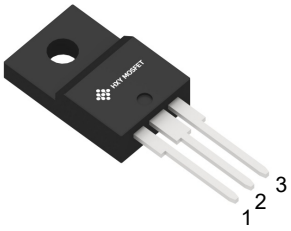
GC210N80FE

SiC Power MOSFET N-Channel Enhancement Mode

Features

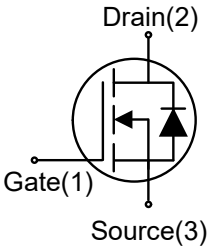
- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low On-Resistance
- Avalanche Ruggednes



TO-220F

Applications

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



Package Marking and Ordering Information

Ordering Part Number	Package	Brand
GC210N80FE	TO-220F	HXY MOSFET

Maximum Ratings (Tc = 25 ˚C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions
V_{DSmax}	Drain - Source Voltage	800	V	
V_{GSmax}	Gate - Source Voltage (dynamic)	-8/+22	V	
V_{GS}	Gate - Source Voltage	-4/+18	V	
I_D	Continuous Drain Current	13.3	A	T_C = 25˚C
		7.7		T_C = 125˚C
$I_{D(pulse)}$	Pulsed Drain Current	45	A	Pulse width t_P limited by T_{jmax}
P_D	Power Dissipation	50	W	T_C = 25˚C
T_J , T_{stg}	Operating Junction and Storage Temperature	-55 to +175	˚C	
I_S	Source current(Body Diode)	13.3	A	T_C = 25˚C
		7.7		T_C = 125˚C
E_{AS}	Avalanche energy, single pulse	180	mJ	L=10mH

●Example of acceptable V_{GS} waveform

Electrical Characteristics (T_C = 25°C unless other wise specified)

Symbol	Parameter	Value			Unit	Test Condition
		min.	typ.	max.		
Static Characteristics						
$V_{(BR)DSS}$	Drain-source breakdown voltage	800	-	-	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	5 -	μA	V_{DS}=800V,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	- -	200 240	260 -	mΩ	V_{GS}=18V, I_D=3.6A, T_J=25°C T_J=175°C
$R_{DS(on)}$	Drain-source on-state resistance	- -	250 310	320 -	mΩ	V_{GS}=15V, I_D=3.6A, T_J=25°C T_J=175°C
Dynamic Characteristics						
C_{iss}	Input Capacitance	-	388.2	-	pF	V_{DS} = 600V V_{GS} = 0V T_J = 25°C V_{AC}=25mV f = 1MHz
C_{oss}	Output Capacitance	-	16.7	-		
C_{rss}	Reverse Transfer Capacitance	-	3.8	-		
Q_G	Gate Total Charge		15.6	-	nC	V_{DS} = 600V V_{GS} = 0/+18V I_D = 3.6A I_G=10mA
Q_{gs}	Gate-Source charge	-	2.76	-		
Q_{gd}	Gate-Drain charge	-	7.86	-		
E_{ON}	Turn-On Switching Energy	-	52.1	-	uJ	V_{DD} = 600V V_{GS} = -4/+18V I_D = 3.6A R_G = 5Ω L = 1mH T_J = 25°C
E_{OFF}	Turn-Off Switching Energy	-	12.62	-		
$t_{d(on)}$	Turn-on delay time	-	4.2	-	ns	
t_r	Rise time	-	2.0	-		
$t_{d(off)}$	Turn-off delay time	-	10.2	-		
t_f	Fall time	-	9.8	-		
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}=1.8A, T_J=25°C
		-	3.8	-		V_{GS}=-4V,I_{SD}=1.8A, T_J=175°C
t_{rr}	Reverse Recovery Time	-	22.2	-	ns	V_R = 600V I_D = 3.6A di/dt = 1000A/μS V_{GS}= -4V T_J = 25°C
Q_{rr}	Reverse Recovery Charge	-	36	-	nC	
E_{REC}	Reverse Recovery Energy	-	14.74	-	uJ	
I_{rrm}	Peak Reverse Recovery Current	-	2.67	-	A	
t_A	Charge Time	-	10.8	-	ns	
t_B	DisCharge Time	-	11.4	-	ns	

Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Test Conditions
R_{thJC}	Thermal Resistance from Junction to Case	3.0	˚C/W	
R_{thJA}	Thermal Resistance From Junction to Ambient	40		

Typical Performance

Fig 1. Output Characteristic (T_J=-55°C)

