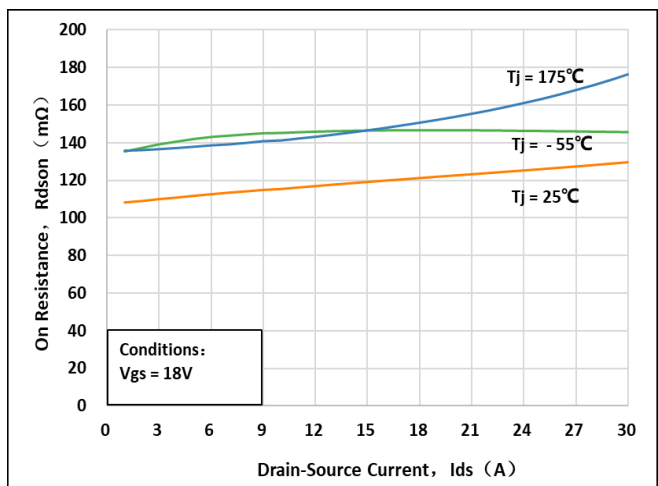


Fig 5: $R_{DS(on)}$ vs. Temperature

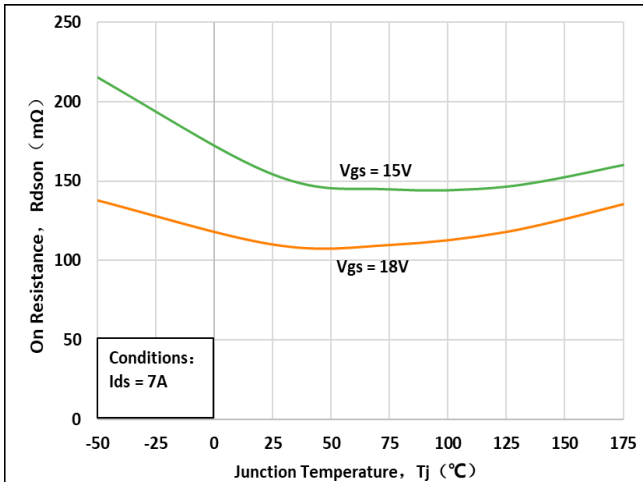


Fig 6: Transfer Characteristics

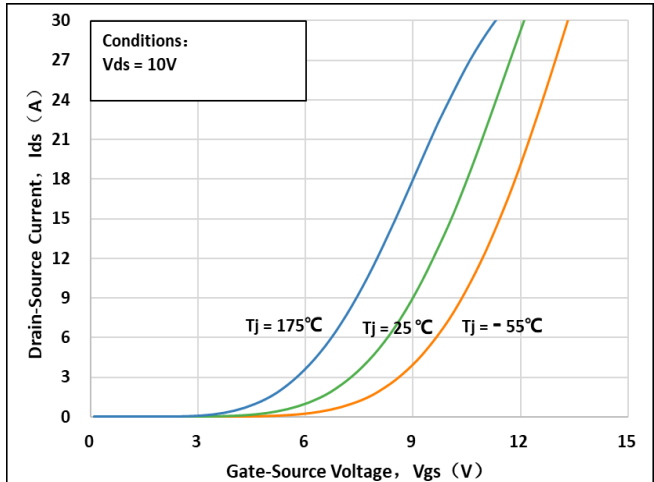




Fig 7: Body-diode Characteristics (T_J=-55°C)

