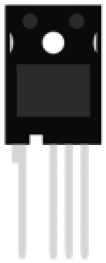
Technical Data
Data Sheet N3262, Rev. -

S4M0200075K Silicon Carbide Power MOSFET

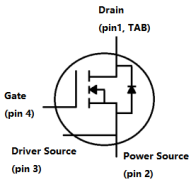


TO-247-4

Features

- Positive temperature characteristics, easy to parallel.
- Low on-resistance typ. RDS(on) = 200 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 μA			750	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			17 12	A	
Pulsed Drain Current	$I_{D(pulse)}$	Pulse width t_P limited by T_{jmax}			32	A	
Power Dissipation	P_D	T_C = 25 ˚C			120	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.

Electrical Characteristics:

Characteristics	Symbol	Conditions	Min.	Typ.	Max.	Units
Drain Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 100 µA	750			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 1.7 mA	2	2.8	4	V
		V_{DS} = V_{GS}, I_D = 1.7 mA, T_J = 175 °C		2.0		V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 750 V, V_{GS} = 0 V			100	µA
Gate Source Leakage Current	I_{GSS}	V_{GS} = 18 V, V_{DS} = 0 V			250	nA
Drain Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 18 V, I_D = 4.25 A		200	260	mΩ
		V_{GS} = 18 V, I_D = 4.25 A, T_J = 175 °C		275		mΩ
Transconductance	gfs	V_{DS} = 20 V, I_{DS} = 4.25 A		2.0		S
		V_{DS} = 20 V, I_{DS} = 4.25 A, T_J = 175 °C		2.5		S
Input Capacitance	C_{ISS}	V_{GS} = 0 V		293		pF
Output Capacitance	C_{OSS}	V_{DS} = 750 V		28		
Reverse Transfer Capacitance	C_{RSS}	V_{AC} = 25 mV		0.4		
COSS Stored Energy	E_{OSS}	f = 1 MHz		9.5		µJ
Turn-On Switching Energy	E_{ON}	V_{DS} = 500 V, V_{GS} = -4 / 18 V		31		µJ
Turn-Off Switching Energy	E_{OFF}	I_D = 4.25 A, $R_{G(ext)}$ = 2.5 Ω, L = 99 uH		17		
Turn-On Delay Time	$t_{d(on)}$	V_{DS} = 500 V, V_{GS} = -4 / 18 V		5		ns
Rise Time	t_r	I_D = 4.25 A, $R_{G(ext)}$ = 2.5 Ω		11		
Turn-Off Delay Time	$t_{d(off)}$	Inductive Load Timing relative to		8		
Fall Time	t_f	$_{VDS}$ Per IEC60747-8-4 pg 83		26		
Internal Gate Resistance	$R_{G(int)}$	f = 1 MHz, AC = 25 mV		1		Ω
Gate to Source Charge	Qg_s	V_{DS} = 500 V, V_{GS} = -4 / 18 V		5.2		nC
Gate to Drain Charge	Q_{gd}	I_D = 4.25 A		3.8		
Total Gate Charge	Q_g	Per IEC60747-8-4 pg 21		13.2		

Technical Data
Data Sheet N3262, Rev. -

Reverse Diode Characteristics (TA = 25 °C, unless otherwise specified)

Characteristics	Symbol	Conditions	Typ.	Max.	Units
Diode Forward Voltage	V_{SD}	V_{GS} = -4 V, I_{SD} = 2.13 A	4.4		V
	V_{SD}	V_{GS} = -4 V, I_{SD} = 2.13 A, T_J = 175°C	3.8		V
Reverse Recovery Time	t_{rr}	V_{GS} = -4 V, I_{SD} = 4.25 A, T_J = 25 °C	8		ns
Reverse Recovery Charge	Q_{rr}	V_R = 500 V	77		nC
Peak Reverse Recovery Current	I_{mm}	dif / dt = 2000 A / µs	6		A

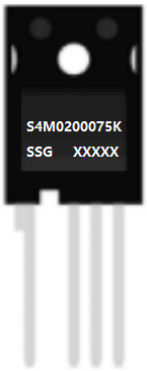
Thermal-Mechanical Specifications

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	$R_{\theta JC}$		1.25	°C /W

