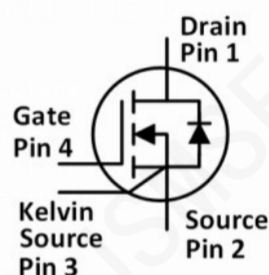


Features

- High blocking voltage with low on-resistance
- Temperature-Independent switching behavior
- High operating junction temperature capability

Applications

- Solar Inverters
- Switch Mode Power Supplies
- Online UPS/Industrial UPS
- High Voltage DC/DC Converters



V_{DS}	650V
I_{DS} ($T_c=25^\circ\text{C}, R_{th(j-c,max)}$)	85A
$R_{DS(ON),typ}$ ($V_{GS}=15V, I_D=30A, T_j=25^\circ\text{C}$)	40m Ω
$T_{j,max}$	175 $^\circ\text{C}$

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

Symbol	Parameter	Conditions	Value	Unit	Note
$V_{DS,max}$	Drain Source Voltage	$V_{GS}=0V, I_D=1mA$	650	V	
$V_{GS,max}$	Gate Source Voltage	Absolute Maximum Values	-8/+22	V	
V_{GSop}	Gate Source Voltage	Recommended Operational Values	-4/+15	V	
I_D	Continuous Drain Current	$V_{GS}=15V, T_c=25^\circ\text{C}$	85	A	Fig.19
		$V_{GS}=15V, T_c=100^\circ\text{C}$	60		
$I_{D(pulse)}$	Pulsed Drain Current	Pulse width t_p limited by $T_{j,max}$	160	A	Fig.22
P_D	Power Dissipation	$T_c=25^\circ\text{C}, T_j=175^\circ\text{C}$	312	W	Fig.20
T_{stg}	Storage Temperature		-55 to 175	$^\circ\text{C}$	
T_j	Operating Junction Temperature		-55 to 175	$^\circ\text{C}$	
T_L	Soldering Temperature	1.6mm (0.063") from case for 10s	260	$^\circ\text{C}$	

Static Characteristics (Tc=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Value			Unit	Note
			Min	Typ	Max		
$V_{(BR)DSS}$	Drain Source Breakdown Voltage	$V_{GS}=0V, I_D=1mA$	650	-	-	V	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=10mA$	1.8	2.9	4.3	V	Fig.11
		$V_{DS}=V_{GS}, I_D=10mA, T_J=175^{\circ}C$	-	2.1	-	V	
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=650V, V_{GS}=0V$		0.02	10	μA	
I_{GSS}	Gate Source Leakage Current	$V_{GS}=15V, V_{DS}=0V$	-	-	100	nA	
$R_{DS(on)}$	Current Drain-Source On-State Resistance	$V_{GS}=15V, I_D=30A$	-	38	51	m Ω	Fig.4,5,6
		$V_{GS}=15V, I_D=30A, T_J=175^{\circ}C$	-	44	-		
		$V_{GS}=18V, I_D=30A$	-	28	41		
		$V_{GS}=18V, I_D=30A, T_J=175^{\circ}C$	-	40	-		
g_{fs}	Transconductance	$V_{DS}=20V, I_D=30A$	-	18	-	S	Fig.7
		$V_{DS}=20V, I_D=30A, T_J=175^{\circ}C$	-	17	-		
$R_{g,int}$	Internal Gate Resistance	$V_{AC}=25mV, f=1MHz$	-	8.3	-	Ω	
V_{SD}	Diode Forward Voltage	$V_{GS}=-4V, I_{SD}=15A$	-	3.2	-	V	Fig.8,9,10
		$V_{GS}=-4V, I_{SD}=15A, T_J=175^{\circ}C$	-	2.8	-		

Dynamic Characteristics (Tc=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Value			Unit	Note
			Min	Typ	Max		
C_{iss}	Input Capacitance	$V_{DS}=600V, V_{GS}=0V, T_J=25^{\circ}C, V_{AC}=25mV, f=100KHz$	-	2682	-	pF	Fig.17, 18
C_{oss}	Output Capacitance		-	246	-		
C_{rss}	Reverse Capacitance		-	12	-		
E_{oss}	Coss Stored Energy		-	46	-	μJ	Fig.16
Q_{gs}	Gate Source Charge	$V_{DS}=400V, V_{GS}=-4/15V, I_D=30A$	-	22	-	nC	Fig.12
Q_{gd}	Gate Drain Charge		-	32	-		
Q_g	Gate Charge		-	103	-		

Switching Characteristics (Tc=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Value			Unit	Note
			Min	Typ	Max		
E _{on}	Turn on Switching Energy	V _{DS} =400V, V _{GS} =-4/+15V, I _D =30A, R _g =2.5Ω, L=120μH	-	341	-	μJ	Fig.23
E _{off}	Turn off Switching Energy		-	62	-		
t _{d(on)}	Turn on Delay Time		-	54	-	nS	Fig.27
t _r	Rise Time		-	25	-		
t _{d(off)}	Turn off Delay Time		-	35	-		
t _f	Fall Time		-	13	-		

Body Diode Characteristics (Tc=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Value			Unit	Note
			Min	Typ	Max		
V _{SD}	Diode Forward Voltage	V _{GS} = -4V, I _{SD} =15A	-	3.2	-	V	Fig.8,9,10
		V _{GS} = -4V, I _{SD} =15A, T _j =175°C	-	2.8	-		
t _{rr}	Reverse Recovery Time	V _R =400V, V _{GS} = -4V, I _D =30A, di/dt=1000A/μS	-	18	-	nS	
Q _{rr}	Reverse Recovery Charge		-	108	-	nC	
I _{rm}	Peak Reverse Recovery Current		-	10	-	A	

