

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	$I_D@25^{\circ}C$
650V	23mΩ@18V	128A

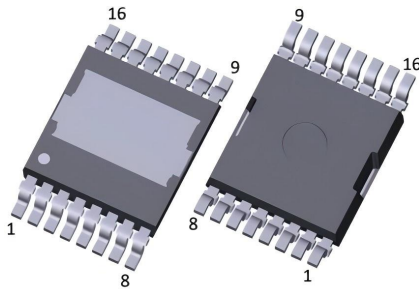
Feature

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low $R_{DS(on)}$
- Easy to Parallel
- Simple to Drive

Application

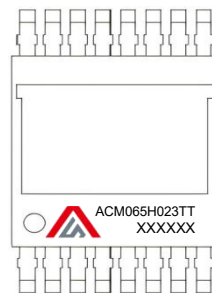
- Power Factor Correction Modules
- Switch Mode Power Supplies
- DC-AC Inverters
- High Voltage DC/DC Converters

Package

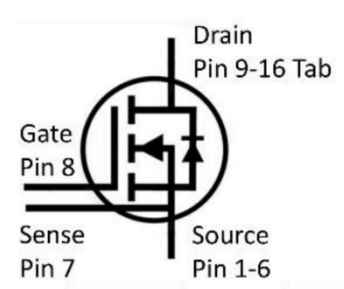


TOLT

Marking



Circuit diagram



Absolute maximum ratings ($T_J=25^{\circ}C$ unless otherwise noted)

Parameter	Symbol	Test Condition	Value	Unit
Drain-Source Voltage	V_{DSmax}		650	V
Gate-Source Voltage	V_{GSmax}		-8/+22	V
Gate-Source Voltage	V_{GSOP}		-4/+18	V
Continuous Drain Current	I_D	$T_C = 25^{\circ}C$	128	A
	I_D	$T_C = 100^{\circ}C$	90	A
Pulsed Drain Current	$I_{D,pulse}$	Pulse with t_p limited by T_{jmax}	258	A
Power Dissipation	P_D	$T_C = 25^{\circ}C$	468	W
Thermal Resistance (Typ)	$R_{\theta JC}$	Junction to Case	0.32	$^{\circ}C/W$
Operating Junction Temperature	T_J		-40~ +175	$^{\circ}C$
Storage Temperature	T_{STG}		-40~ +175	$^{\circ}C$

Electrical characteristics (T_J=25°C unless otherwise noted)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Static Characteristics							
Drain-source breakdown voltage	V _{(BR)DSS}	V _{GS} =0V, I _D =100μA	650			V	
Zero gate voltage drain current	I _{DSS}	V _{DS} =650V, V _{GS} =0V			1	μA	
Gate-Source leakage current	I _{GSS}	V _{DS} =0V, V _{GS} =18V			250	nA	
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =10mA	2	2.7	4	V	
		V _{DS} =V _{GS} , I _D =10mA, T _J =175℃		2			
Drain-source on-resistance	R _{DS(on)}	V _{GS} =15V, I _D =33.5A		29	39	mΩ	
		V _{GS} =15V, I _D =33.5A, T _J =175℃		27			
		V _{GS} =18V, I _D =33.5A		23	30		
		V _{GS} =18V, I _D =33.5A, T _J =175℃		25			
Dynamic characteristics							
Input Capacitance	C _{iss}	V _{DS} =600V, V _{GS} =0V, f =100kHz		2162		pF	
Output Capacitance	C _{oss}			195			
Reverse Transfer Capacitance	C _{rss}			14			
C _{oss} Stored Energy	E _{oss}				40		μJ
Internal Gate Resistance	R _{G(int)}	f =1MHz		1.6		Ω	
Total Gate Charge	Q _g	V _{DS} =400V, V _{GS} =-4/18V I _D =33.5A		100		nC	
Gate-Source Charge	Q _{gs}			25			
Gate-Drain Charge	Q _{gd}			28			
Turn-on delay time	t _{d(on)}	V _{DS} =400V, V _{GS} =-4V/+18V I _D =33.5A, R _{G(ext)} =2.5Ω L =200μH		11		nS	
Turn-on rise time	t _r			22			
Turn-off delay time	t _{d(off)}			25			
Turn-off fall time	t _f			7			
Turn-on Switching Energy	E _{on}				192		μJ
Turn-off Switching Energy	E _{off}				32		
Source-Drain Diode characteristics							
Diode Forward Current	I _S	V _{GS} =-4V, T _C =25℃		103		A	
	I _S	V _{GS} =-4V, T _C =100℃		56			
Diode Forward voltage	V _{SD}	V _{GS} =-4V, I _{SD} =16.8A		3.8		V	
		V _{GS} =-4V, I _{SD} =16.8A, T _J =175℃		3.4			
		V _{GS} =-4V, I _{SD} =33.5A		4.2			
		V _{GS} =-4V, I _{SD} =33.5A, T _J =175℃		3.9			
Reverse Recovery Time	T _{rr}	V _{GS} =-4V, V _R =400V, I _{SD} =33.5A dif/dt =3000 A/μs		19		nS	
Reverse Recovery Charge	Q _{rr}			194		nC	
Peak Reverse Recovery Current	I _{rrm}				17		A

