YZPST Yangzhou Positioning Tech. Co., Ltd

P/N:YZPST-M1A045170L

V_{DS}	=	1700V
I_D (T_C=25 ˚C)	=	85 A
$R_{DS(on)}$	=	34 mΩ

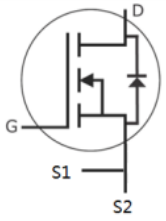
Silicon Carbide Power MOSFET

(N Channel Enhancement Mode)

Features

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low On-Resistance
- Easy to Parallel and Simple to Drive
- Resistant to Latch-UP
- Halogen Free, RoHS Compliant

Package



S1: Driver Source
S2: Power Source

Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Motor Drive

Part Number	Package	Marking
M1A045170L	TO-247-4L	M1A045170L

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

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DSmax}	Drain-Source Voltage	1700	V	V_{GS} = 0 V, I_D = 100 μA	
V_{GSmax}	Gate-Source Voltage	-10/+25	V	Absolute maximum values	
V_{GSop}	Gate-Source Voltage	-5/+20	V	Recommended operational values	
I_D	Continuous Drain Current	85	A	V_{GS} = 20 V, T_C = 25˚C	
		55		V_{GS} = 20 V, T_C = 100˚C	
$I_{D(pluse)}$	Pulsed Drain Current	160	A	Pulse width t_P limited by T_{jmax}	
P_D	Power Dissipation	520	W	T_C =25˚C, T_J =150˚C	
T_J , T_{stg}	Operating Junction and Storage Temperature	-55 to 175	˚C		
T_L	Solder Temperature	260	˚C	1.6mm (0.063”) from case for 10s	
M_d	Mounting Torque	1 8.8	Nn lbf-in	M3 or 6-32 screw	

Electrical Characteristics (Tc = 25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
$V_{(BR)DSS}$	Drain Drain-Source Breakdown Voltage	1700		-	V	V_{GS} = 0 V, I_D = 100 μA	
$V_{GS(th)}$	Gate threshold Voltage	2.0	2.6	4	V	V_{DS} = V_{GS}, I_D = 18mA	
			1.9		V	V_{DS} = V_{GS}, I_D = 18mA, T_J=150°C	
I_{DSS}	Zero Gate Voltage Drain Current		2	100	μA	V_{DS} = 1700 V, V_{GS} = 0 V	
I_{GSS}	Gate Source Leakage Current			2	uA	V_{GS} = 20 V, V_{DS} = 0 V	
R_{DSON}	Drain-Source On-State Resistance		34	60	mΩ	V_{GS} = 20 V, I_D = 50 A	
			66			V_{GS} = 20 V, I_D = 50A, T_J=150°C	
g_{fs}	Transconductance		16		S	V_{GS} = 20 V, I_D = 50A	
			19			V_{GS} = 20 V, I_D = 50A, T_J=150°C	
C_{iss}	Input Capacitance		4078		pF	V_{DS}=1000V,TJ=25°C,f=1MHz	
C_{oss}	Output Capacitance		167				
C_{rss}	Reverse Capacitance		39				
E_{oss}	C_{oss} Stored Energy		203		μJ		
E_{on}	Turn on Switching Energy		1.9		mJ	V_{DS} = 1200 V, V_{GS} = -5/20 V, I_D = 50A, $R_{g(ext)}$ = 2.5Ω, TJ=150°C	
E_{off}	Turn off Switching Energy		0.3				
t_{don}	Turn on delay time		21		ns	V_{DS} = 1200 V, V_{GS} = -5/20 V, I_D = 50A, $R_{g(ext)}$= 2.5Ω	
t_r	Rise time		46				
t_{doff}	Turn off delay time		50				
t_f	Fall time		19				
R_{gint}	Internal Gate Resistance		2.6			V_{AC}=25mV, f=1MHz	
Q_{gs}	Gate to Source Charge		44		nC	V_{DS} = 1200 V, V_{GS} = -5/20 V, I_D = 50A	
Q_{gd}	Gate to Drain Charge		84				
Q_g	Total Gate Charge		248				

Electrical Characteristics (Tc = 25°C unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit	Test Conditions	Note
V_{SD}	Diode Forward Voltage		6.1	-	V	V_{GS} = -5 V, I_{SD} = 25 A	
			5.2			V_{GS} = -5 V, I_{SD} = 25 A,T_J=150°C	
I_S	Continuous Diode Forward Current			75	A	V_{GS} = -5V, T_C=25°C	
t_{rr}	Reverse Recovery Time		126		ns	V_R= 1200 V, V_{GS} = -5V, I_D = 50A, di/dt=1400A/μS,, T_J=150°C	
Q_{rr}	Reverse Recovery Charge		1360		nC		
I_{rrm}	Peak Reverse Recovery Current		19		A		

Thermal Characteristics

Symbol	Parameter	Value	Unit	Note
$R_{\theta JC}$	Thermal Resistance(Junction to Case)	0.24	°C/W	
$R_{\theta JA}$	Thermal Resistance From Junction to Ambient	30		

