

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)MAX}$	$I_D@25^{\circ}C$
650V	58mΩ@20V	59A

Feature

- Wide bandgap SiC MOSFET technology
- Low On-Resistance with High Blocking Voltage
- Low Capacitances with High-Speed switching
- Low reverse recovery(Qrr)

Application

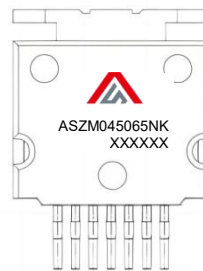
- Switch mode power supplies
- Renewable energy
- On Board Charger
- High voltage DC/DC converters

Package

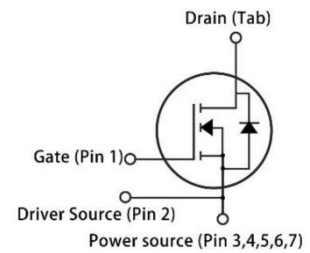


T2PAK

Marking



Circuit diagram



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

Parameter	Symbol	Test Condition	Value	Unit
Drain-Source Voltage	V_{DSmax}	$V_{GS} = 0V, I_D = 100\mu A$	650	V
Gate-Source Voltage	V_{GSmax}	AC ($f > 1\text{ Hz}$)	-10/+25	V
Recommend Gate-Source Voltage	V_{GSop}	Static	-4/+20	V
Continuous Drain Current	I_D	$V_{GS} = 20V, T_C = 25^{\circ}C$	59	A
	I_D	$V_{GS} = 20V, T_C = 100^{\circ}C$	42	A
Pulsed Drain Current	$I_{DM (pluse)}$	Pulse with t_p limited by T_{jmax} at 1ms	116	A
		Pulse with t_p limited by T_{jmax} at 100μs	280	A
Power Dissipation	P_D	$T_C = 25^{\circ}C$	238	W
Thermal Resistance (Typ)	$R_{\theta JC}$	Junction-to-Case	0.63	$^{\circ}C/W$
Junction Temperature	T_J		-55~ +175	$^{\circ}C$
Storage Temperature	T_{STG}		-55~ +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			50	μA
Gate-Source leakage current	I _{GSS}	V _{GS} = 20V, V _{DS} = 0V			250	nA
Gate threshold voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 5mA	2.0	2.7	3.8	V
		V _{DS} = V _{GS} , I _D = 5mA, T _j = 175°C		1.8		
Drain-source on-resistance	R _{DS(on)}	V _{GS} = 20V, I _D = 20A	30	45	58	mΩ
		V _{GS} = 20V, I _D = 20A, T _j = 175°C		60		
Transconductance	g _{FS}	V _{DS} = 20V, I _D = 20A		18		S
		V _{DS} = 20V, I _D = 20A, T _j = 175°C		11		
Dynamic characteristics						
Input Capacitance	C _{iss}	V _{DS} = 600V, V _{GS} = 0V, f = 1 MHz V _{AC} = 25mV		1410		pF
Output Capacitance	C _{oss}			119		
Reverse Transfer Capacitance	C _{rss}			4		
Total Gate Charge	Q _g	V _{DS} = 400V, I _D = 20A V _{GS} = -4V/20V		42.3		nC
Gate-Source Charge	Q _{gs}			13.8		
Gate-Drain Charge	Q _{gd}			17.3		
Internal Gate Resistance	R _{G(int)}	f = 1MHz, V _{AC} = 25mV		1.8		Ω
Turn-on delay time	t _{d(on)}	V _{DS} = 400V, V _{GS} = -4/+20V, I _D = 20A, R _{G(int)} = 5Ω, L = 294μH		2		nS
Turn-on rise time	t _r			13		
Turn-off delay time	t _{d(off)}			19		
Turn-off fall time	t _f			7		μJ
Turn-On Energy	E _{on}			23		
Turn-Off Energy	E _{off}			30		
Total switching energy	E _{tot}			53		
Source-Drain Diode characteristics						
Diode Forward Current	I _S	V _{GS} = -4V, T _C = 25°C		48		A
Diode pulse Current	I _{S, pulse}	V _{GS} = -4V, pulse width tp limited by T _{jmax}		116		A
Diode Forward voltage	V _{SD}	V _{GS} = -4V, I _{SD} = 8.8A		3.7		V
		V _{GS} = -4V, I _{SD} = 8.8A, T _j = 175°C		3.1		
Reverse Recovery Time	t _{rr}	V _{GS} = -4V, I _{SD} = 20A, V _R = 400V dif/dt = 2200 A/μs		15		nS
Reverse Recovery Charge	Q _{rr}			142		nC
Peak Reverse Recovery Current	I _{rrm}			16		A