Ordering Information

Device	Package	Shipping
S4M0200075KA1	TO-247-4	30 pcs/tube

Marking Diagram



Where XXXXX is YYWWL

S4M = Device Type
0200 = RDS(on)
075 = Reverse Voltage (750V)
K = Package
SSG = SSG
YY = Year
WW = Week
L = Lot Number

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

Ratings and Characteristics Curves

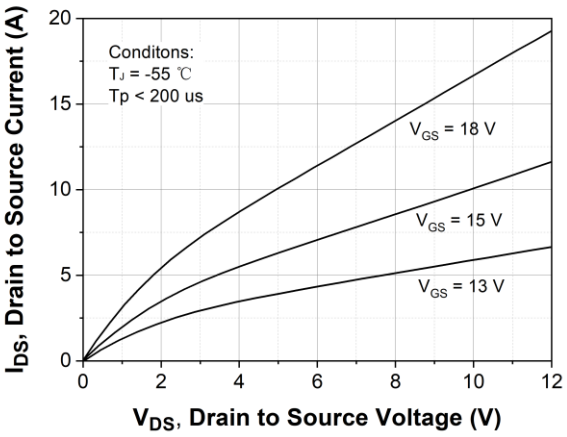


Figure 1. Output Characteristics T_J = -55 °C

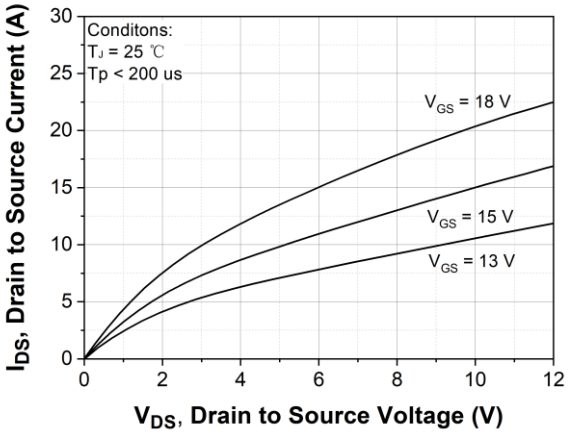


Figure 2. Output Characteristics T_J = 25 °C