Typical Performance

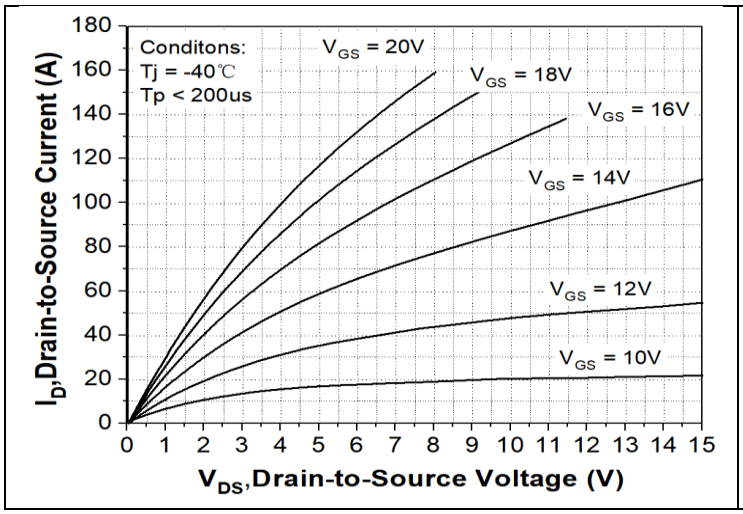


Figure 1. Output Characteristics T_J = -40 ºC

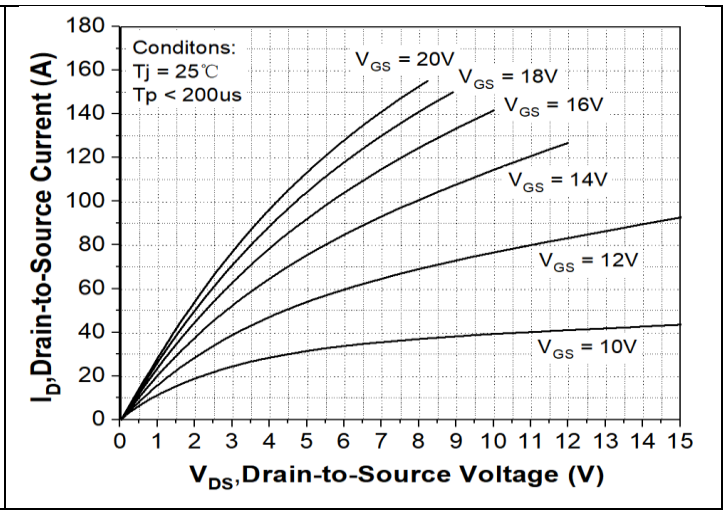


Figure 2. Output Characteristics T_J = 25 ºC

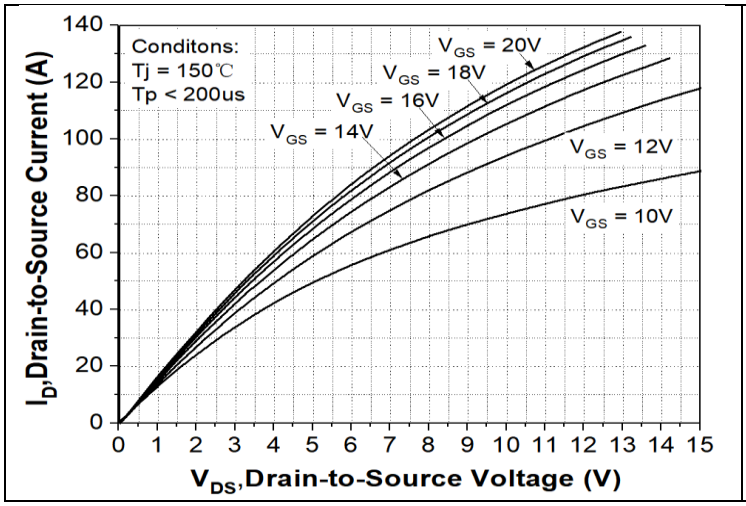


Figure 3. Output Characteristics T_J = 150ºC

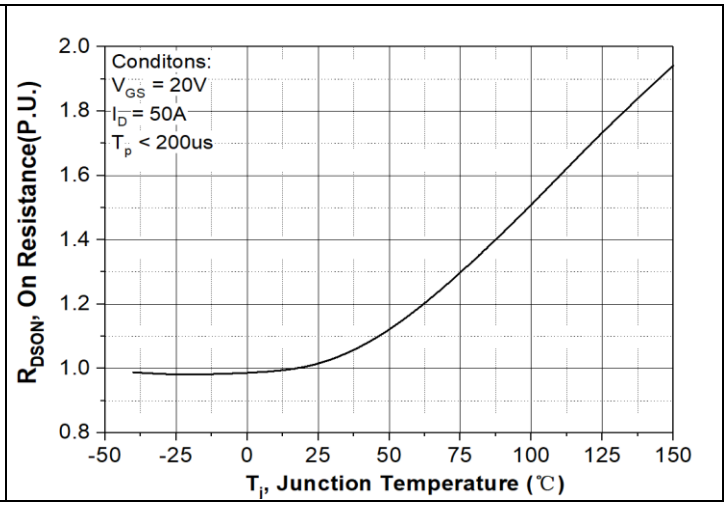


Figure 4. Normalized On-Resistance vs. Temperature

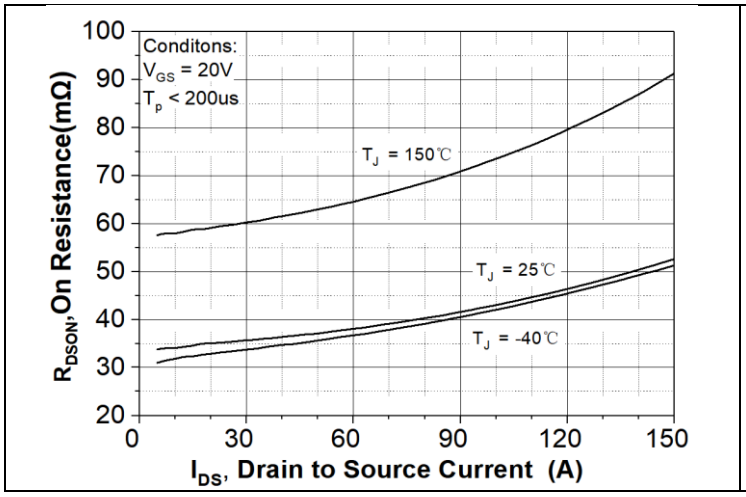