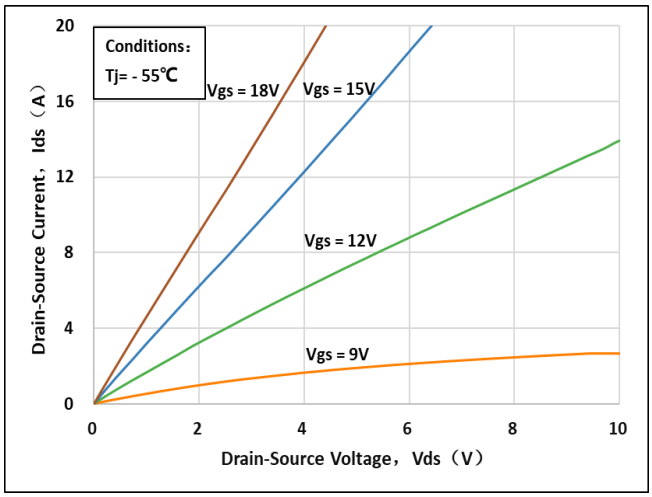


Fig 2. Output Characteristic (T_J=25°C)

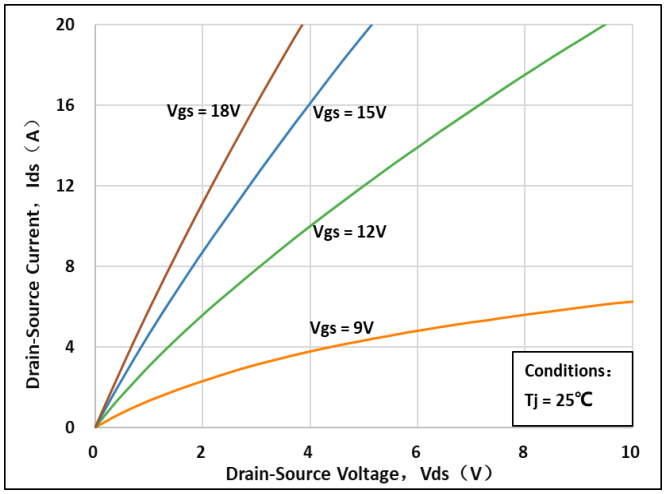


Fig 3. Output Characteristic (T_J=175°C)