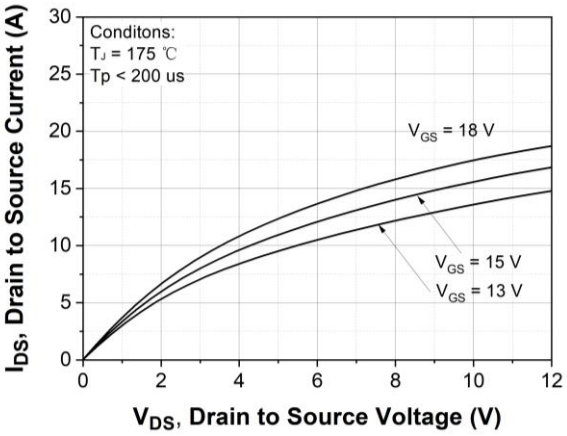


Figure 3. Output Characteristics T_J = 175 °C

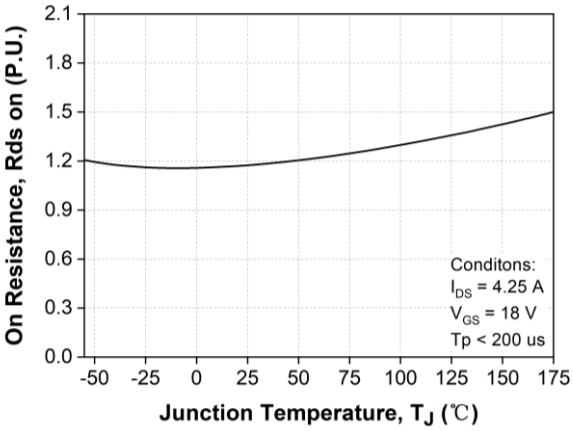


Figure 4. Normalized On-Resistance vs. Temperature

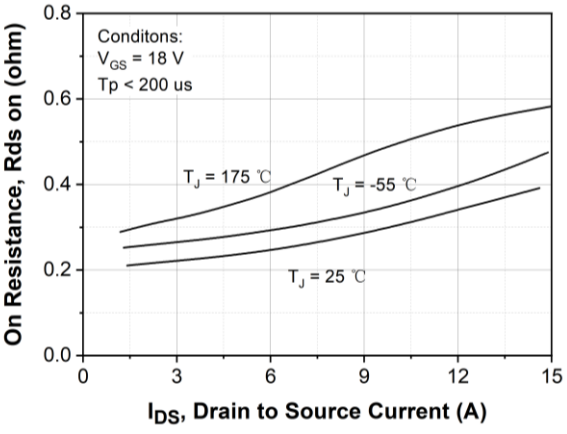


Figure 5. On-Resistance vs. Drain Current
For Various Temperatures

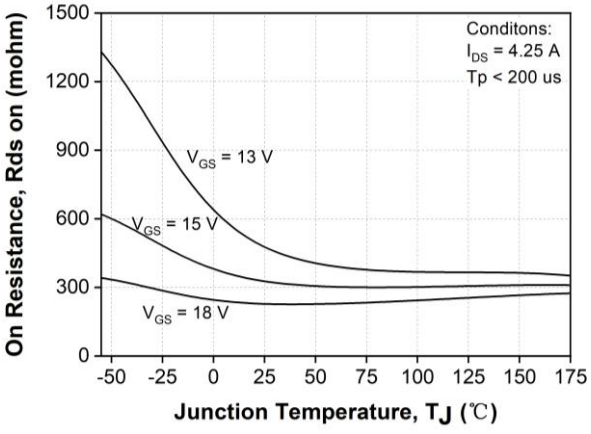


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

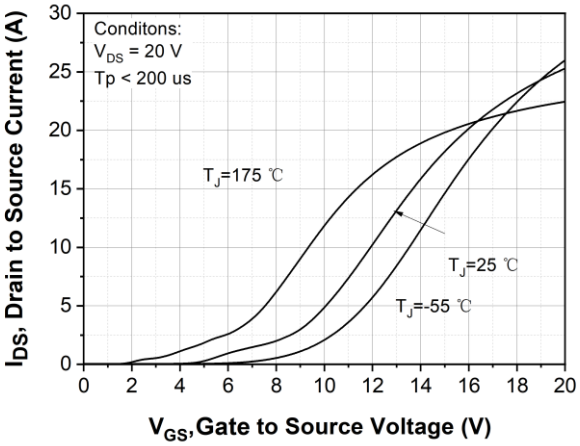


Figure 7. Transfer Characteristic for Various Junction Temperatures

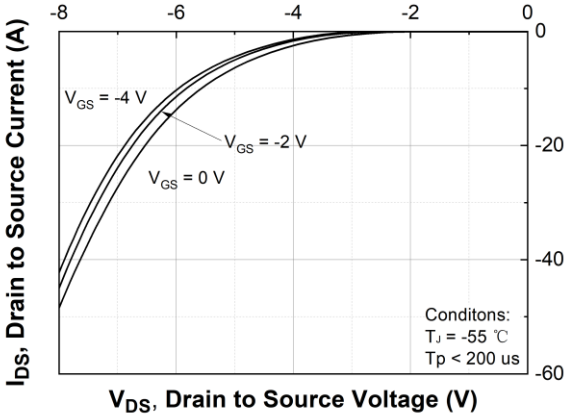


Figure 8. Body Diode Characteristic at T_J = -55 °C

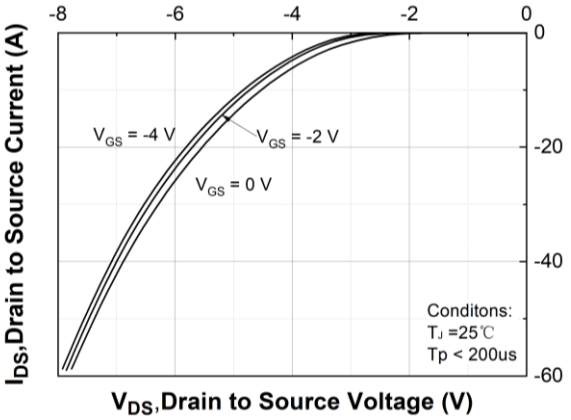


Figure 9. Body Diode Characteristic at T_J = 25 °C

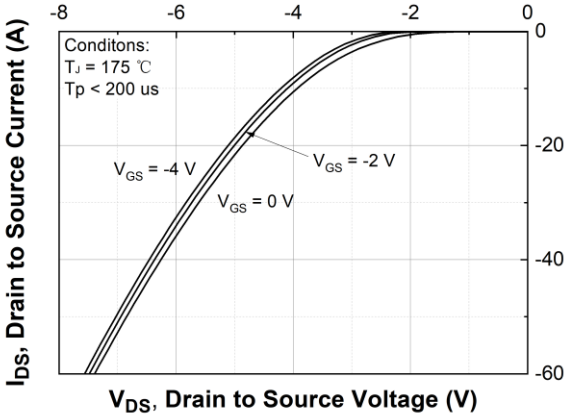


Figure 10. Body Diode Characteristic at T_J = 175 °C

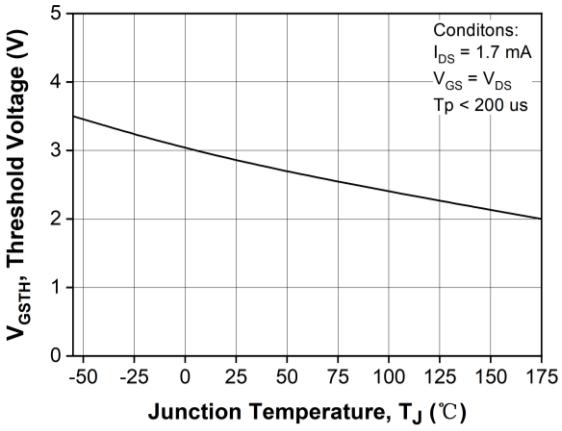


Figure 11. Threshold Voltage vs. Temperature

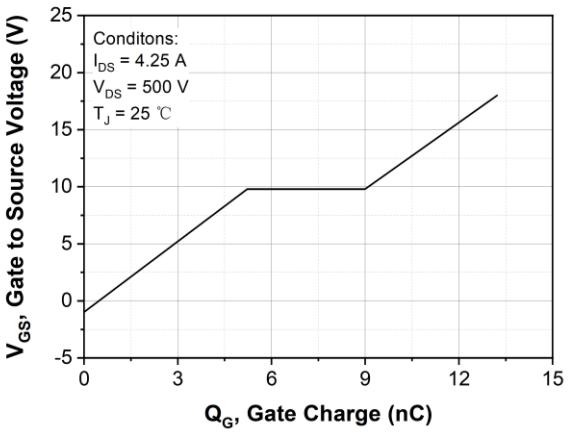


Figure 12. Gate Charge Characteristic

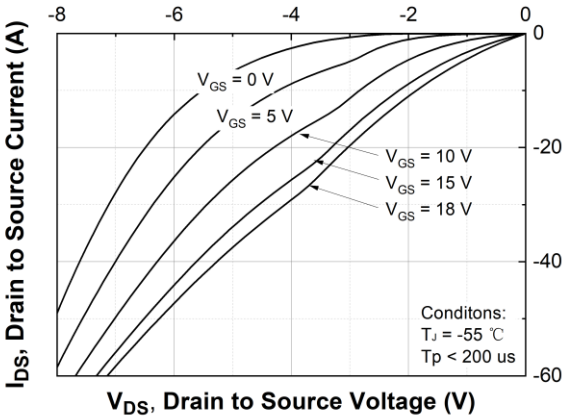


Figure 13. 3rd Quadrant Characteristic at T_J = -55 °C