Typical Characteristics

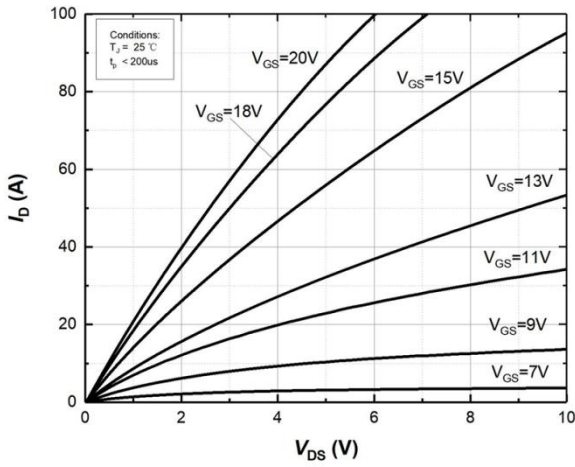


Figure 1. Output characteristics at $T_j=25^\circ\text{C}$

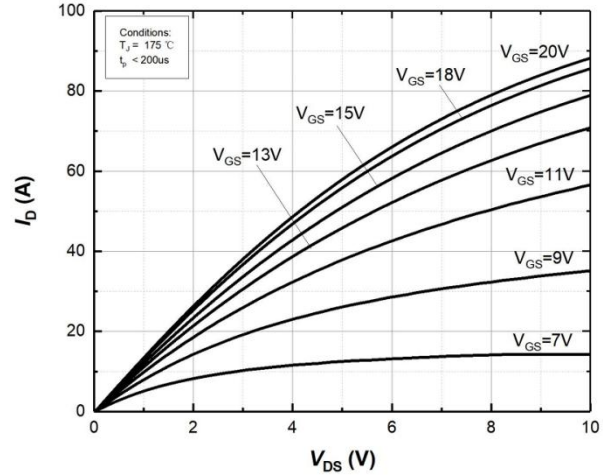


Figure 2. Output characteristics at $T_j=175^\circ\text{C}$

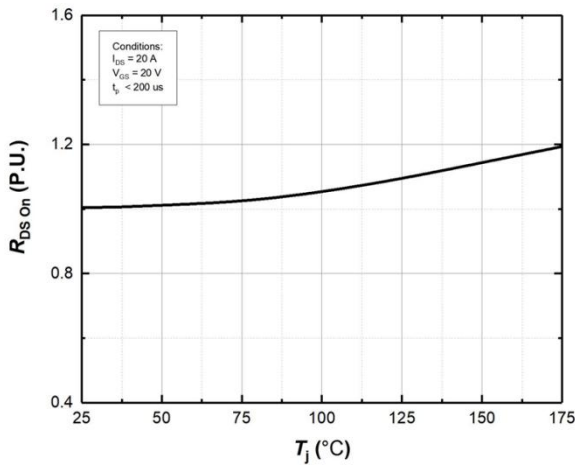


Figure 3. Normalized On-Resistance vs. Temperature

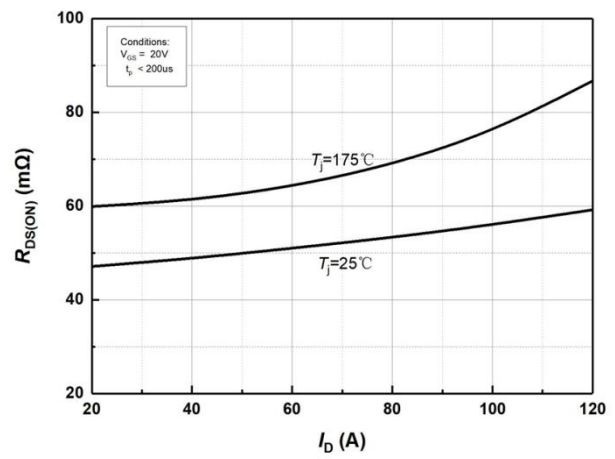