Typical Characteristics

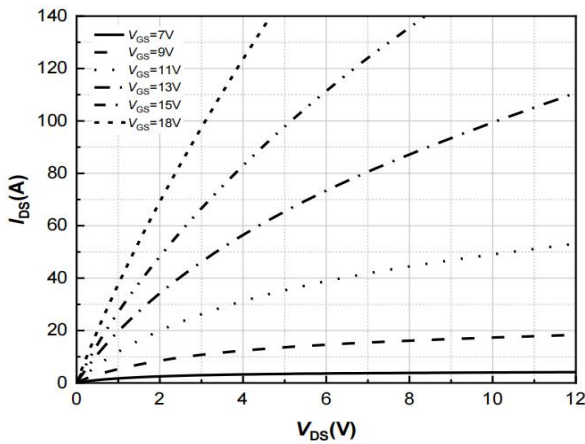


Figure 1. Output Characteristics
 $T_j = -40^\circ\text{C}$

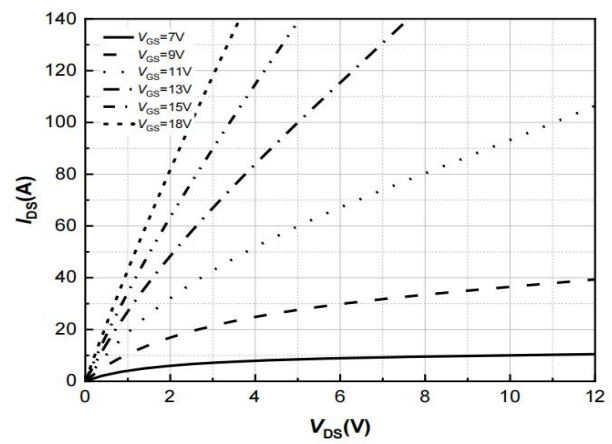


Figure 2. Output Characteristics
 $T_j = 25^\circ\text{C}$

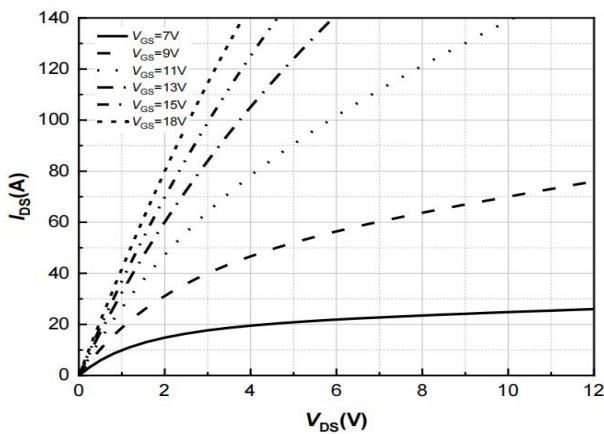


Figure 3. Output Characteristics
 $T_j = 175^\circ\text{C}$

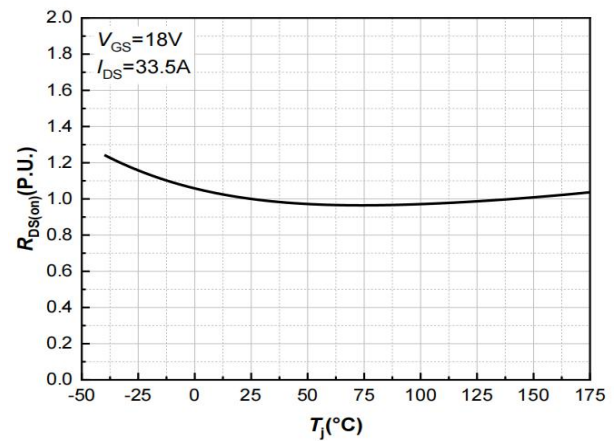


Figure 4. Normalized On-Resistance vs. Temperature