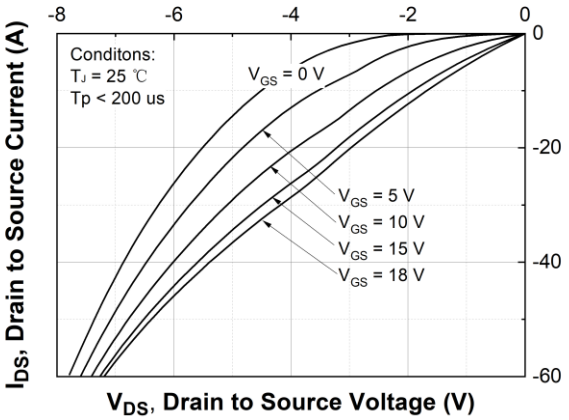


Figure 14. 3rd Quadrant Characteristic at T_J = 25 °C

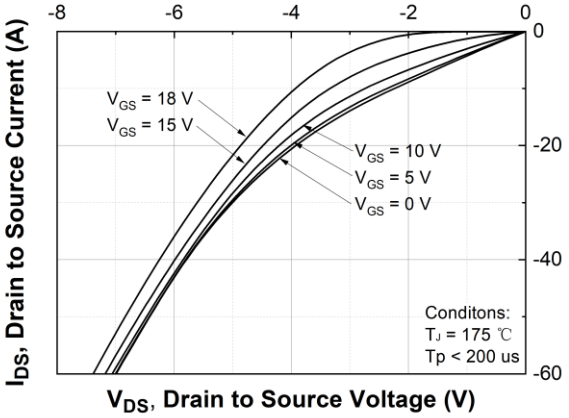


Figure 15. 3rd Quadrant Characteristic at T_J = 175 °C

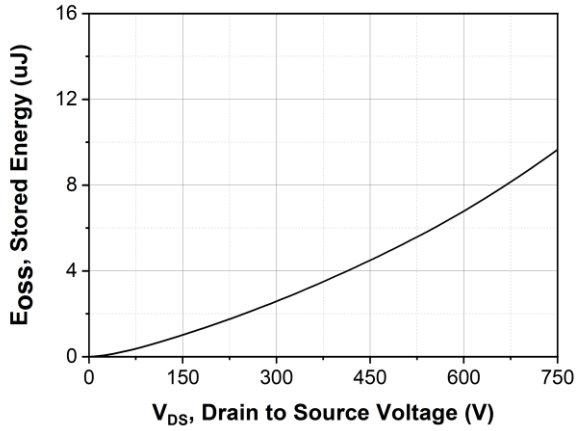


Figure 16. Output Capacitor Stored Energy

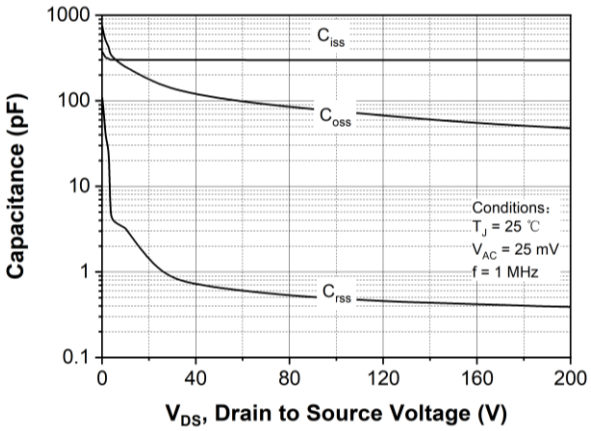


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 200 V)

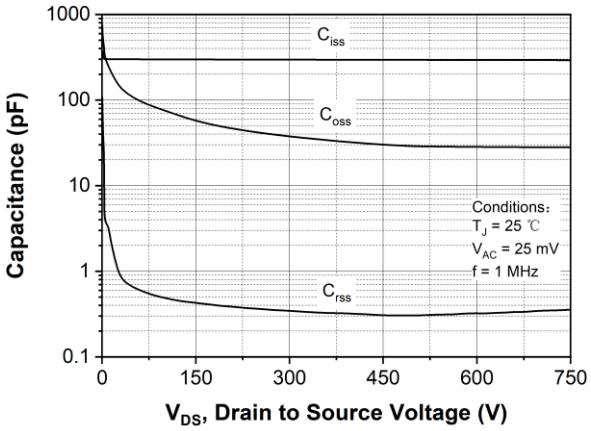


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 750 V)

