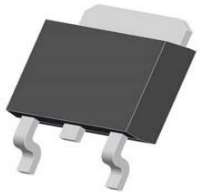
AUIRLR3636

D-Pak
AUIRLR3636

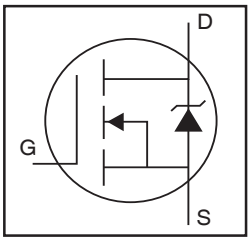


Features

- Advanced Process Technology
- Ultra Low On-Resistance
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free, RoHS Compliant
- Automotive Qualified *

Description

Specifically designed for Automotive applications, thi MOSFET utilizes the latest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of this design are a 175°C junction operating temperature, fast switching speed and improved repetitive avalanche rating . These features combine to make this design an extremely efficient and reliable device for use in Automotive applications and a wide variety of other applications.



V_{DSS}	60V
$R_{DS(on)}$ typ.	5.4mΩ
max.	6.8mΩ
$I_{D\ (Silicon\ Limited)}$	99A①
$I_{D\ (Package\ Limited)}$	50A

Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only; and functional operation of the device at these or any other condition beyond those indicated in the specifications is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions. Ambient temperature (T_A) is 25°C, unless otherwise specified.

Symbol	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V (Silicon Limited)	99 ①	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V (Silicon Limited)	70 ①	
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V (Package Limited)	50	
I_{DM}	Pulsed Drain Current ②	396	
P_D @T_C = 25°C	Maximum Power Dissipation	143	W
	Linear Derating Factor	0.95	W/°C
V_{GS}	Gate-to-Source Voltage	±16	V
E_{AS}	Single Pulse Avalanche Energy (Thermally Limited) ③	170	mJ
I_{AR}	Avalanche Current ②	See Fig.14, 15, 22a, 22b	A
E_{AR}	Repetitive Avalanche Energy ②		mJ
dv/dt	Peak Diode Recovery ④	22	V/ns
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑨	—	1.05	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount) ⑧	—	50	
$R_{\theta JA}$	Junction-to-Ambient	—	110	

Static Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

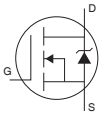
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	60	—	—	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.07	—	V/°C	Reference to 25°C, I_D = 5mA②
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	5.4	6.8	mΩ	V_{GS} = 10V, I_D = 50A ⑤
		—	6.6	8.3		V_{GS} = 4.5V, I_D = 50A ⑤
$V_{GS(th)}$	Gate Threshold Voltage	1.0	—	2.5	V	V_{DS} = V_{GS}, I_D = 100µA
gfs	Forward Transconductance	31	—	—	S	V_{DS} = 25V, I_D = 50A
$R_{G(int)}$	Internal Gate Resistance	—	0.6	—	Ω	
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	µA	V_{DS} = 60V, V_{GS} = 0V
		—	—	250		V_{DS} = 60V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	V_{GS} = 16V
	Gate-to-Source Reverse Leakage	—	—	-100		V_{GS} = -16V

Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge	—	33	49	nC	I_D = 50A
Q_{gs}	Gate-to-Source Charge	—	11	—		V_{DS} = 30V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	15	—		V_{GS} = 4.5V ⑤
Q_{sync}	Total Gate Charge Sync. (Q_g - Q_{gd})	—	18	—		I_D = 50A, V_{DS} =0V, V_{GS} = 4.5V
$t_{d(on)}$	Turn-On Delay Time	—	45	—	ns	V_{DD} = 39V
t_r	Rise Time	—	216	—		I_D = 50A
$t_{d(off)}$	Turn-Off Delay Time	—	43	—		R_G = 7.5 Ω
t_f	Fall Time	—	69	—		V_{GS} = 4.5V ⑤
C_{iss}	Input Capacitance	—	3779	—	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	—	332	—		V_{DS} = 50V
C_{rss}	Reverse Transfer Capacitance	—	163	—		f = 1.0MHz
C_{oss} eff. (ER)	Effective Output Capacitance (Energy Related)⑦	—	437	—		V_{GS} = 0V, V_{DS} = 0V to 48V ⑦,See Fig.11
C_{oss} eff. (TR)	Effective Output Capacitance (Time Related) ⑥	—	636	—		V_{GS} = 0V, V_{DS} = 0V to 48V ⑥

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	99 ①	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ②	—	—	396		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	T_J = 25°C, I_S = 50A, V_{GS} = 0V ