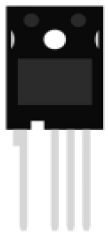
Technical Data
Data Sheet N3229, REV. -

S4M0016150K Silicon Carbide Power MOSFET

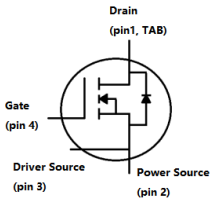


TO-247-4

Features

- Positive temperature characteristics, easy to parallel.
- Low on-resistance typ. RDS(on) = 16 mΩ .
- Fast switching speed and low switching losses.
- Very fast and robust intrinsic body diode.
- Process of non-bright tin electroplatin.
- "-A" is an AEC-Q101 qualified device.

Circuit Diagram



Applications

- EV Fast Charging Modules
- EV On Board Chargers
- Solar Inverters
- Online UPS/Industrial UPS
- SMPS (Switch Mode Power Supplies)
- DC-DC Converters
- ESS (Energy Storage Systems)

Maximum Ratings(T_C =25˚C unless otherwise specified)

Characteristics	Symbol	Conditions	Min.	Typ.	Max.	Units	Note
Drain - Source Voltage	V_{DSmax}	V_{GS} = 0 V, I_D = 100 μ A			1500	V	
Gate - Source Voltage (dynamic)	V_{GSmax}	AC (f > 1 Hz)	-8		+22	V	
Gate - Source Voltage (static)	V_{GSop}	Static		-4 / +18		V	[1]
Continuous Drain Current	I_D	V_{GS} = 18 V, T_C = 25 ˚C V_{GS} = 18 V, T_C = 100 ˚C			134 95	A	
Pulsed Drain Current	$I_{D(pulse)}$	Pulse width t_P limited by T_{jmax}			320	A	
Power Dissipation	P_D	T_C = 25 ˚C			817	W	

[1] Recommended turn off gate voltage is -4 V. Recommended turn on gate voltage is 18 V. Do not use with VGSON < 12 V.

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Electrical Characteristics:

Characteristics	Symbol	Conditions	Min.	Typ.	Max.	Units
Drain Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 100 µ A	1500			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 25 mA	2	3.0	4	V
		V_{DS} = V_{GS}, I_D = 25 mA, T_J = 175 ˚C		2.25		V
Zero Gate Voltage Drain Current	IDSS	V_{DS} = 1500 V, V_{GS} = 0 V		1	100	µ A
Gate Source Leakage Current	IGSS	V_{GS} = 18 V, V_{DS} = 0 V		10	250	nA
Drain Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 18 V, I_D = 75 A	12	16	21	mΩ
		V_{GS} = 18 V, I_D = 75 A, T_J = 175 ˚C		29		mΩ
Transconductance	gfs	V_{DS} = 20 V, I_{DS} = 75 A		12		S
		V_{DS} = 20 V, I_{DS} = 75 A, T_J = 175 ˚C		7.2		S
Input Capacitance	C_{ISS}	V_{GS} = 0 V		4160		pF
Output Capacitance	C_{OSS}	V_{DS} = 1500 V		196		
Reverse Transfer Capacitance	C_{RSS}	V_{AC} = 25 mV		7		
COSS Stored Energy	E_{OSS}	f = 100kHz		246		µ J
Turn-On Switching Energy	E_{ON}	V_{DS} = 1000 V, V_{GS} = -4 / 18 V		753		µ J
Turn-Off Switching Energy	E_{OFF}	I_D = 75 A, $R_{G(ext)}$ = 2.5 Ω, L = 99 uH		280		
Turn-On Delay Time	$t_{d(on)}$	V_{DS} = 1000 V, V_{GS} = -4 / 18 V		16		ns
Rise Time	t_r	I_D = 75 A, $R_{G(ext)}$ = 2.5 Ω		19		
Turn-Off Delay Time	$t_{d(off)}$	Inductive Load Timing relative to		31		
Fall Time	t_f	V_{DS} Per IEC60747-8-4 pg 83		8		
Internal Gate Resistance	$R_{G(int)}$	f = 1 MHz, AC = 25 mV		1.8		Ω
Gate to Source Charge	Q_{gs}	V_{DS} = 1000 V, V_{GS} = -4 / 18 V		38		nC
Gate to Drain Charge	Q_{gd}	I_D = 75 A		36		
Total Gate Charge	Q_g	Per IEC60747-8-4 pg 21		174		