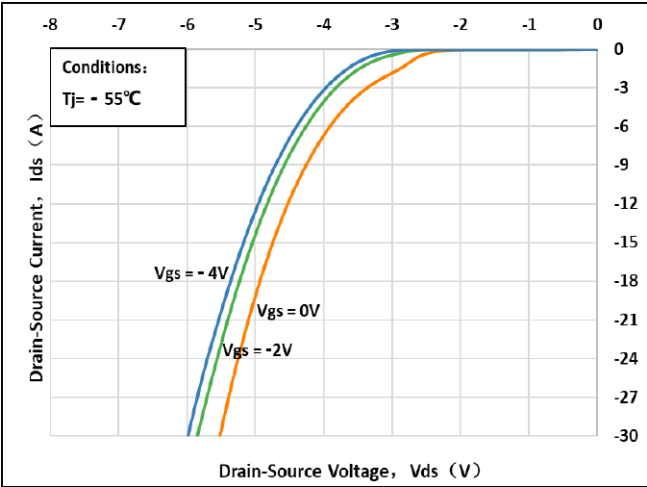


Fig 8: Body-diode Characteristics (T_J=25°C)

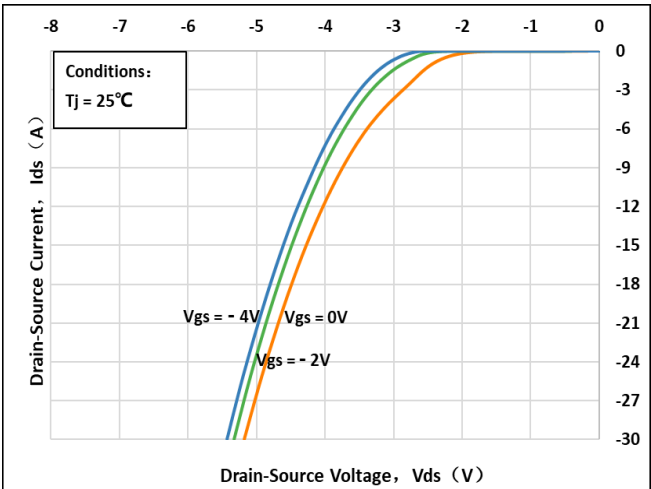


Fig 9: Body-diode Characteristics (T_J=175°C)

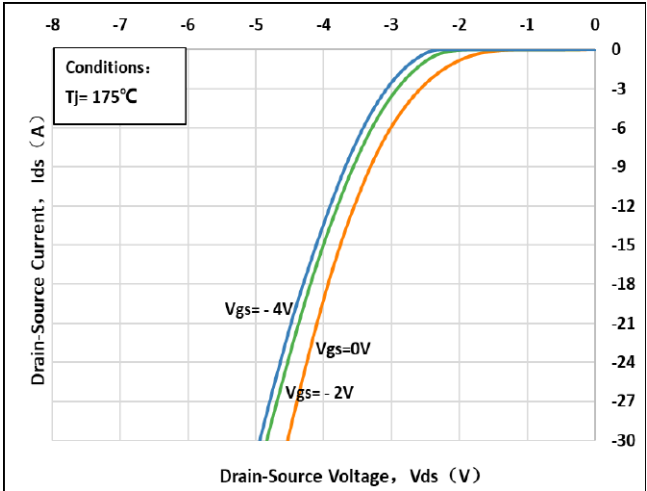


Fig 10: V_{TH} Vs T_J Temperature Characteristics

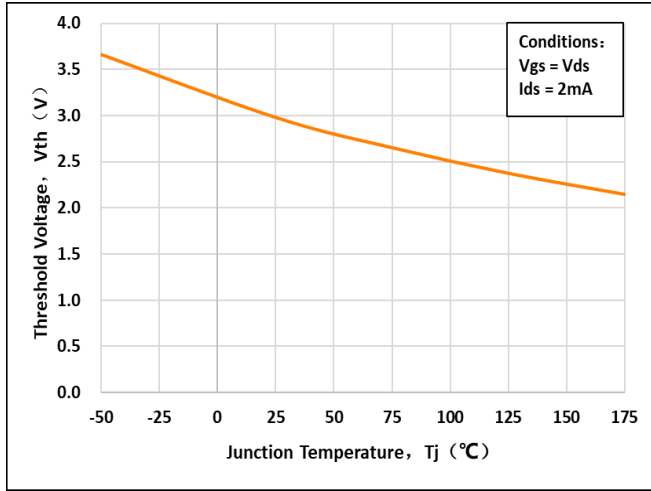


Fig 11: 3rd Quadrant Characteristics(T_J=-55°C)

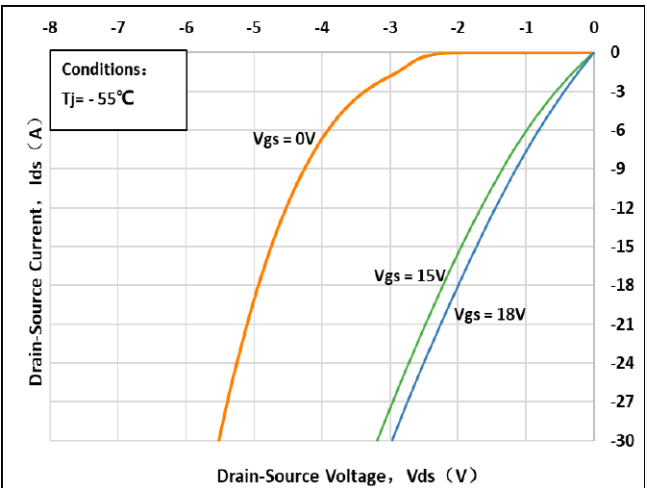


Fig 12: 3rd Quadrant Characteristics(T_J=25°C)

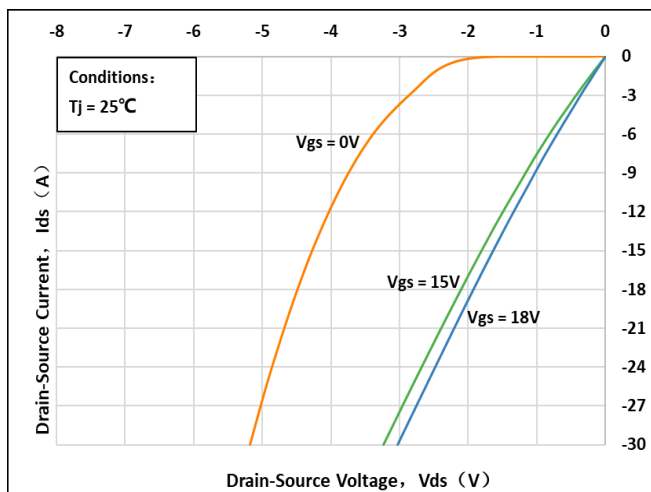




Fig 13: 3rd Quadrant Characteristics($T_J=175^{\circ}\text{C}$)