Figure 4. On-Resistance vs. Drain current for Various Temperature

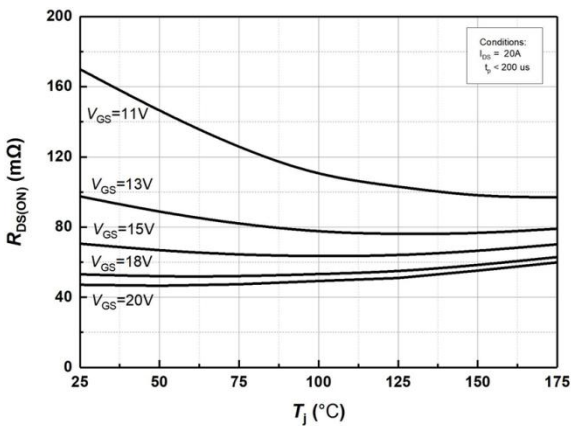


Figure 5. On-Resistance vs. Temperature for Various Gate Voltage

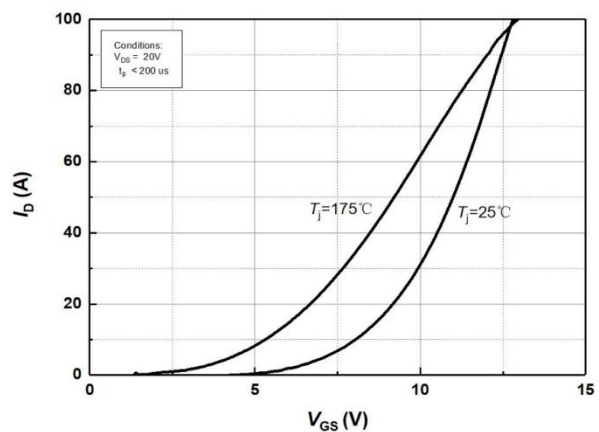


Figure 6. Transfer Characteristics for Various Junction Temperatures

Typical Characteristics

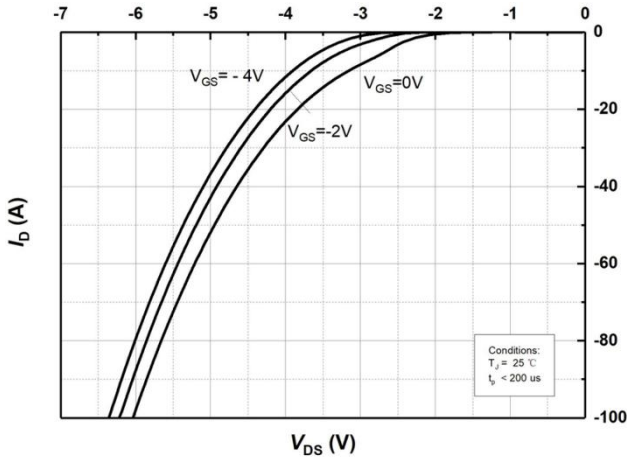


Figure 7. Body Diode Characteristics at Tj=25°C