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Reverse Diode Characteristics (T_A= 25 ˚C, unless otherwise specified)

Characteristics	Symbol	Conditions	Typ.	Max.	Units
Diode Forward Voltage	V_{SD}	V_{GS} = -4 V, I_{SD} = 37.5 A	3.8		V
	V_{SD}	V_{GS} = -4 V, I_{SD} = 37.5 A, T_J = 175˚C	3.3		V
Reverse Recovery Time	t_{rr}	V_{GS} = -4 V, I_{SD} = 75 A, T_J = 25 ˚C	26		ns
Reverse Recovery Charge	Q_{rr}	V_R = 1000 V	440		nC
Peak Reverse Recovery Current	I_{RRM}	dif / dt = 2000 A / µs	30		A

Thermal-Mechanical Specifications

Characteristics	Symbol	Condition	Specification	Units
Junction Temperature	T_J	-	-55 to +175	˚C
Storage Temperature	T_{stg}	-	-55 to +175	˚C
Typical Thermal Resistance Junction to Case	$R_{\theta JC}$	DC operation	0.18	˚C /W

Ordering Information

Device	Package	Shipping
S4M0016150K	TO-247-4	30 pcs/tube

Marking Diagram

Where XXXXX is YYWWL

S4M	= Device Type
0016	= RDS(on)
150	= Reverse Voltage (1500V)
K	= Package
SSG	= SSG
YY	= Year
WW	= Week
L	= Lot Number