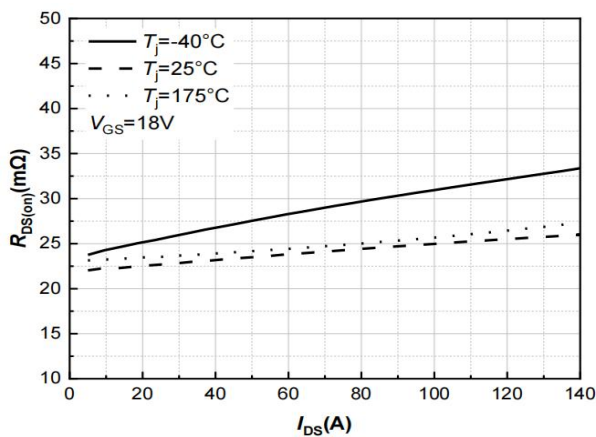


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

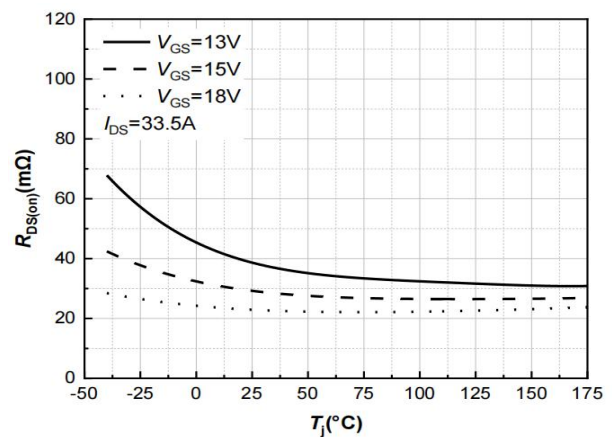


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

Typical Characteristics

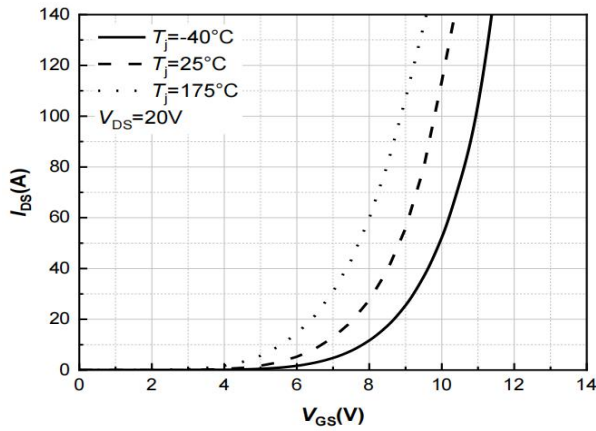


Figure 7. Transfer Characteristic for Various Junction Temperatures

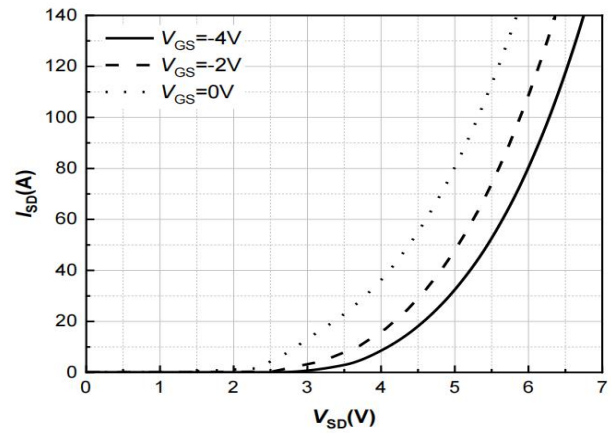


Figure 8. Body Diode Characteristic $T_J = -40^\circ\text{C}$

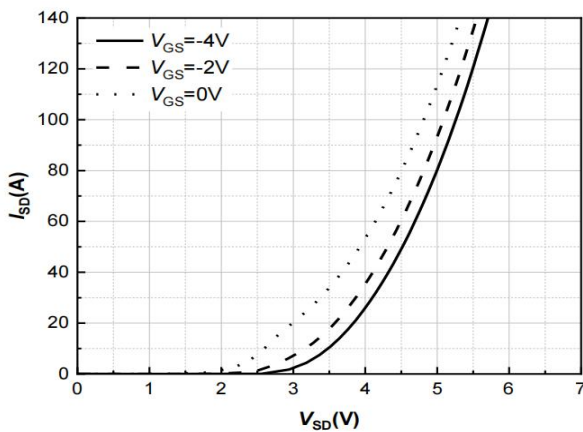