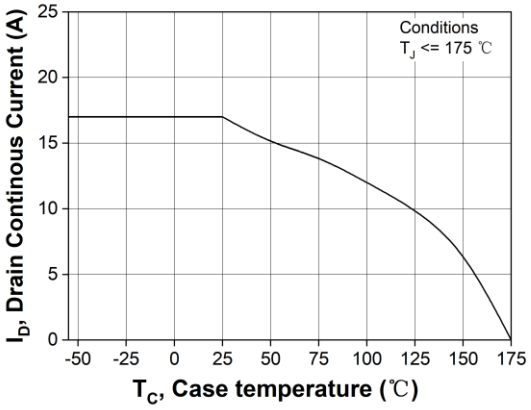


Figure 19. Continuous Drain Current Derating vs. Case Temperature

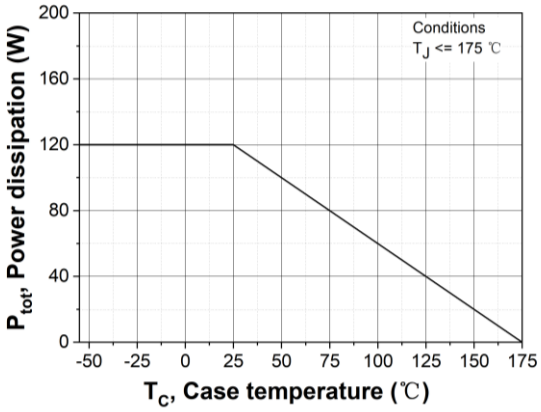


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

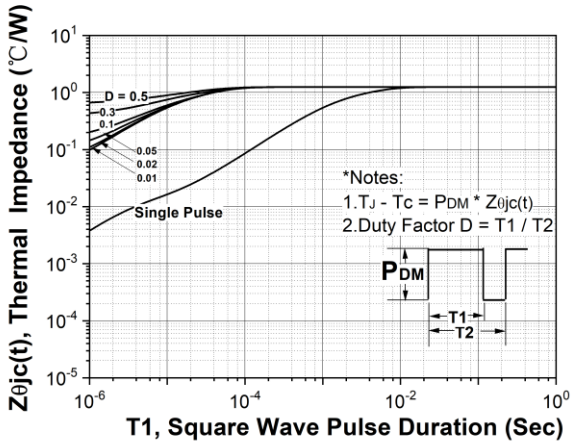


Figure 21. Transient Thermal Impedance (Junction - Case)

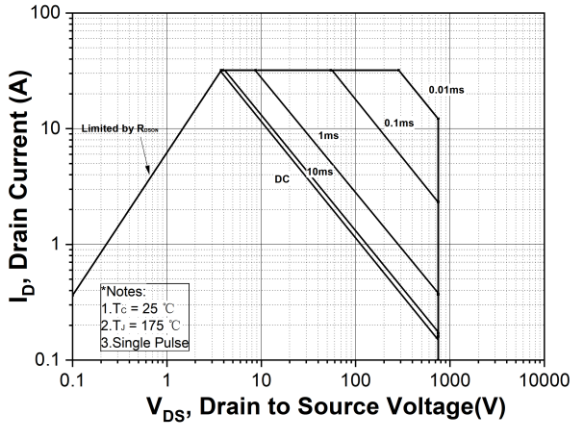


Figure 22. Safe Operating Area

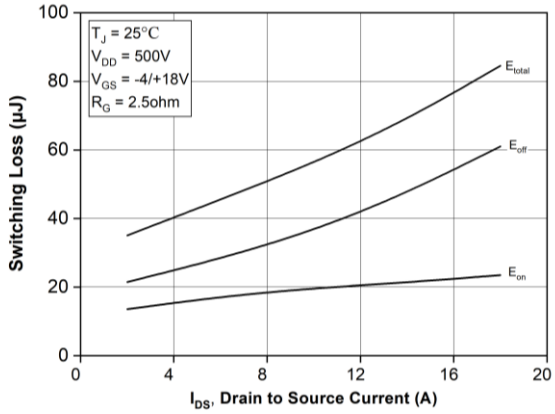


Figure 23. Clamped Inductive Switching Energy vs. Drain Current (V_{DD} = 400V)

