650V SiC N-Channel MOSFET

DESCRIPTION：

·High Speed Switching

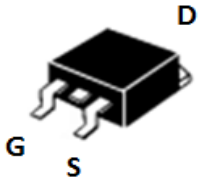
·High Blocking Voltage with Low $R_{DS(ON)}$

·Easy to Parallel

·Simple to Drive

·RoHS compliant.

V_{DS}	650V
I_D	19A (Tc=25℃)
$R_{DS(ON)}$	154mΩ



TO-252-2L

TYPICAL APPLICATIONS：

·Power Factor Correction Modules

·Switch Mode Power Supplies

·DC-AC Inverters

·High Voltage DC-DC Converters

MAXIMUM RATINGS (at T_J = 25 °C, unless otherwise specified)

Characteristic	Condition	Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	650	V
Continuous Drain Current	V_{GS} =18V,Tc=25℃ V_{GS} =18V,Tc=100℃	I_D	19 13	A
Peak Drain Current	Pulse width tp limited by T_{jmax}	I_{DM}	35	A
Gate-Source Voltage, max. Transient Voltage	tp≤0.5μs, D<0.001	V_{GSmax}	-8/+22	V
Gate-Source Voltage		V_{GSmax}	-8/+22	V
Recommend Gate-Source Voltage		V_{GSop}	-4/+18	V
Power Dissipation	Tc=25℃ Tc=100℃	P_{TOT}	72 36	W
Operation Junction temperature		Tj	-40~+175	℃
Storage temperature		T_{STG}	-40~+150	℃
Soldering Temperature	1.6mm (0.063”) from case for 10s	T_{SOLD}	260	℃

ELECTRICAL CHARATERISTICS (at T_J = 25 °C, unless otherwise specified)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage VGS = 0V, ID = 100μA	$V_{(BR)DSS}$	650			V
Zero Gate Voltage Drain Current VDS = 650V, VGS = 0 V	I_{DSS}		1	10	uA
Gate-Source Leakage Current VGS = 18V, VDS = 0V	I_{GSS}			250	nA
Gate-Source Threshold Voltage VDS = VGS, ID = 2.5mA Tj=25℃ VDS = VGS, ID = 2.5mA Tj=175℃	$V_{GS(th)}$	2	2.9 2.1	4	V
Drain-Source On-State Resistance VGS = 15V, ID = 10A Tj=25℃ VGS = 15V, ID = 10A Tj=175℃ VGS = 18V, ID = 10A Tj=25℃ VGS = 18V, ID = 10A Tj=175℃	$R_{DS(on)}$		200 208 154 188	290 208 	mΩ
Forward Transconductance VDS =20V, ID = 10 V	gfs		7.2		S
Input capacitance f=1MHz, VDS=600 V, VGS=0 V	C_{iss}		308		pF
Output capacitance f=1MHz, VDS=600 V, VGS=0 V	C_{oss}		32		pF
Reverse transfer capacitance f=1MHz, VDS=600 V, VGS=0 V	C_{rss}		4.2		pF
Coss Stored Energy f=1MHz, VDS=600 V, VGS=0 V	E_{oss}		5.3		uJ
Internal Gate Resistance f=1MHz	$R_{G(INT)}$		3.9		Ω
Total Gate Charge VDS= 400V, ID= 10A,VGS= -4/18V	Q_G		15		nC
Gate to Source Charge VDS= 400V, ID= 10A,VGS= -4/18V	Q_{GS}		3		nC
Gate to Drain Charge VDS= 400V, ID= 10A,VGS= -4/18V	Q_{GD}		4.4		nC
Turn-on Delay Time VDD=400 V, ID=10A, VGS= -4/18V, RG=2.5Ω, L=200μH	td (ON)		4		ns
Rise Time VDD=400 V, ID=10A, VGS= -4/18V, RG=2.5Ω, L=200μH	tr		12		ns
Turn-off Delay Time VDD=400 V, ID=10A, VGS= -4/18V, RG=2.5Ω, L=200μH	td (OFF)		7		ns
Fall Time VDD=400 V, ID=10A, VGS= -4/18V, RG=2.5Ω, L=200μH	tf		5		ns
Turn-on Switching Energy VDD=400 V, ID=10A, VGS= -4/18V, RG=2.5Ω, L=200μH	$E_{(ON)}$		43		uJ
Turn-off Switching Energy VDD=400 V, ID=10A, VGS= -4/18V, RG=2.5Ω, L=200μH	$E_{(OFF)}$		8		uJ