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

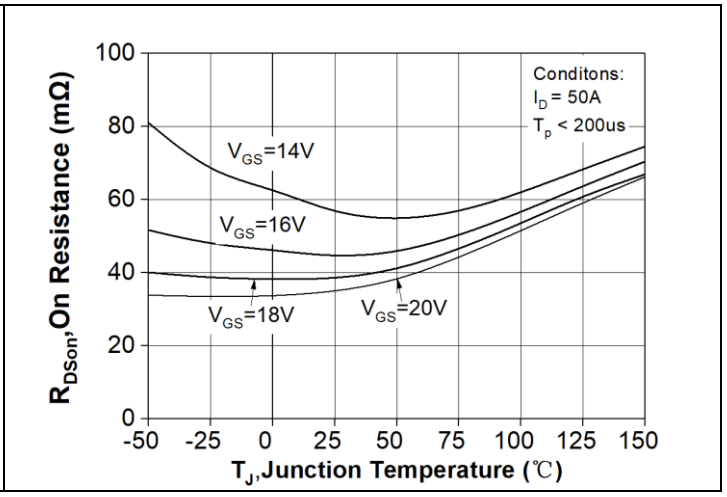


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

Typical Performance

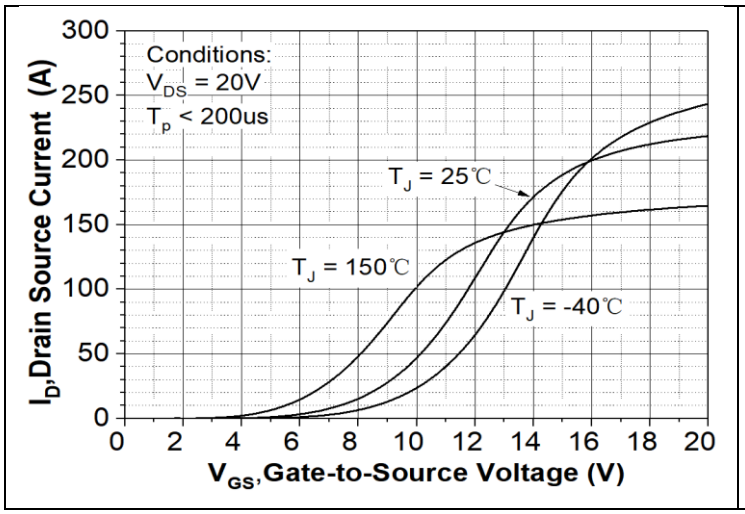


Figure 7. Transfer Characteristic for Various Junction Temperatures

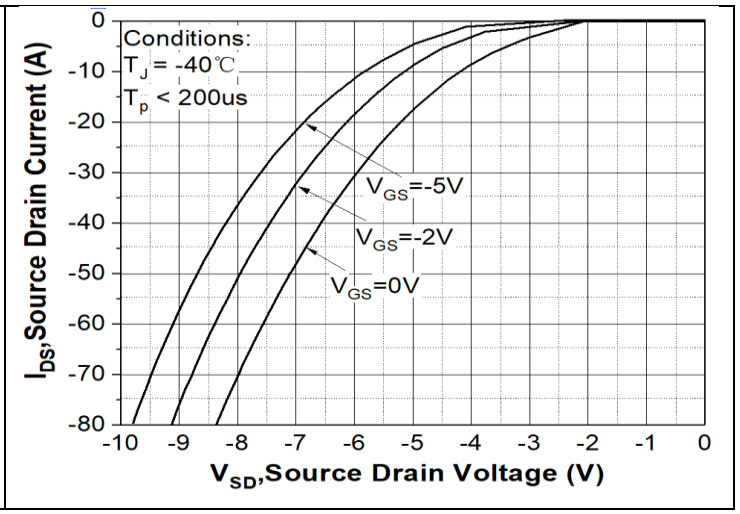


Figure 8. Body Diode Characteristic at T_J = -40 ºC

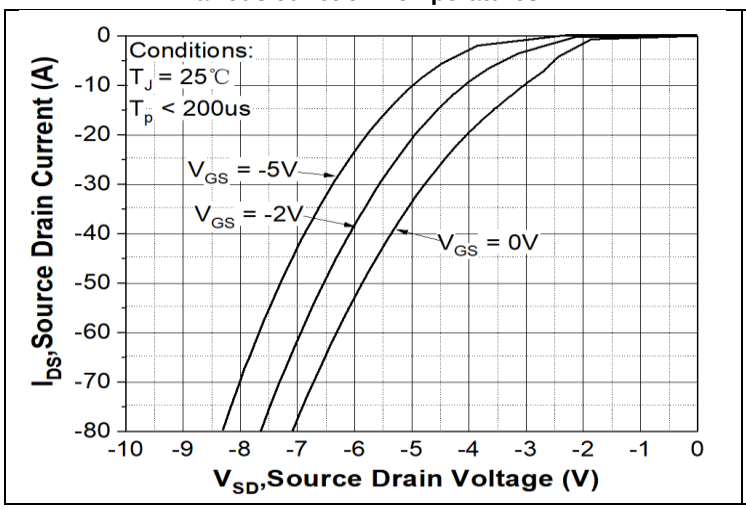