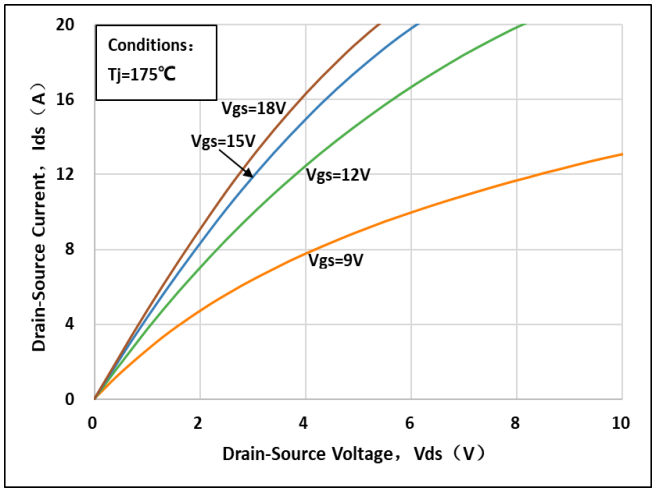


Fig 4: Rdson Vs Ids Characteristic

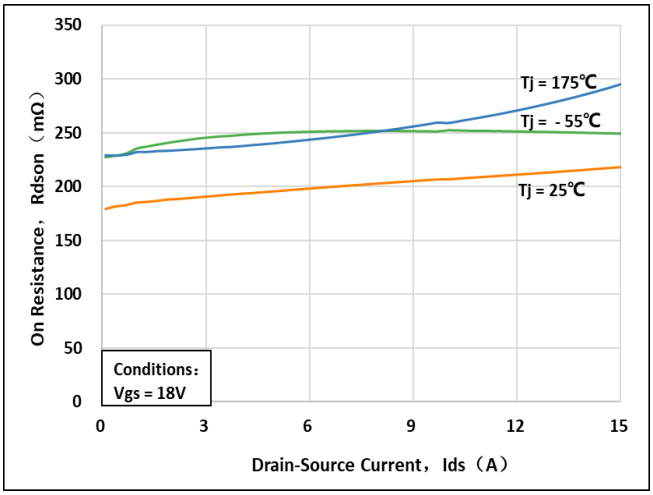


Fig 5: Rds(on) vs. Temperature

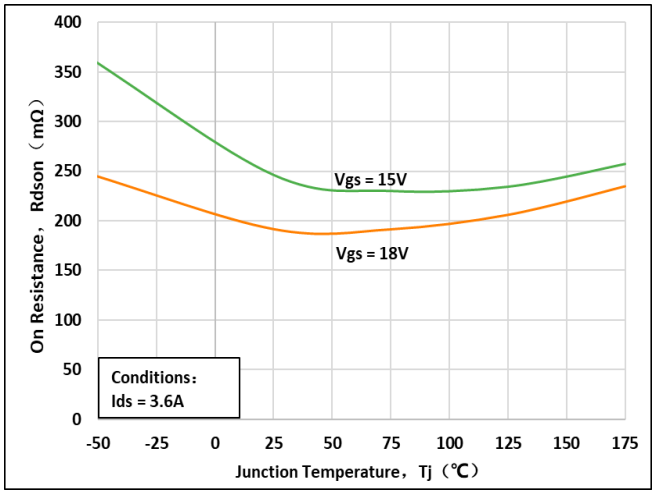


Fig 6: Transfer Characteristic

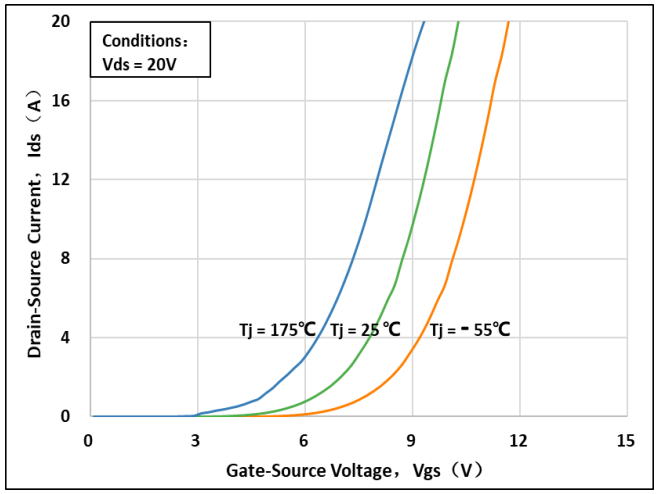


Fig 7: Body-diode Characteristic (T_J=-55°C)

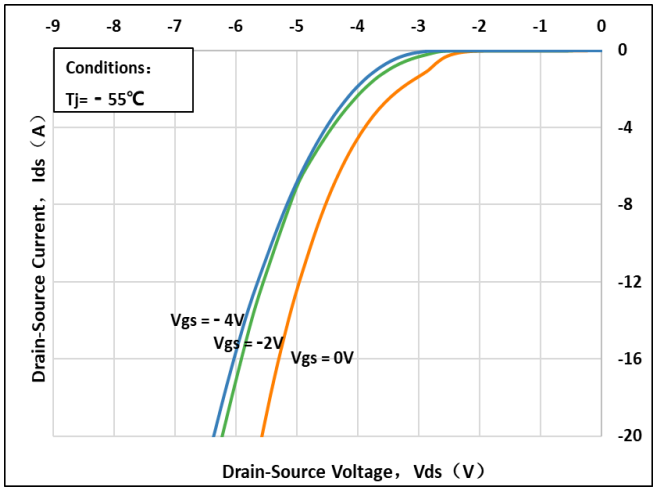


Fig 8: Body-diode Characteristic (T_J=25°C)

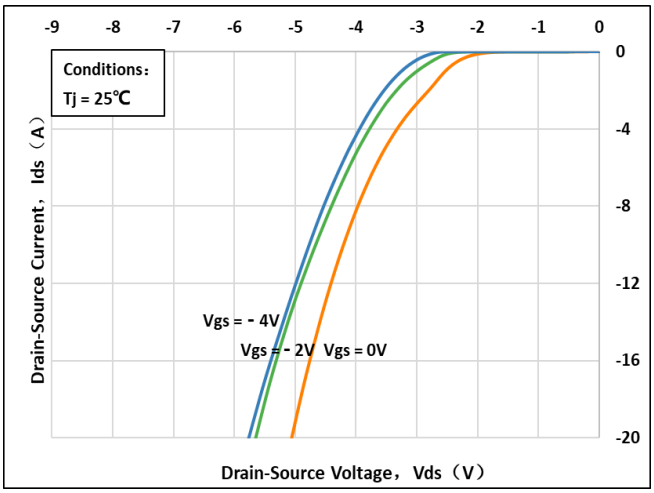


Fig 9: Body-diode Characteristic (T_J=175°C)