Figure 9. Body Diode Characteristic $T_J = 25^\circ\text{C}$

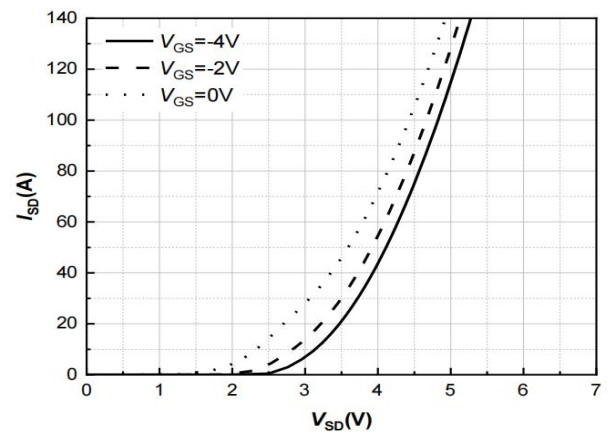


Figure 10. Body Diode Characteristic $T_J = 175^\circ\text{C}$

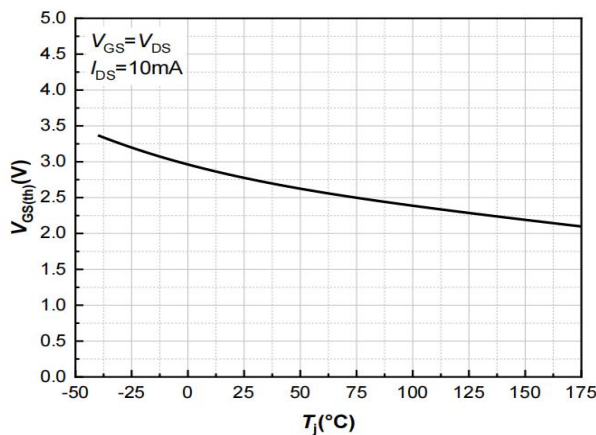


Figure 11. Threshold Voltage vs. Temperature

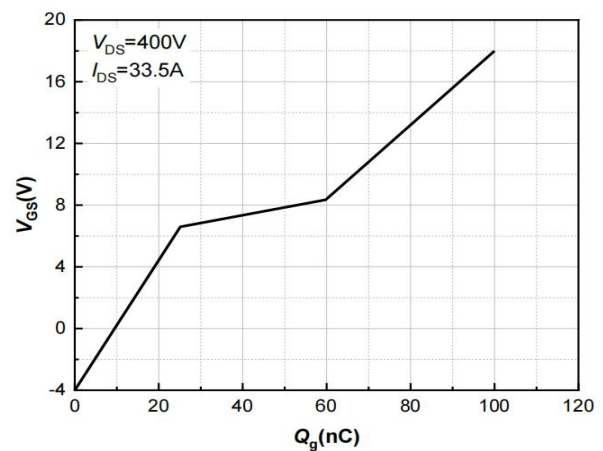


Figure 12. Gate Charge Characteristics

Typical Characteristics

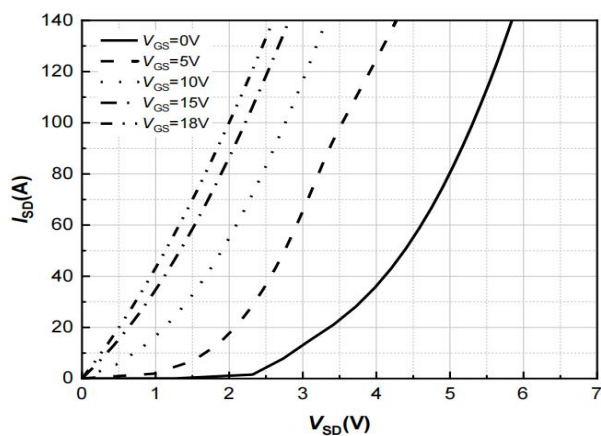


Figure 13. 3rd Quadrant Characteristic