Figure 9. Body Diode Characteristic at T_J = 25 ºC

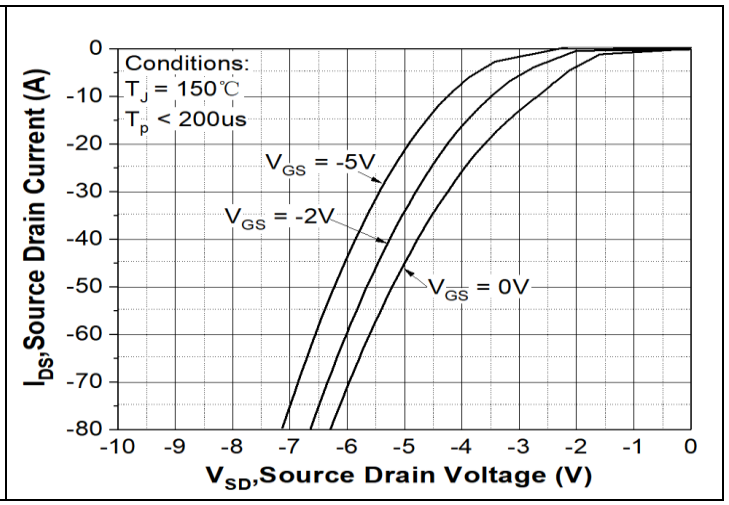


Figure 10. Body Diode Characteristic at T_J = 150 ºC

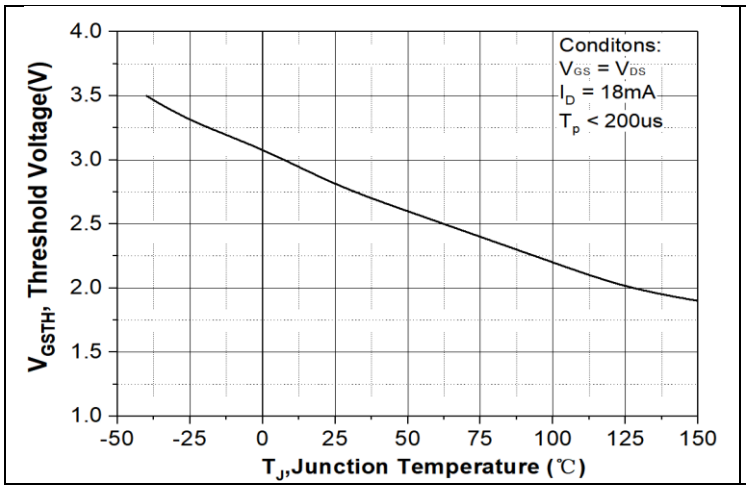


Figure 11. Threshold Voltage vs. Temperature

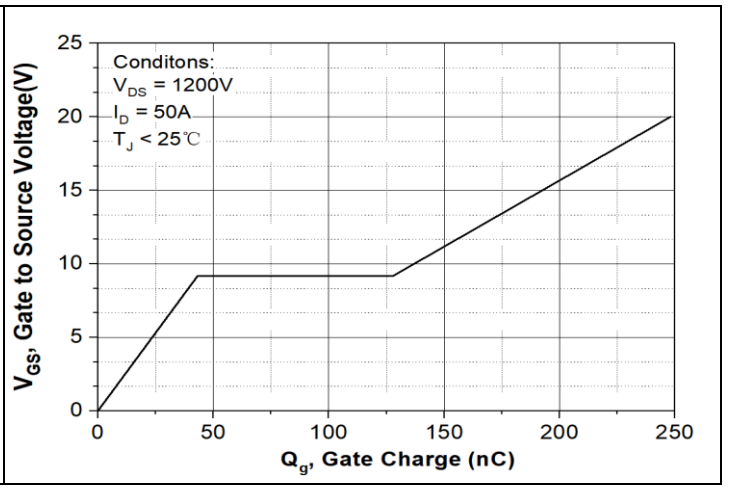


Figure 12. Gate Charge Characteristic

Typical Performance

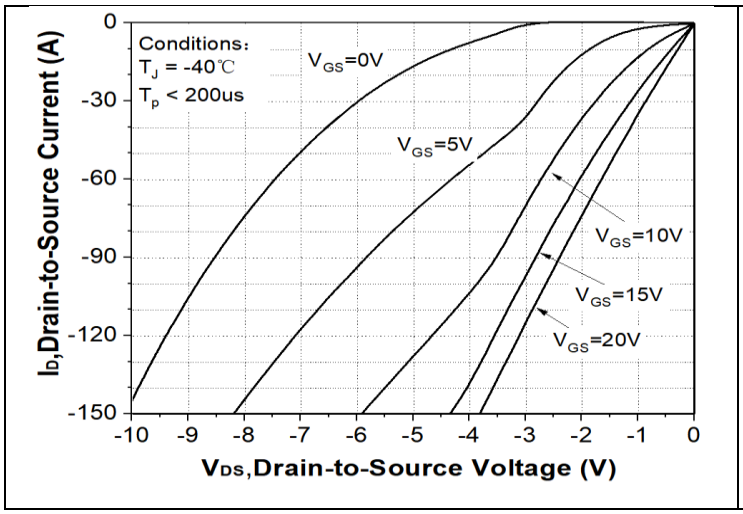