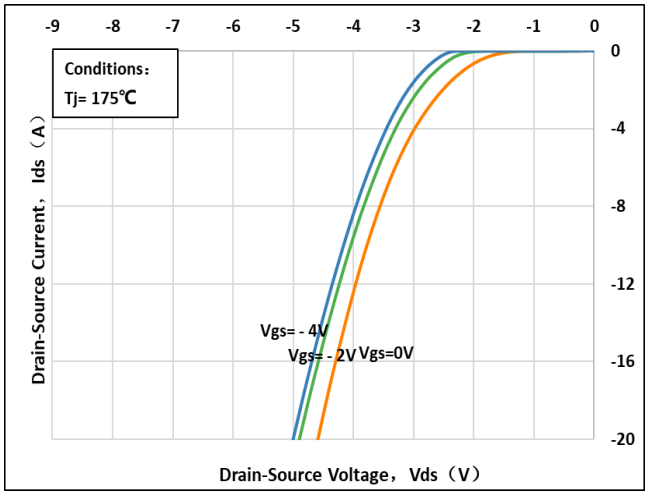


Fig 10: V_{TH} Vs T_J Temperature Characteristic

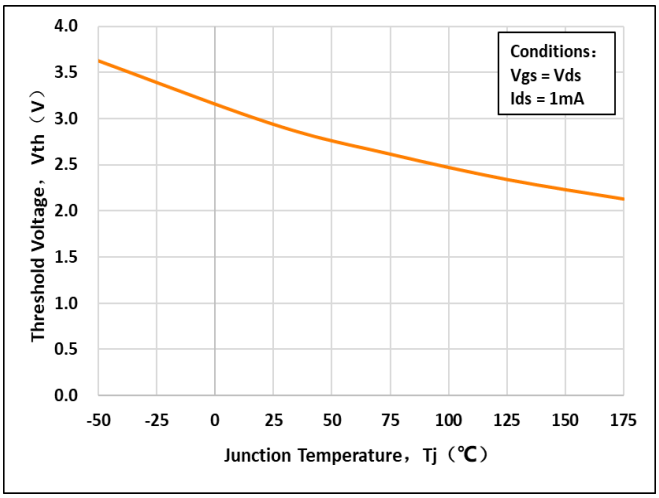


Fig 11: 3rd Quadrant Characteristic(T_J=-55°C)

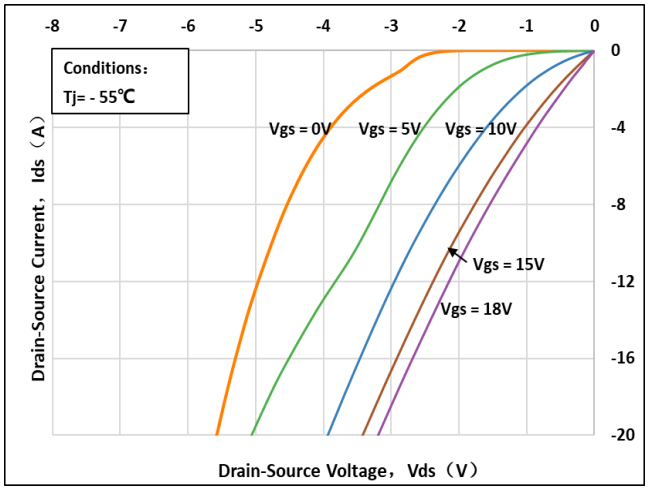


Fig 12: 3rd Quadrant Characteristic(T_J=25°C)

