Features

- Effectively lower down T_j and R_{th}, high anti-EMI ability
- High speed switching with low capacitances
- High blocking voltage with low $R_{DS(on)}$
- Easy to drive and parallel
- RoHS compliant

Benefits

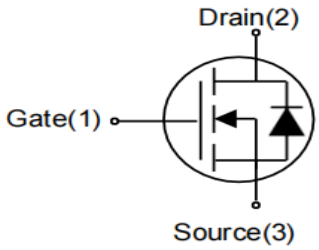
- Increased power density
- Higher operating frequency
- Reduced heat sink requirements
- Higher efficiency
- EMI reduction

Applications

- Power factor correction modules
- Switch mode power supplies
- Power inverters
- High voltage converters

Parameter	Rating	Units
V_{DS}	**800**	V
$I_{D\ @\ 25°C}$	**4**	A
$R_{DS(on)}$	**900**	mΩ

TO-220F (Full Pack)



Part Number	Package	Marking
GC3M090065F	TO-220F	GC3M090065

Maximum Ratings (T_C=25℃ unless otherwise specified)

Symbol	Parameter	Test conditions	Value	Unit	Note
V_{DSmax}	Drain-Source Voltage	V_{GS} = 0V, I_D = 100μA	800	V	
V_{GS}	Gate-Source voltage (transient)	t_p≤500ns, duty cycle ≤1%	-8/+22	V	
V_{GSop}	Recommend Gate-Source Voltage	Static	-4/+18	V	
$V_{GSop,max}$	Maximum recommend Gate-Source Voltage		-5/+20	V	
EAS	Single pulse avalanche energy	V_{DS}=800V, V_{DD}=50V, V_{GS}=15V, L=1mH, T_C=25°C	32	mJ	
I_D	Continuous Drain current[1)]	V_{GS} = 15V, T_C = 25°C	4	A	Fig. 14
		V_{GS} = 15V, T_C = 100°C	3		
I_{DM}	Pulsed Drain Current[2)]	Pulse width t_p limited by T_{jmax}	30	A	Fig. 18
P_D	Power Dissipation	T_C = 25°C, Tj = 175°C	20	W	Fig. 16
T_j	Operating junction temperature		-55~175	°C	
T_{stg}	Storage temperature		-55~175	°C	

Thermal Characteristics

Symbol	Parameter	Value			Unit	Note
		Min.	Typ.	Max.		
$R_{th(jc)}$	Thermal resistance from Junction to Case		3.5		K/W	Fig. 15
$R_{th(ja)}$	Thermal resistance from Junction to Ambient		40		K/W	

Electrical Characteristics T_j=25°C unless otherwise specified

Static Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
$V_{(BR)DSS}$	Drain-Source Breakdown voltage	V_{GS} = 0V, I_D = 100μA	800			V	
$V_{GS(th)}$	Gate Threshold voltage	V_{GS} = V_{DS}, I_D = 10mA		3.2		V	Fig. 9
		V_{GS} = V_{DS}, I_D = 10mA, T_j=175°C		2.2			
I_{GSS}	Gate-Source Leakage current	V_{GS} = 15V, V_{DS} = 0V			250	nA	
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 800V, V_{GS} = 0V, T_j = 25°C		1	50	μA	
$R_{DS(on)}$	Drain-Source On-state Resistance	V_{GS} = 15V, I_D = 0.5A V_{GS} = 18V, I_D = 0.5		900 700		mΩ	Fig. 3, 4, 5
		V_{GS} = 15V, I_D = 0.5A, T_j = 175°C V_{GS} = 18V, I_D = 0.5A, T_j = 175°C		1000 800			
g_{fs}	Transconductance	V_{DS} = 10V, I_D = 1A		30		S	Fig. 6
		V_{DS} = 10V, I_D = 1A, T_j = 175°C		28			

Gate Charge Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
Q_{GS}	Gate to Source Charge	V_{GS}= -4/+18V, V_{DS}= 400V, I_D= 1A, Tj= 25°C		1		nC	Fig. 10
Q_{GD}	Gate to Drain Charge			4			
Q_G	Total Gate Charge			8			

AC Characteristics (T_j=25°C unless otherwise specified)

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
C_{iss}	Input Capacitance	V_{GS}= 0V, V_{DS}= 400V, f= 100KHz, Tj= 25°C		165		pF	Fig. 13
C_{oss}	Output Capacitance			10		pF	
C_{rss}	Reverse Transfer Capacitance			2		pF	
$R_{G(int)}$	Internal Gate Resistance	f=1 MHz, V_{AC} = 25mV		12		Ω	

Reverse Diode Characteristics (T_j=25°C unless otherwise specified)