Thermal Characteristics

Symbol	Parameter	Conditions	Value	Unit	Note
R _{th(j-c)}	Thermal Resistance from Junction to Case		0.48	°C/W	Fig.21

Electrical Characteristic Curves

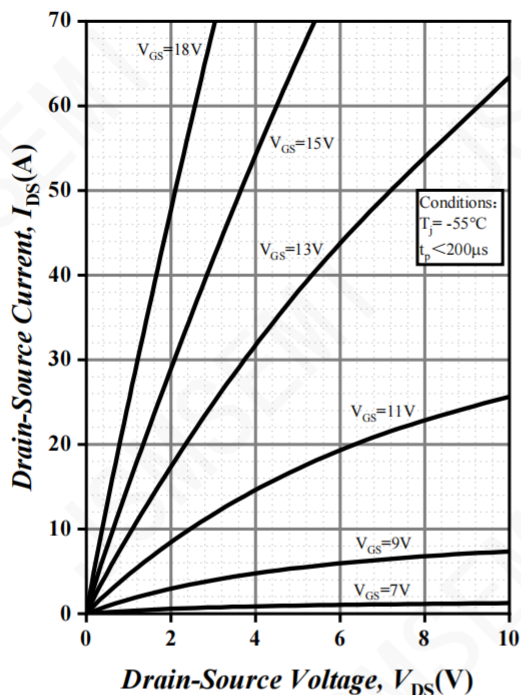


Figure 1. Output Characteristic $T_j = -55^\circ\text{C}$

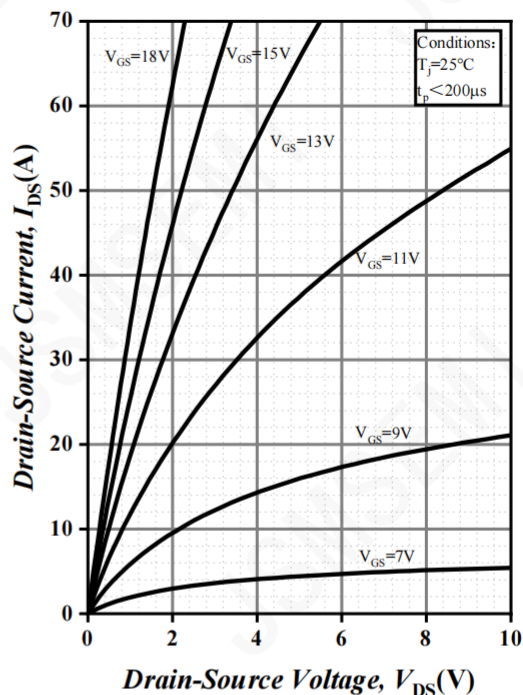


Figure 2. Output Characteristic $T_j = 25^\circ\text{C}$

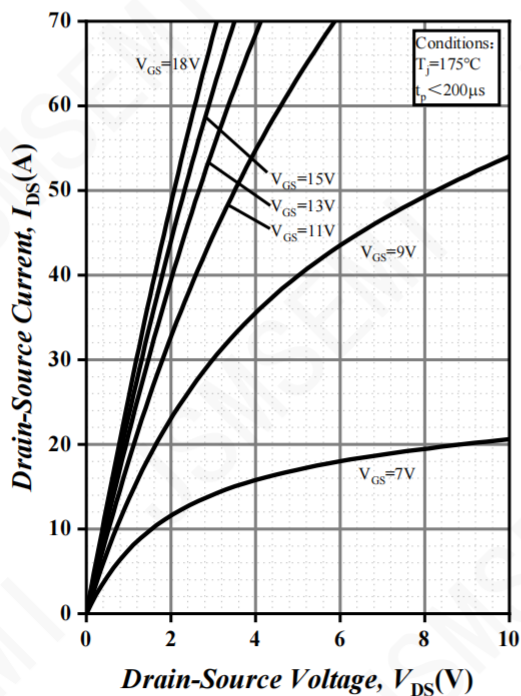


Figure 3. Output Characteristic $T_j = 175^\circ\text{C}$

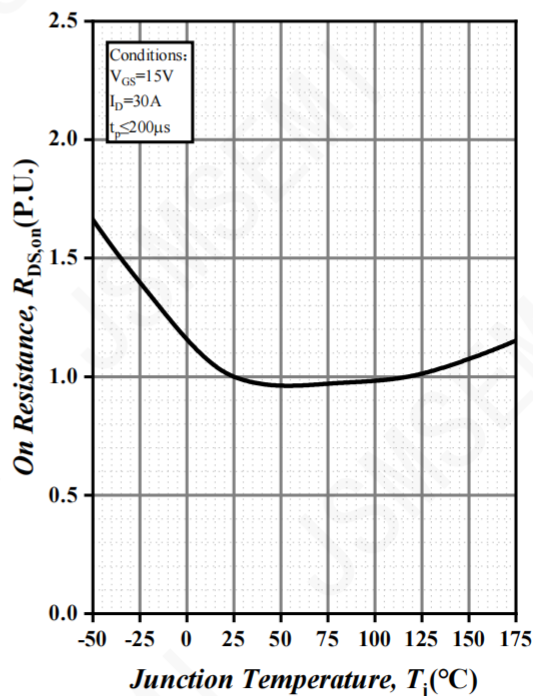