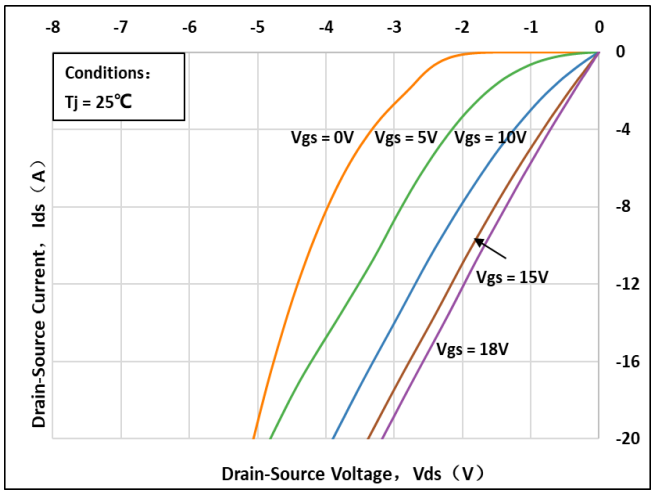


Fig 13: 3rd Quadrant Characteristic(T_J=175°C)

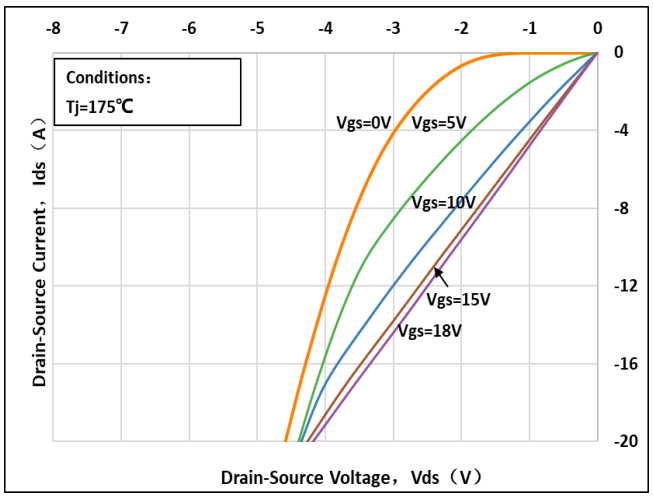


Fig 14: Gate Charge Characteristics

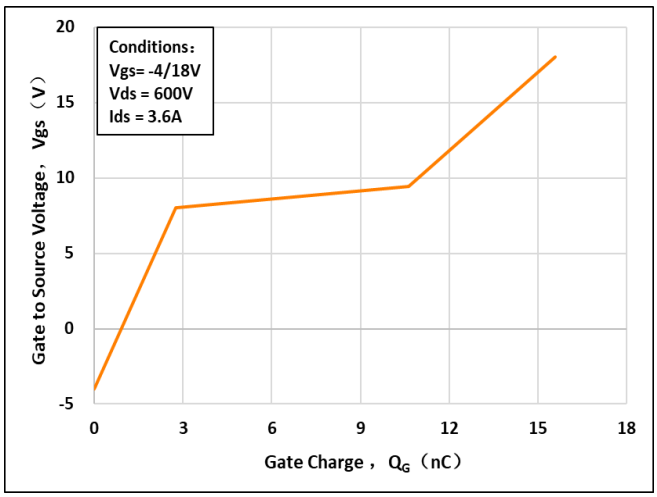


Fig 15: Drain Current vs.Case Temperature