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
V_{SD}	Diode Forward Voltage	V_{GS} = -4V, I_{SD} = 1.25A		4.3		V	Fig. 7,8
		V_{GS} = -4V, I_{SD} = 1.25A, T_j = 175°C		3.8			
I_S	Continuous Diode Forward Current	V_{GS} = -4V, T_C = 25°C		7.4		A	
$I_{S,\ pulse}$	Diode pulse Current	V_{GS} = -4V, pulse width t_p limited by T_{jmax}		32		A	
t_{rr}	Reverse Recovery Time	V_{GS} = -4V, I_{SD} = 2.5A, V_R = 400V dif/dt =1000A/us		33		nS	
Q_{rr}	Reverse Recovery Charge			35		nC	
I_{rrm}	Peak Reverse Recovery Current			1.9		A	

Switching Characteristics

Symbol	Parameter	Test conditions	Value			Unit	Note
			Min.	Typ.	Max.		
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = 400V, V_{GS} = -4/+15V I_D= 2.5A, $R_{G(ext)}$ = 20Ω L = 2.4mH		1		nS	Fig.22
t_r	Rise Time			6		nS	
$t_{d(off)}$	Turn-Off Delay Time			4		nS	
t_f	Fall Time			12		nS	
E_{on}	Turn-On Energy			5		μJ	Fig.19
E_{off}	Turn-Off Energy			3		μJ	
E_{tot}	Total switching energy			8		μJ	

