NCE Automotive P-Channel Enhancement Mode Power MOSFET

Description

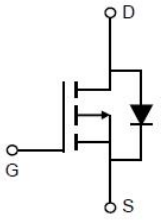
The NCEA2309 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge .This device is well suited for use as a load switch or in PWM applications.

General Features

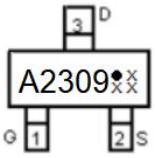
- V_{DS} =-60V,I_D =-2.3A
  $R_{DS(ON)}$ <160mΩ @ V_{GS}=-10V
  $R_{DS(ON)}$ <200mΩ @ V_{GS}=-4.5V
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation
- **AEC-Q101 qualified**

Application

- Automotive application
- Load switch
- PWM application



Schematic diagram



Marking and pin Assignment

SOT-23 top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
A2309	NCEA2309	SOT-23	Ø180mm	8 mm	3000 units

Absolute Maximum Ratings (T_A=25℃unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	-60	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous (T_A=25℃)	I_D	-2.3	A
Drain Current-Continuous (T_A=100℃)	I_D	-1.4	A
Pulsed Drain Current	I_{DM}	-9.2	A
Maximum Power Dissipation	P_D	1.5	W
Single pulse avalanche energy (Note 1)	E_{AS}	19	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 150	℃

Thermal Characteristic

Thermal Resistance, Junction-to-Ambient (Note 4)	$R_{\theta JA}$	83.3	℃/W

Electrical Characteristics (T_A=25℃unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=-250μA	-60	-	-	V

Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=-60V,V_{GS}=0V	-	-	-1	μA
Parameter	**Symbol**	**Condition**	**Min**	**Typ**	**Max**	**Unit**
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=-250μA	-1.4	-2.0	-2.6	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=-10V, I_D=-1.6A	-	133	160	mΩ
		V_{GS}=-4.5V, I_D=-1.6A	-	162	200	mΩ
Forward Transconductance	g_{FS}	V_{DS}=-5V,I_D=-1.6A	-	3	-	S
Dynamic Characteristics						
Input Capacitance	C_{lss}	V_{DS}=-30V,V_{GS}=0V, F=1.0MHz	-	444.2	-	pF
Output Capacitance	C_{oss}		-	19.6	-	pF
Reverse Transfer Capacitance	C_{rss}		-	17.9	-	pF
Switching Characteristics (Note 2)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=-30V, I_D=-1.6A, V_{GS}=-10V,R_G=3Ω	-	40	-	nS
Turn-on Rise Time	t_r		-	35	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	15	-	nS
Turn-Off Fall Time	t_f		-	10	-	nS
Total Gate Charge	Q_g	V_{DS}=-30,I_D=-1.6A, V_{GS}=-10V	-	12.0	-	nC
Gate-Source Charge	Q_{gs}		-	2.0	-	nC
Gate-Drain Charge	Q_{gd}		-	2.1	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V_{SD}	V_{GS}=0V,I_S=-1.6A	-	-	-1.2	V
Diode Forward Current	I_S		-	-	-2.3	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F =- 1.6A di/dt = -100A/μs	-	25	-	nS
Reverse Recovery Charge	Qrr		-	31	-	nC

Notes:

1. EAS condition : Tj=25℃,V_{DD}=-30V,V_G=-10V,L=0.5mH,Rg=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=150°C. The SOA curve provides a single pulse rating.
4. The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A =25° C. The maximum allowed junction temperature of 150° C. The value in any given application depends on the user's specific board design.