Figure 13. 3rd Quadrant Characteristic at T_J = -40 °C

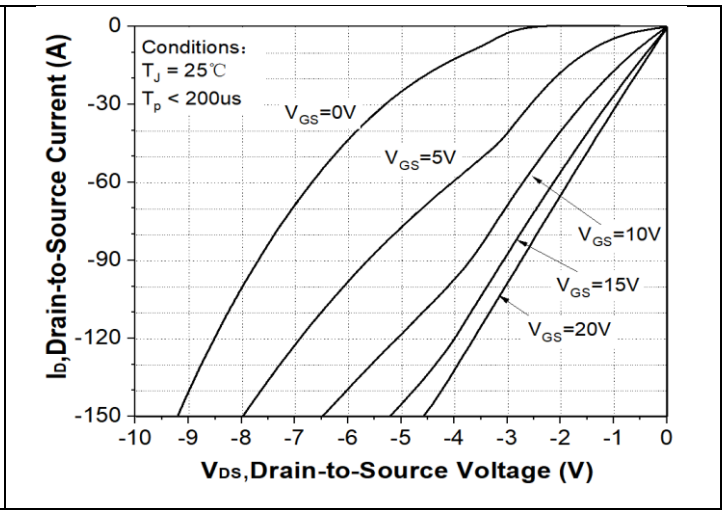


Figure 14. 3rd Quadrant Characteristic at T_J = 25 °C

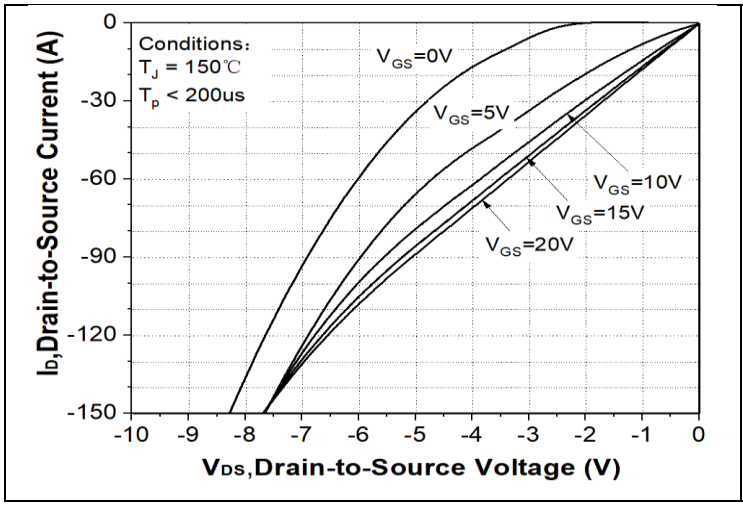


Figure 15. 3rd Quadrant Characteristic at T_J = 150°C

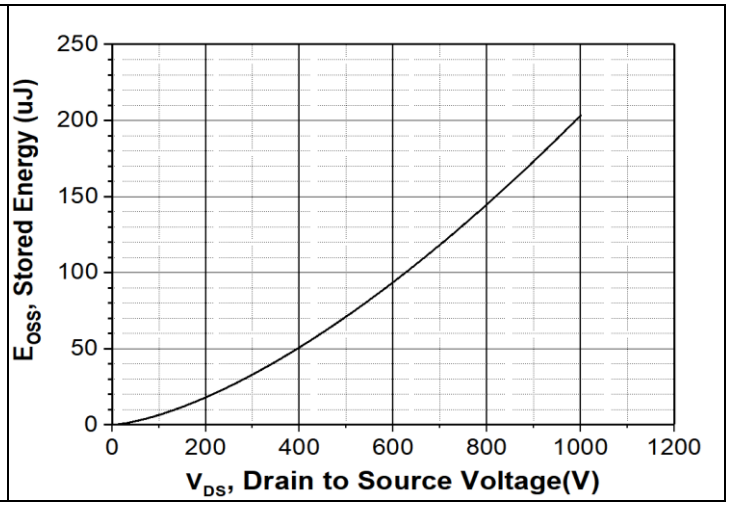


Figure 16. Output Capacitor Stored Energy

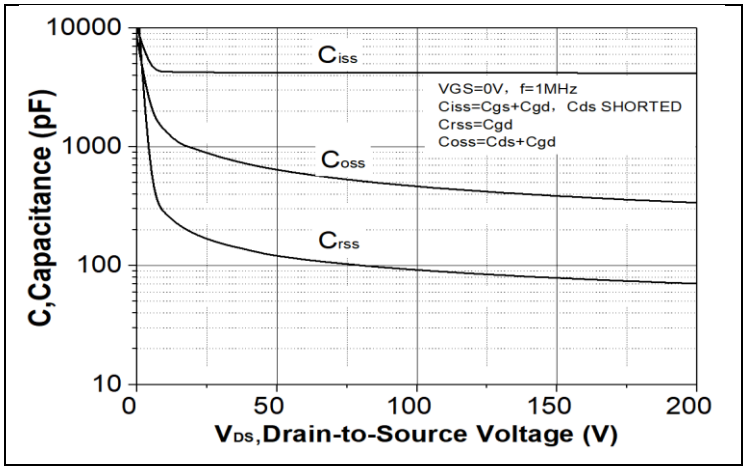


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200V)