Cautions: Molding resin
Epoxy resin UL:94V-0

Ratings and Characteristics Curves

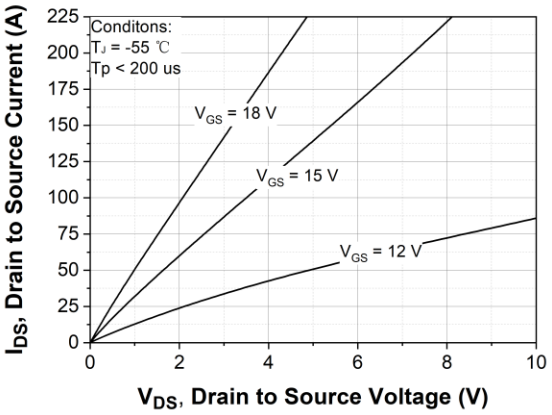

Figure 1. Output Characteristics T_J = -55 °C

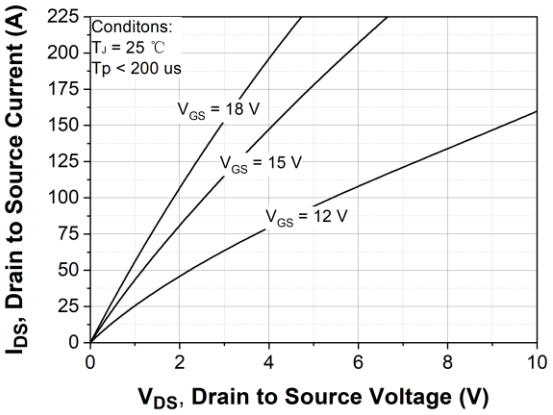

Figure 2. Output Characteristics T_J = 25 °C

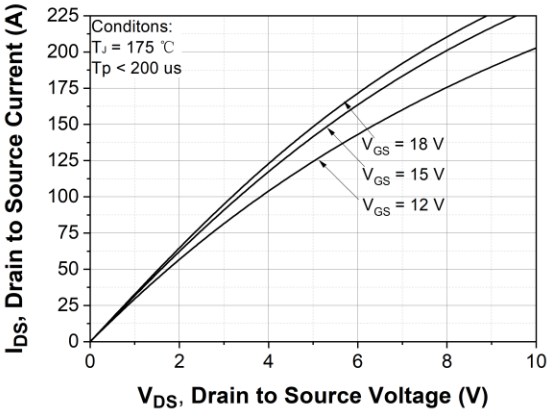

Figure 3. Output Characteristics T_J = 175 °C

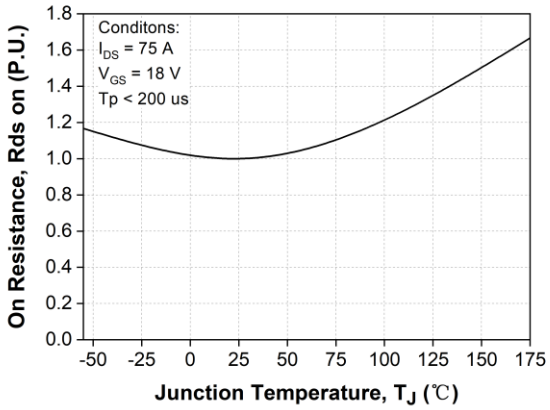

Figure 4. Normalized On-Resistance vs. Temperature

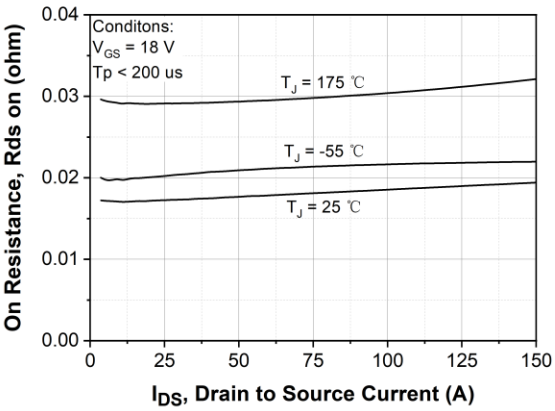

Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

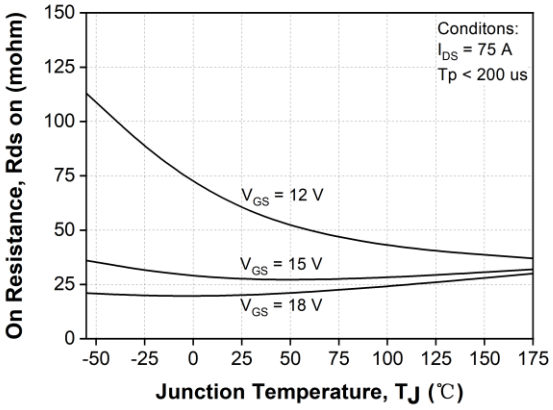

Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

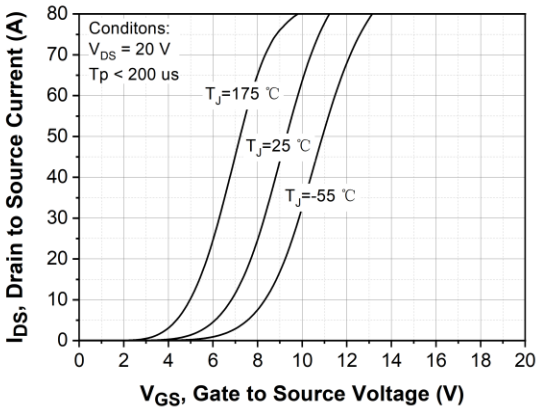

Figure 7. Transfer Characteristic for Various Junction Temperatures

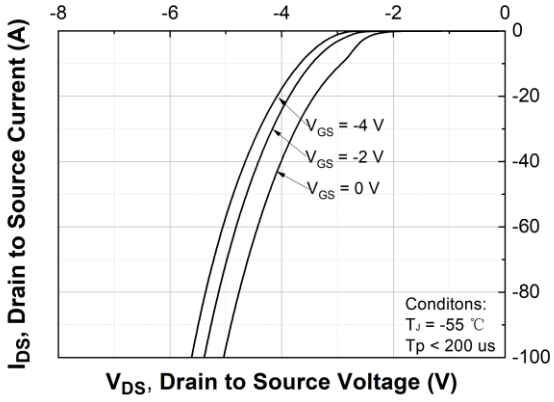

Figure 8. Body Diode Characteristic at T_J = -55 °C

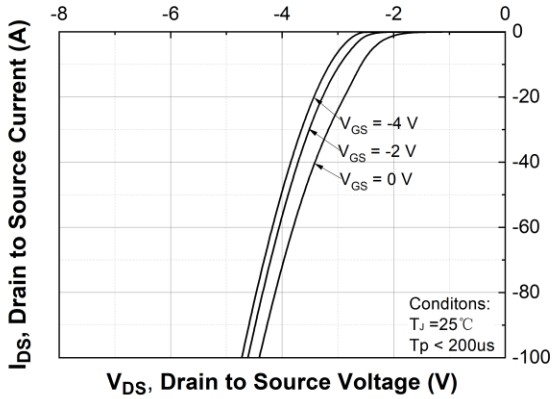

Figure 9. Body Diode Characteristic at T_J = 25 °C

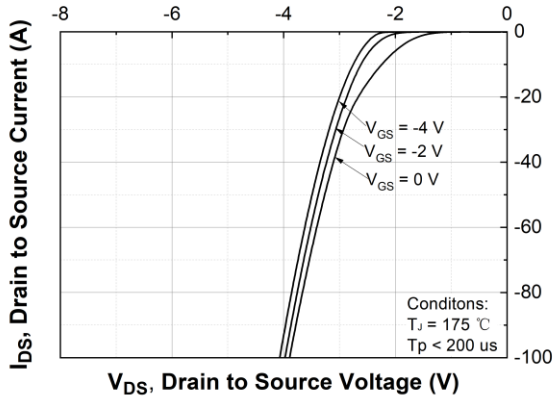

Figure 10. Body Diode Characteristic at T_J = 175 °C

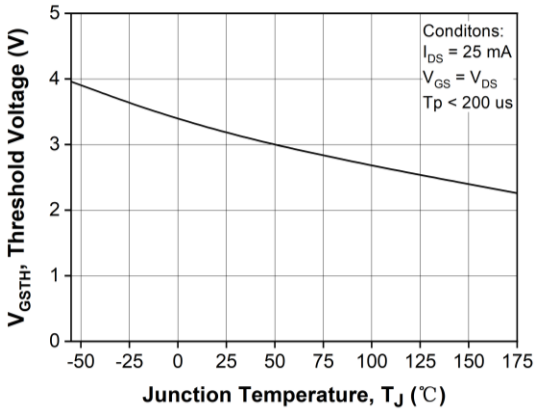

Figure 11. Threshold Voltage vs. Temperature

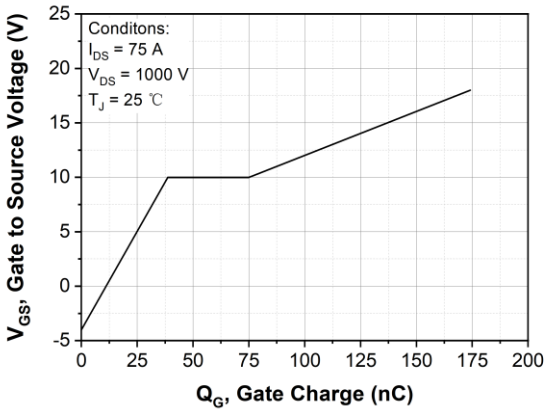

Figure 12. Gate Charge Characteristic