 $T_j = -40^\circ\text{C}$

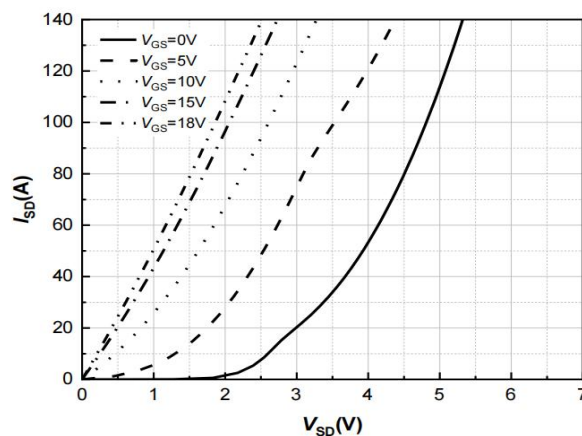


Figure 14. 3rd Quadrant Characteristic
 $T_j = 25^\circ\text{C}$

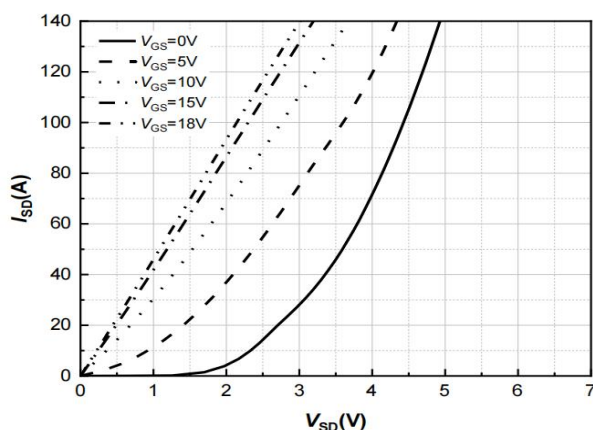


Figure 15. 3rd Quadrant Characteristic
 $T_j = 175^\circ\text{C}$

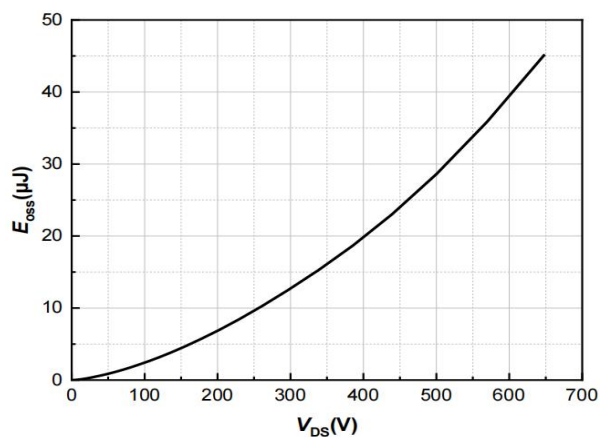


Figure 16. Output Capacitor Stored Energy

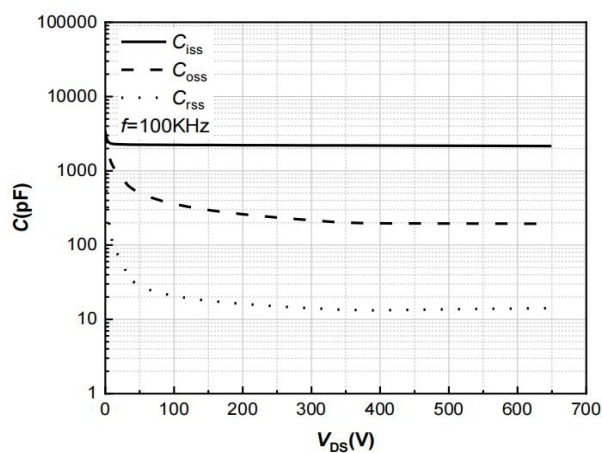


Figure 17. Capacitances vs. Drain-Source

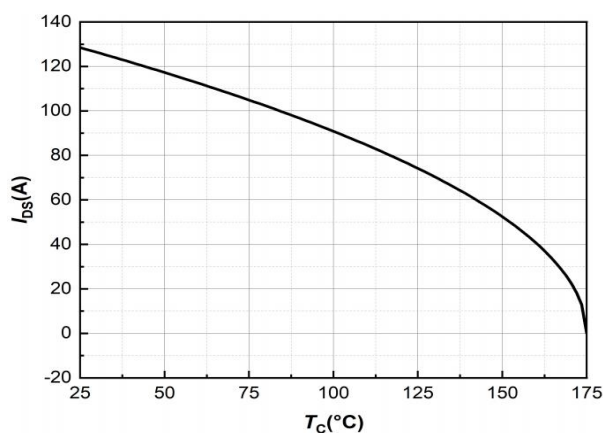