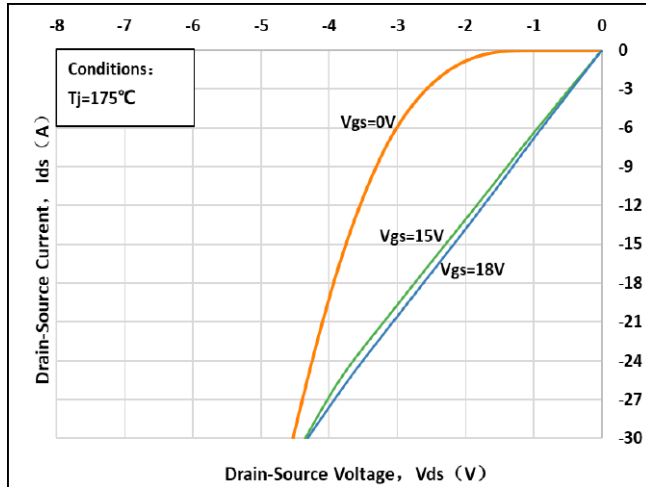


Fig 14: Gate Charge Characteristics

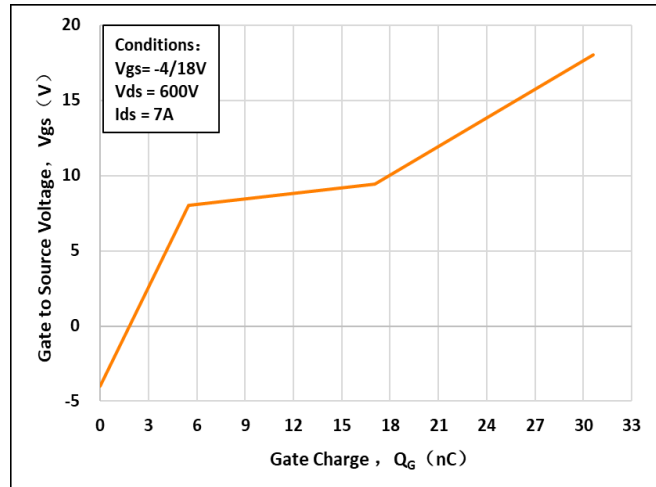


Fig 15: Drain Current vs. Case Temperature

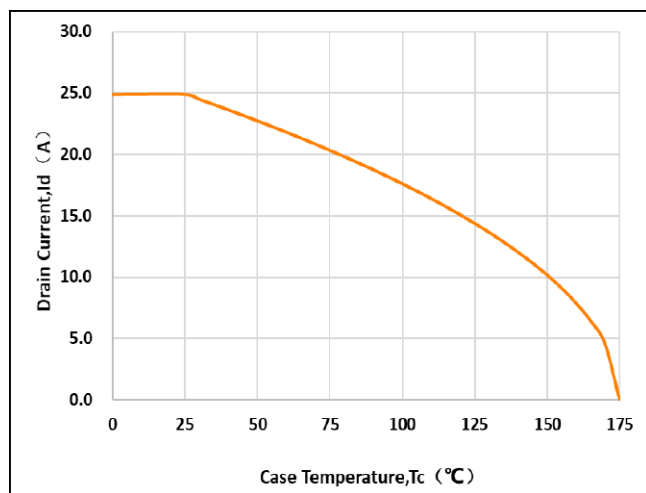