Figure 4. Normalized On-Resistance vs. Temperature

Electrical Characteristic Curves

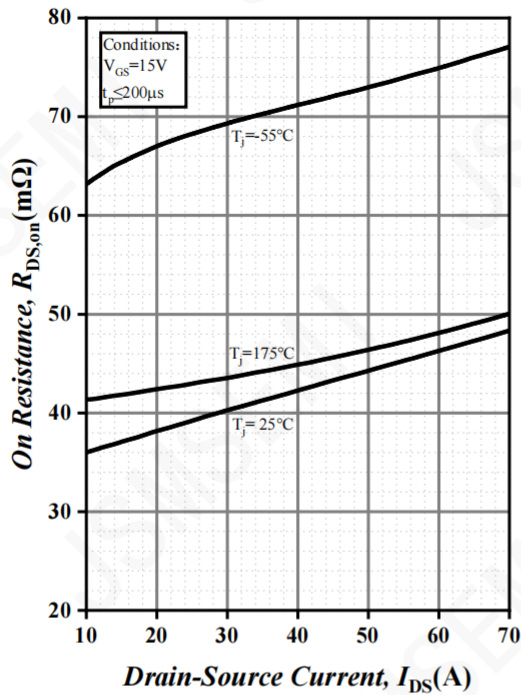


Figure 5. On-Resistance vs. Drain Current for Various Temperature

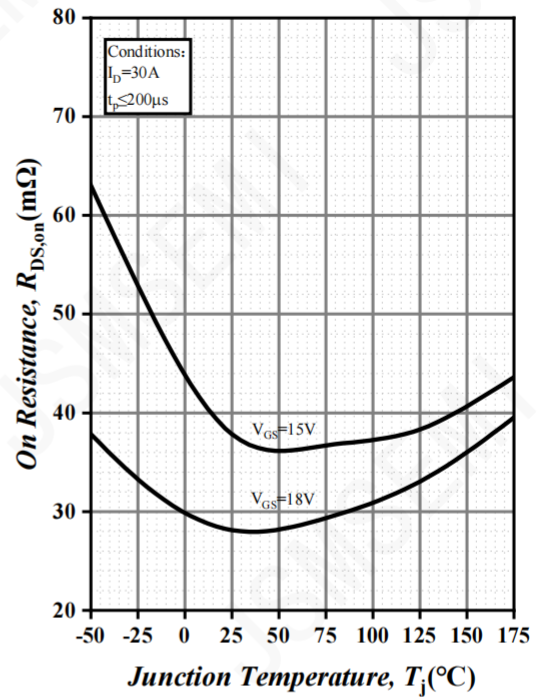


Figure 6. On-Resistance vs. Temperature for Various Gate Voltage

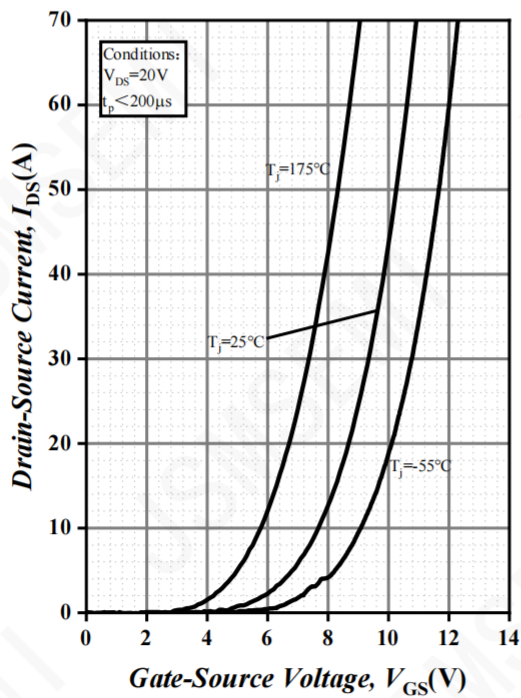


Figure 7. Transfer Characteristic for Various Junction Temperature

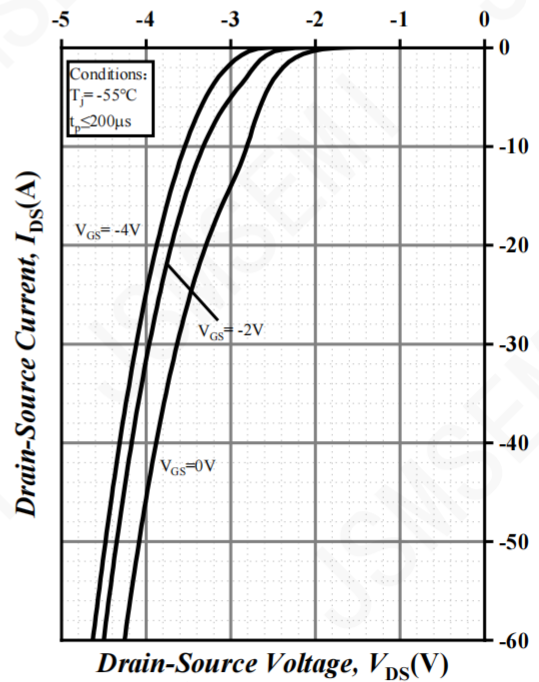


Figure 8. Body Diode Characteristic $T_J = -55^\circ\text{C}$