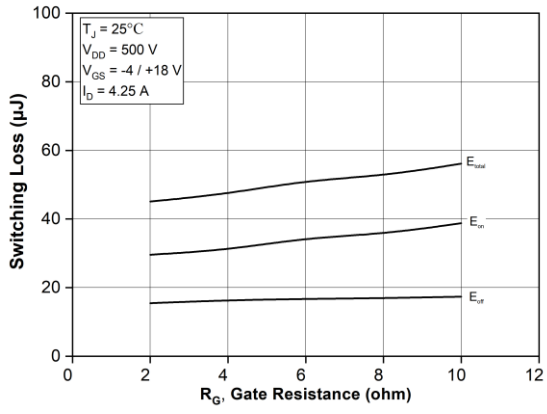


Figure 24. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

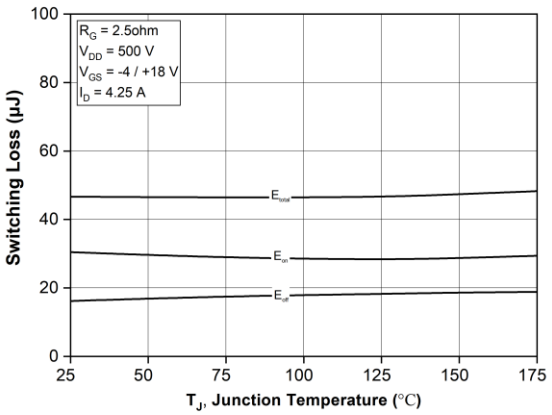


Figure 25. Clamped Inductive Switching Energy vs. Temperature

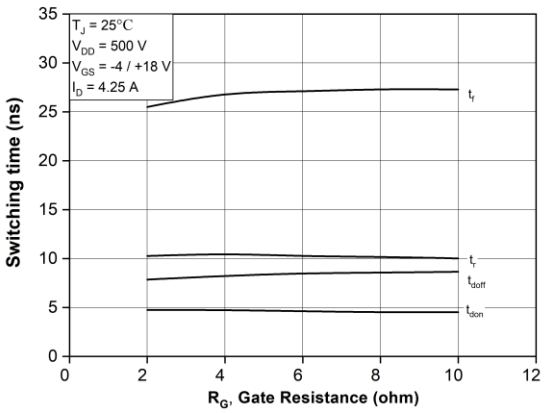
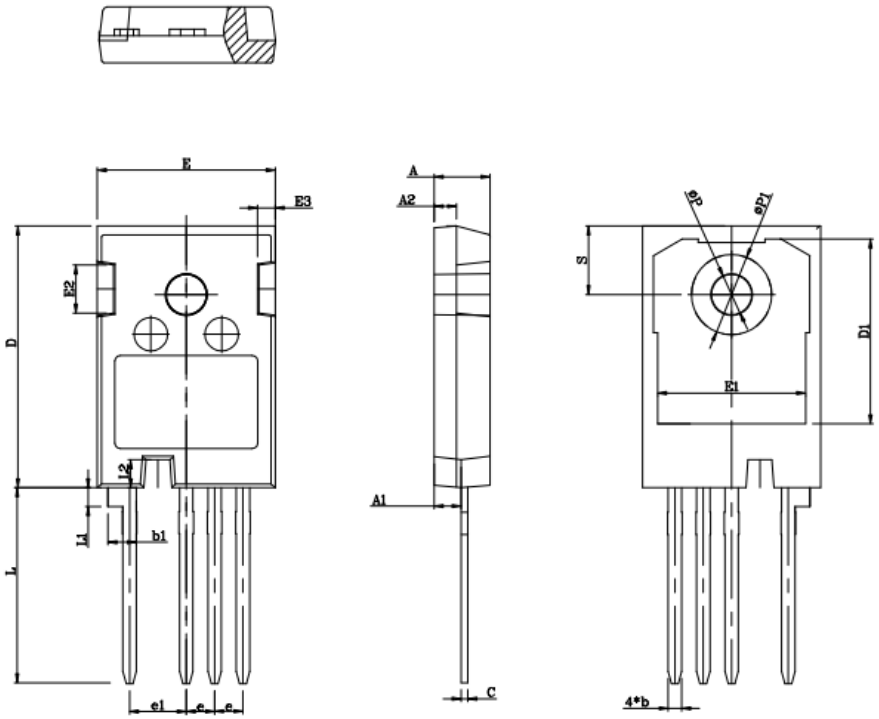


Figure 26. Switching Times vs. $R_{G(ext)}$

Technical Data
Data Sheet N3262, Rev. -

Mechanical Dimensions TO-247-4



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	1.70	1.90
ØP	3.51	3.60	3.65
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.

Technical Data
Data Sheet N3262, Rev. -

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