Typical Characteristics

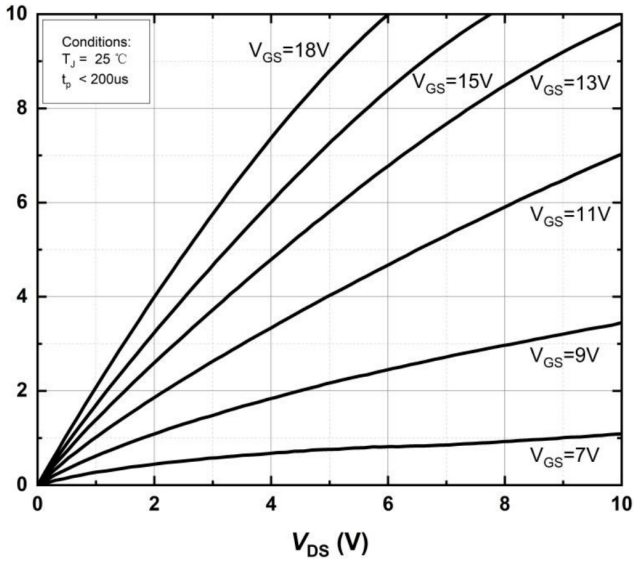


Figure 1. Output characteristics at Tj=25°C

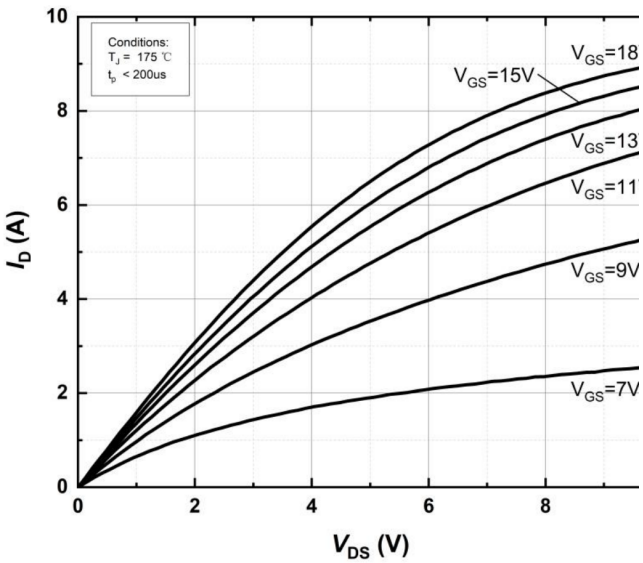


Figure 2. Output characteristics at Tj=175°C

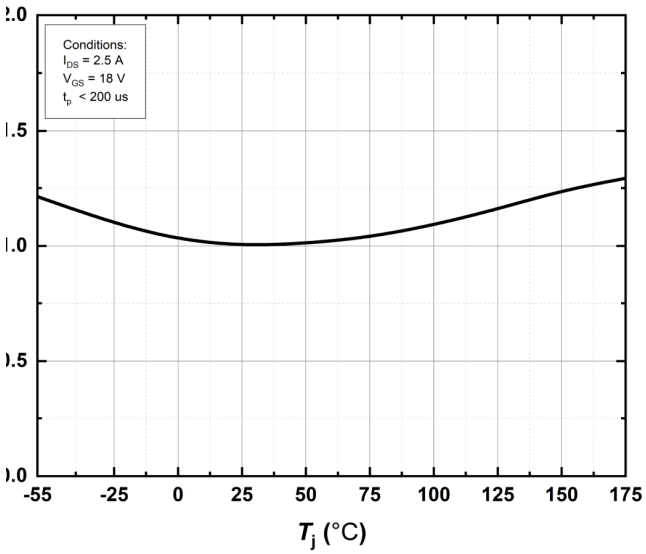


Figure 3. Normalized On-Resistance vs. Temperature

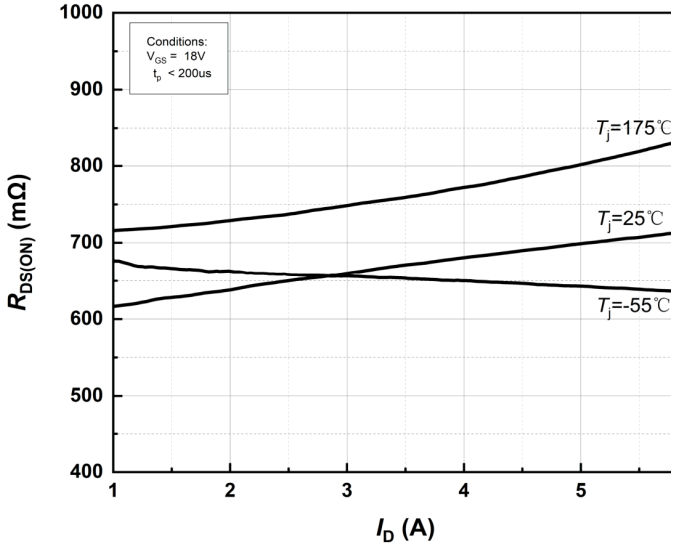


Figure 4. On-Resistance vs. Drain current for Vari Temperature