Typical Electrical and Thermal Characteristics (Curves)

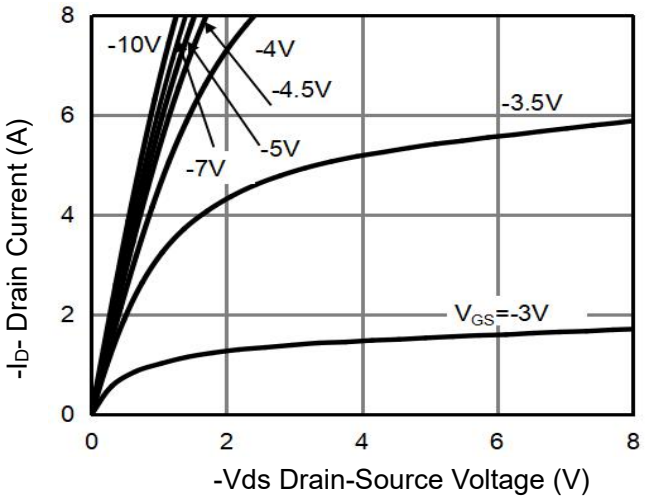


Figure 1 Output Characteristics

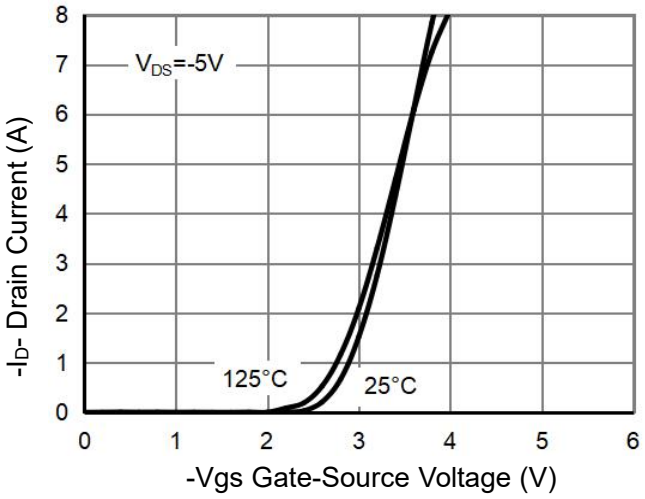


Figure 2 Transfer Characteristics

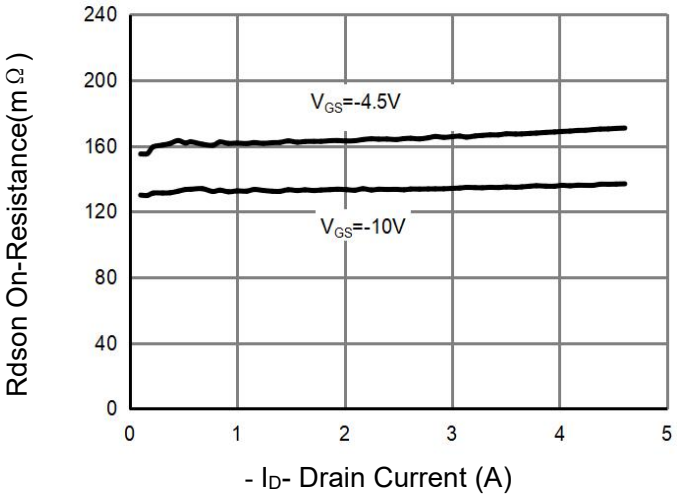