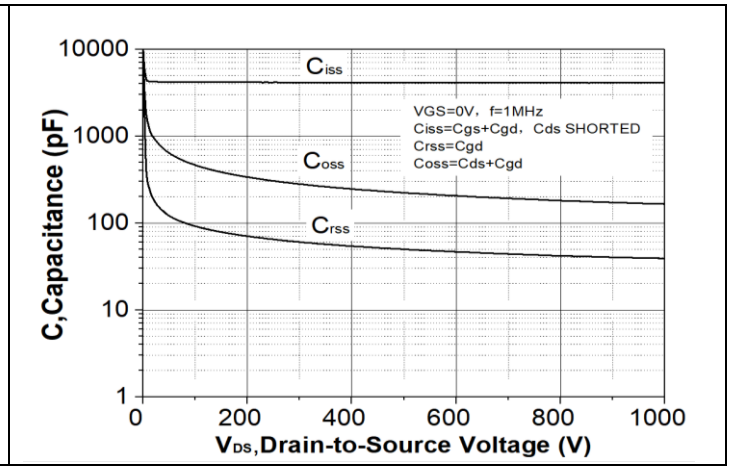


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1000V)

Typical Performance

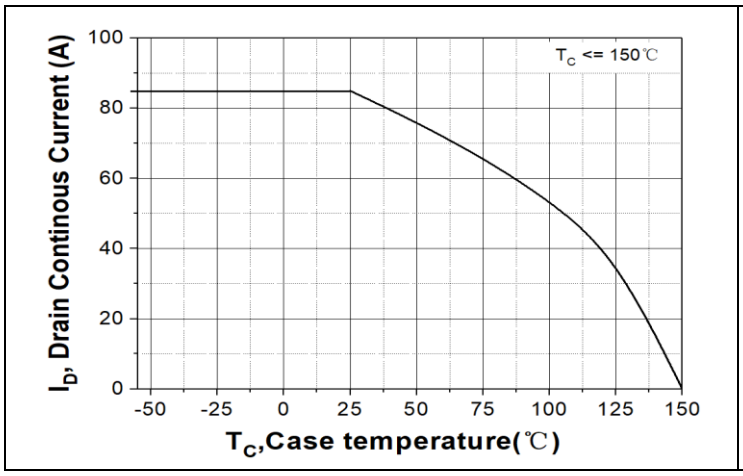


Figure 19. Continuous Drain Current Derating vs. Case Temperature

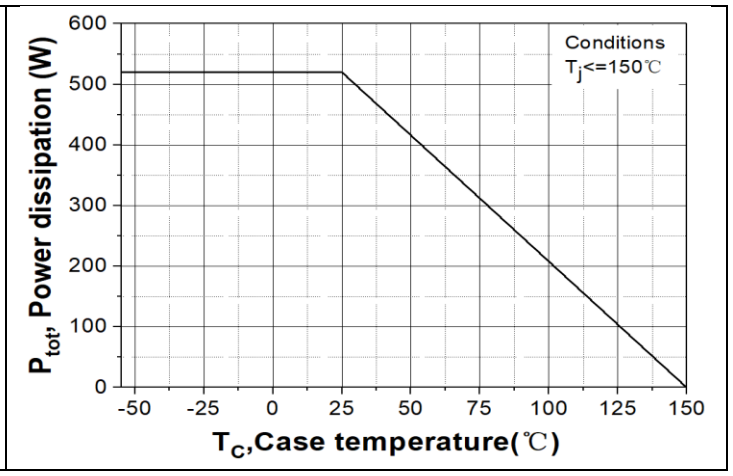


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

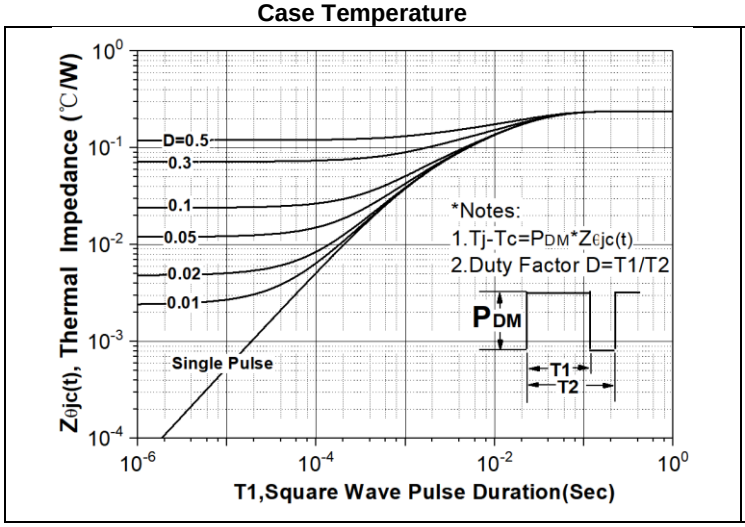


Figure 21. Transient Thermal Impedance (Junction - Case)