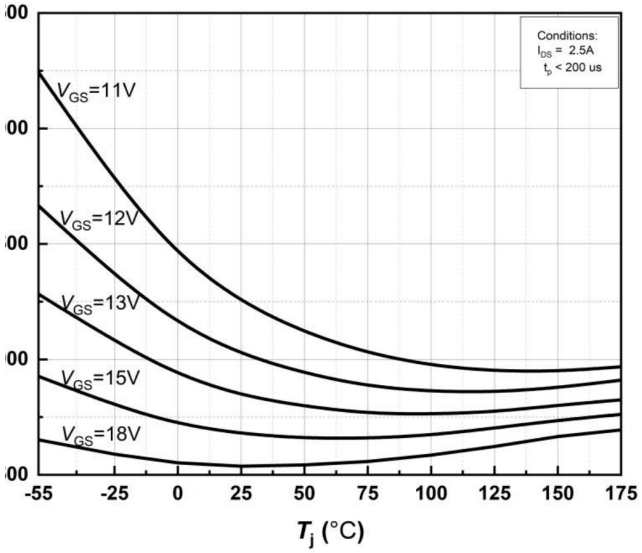


Figure 5. On-Resistance vs. Temperature for Various Gate Voltage

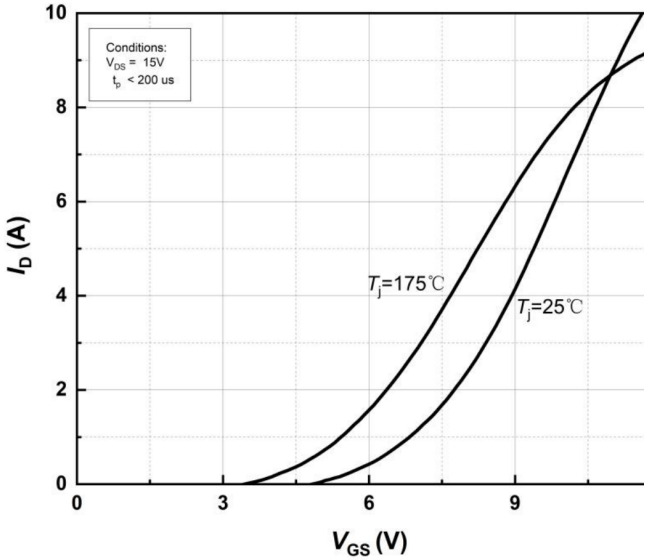


Figure 6. Transfer Characteristics for Various Junction Temperatures

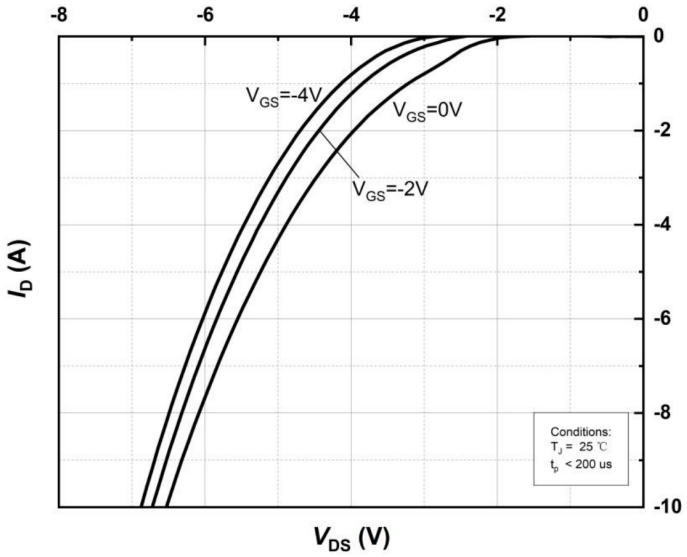


Figure 7. Body Diode Characteristics at Tj=25°C

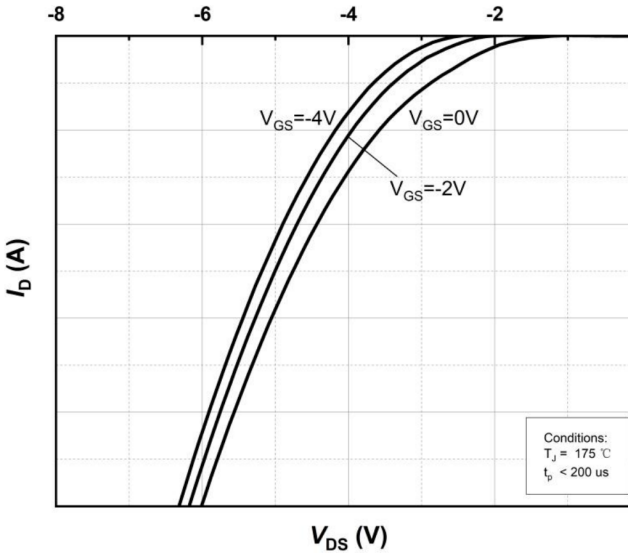


Figure 8. Body Diode Characteristics at Tj=175°C

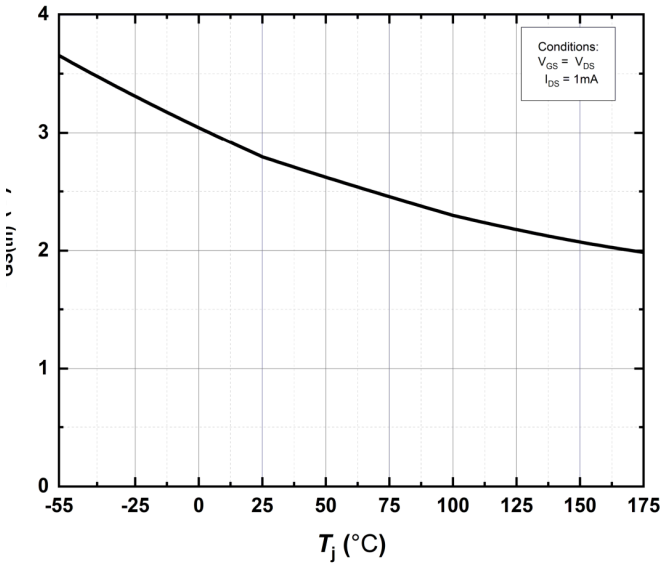