Fig 16: Safe Operating Area

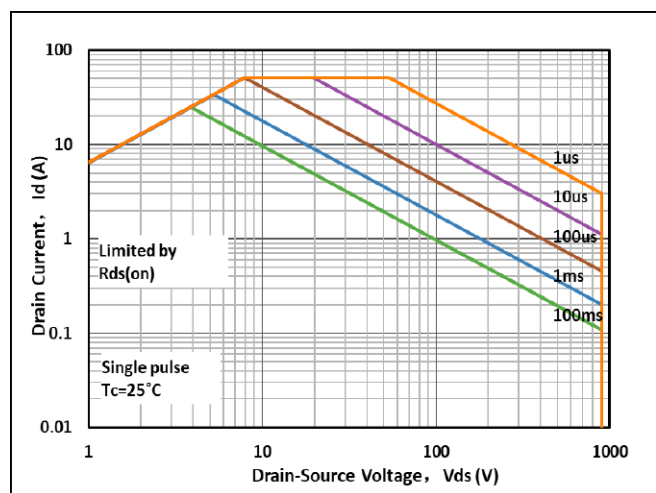


Fig 17: Capacitance Characteristics

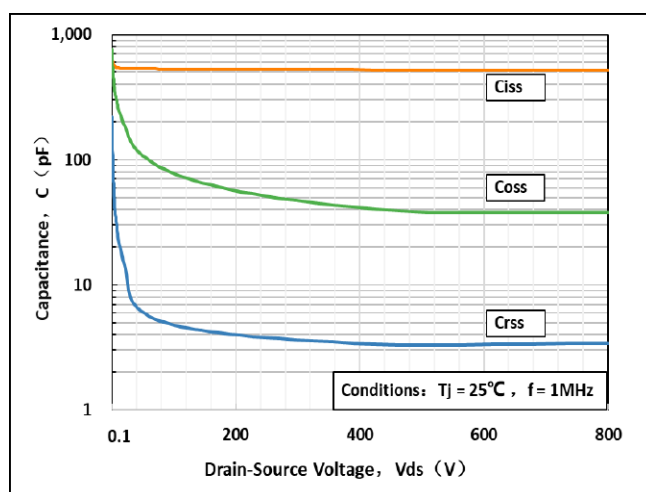
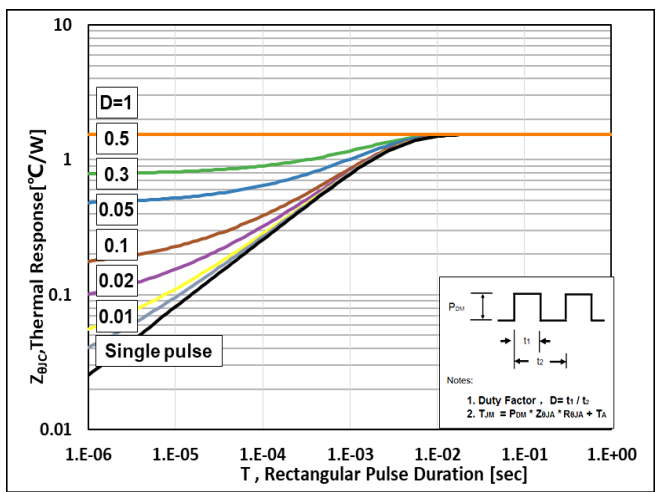