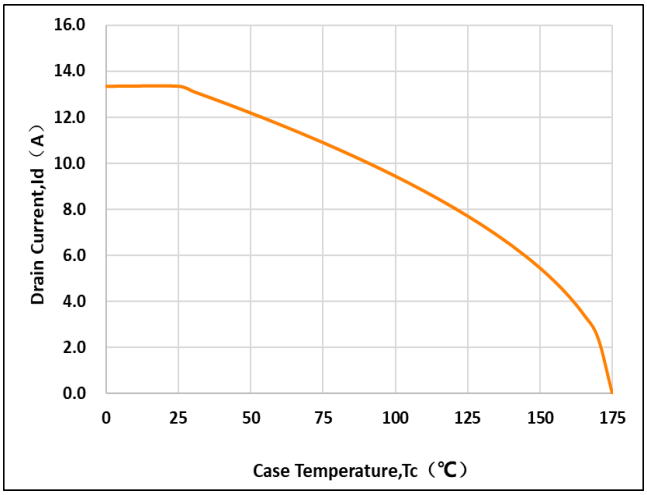


Fig 16: Safe Operating Area

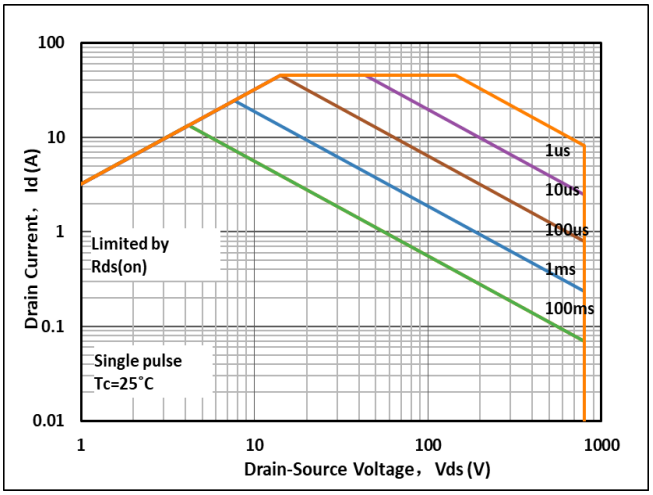


Fig 17: Capacitance Characteristics

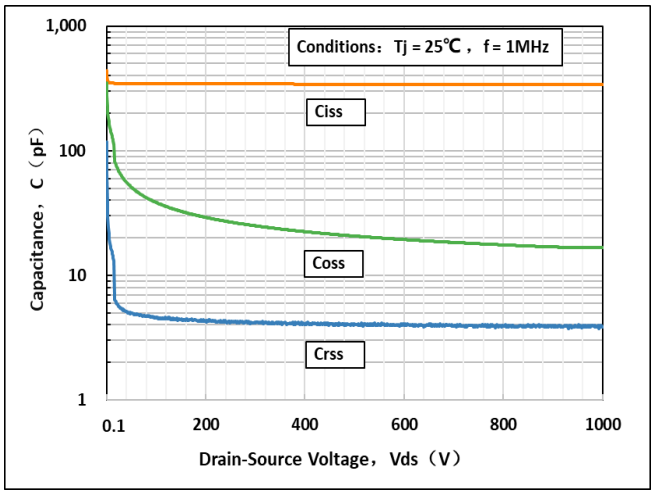
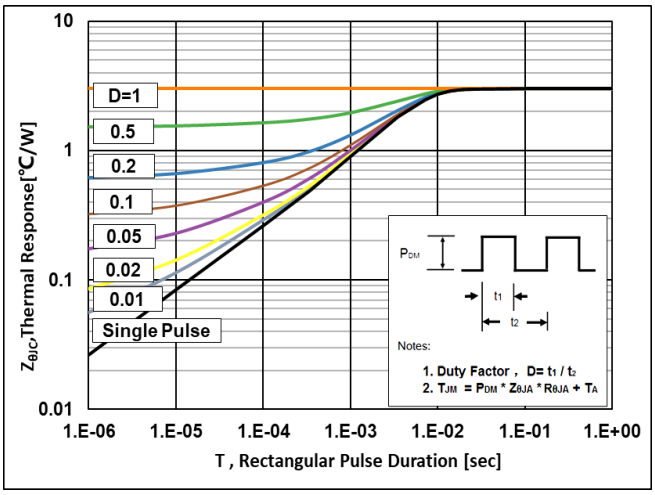
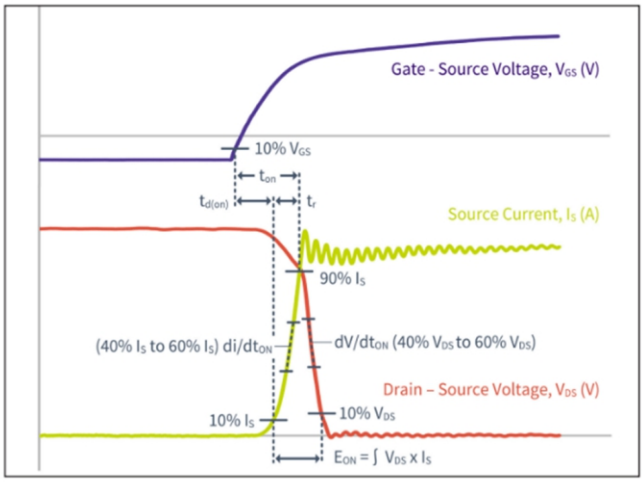