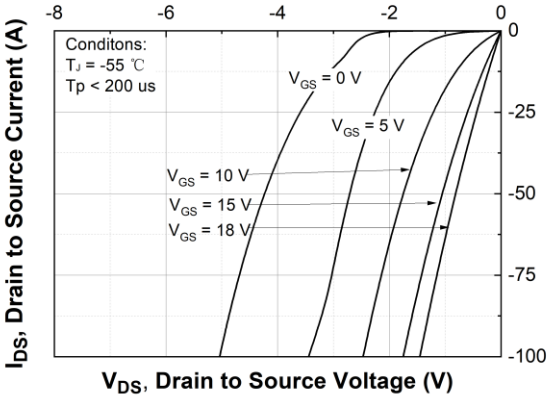

Figure 13. 3rd Quadrant Characteristic at T_J = -55 °C

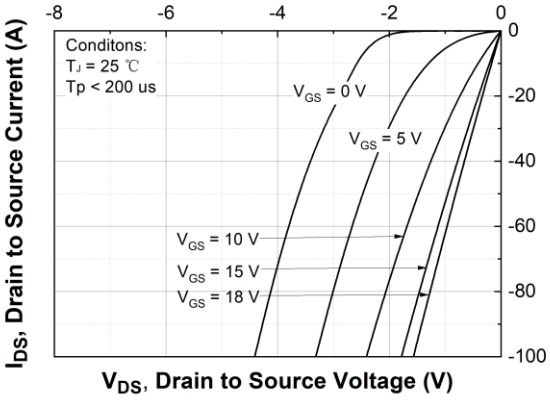

Figure 14. 3rd Quadrant Characteristic at T_J = 25 °C

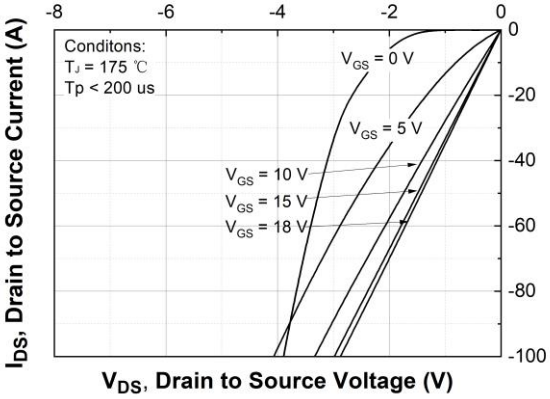

Figure 15. 3rd Quadrant Characteristic at T_J = 175 °C

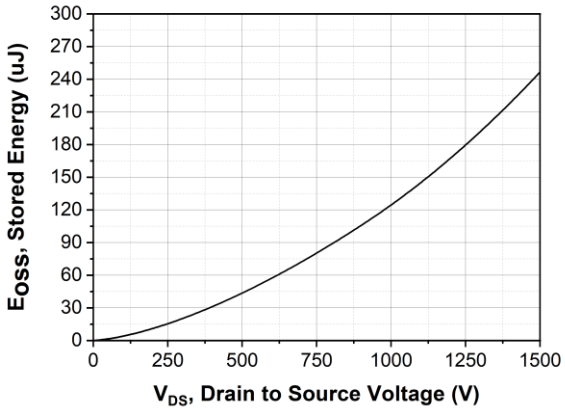

Figure 16. Output Capacitor Stored Energy

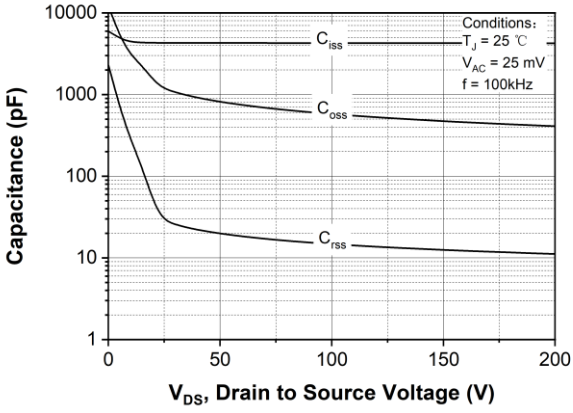

Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200 V)

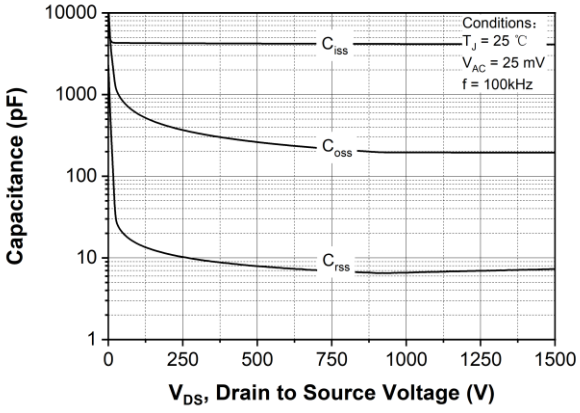

Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1500 V)