Figure 3 Rdson- Drain Current

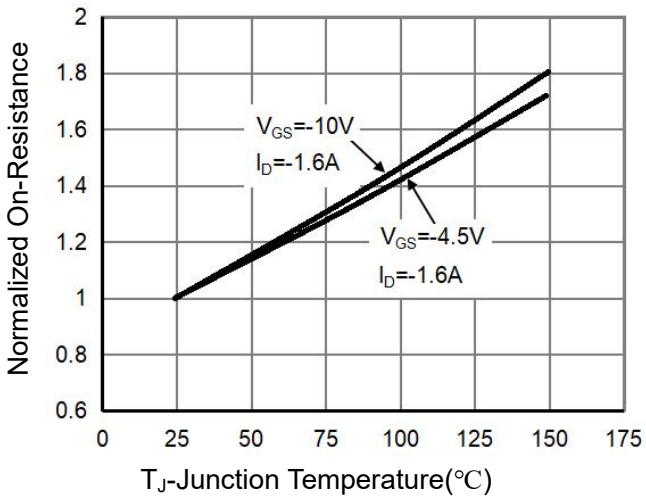


Figure 4 Rdson-Junction Temperature

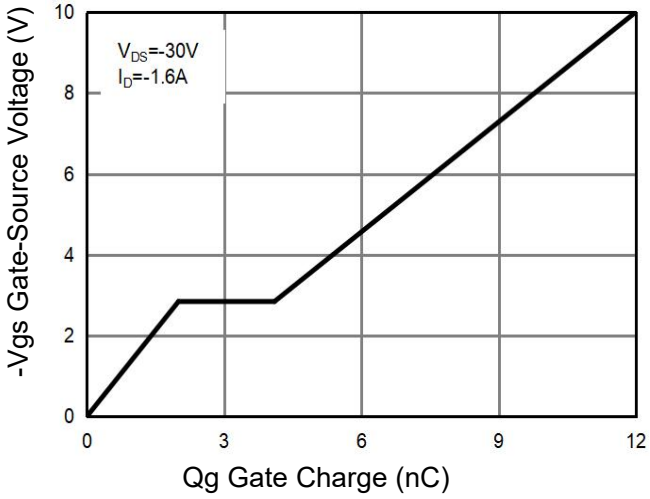


Figure 5 Gate Charge

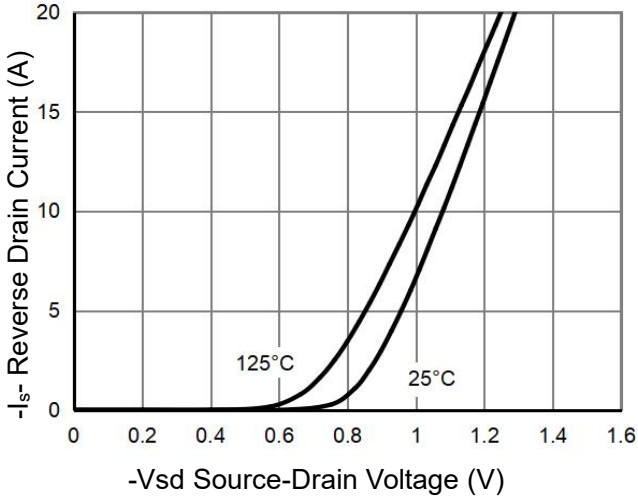