Fig 18: Transient Thermal Impedance

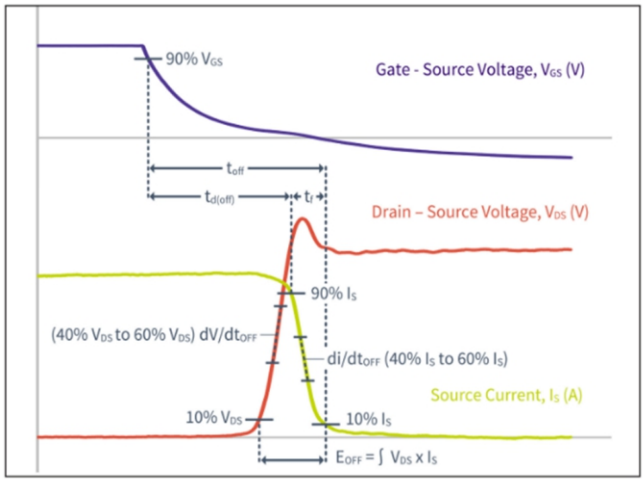


Test Circuit & Waveform

Figure A. Definition of switching times



Turn-on Transient Definitions



Turn-off Transient Definitions

Figure B. Dynamic test circuit

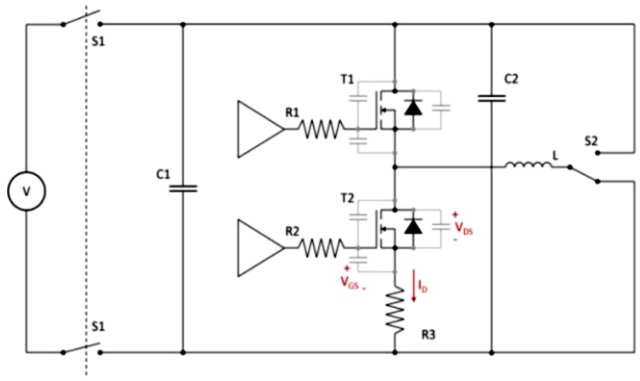
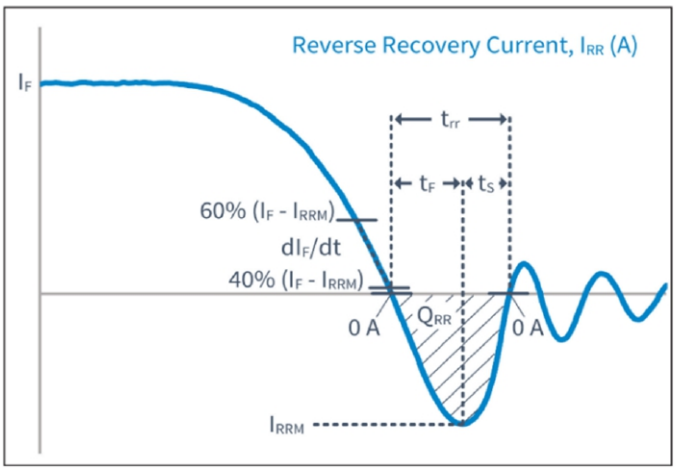


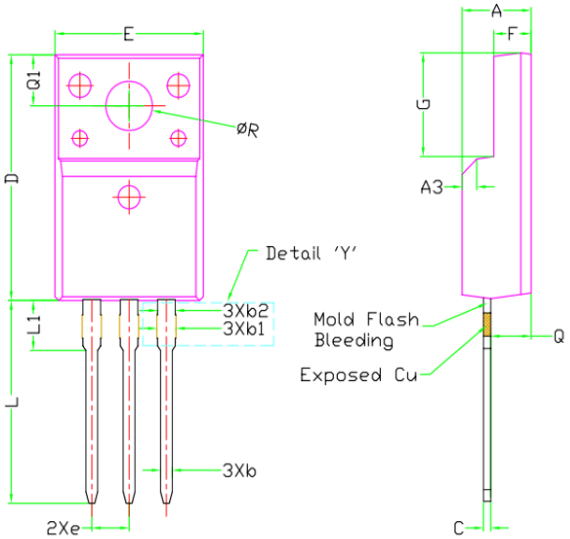
Figure C. Definition of body diodes switching characteristics

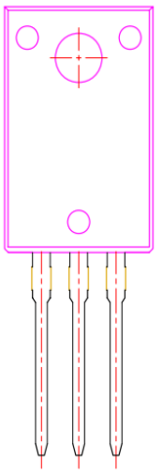


Reverse Recovery Definitions

Package Dimensions

Package TO-220F





BOTTOM VIEW

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

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