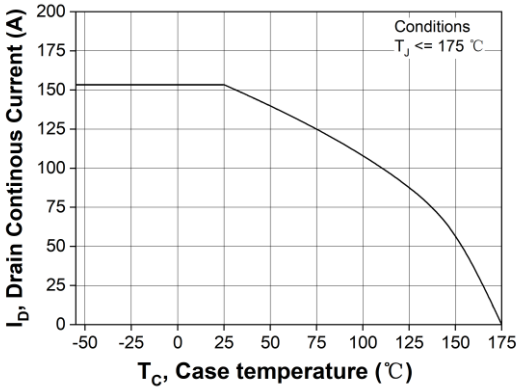

Figure 19. Continuous Drain Current Derating vs. Case Temperature

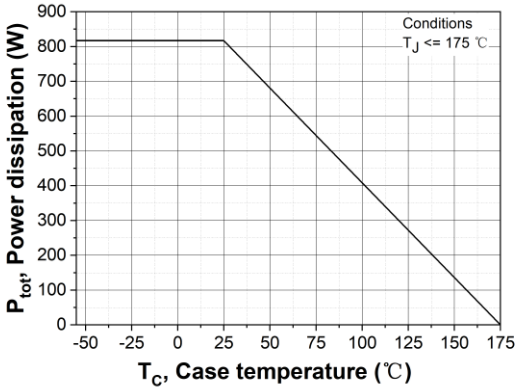

Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

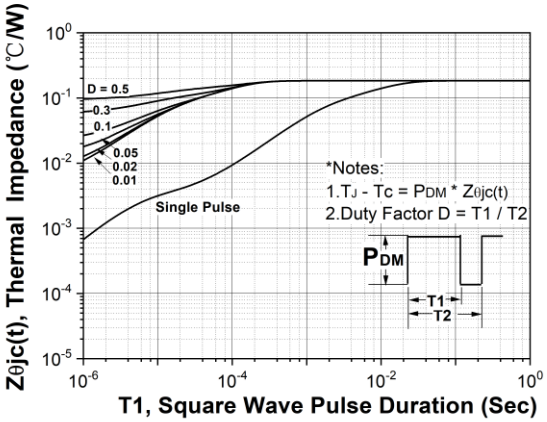

Figure 21. Transient Thermal Impedance (Junction - Case)

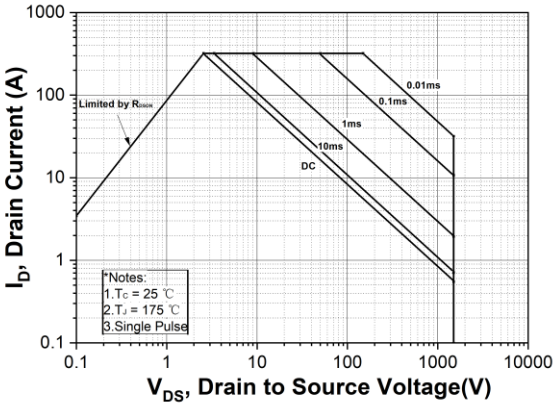

Figure 22. Safe Operating Area

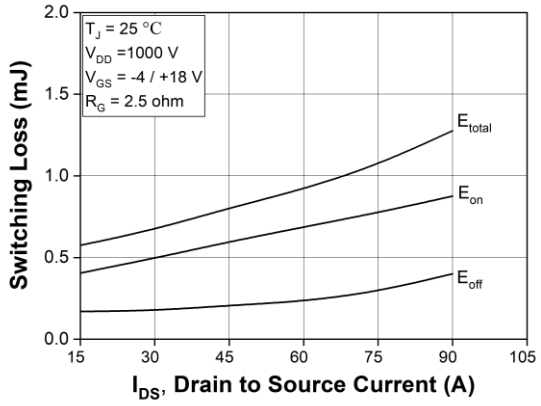

Figure 23. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 1000V)