Figure 9. Threshold Voltage vs. Temperature

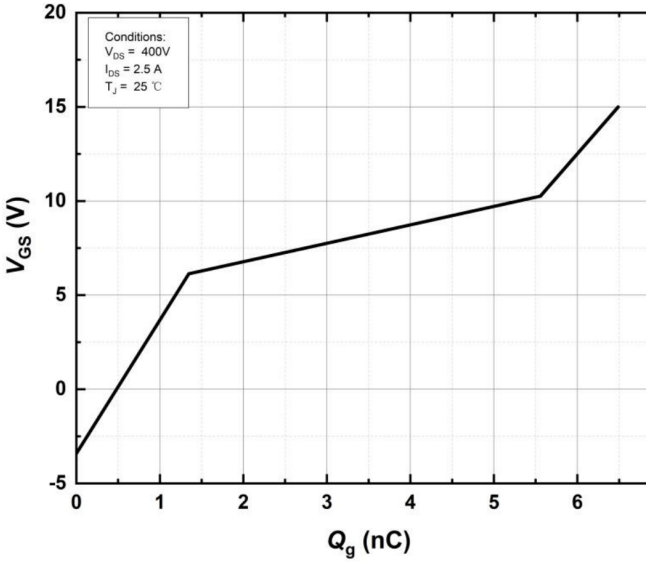


Figure 10 Gate Charge Characteristics

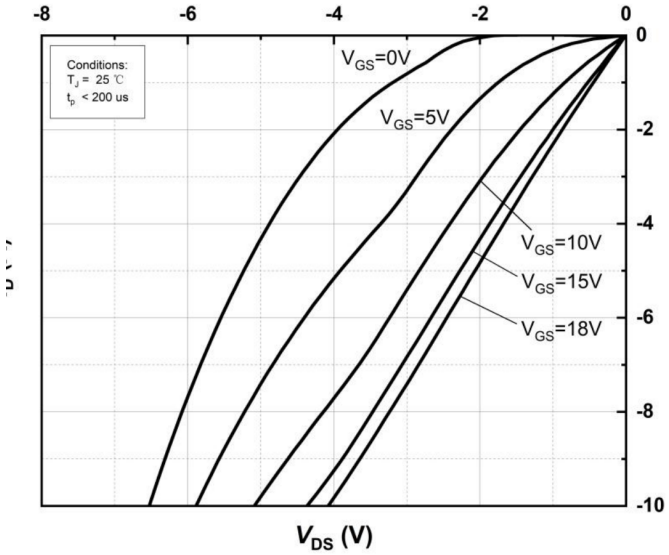


Figure 11. 3rd Quadrant Characteristic at Tj=25°C

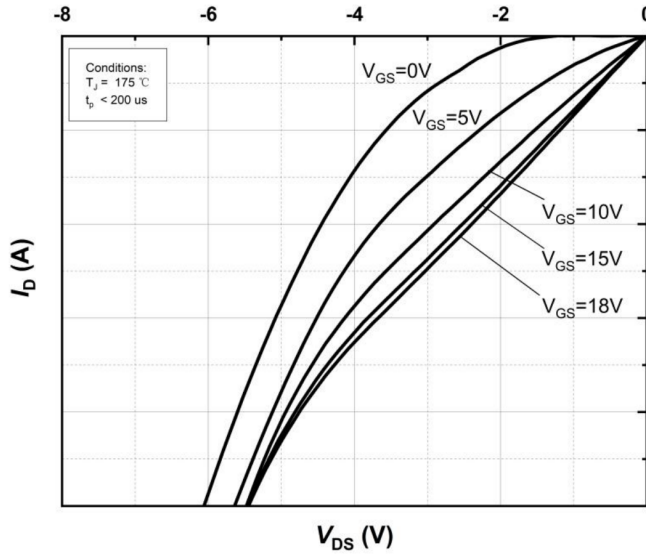


Figure 12. 3rd Quadrant Characteristic at Tj=175°C

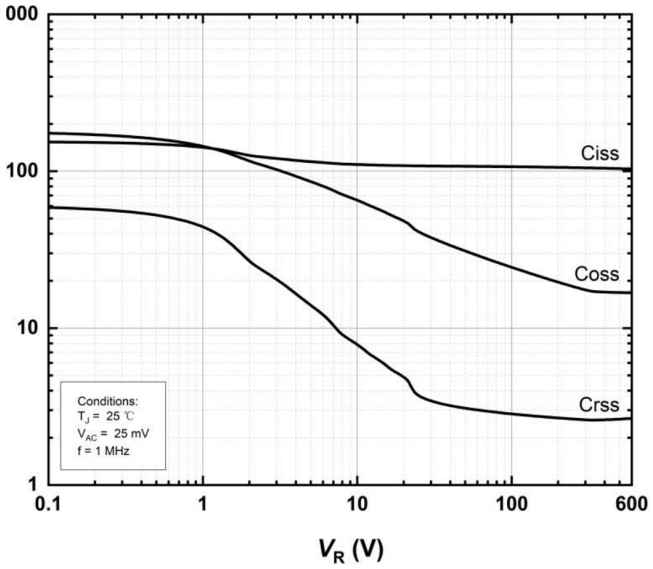


Figure 13. Capacitances vs. Drain-Source Voltage (0 – 600V)