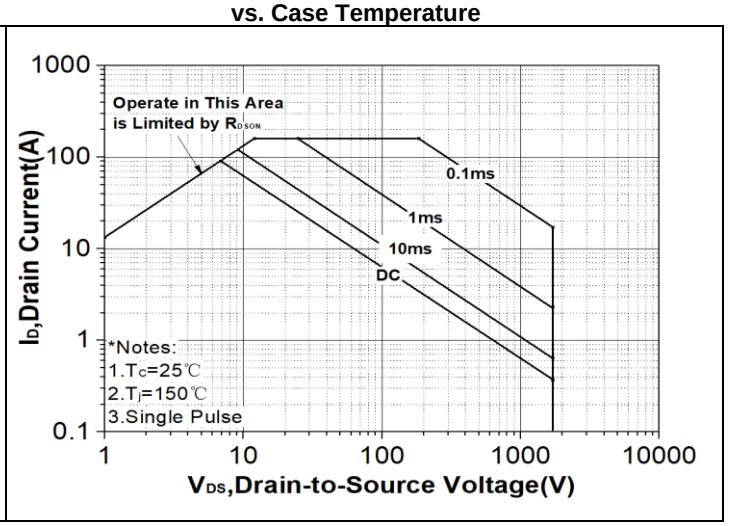


Figure 22. Safe Operating Area

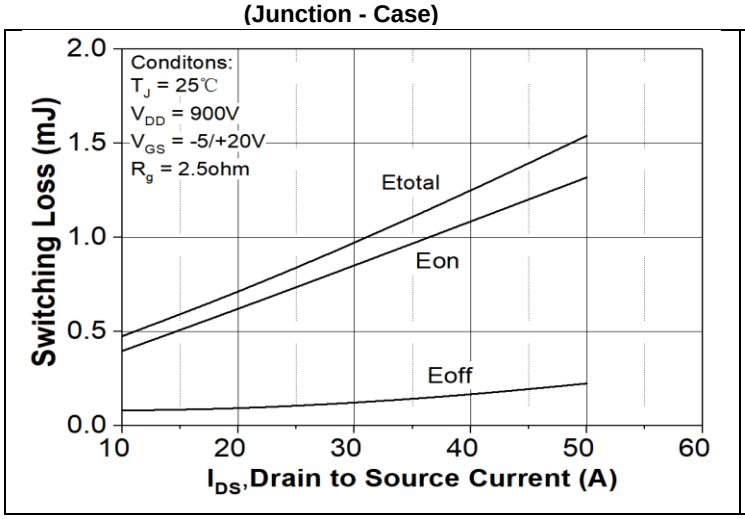


Figure 23. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 900V)

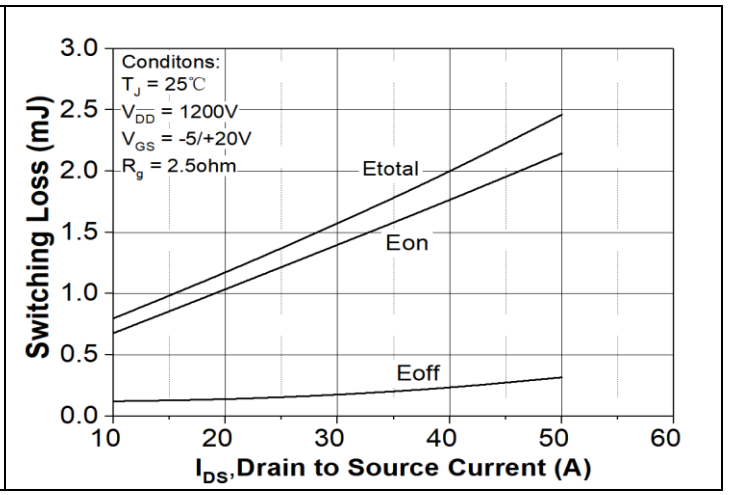


Figure 24. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 1200V)