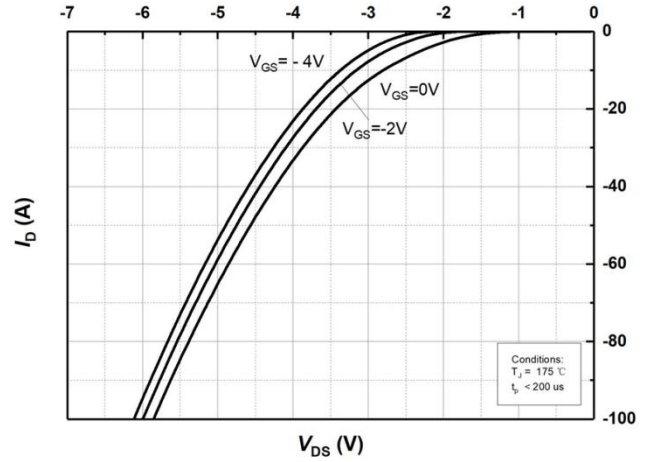


Figure 8. Body Diode Characteristics at Tj=175°C

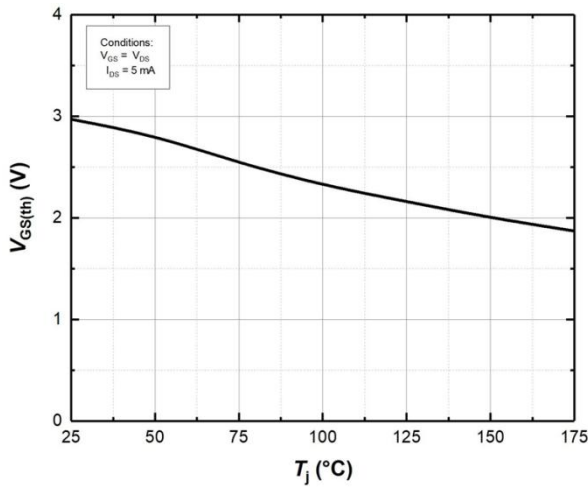


Figure 9. Threshold Voltage vs. Temperature

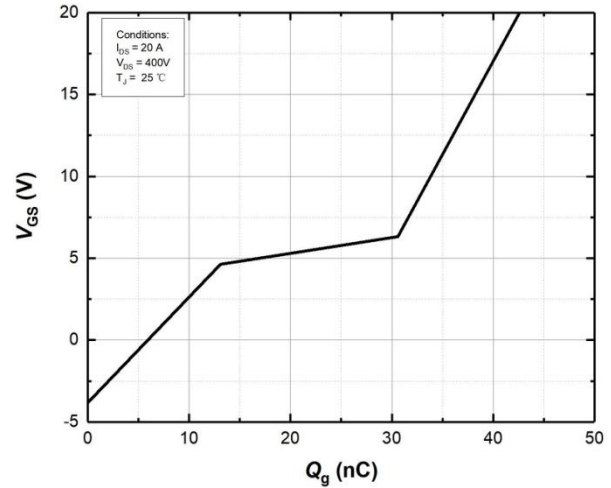


Figure 10 Gate Charge Characteristics

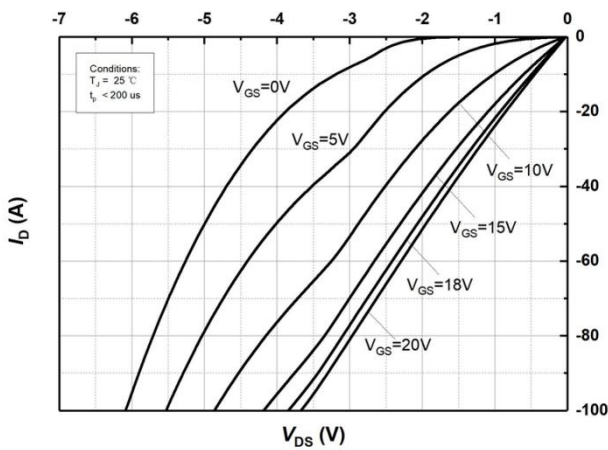


Figure 11. 3rd Quadrant Characteristic at Tj=25°C

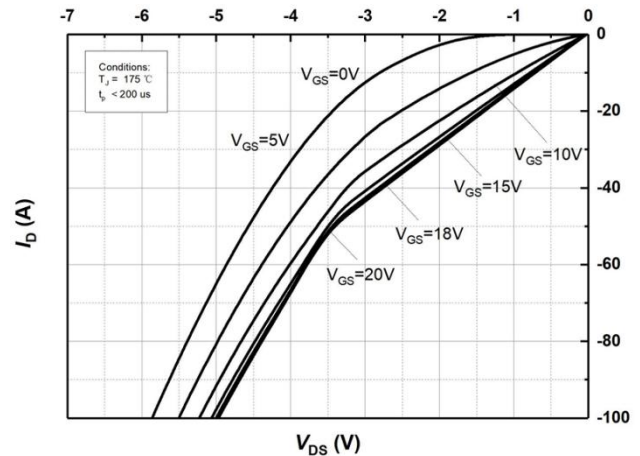