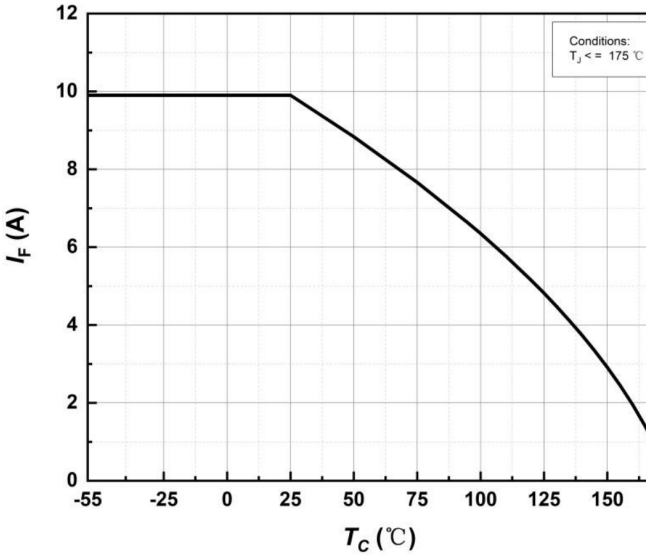


Figure 14. Continuous Drain Current Derating vs Case Temperature

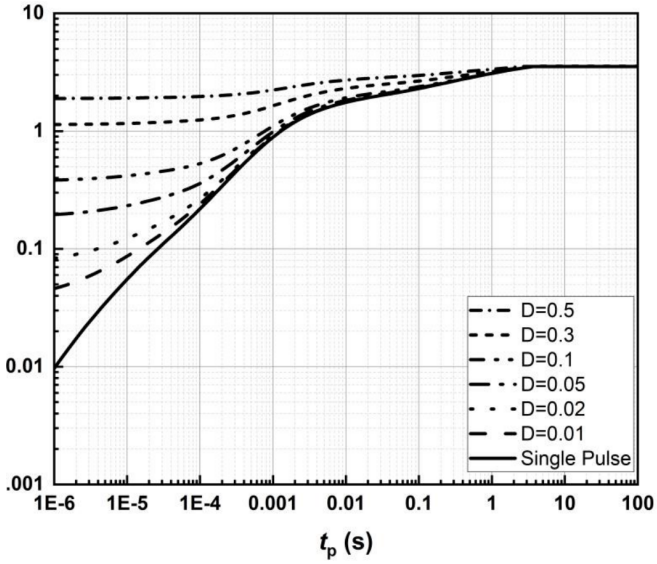


Figure 15.Transient Thermal Impedance (Junction – Case)