THERMAL CHARACTERISTICS

Characteristic	Condition	Symbol	Typical	Unit
Thermal resistance, junction - case		$R_{th(j-C)}$	2.06	℃/W

Body Diode

ELECTRICAL CHARATERISTICS (at T_J = 25 °C, unless otherwise specified)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Diode Forward Voltage VGS = -4V, ISD = 5A Tj=25℃ VGS = -4V, ISD = 5A Tj=175℃	V_{SD}		4.0 3.7		V
Continuous Diode Forward Current VGS = -4V, Tc=25℃ VGS = -4V, Tc=100℃	I_S		17 9		A
Revers Recovery Time VR=400 V, ISD=5A, VGS= -4V,di/dt = 2000A/us, Tj=25℃ VR=400 V, ISD=5A, VGS= -4V,di/dt = 2000A/us, Tj=175℃	Trr		9 28		ns
Revers Recovery Charge VR=400 V, ISD=5A, VGS= -4V,di/dt = 2000A/us, Tj=25℃ VR=400 V, ISD=5A, VGS= -4V,di/dt = 2000A/us, Tj=175℃	Qrr		33 81		nC
Peak Revers Recovery Current VR=400 V, ISD=5A, VGS= -4V,di/dt = 2000A/us, Tj=25℃ VR=400 V, ISD=5A, VGS= -4V,di/dt = 2000A/us, Tj=175℃	I_{rrm}		6.4 6.1		A

Typical Characteristics

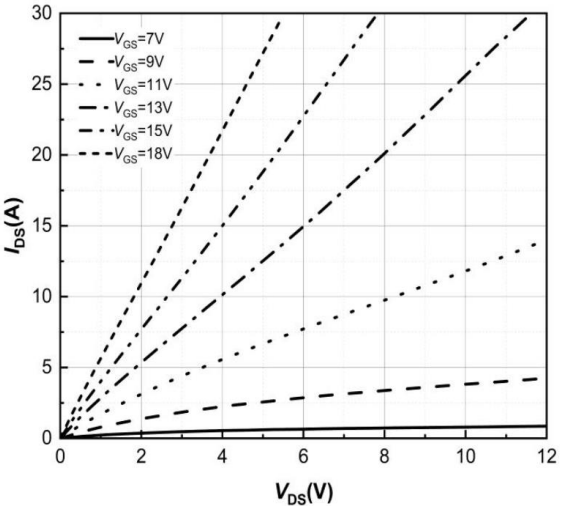


Figure 1. Output Characteristics (Tj=-40℃)

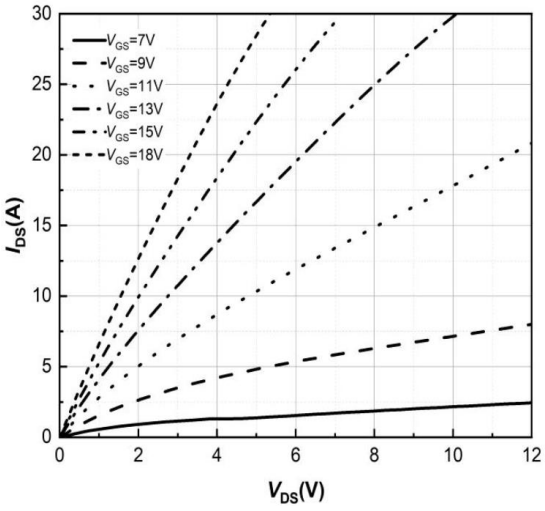


Figure 2. Output Characteristics (Tj=25℃)

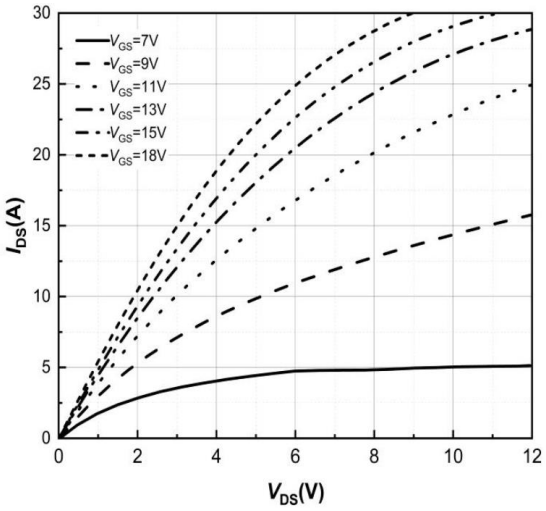


Figure 3. Output Characteristics (Tj=175℃)