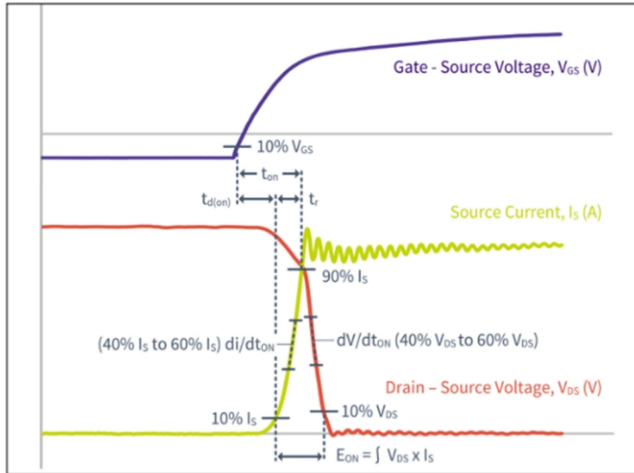
Fig 18: Transient Thermal Impedance



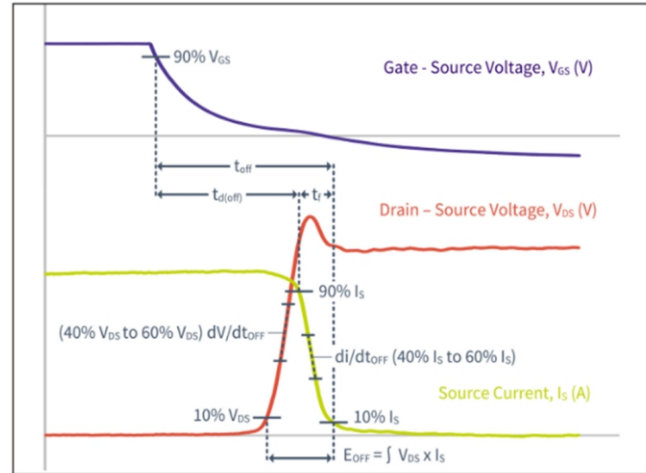


Test Circuit & Waveform

Figure A. Definition of switching times



Turn-on Transient Definitions



Turn-off Transient Definitions

Figure B. Dynamic test circuit

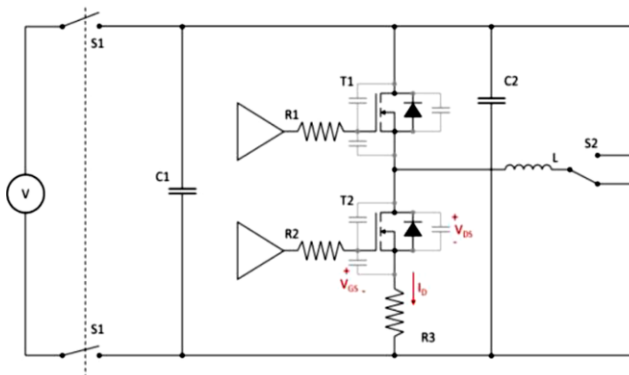
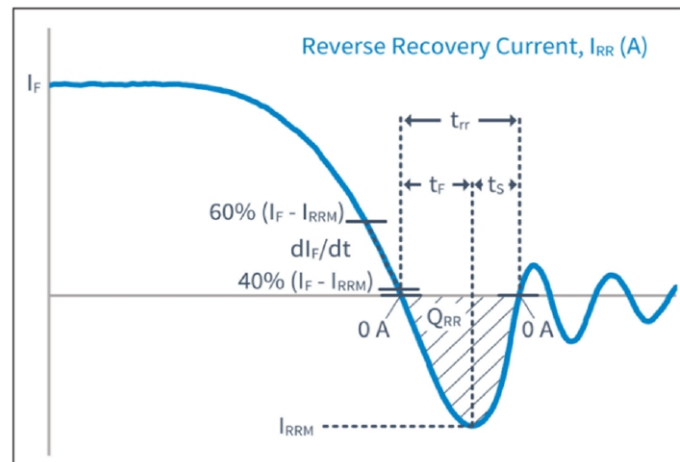


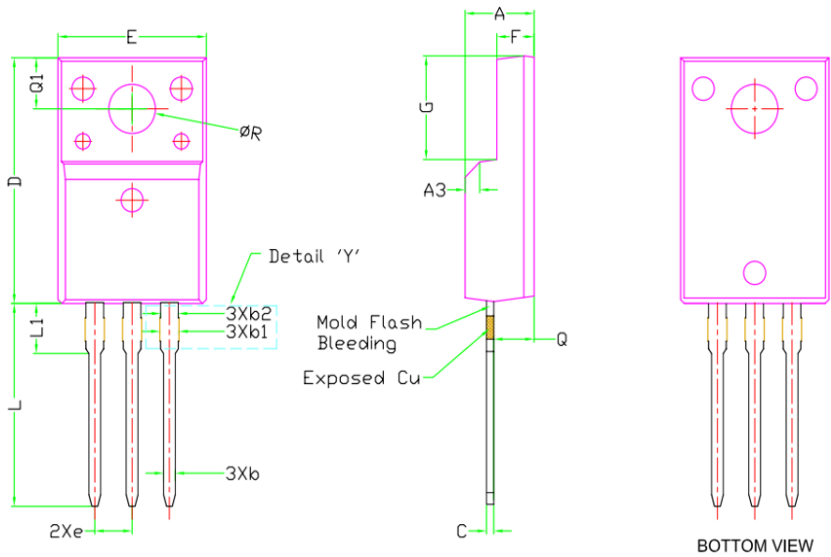
Figure C. Definition of body diodeswitching characteristics



Reverse Recovery Definitions



Package Dimensions
Package TO-220F



SYMBOL	DIMENSIONS		
	Min.	Nom.	Max.
A	4.60	4.70	4.80
b	0.70	0.80	0.91
b1	1.20	1.30	1.47
b2	1.10	1.20	1.30
C	0.45	0.50	0.63
D	15.80	15.87	15.97
e	2.54		
E	10.00	10.10	10.30
F	2.44	2.54	2.64
G	6.50	6.70	6.90
L	12.90	13.10	13.30
L1	3.13	3.23	3.33
Q	2.65	2.75	2.85
Q1	3.20	3.30	3.40
ϕR	3.08	3.18	3.28



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.