Electrical Characteristic Curves

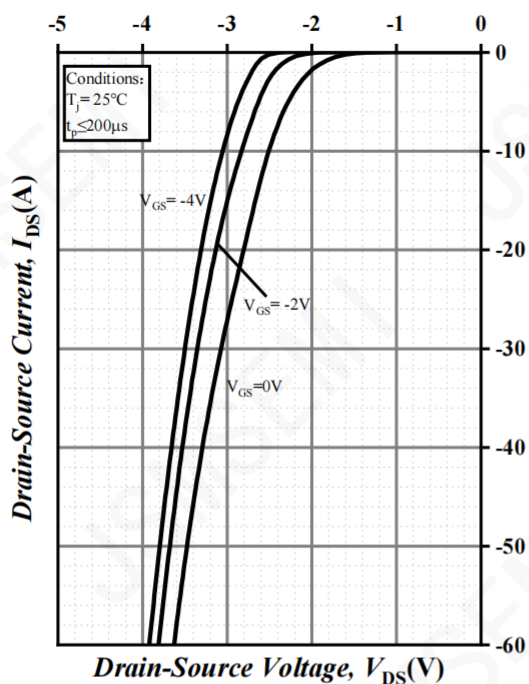


Figure 9. Body Diode Characteristic $T_j = 25^\circ\text{C}$

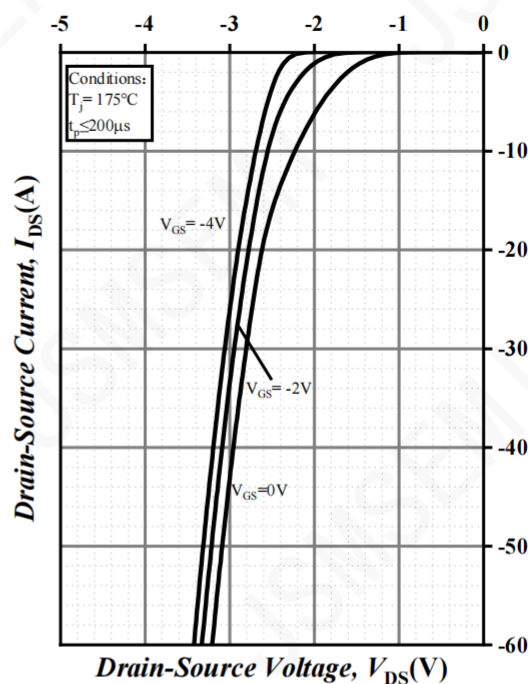


Figure 10. Body Diode Characteristic $T_j = 175^\circ\text{C}$

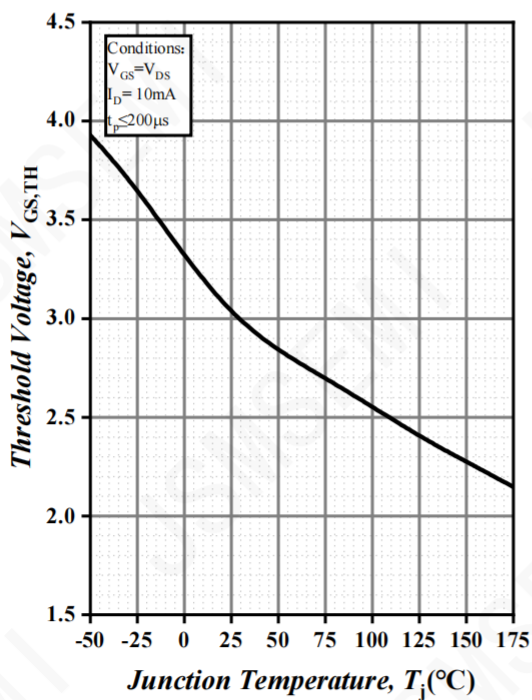


Figure 11. Threshold Voltage vs. Temperature

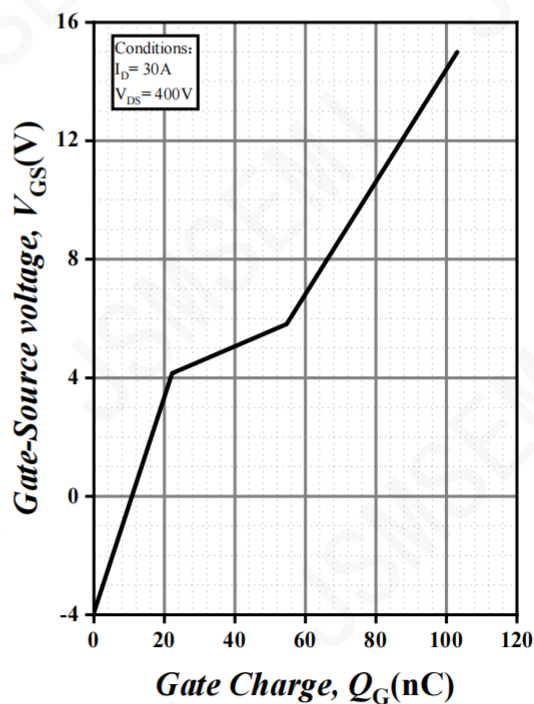


Figure 12. Gate Charge Characteristic

Electrical Characteristic Curves

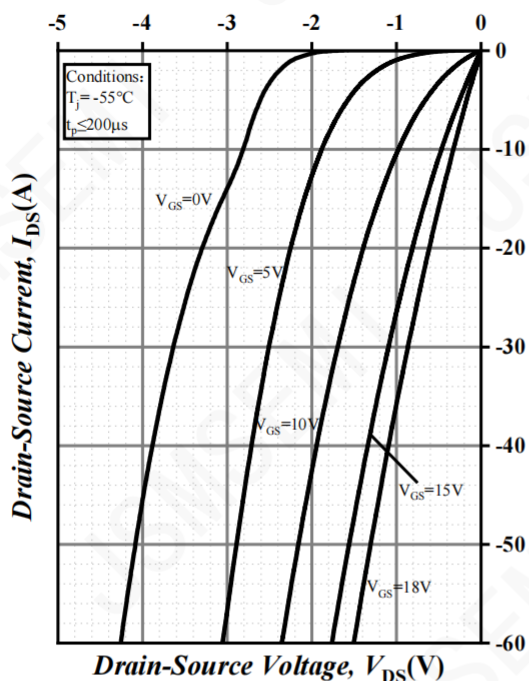