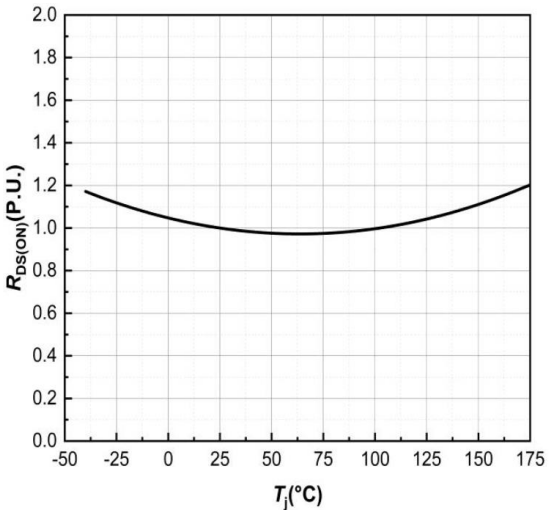


Figure 4. Normalized On-Resistance vs. Temperatures

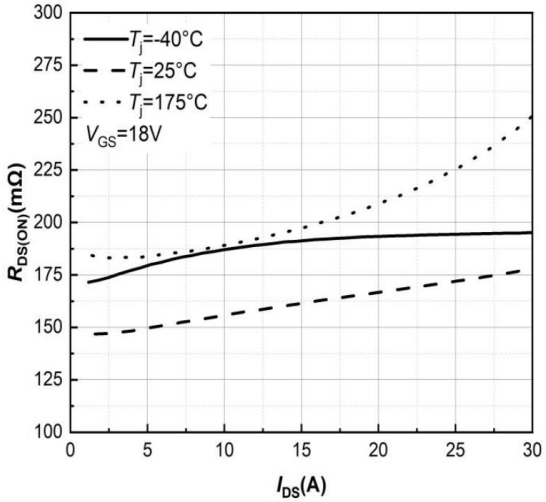


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

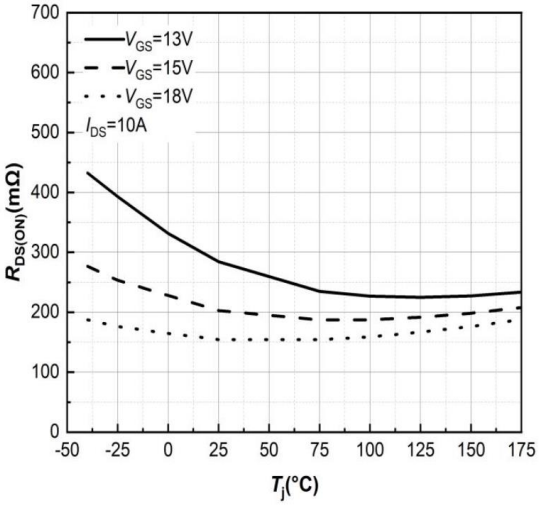


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

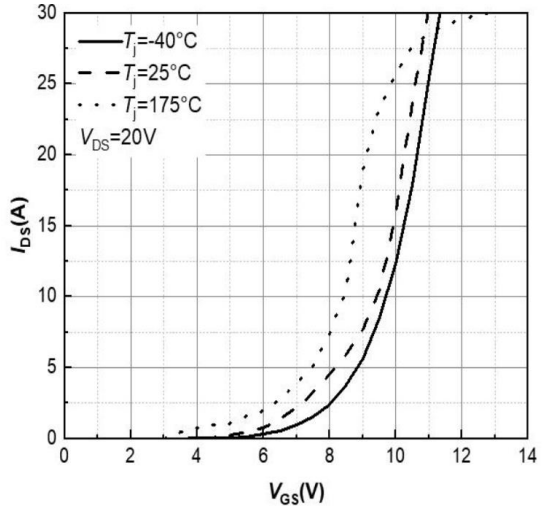


Figure 7. Transfer Characteristic for Various Junction Temperatures

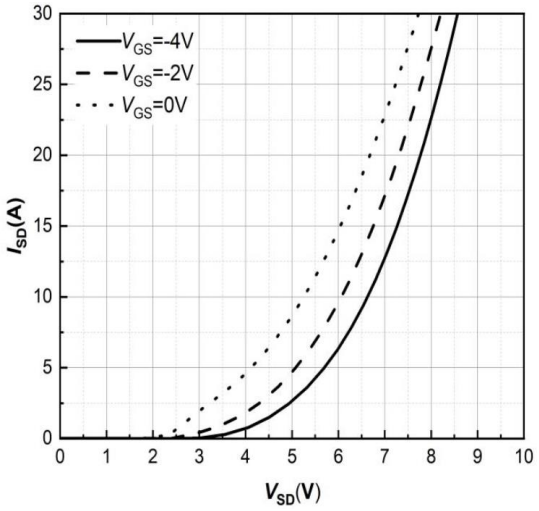


Figure 8. Body Diode Characteristic Tj=-40°C