Figure 12. 3rd Quadrant Characteristic at Tj=175°C

Typical Characteristics

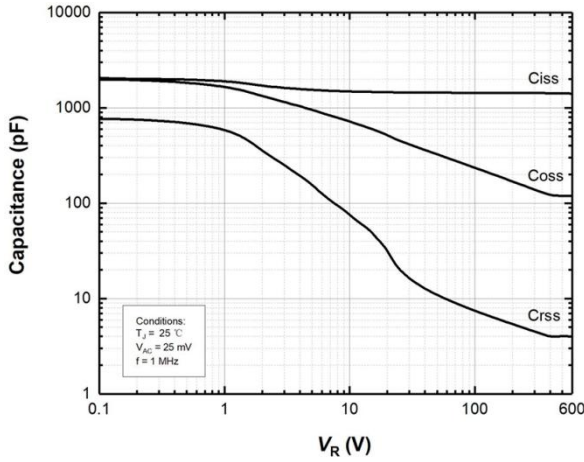


Figure 13. Capacitances vs. Drain-Source Voltage (0 – 600V)

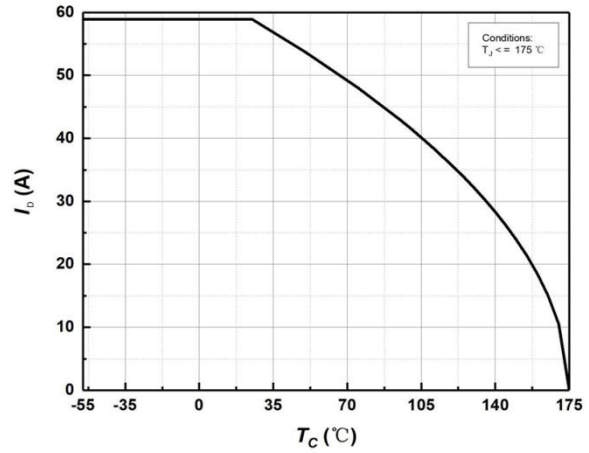


Figure 14. Continuous Drain Current Derating vs. Case Temperature

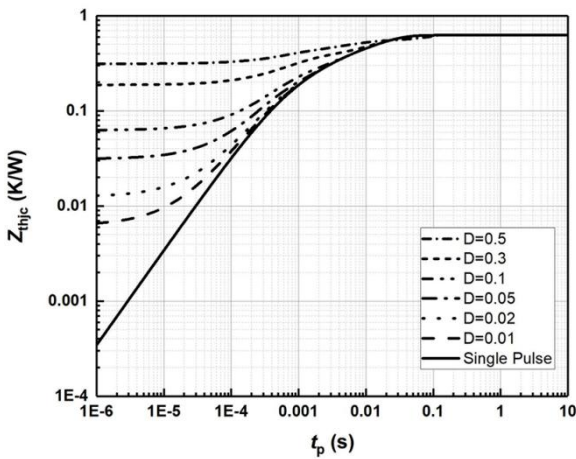


Figure 15. Transient Thermal Impedance (Junction – Case)