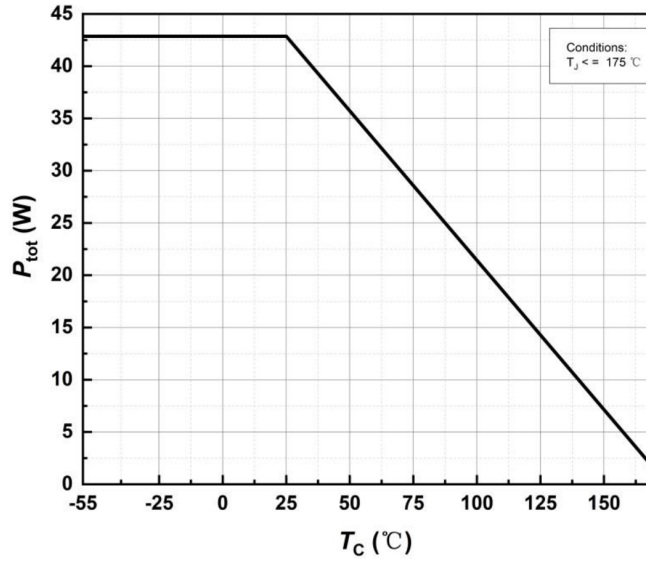


Figure 16. Maximum Power Dissipation Derating Case Temperature

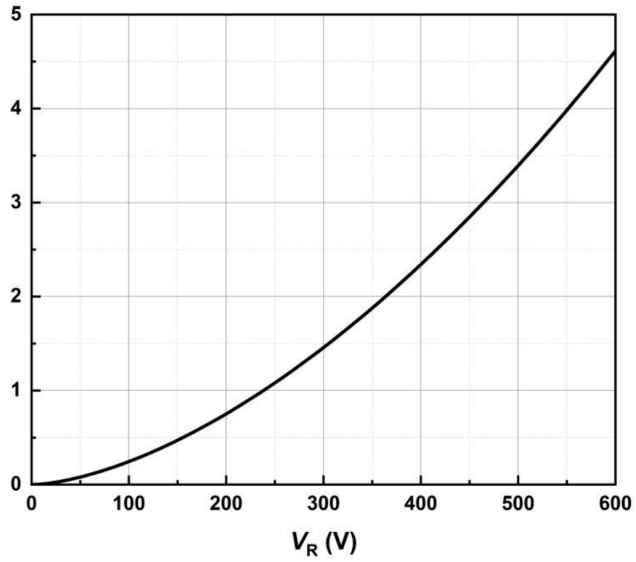


Figure 17. Output Capacitor Stored Energy

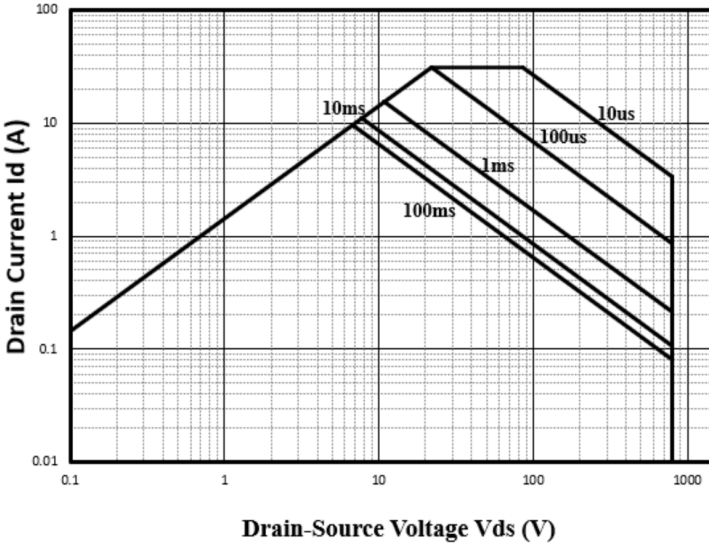


Figure 18. Safe Operating Area

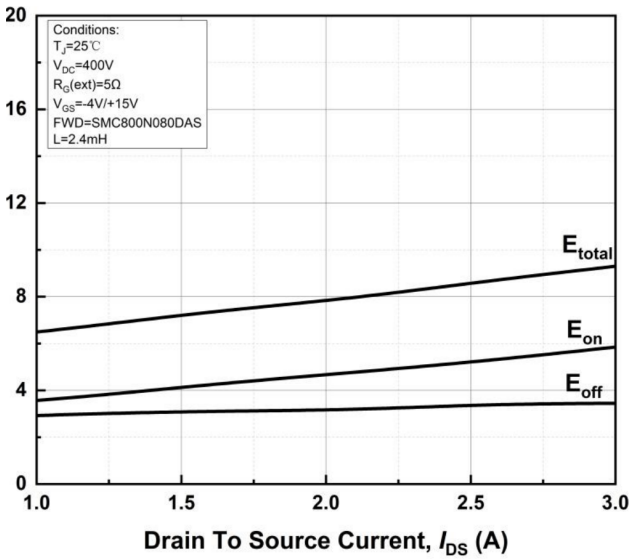


Figure 19. Clamped Inductive Switching Energy vs. Drain Current(V_{DD} = 400V)

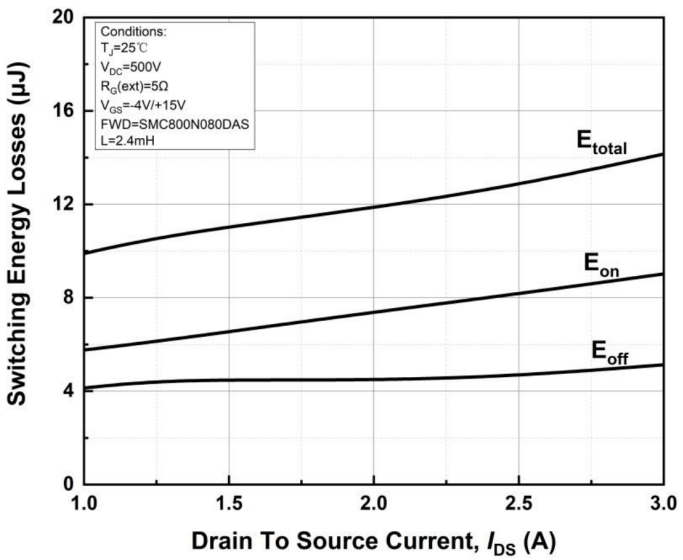


Figure 20. Clamped Inductive Switching Energy vs Drain Current(V_{DD} = 500V)