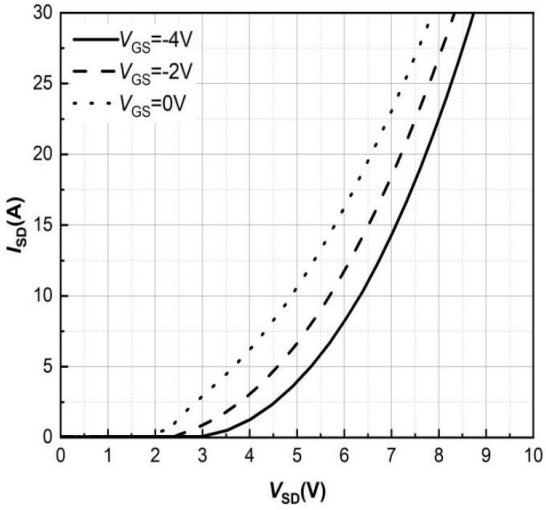


Figure 9. Body Diode Characteristic Tj=25°C

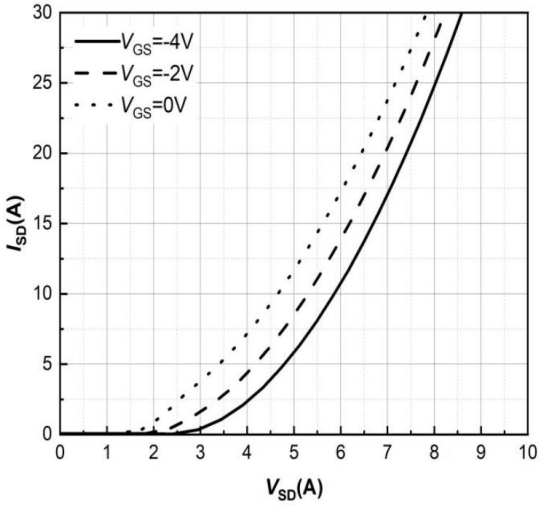


Figure 10. Body Diode Characteristic Tj=175°C

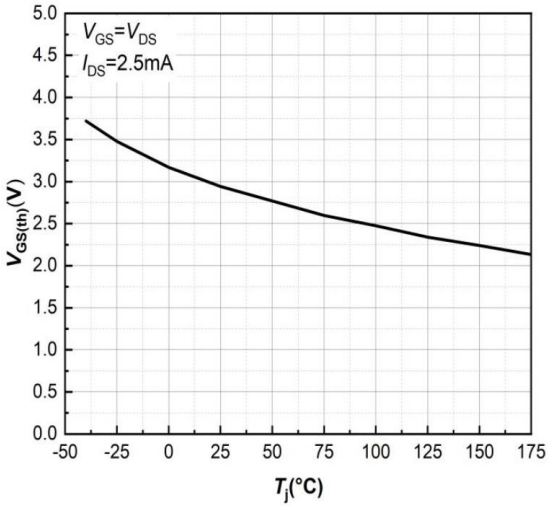


Figure 11. Threshold Voltage vs. Temperature

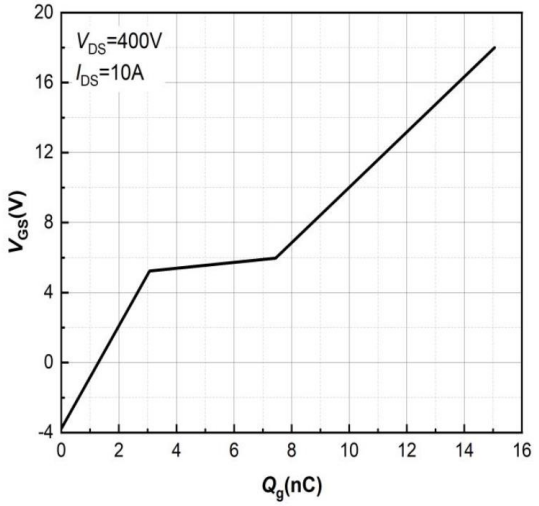


Figure 12. Gate Charge Characteristics

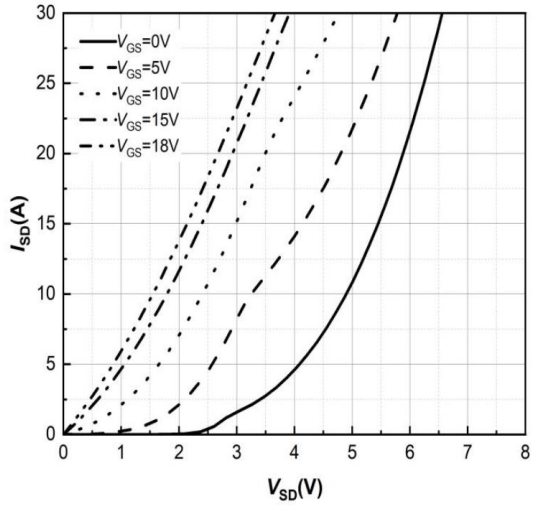


Figure 13. 3rd Quadrant Characteristic，Tj=-40°C

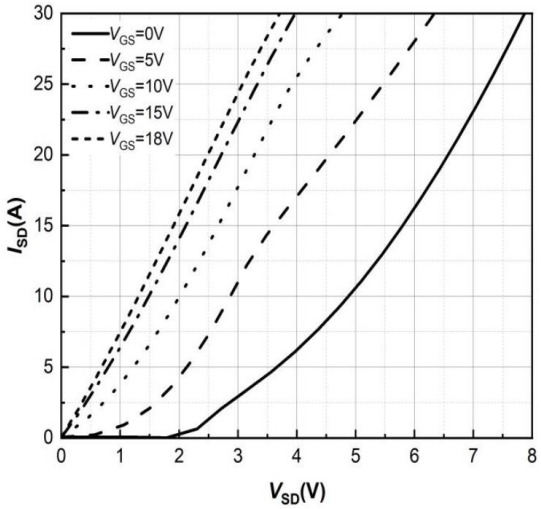