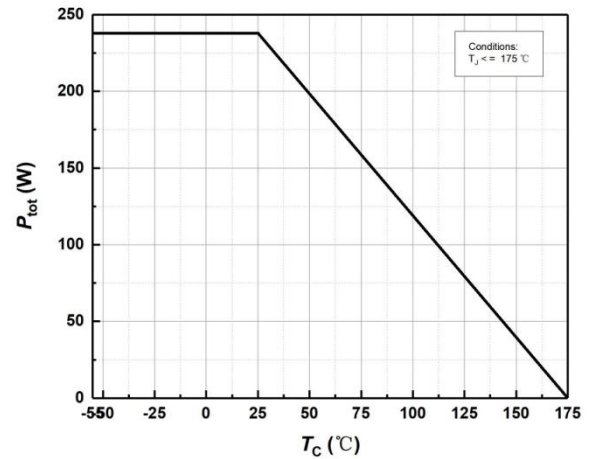


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

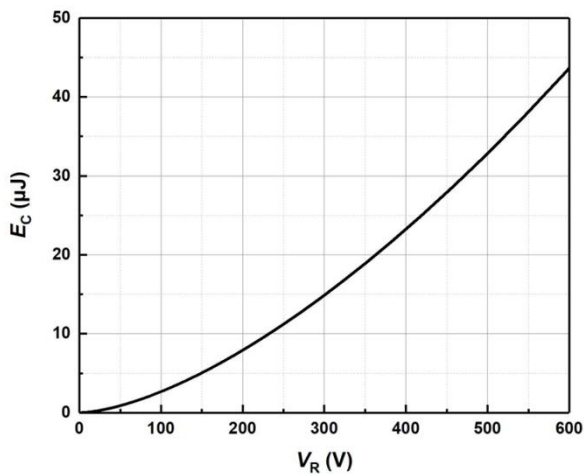


Figure 17. Output Capacitor Stored Energy

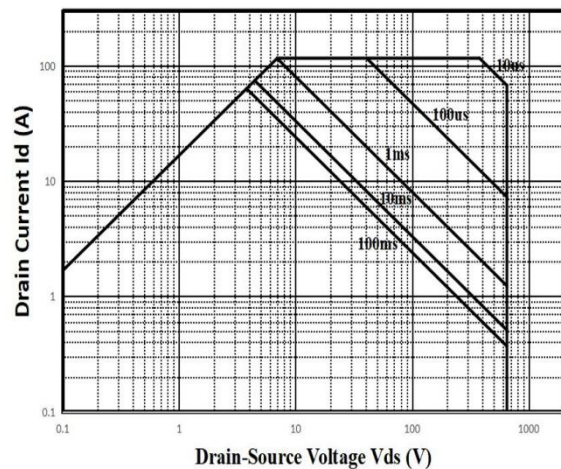


Figure 18. Safe Operating Area

Typical Characteristics

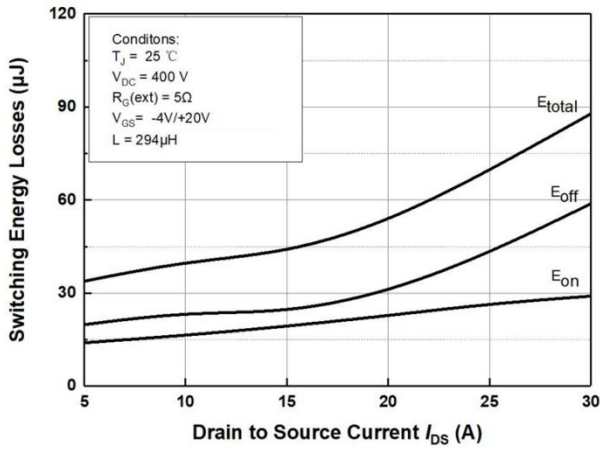


Figure 19. Clamped Inductive Switching Energy vs. Drain Current ($V_{DC} = 400V$)