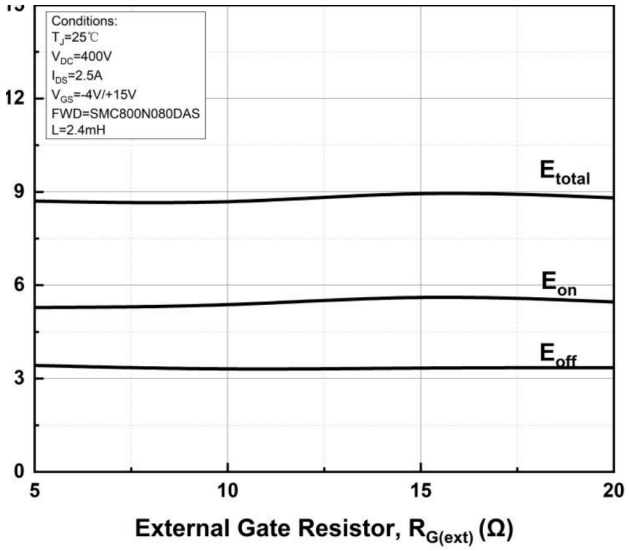


Figure 21. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

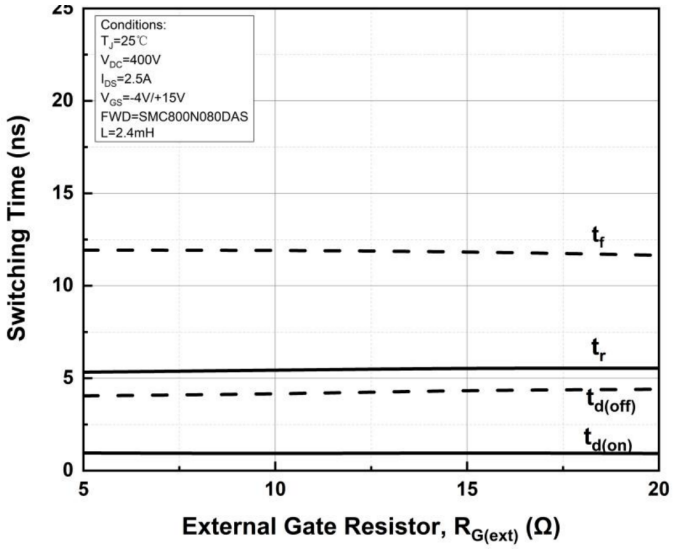
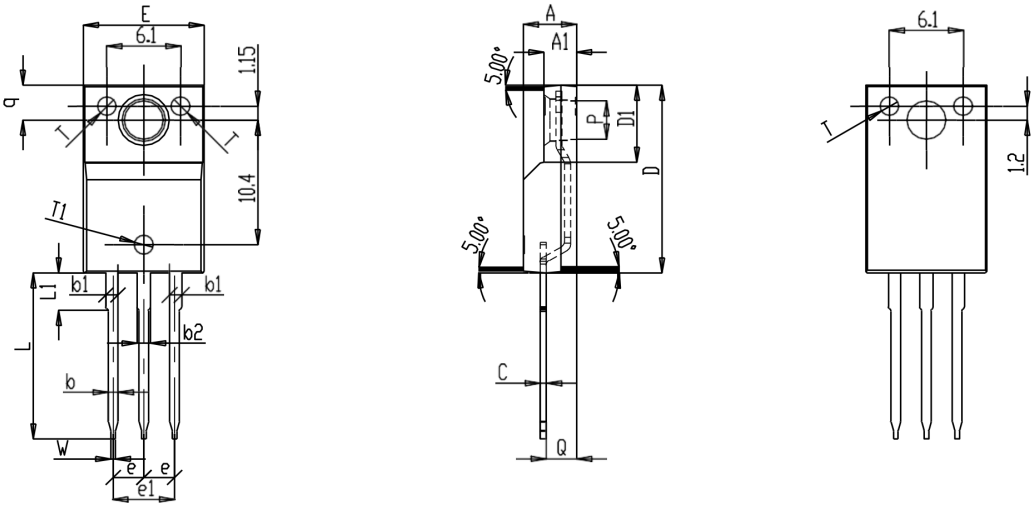


Figure 22. Switching Times vs. $R_{G(ext)}$

Package Outline Dimension: TO-220F (Full Pack)

TO-220F (Full Pack)



SYMBOL	MILLIMETERS			NOTES	SYMBOL	MILLIMETERS			NOTES
	Normal	MIN.	MAX.			Normal	MIN.	MAX.	
A	4.4	4.2	4.6		e1	5.08	5	5.12	
A1	2.7	2.5	2.9		L	13.90	13.5	14.4	
b	0.8	0.7	0.9		L1	3.12	2.8	3.3	
b1	1.07	0.9	1.3		P	3.14	3.00	3.20	
b2	1.17	1	1.4		Q	2.44	2.3	2.6	
C	0.5	0.4	0.6		q	2.87	2.6	3	
D	15.63	15.4	15.8		W	0.37	0.3	0.5	
D1	6.22	6	6.4		T	1.52	1.3	1.7	
E	10.06	9.7	10.3		T1	1.20	1.1	1.3	
e	2.54	2.5	2.58						

Revision History

Revision	Date of Release	Description of Changes
Preliminary	2025-07-19	Initial release.

Information

For further information on technology, delivery terms and conditions and prices, please contact SUPSiC.

Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device. Hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non- infringement of intellectual property rights of any third party. 1 9.Sep. 2025 V 1.0 SUPSiC Copyright