Figure 14. 3rd Quadrant Characteristic，Tj=25°C

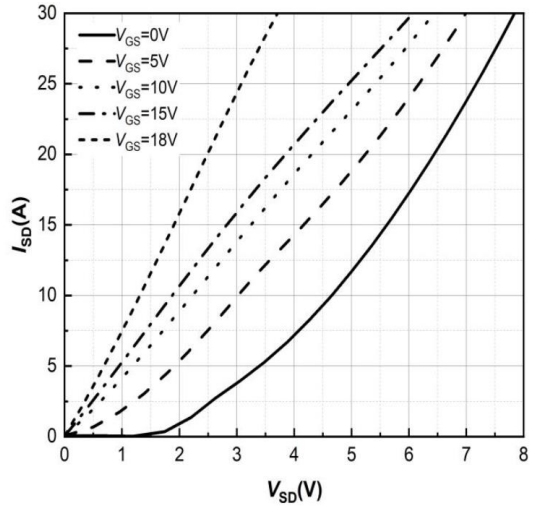


Figure 15. 3rd Quadrant Characteristic，Tj=175°C

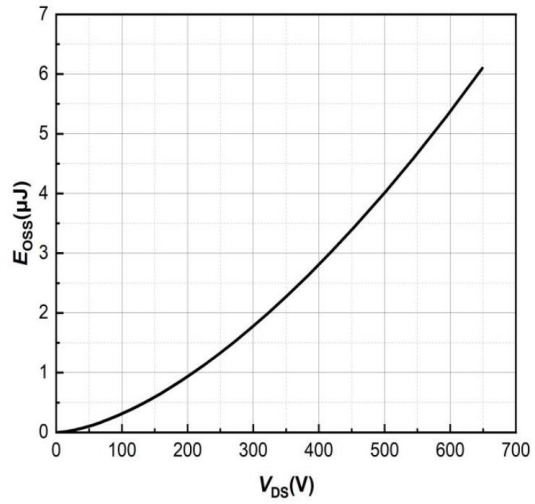


Figure 16. Output Capacitor Stored Energy

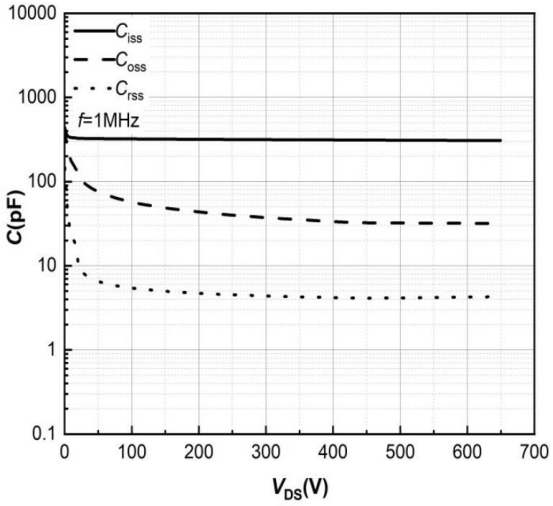


Figure 17. Capacitances vs. Drain-Source

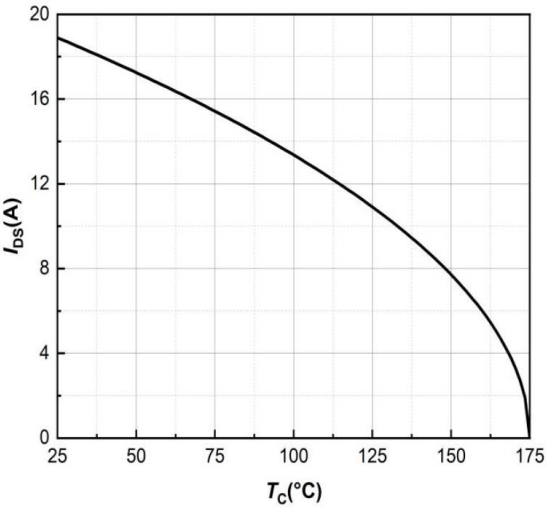


Figure 18. Continuous Drain Current Derating vs. Case Temperature

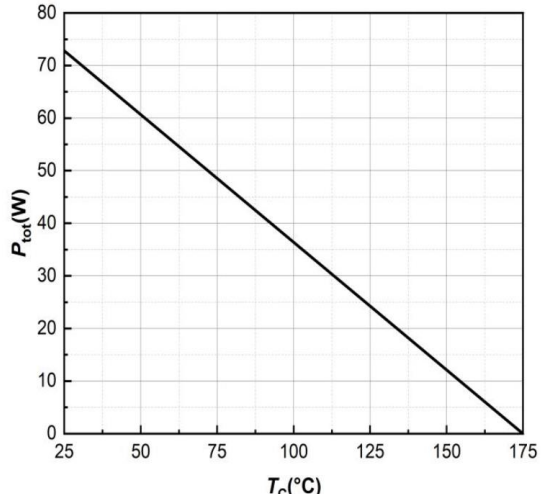


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