Figure 13. 3rd Quadrant Characteristic $T_j = -55^\circ\text{C}$

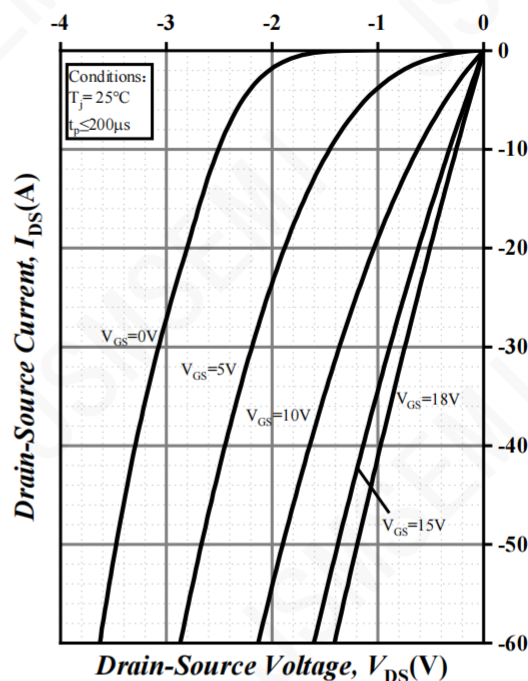


Figure 14. 3rd Quadrant Characteristic $T_j = 25^\circ\text{C}$

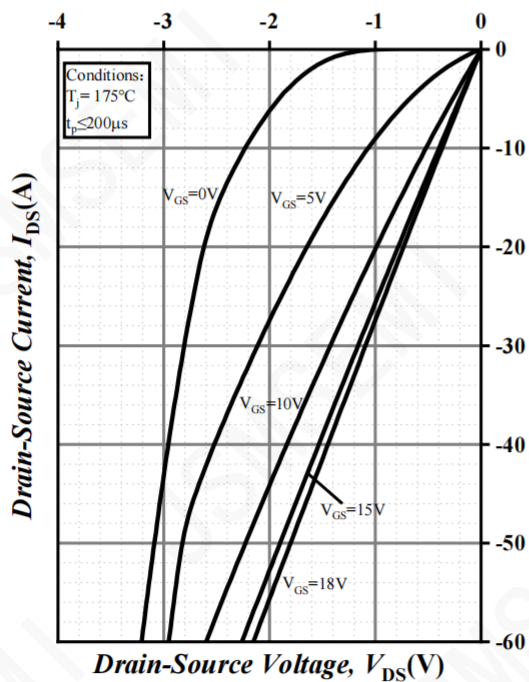


Figure 15. 3rd Quadrant Characteristic $T_j = 175^\circ\text{C}$

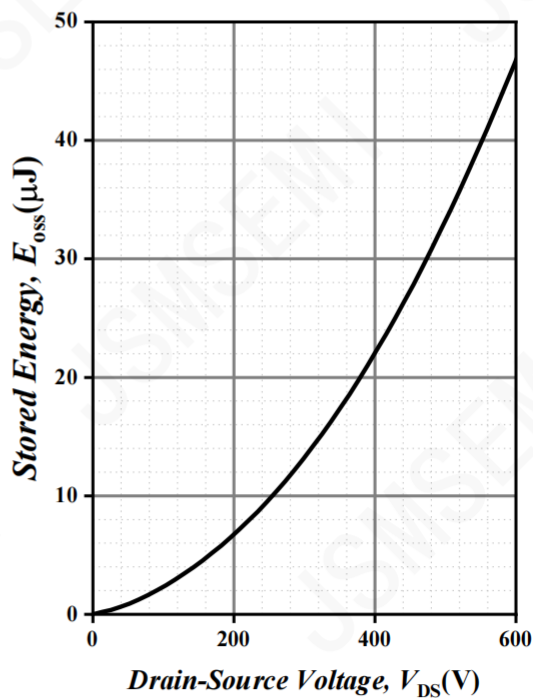


Figure 16. Output Capacitor Stored Energy

Electrical Characteristic Curves

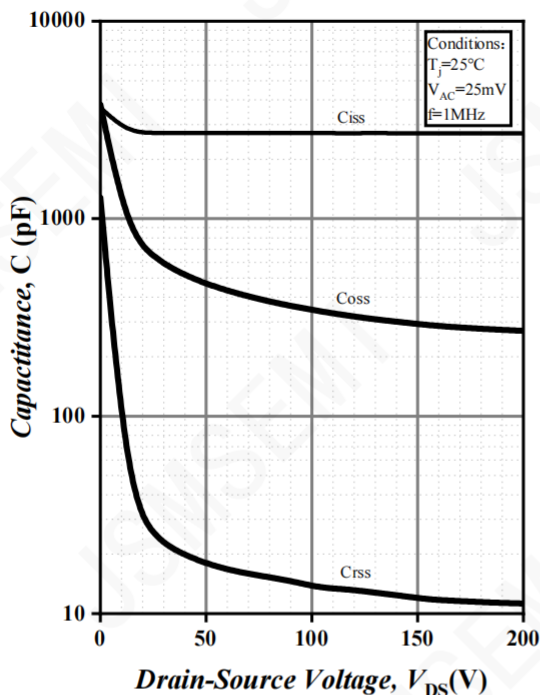


Figure 17. Capacitance vs. Drain-Source Voltage(0 - 200V)