Typical Performance

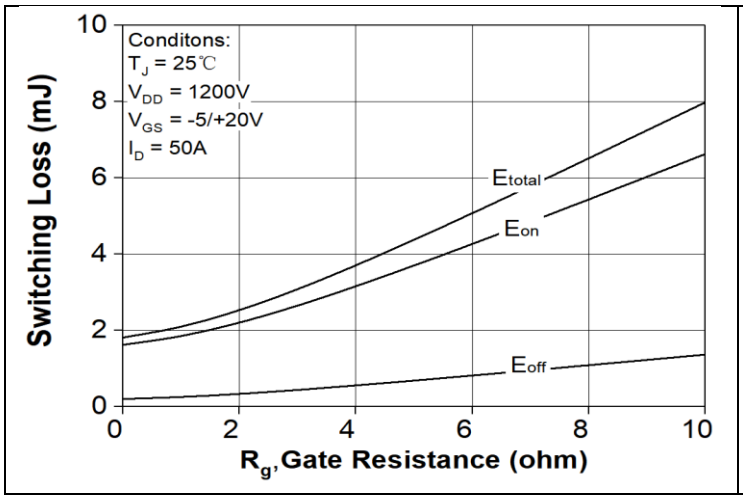


Figure 25. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

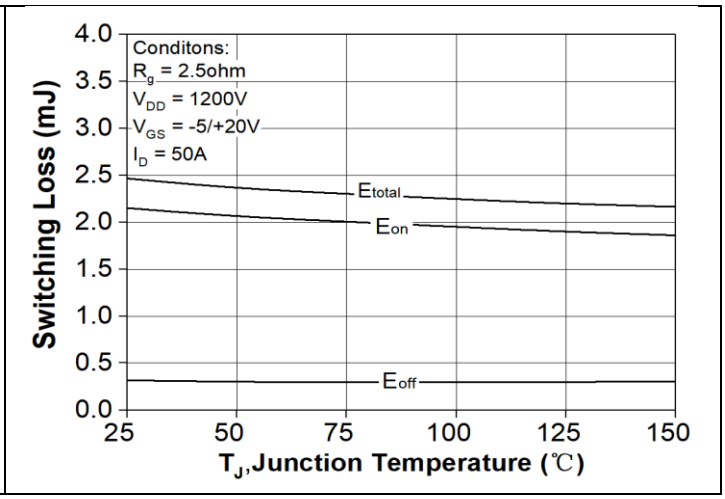


Figure 26. Clamped Inductive Switching Energy vs. Temperature

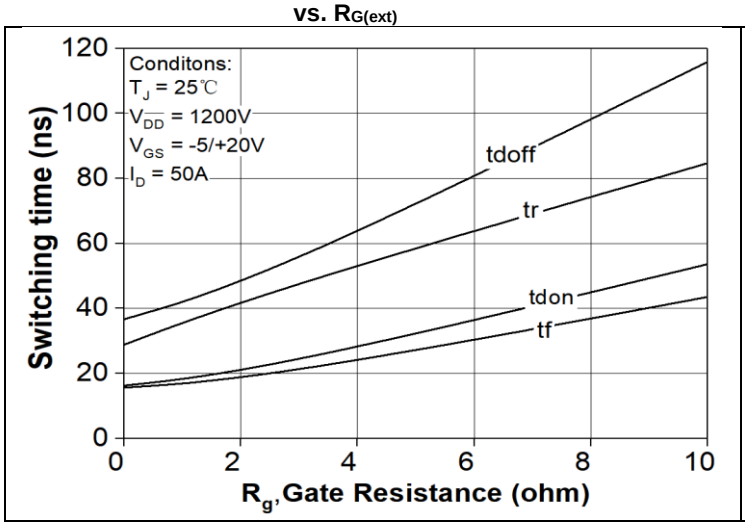


Figure 27. Switching Times vs. $R_{G(ext)}$

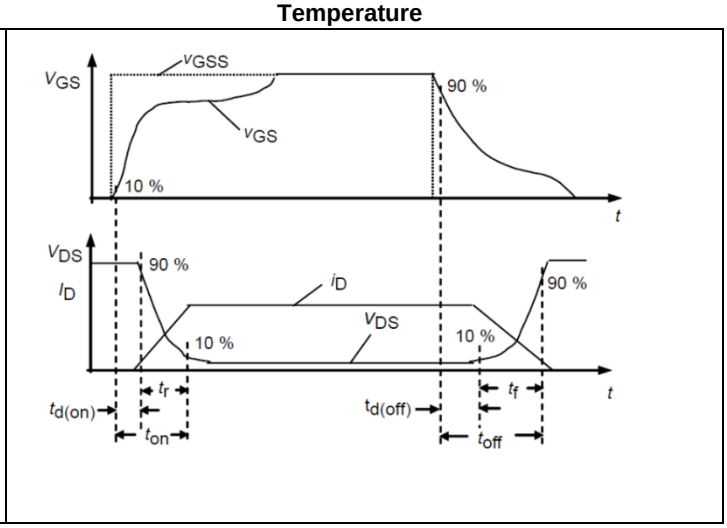
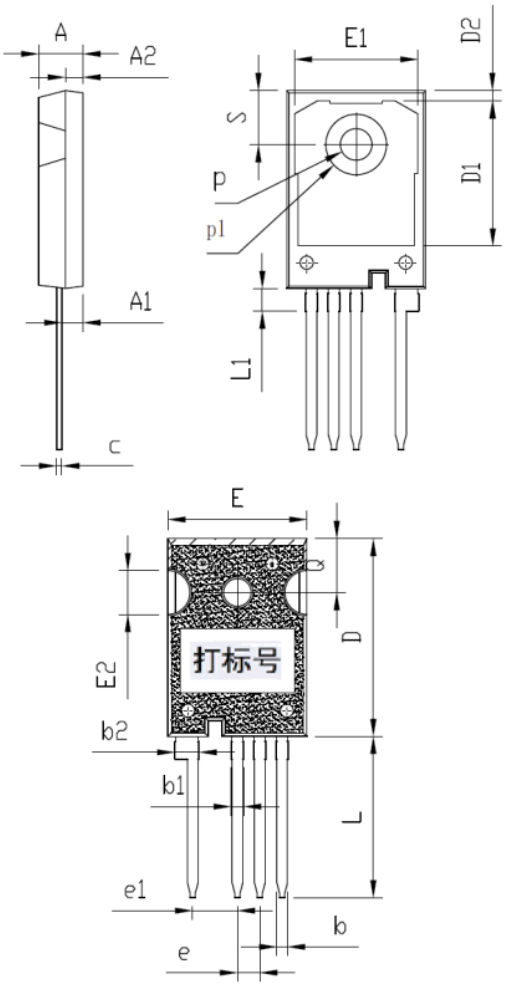


Figure 28. Switching Times Definition

Package Dimensions

Package TO-247-4



SYMBOLS	DIMENSIONS IN MILLMETERS		
	MIN	NOM	MAX
A		5.00	
A1		2.40	
A2		2.00	
b		1.20	
b1		1.30	
b2		2.65	
c		0.6	
D		22.54	
D1		16.50	
D2		1.17	
e		2.54	
e1		5.08	
E		15.80	
E1		14.00	
E2		5.00	
L		18.38	
L1		2.58	
p		3.60	
p1		6.80	
Q		6.15	
S		6.15	