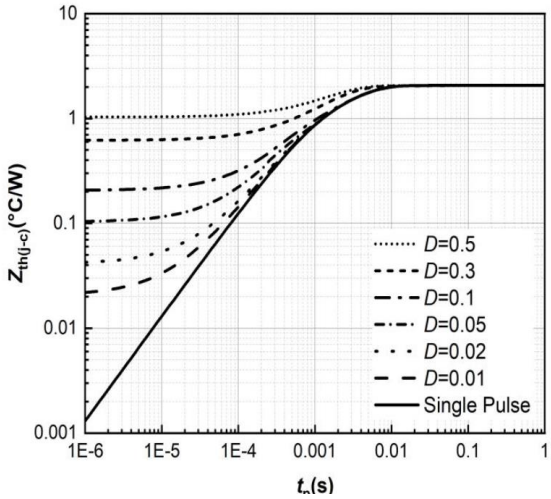


Figure 20. Transient Thermal Impedance

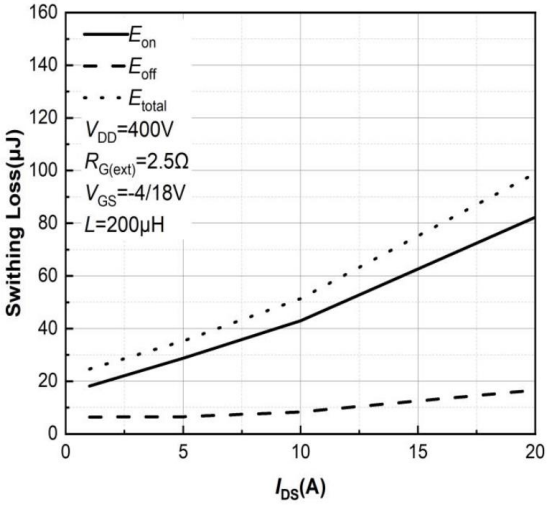


Figure 21. Clamped Inductive Switching Energy vs. Drain Current，Tj=25°C

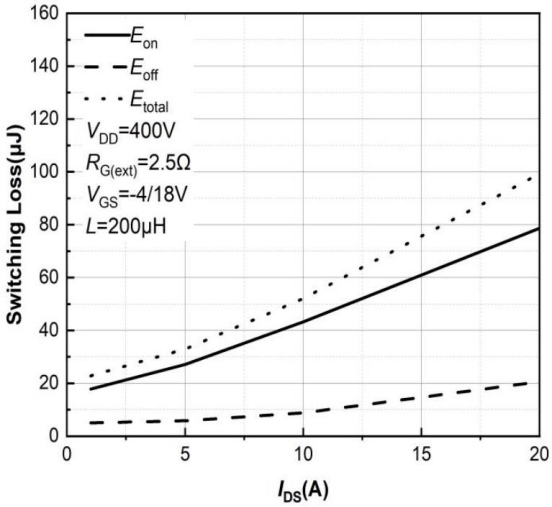


Figure 22. Clamped Inductive Switching Energy vs. Drain Current，Tj=175°C

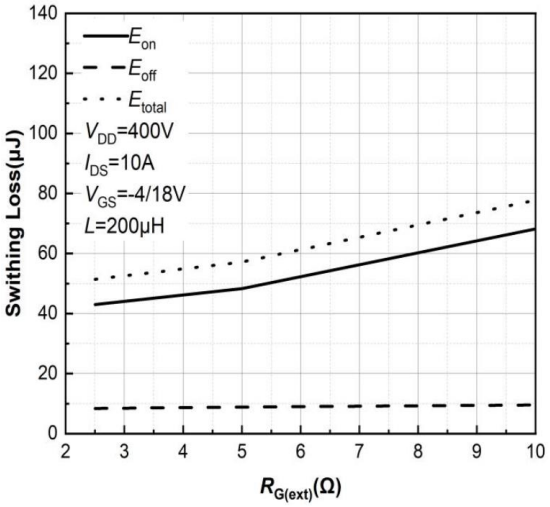


Figure 23. Clamped Inductive Switching Energy vs. $R_{G(ext)}$，Tj=25°C

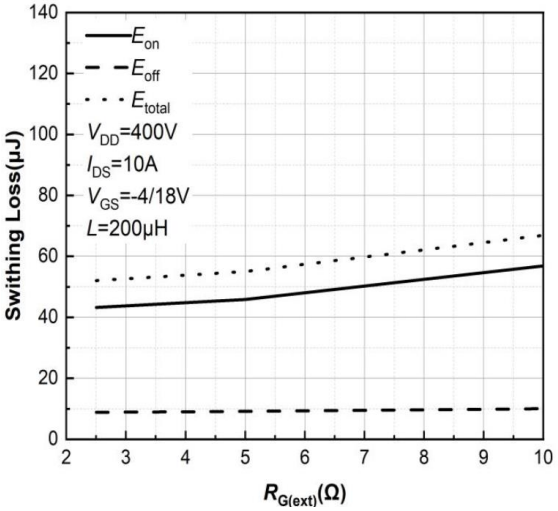


Figure 24. Clamped Inductive Switching Energy vs. $R_{G(ext)}$，Tj=175°C

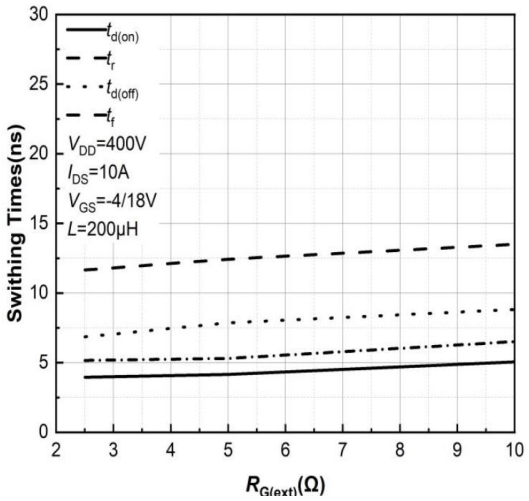


Figure 25. Switching Times vs. $R_{G\ (ext)}$,Tj=25°C

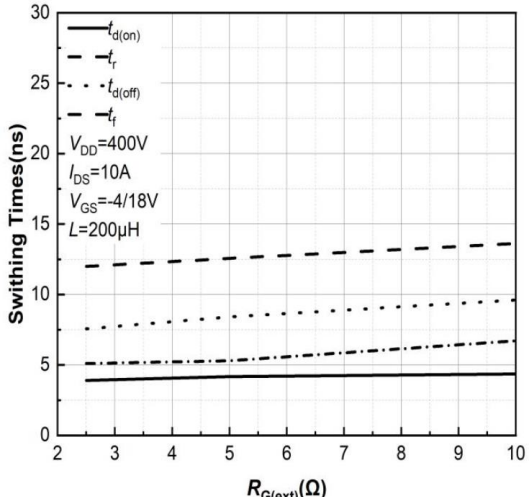


Figure 26. Switching Times vs. $R_{G\ (ext)}$,Tj=175°C

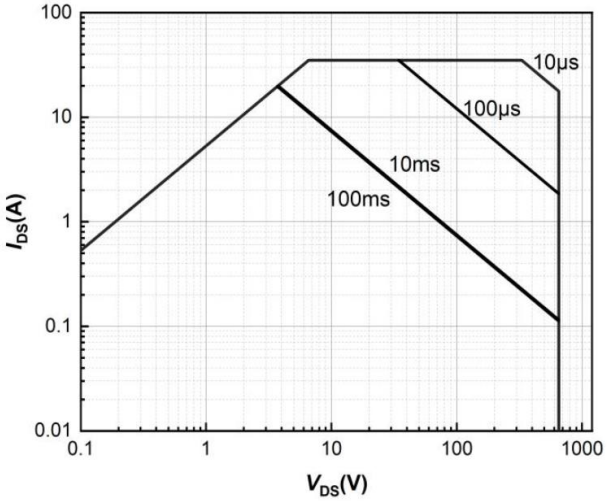
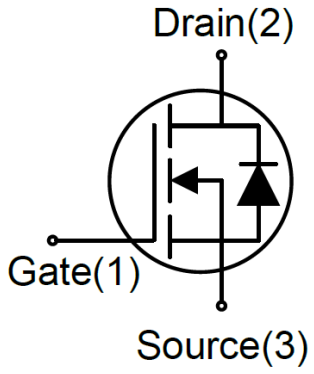
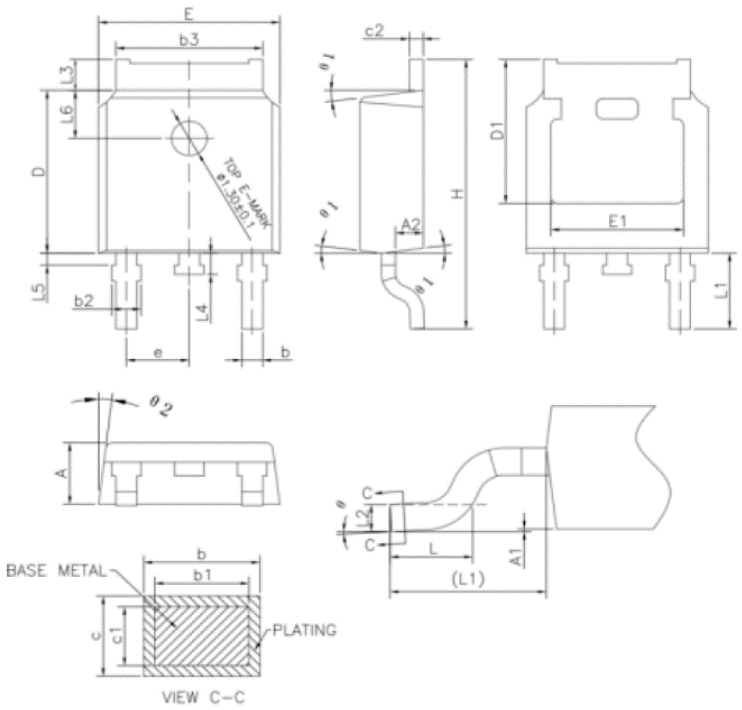


Figure 27. Safe Operating Area

·Circuit diagram



·TO-252 Package outlines : Dimensions in (mm)



e	Unit:mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0	-	0.10
A2	0.90	1.01	1.10
b	0.72	-	0.85
b1	0.71	0.76	0.81
b2	0.72	-	0.90
b3	5.13	5.33	5.46
c	0.47	-	0.60
c1	0.46	0.51	0.56
c2	0.47	-	0.60
D	6.00	6.10	6.20
D1	5.25	-	-
E	6.50	6.60	6.70
E1	4.70	-	-
e	2.186	2.286	2.386
H	9.80	10.10	10.40
L	1.40	1.50	1.70
L1	2.90 REF		
L2	0.50 BSC		
L3	0.90	-	1.25
L4	0.60	0.80	1.00
L5	0.15	-	0.75
L6	1.80 REF		
θ	0°	-	8°
θ1	5°	7°	9°
θ2	5°	7°	9°

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