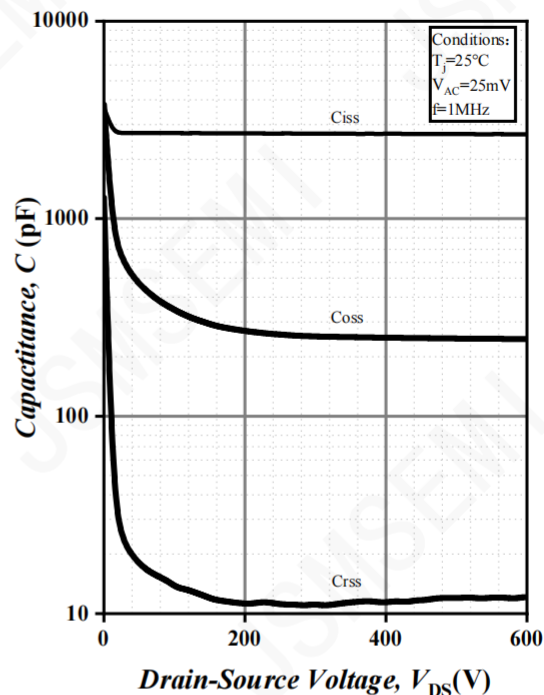


Figure 18. Capacitance vs. Drain-Source Voltage(0 - 600V)

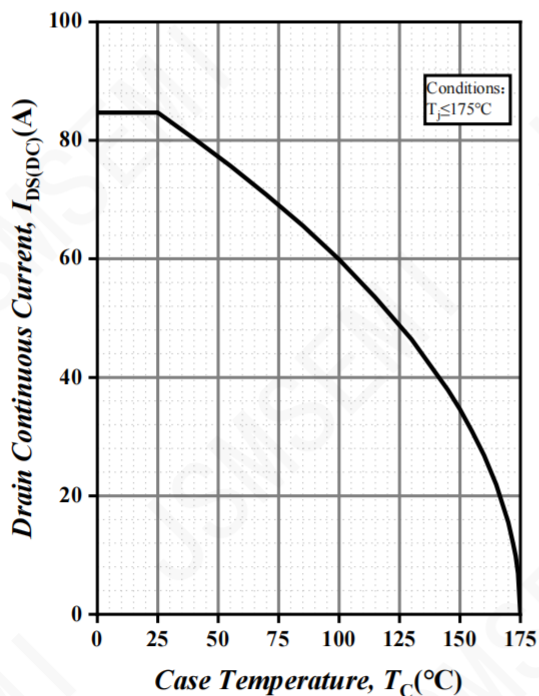


Figure 19. Continuous Drain Current Derating vs. Case Temperature

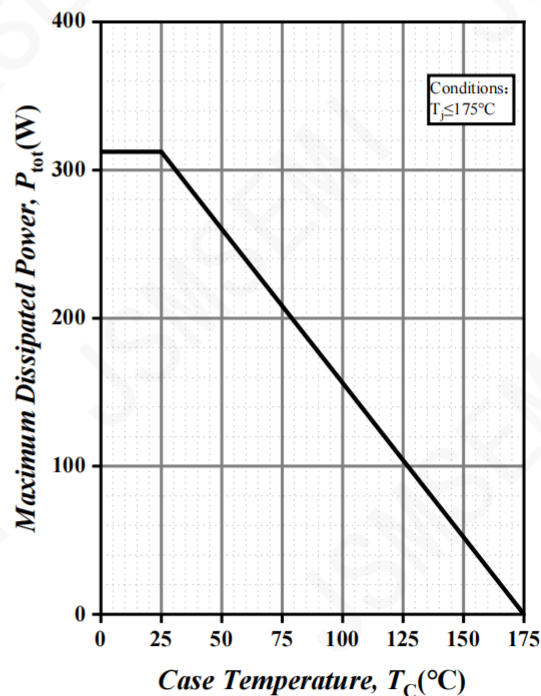


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

Electrical Characteristic Curves

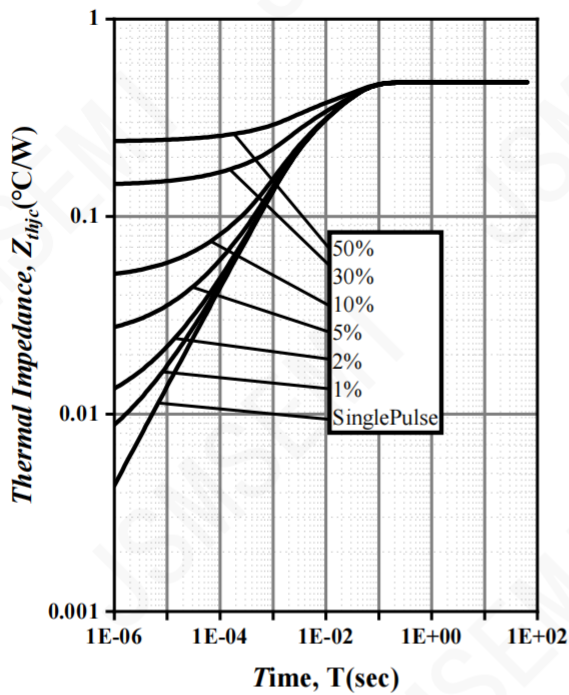


Figure 21. Transient Thermal Impedance (Junction - Case)