Figure 18. Continuous Drain Current
Derating vs. Case Temperature

Typical Characteristics

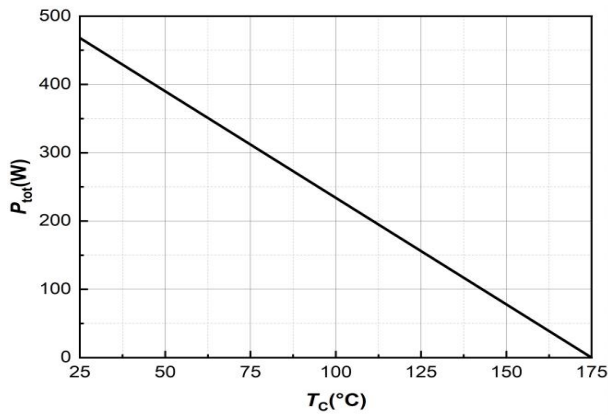


Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

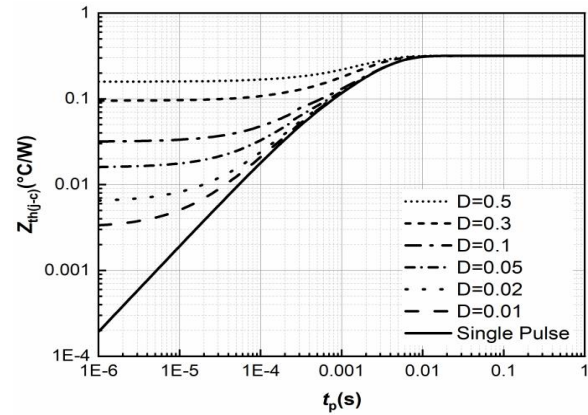


Figure 20. Transient Thermal Impedance

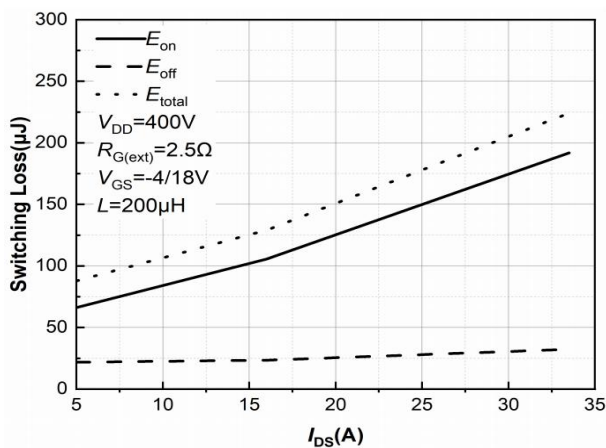


Figure 21. Clamped Inductive Switching Energy vs. Drain Current

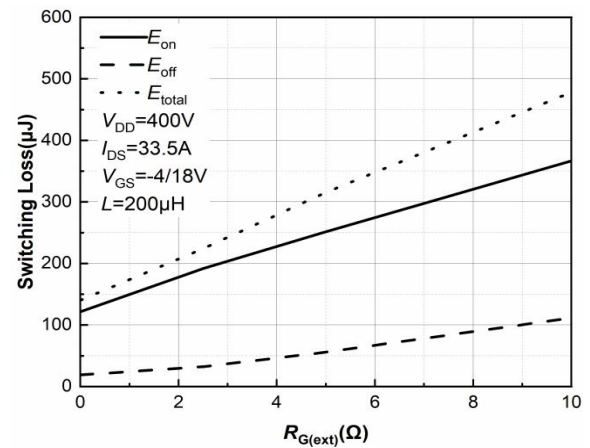