Figure 6 Source- Drain Diode Forward

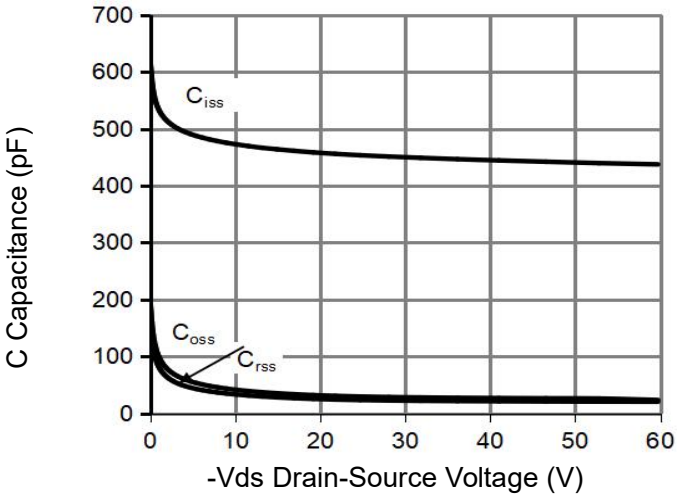


Figure 7 Capacitance vs Vds

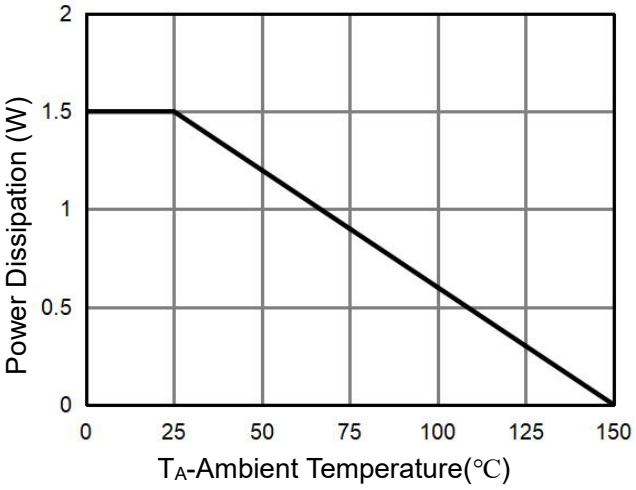


Figure 9 Power De-rating

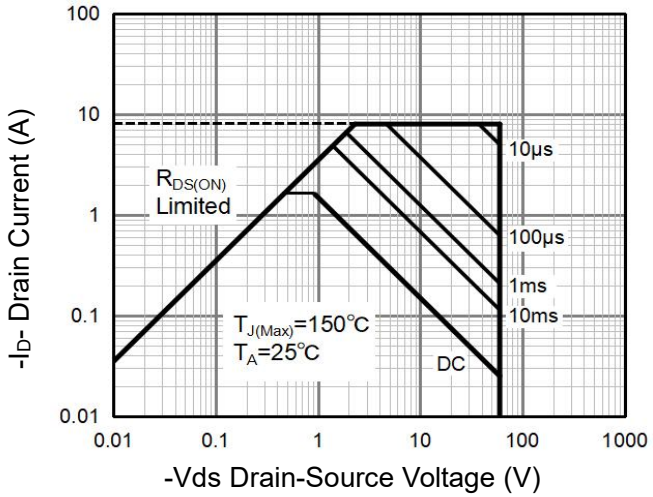


Figure 8 Safe Operation Area (Note3)