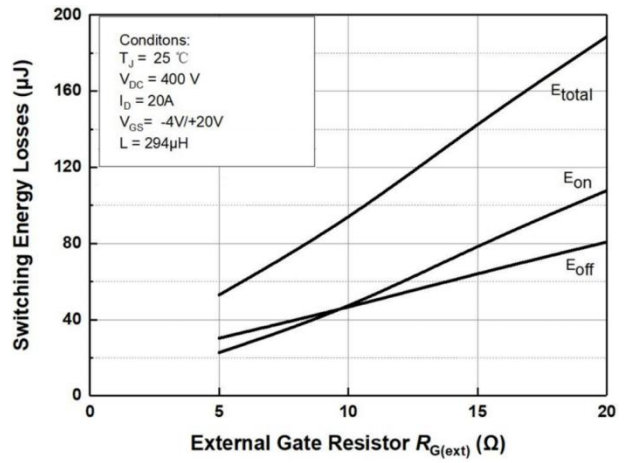


Figure 20. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

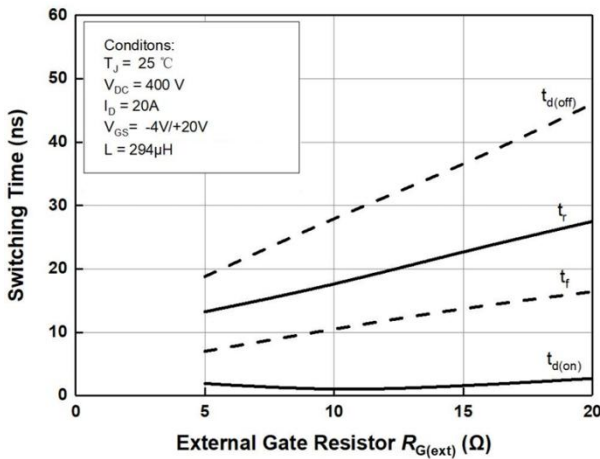
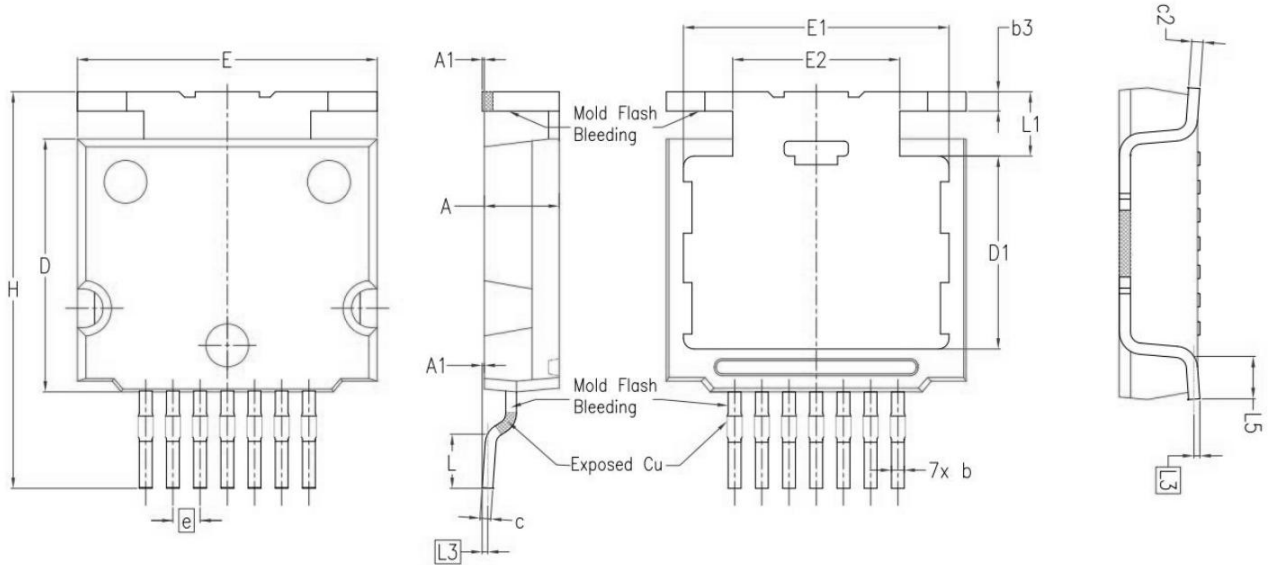


Figure 21. Switching Times vs. $R_{G(ext)}$

T2PAK Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	3.400	3.600	0.134	0.142
A1	0.000	0.250	0.000	0.010
b	0.500	0.700	0.020	0.028
b3	0.800	1.000	0.031	0.039
c	0.400	0.600	0.016	0.024
c2	0.400	0.600	0.016	0.024
D	11.700	11.900	0.461	0.469
D1	8.800	9.100	0.346	0.358
E	13.900	14.100	0.547	0.555
E1	12.300	12.500	0.484	0.492
E2	7.750	7.850	0.305	0.309
e	1.270 BSC		0.050 BSC	
H	18.000	19.000	0.709	0.748
L	2.300	2.750	0.091	0.108
L1	3.050 BSC		0.120 BSC	
L3	0.260 BSC		0.010 BSC	
L5	1.700	2.150	0.067	0.085