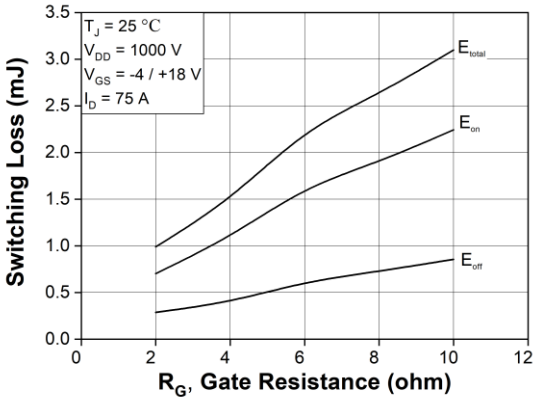

Figure 24. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

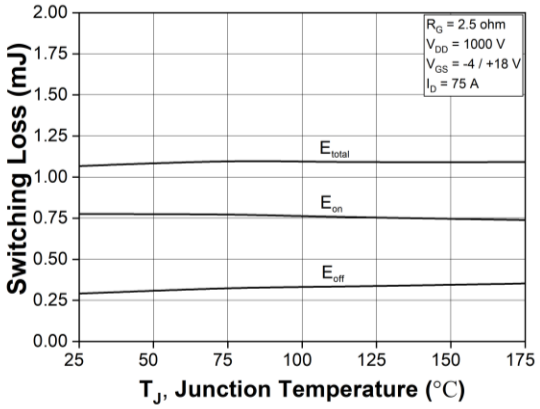

Figure 25. Clamped Inductive Switching Energy vs. Temperature

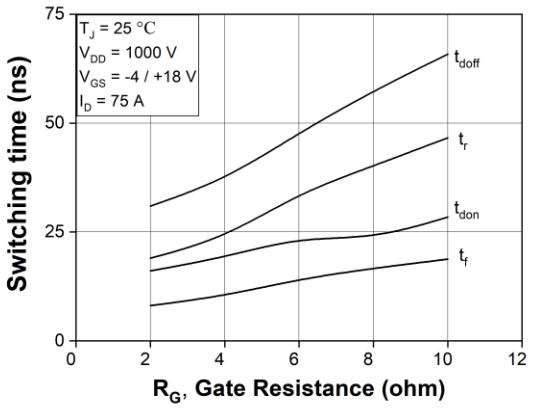

Figure 26. Switching Times vs. $R_{G(ext)}$

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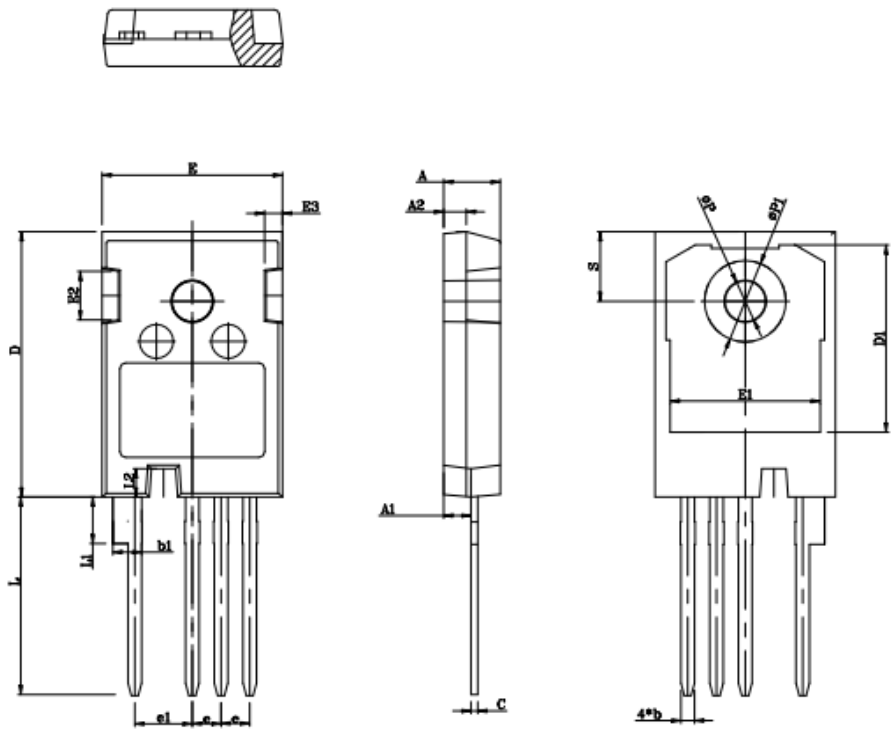
Mechanical Dimensions TO-247-4



COMMON DIMENSIONS

SYMBOL	mm		
	Min	Nom	Max
A	4.80	5.00	5.20
A1	2.23	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b1	2.35	2.55	2.75
c	0.51	0.61	0.75
D	23.30	23.45	23.60
D1	16.25	16.55	16.85
E	15.75	15.94	16.10
E1	13.00	13.26	13.43
E2	4.00	4.30	4.60
E3	1.15	1.45	1.75
e		2.54BSC	
e1		5.08BSC	
L	17.31	17.47	17.82
L1	1.50	4.12	4.30
L2	2.35	2.5	2.65
ØP	3.55	3.65	3.75
ØP1	7.08	7.19	7.30
S		6.15BSC	

The outline from different package houses may have slight differences. So the outline above is just schematic. The dimensions are controlled per specifications.

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