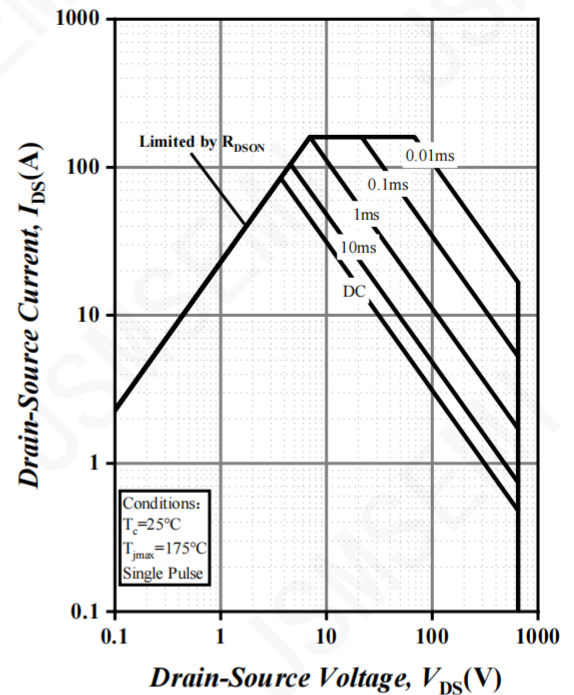


Figure 22. Safe Operation Area

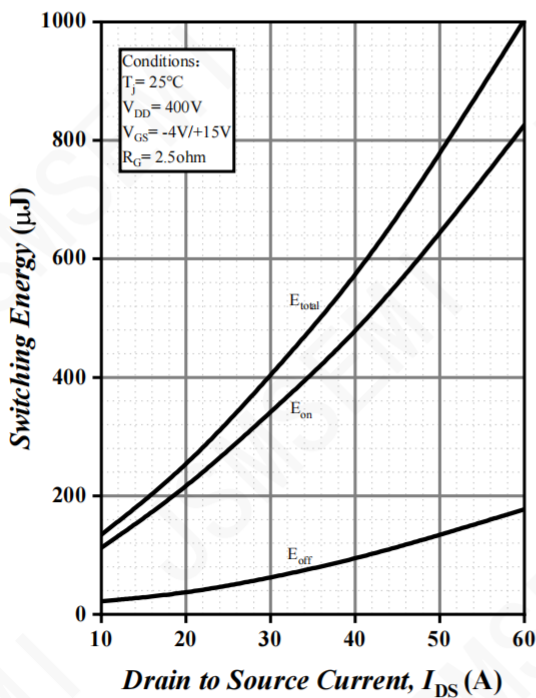


Figure 23. Clamped Inductive Switching Energy vs. Drain Current($V_{DD}=400V$)

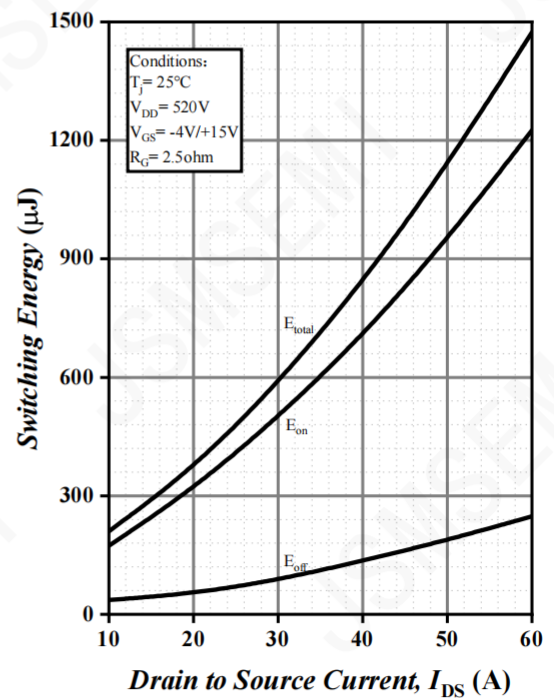


Figure 24. Clamped Inductive Switching Energy vs. Drain Current($V_{DD}=520V$)