Figure 22. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

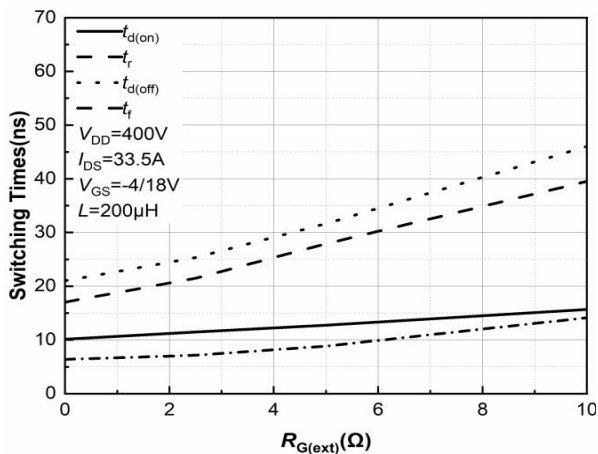


Figure 23. Switching Times vs. $R_{G(ext)}$

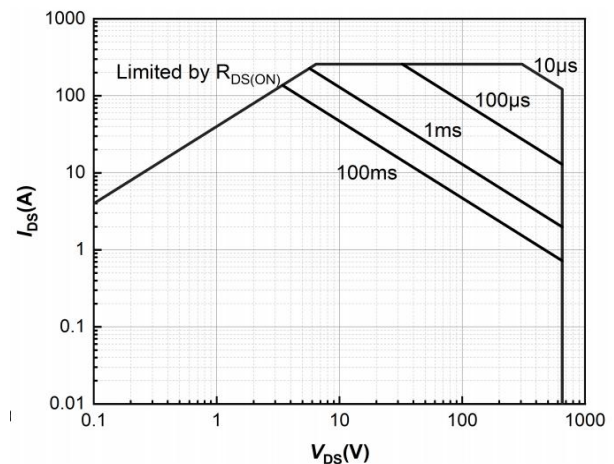
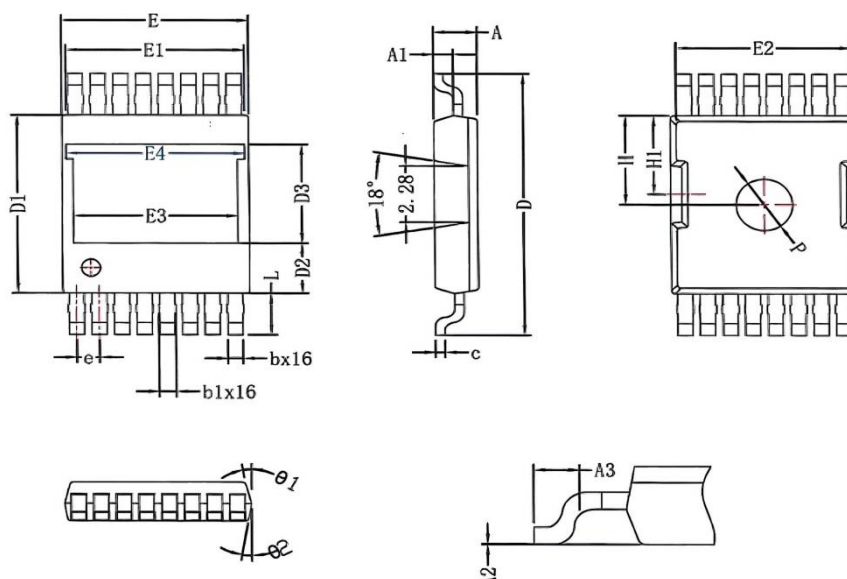


Figure 24. Safe Operating Area

TOLT Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.250	2.350	0.089	0.093
A1	1.000	1.080	0.039	0.043
A2	0.010	0.160	0.000	0.006
A3	1.500 REF.		0.059 REF.	
b	0.680	0.740	0.027	0.029
b1	0.750	0.950	0.030	0.037
c	0.450	0.550	0.018	0.022
D	14.800	15.200	0.583	0.598
D1	10.00	10.300	0.394	0.406
D2	2.400	2.800	0.094	0.110
D3	5.770 REF.		0.227 REF.	
E	9.700	10.100	0.382	0.398
E1	9.460 REF.		0.372 REF.	
E2	9.250 REF.		0.364 REF.	
E3	8.250 REF.		0.325 REF.	
E4	8.700 REF.		0.343 REF.	
e	1.180	1.220	0.046	0.048
H	5.000	5.400	0.197	0.213
H1	4.400	4.800	0.173	0.189
L	2.400	2.500	0.094	0.098
P	2.800	3.200	0.110	0.126
θ1	7°	9°	7°	9°
θ2	7°	9°	7°	9°