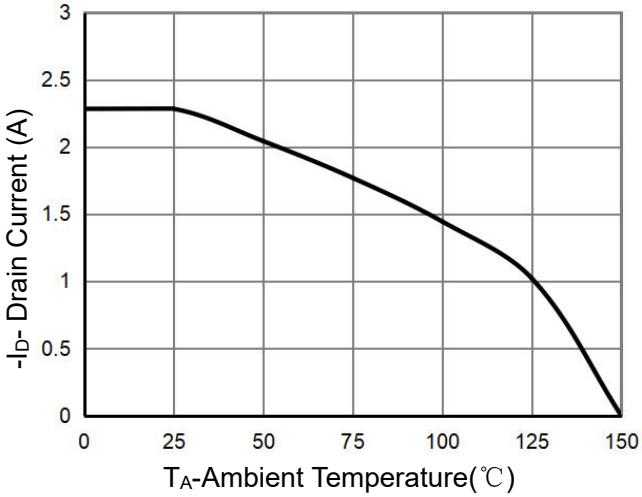


Figure 10 ID Current De-rating

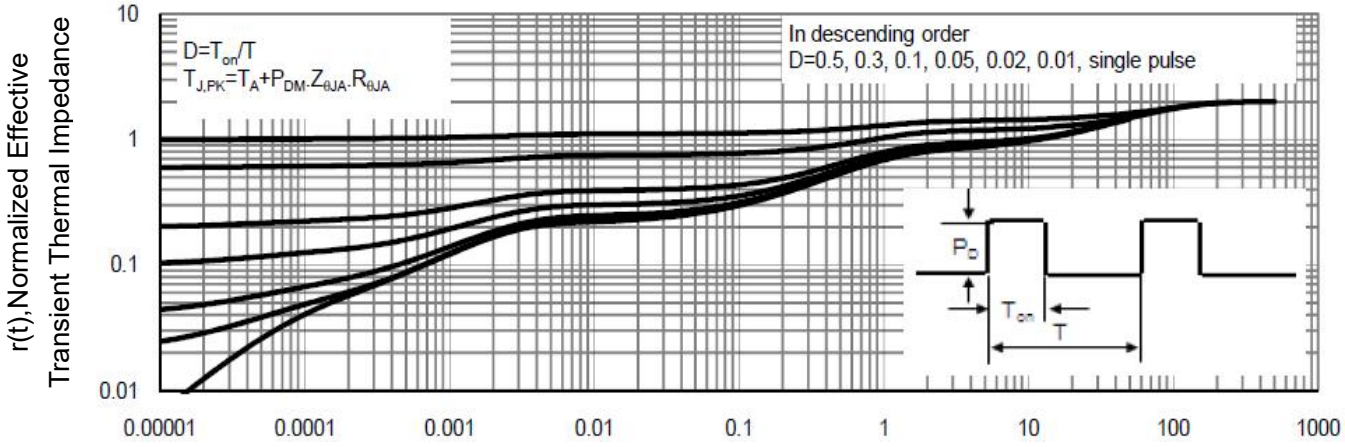
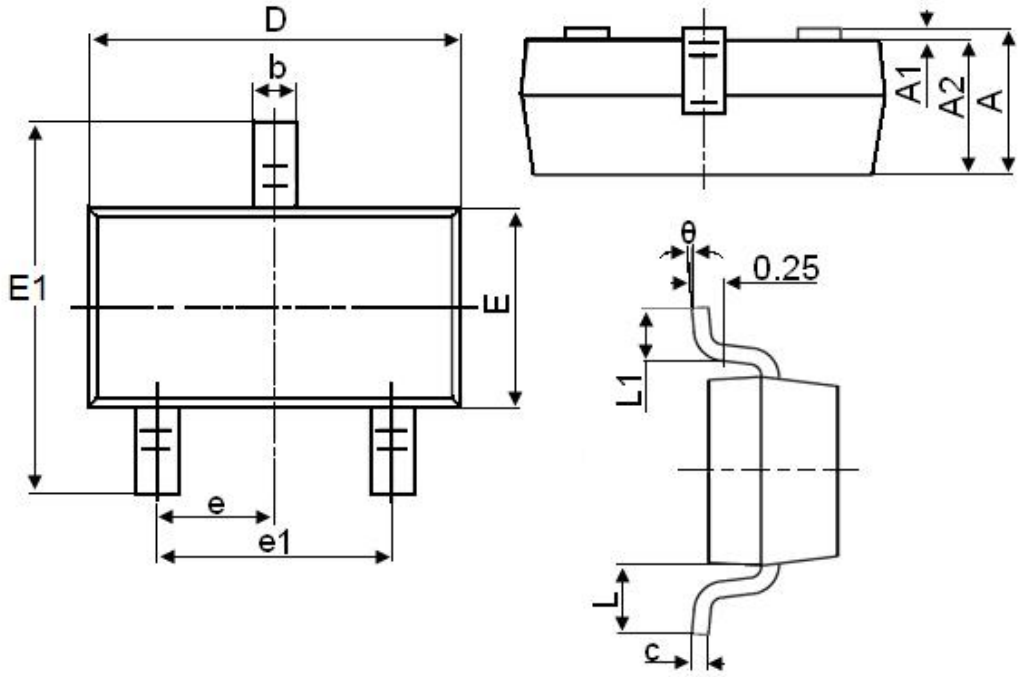


Figure 11 Normalized Maximum Transient Thermal Impedance

SOT-23 Package Information



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°

Notes

1. All dimensions are in millimeters.
2. Tolerance ±0.10mm (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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