Electrical Characteristic Curves

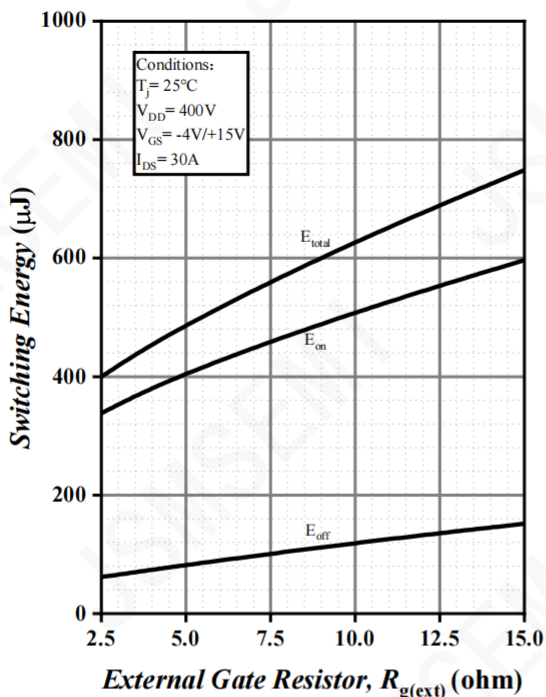


Figure 25. Clamped Inductive Switching Energy vs. $R_{g(ext)}$

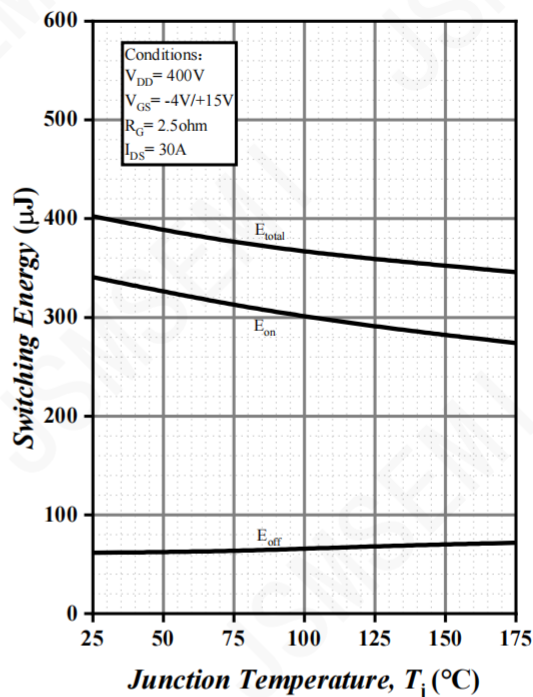


Figure 26. Clamped Inductive Switching Energy vs. Temperature

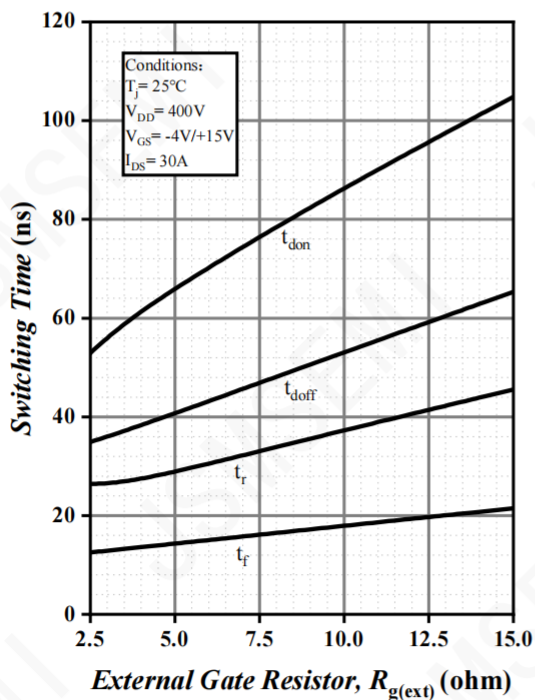
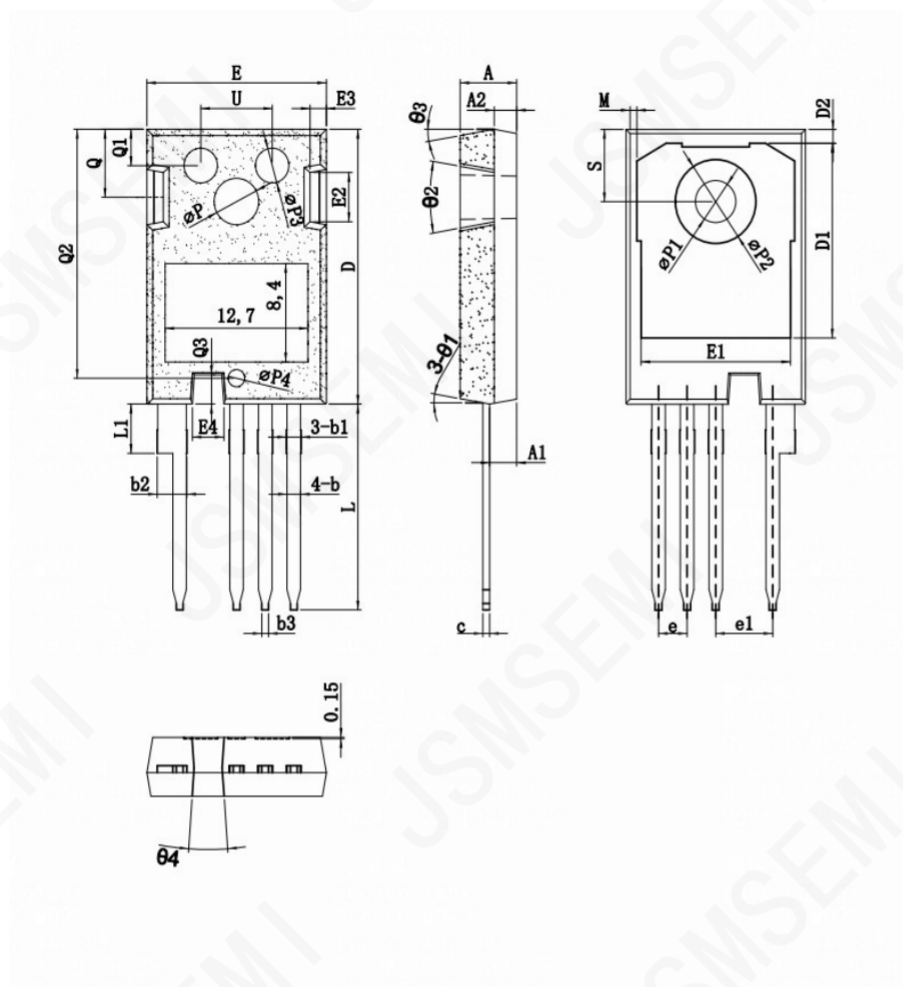


Figure 27. Switching Times vs. $R_{g(ext)}$

Package Outline



Common Dimensions

SYMBOL	mm		
	MIN	NOM	MAX
*A	4.83	5.02	5.21
*A1	2.29	2.42	2.54
A2	1.91	2.00	2.16
*b	1.07	1.20	1.33
*b1	1.15	1.30	1.45
*b2	2.39	2.67	2.94
b3	0.45	0.60	0.75
*C	0.55	0.60	0.68
*D	23.30	23.45	23.60
D1	16.35	16.65	16.95
D2	0.95	1.19	1.25
*E	15.75	15.94	16.13
E1	13.10	13.25	13.40
E2	4.00	4.40	4.80
E3	1.00	1.45	1.90
E4	2.40	2.80	3.20
*e	2.50	2.54	2.58
*e1	5.03	5.08	5.13
*L	17.31	17.57	17.82
*L1	-	-	4.37
M	0.40	0.60	0.80
*ΦP	3.90	4.00	4.10
*ΦP1	3.51	3.61	3.71
ΦP2	7.03	7.18	7.33
ΦP3	2.80	3.00	3.20
ΦP4	1.30	1.50	1.70
Q	5.49	5.79	6.00
Q1	2.80	3.10	3.40
Q2	19.95	21.25	21.55
Q3	2.35	2.50	2.65
S	6.04	6.17	6.30
U	6.05	6.35	6.55
θ1	6°	10°	13°
θ2	16°	20°	24°
θ3	6°	10°	13°
θ4	5°	8°	11°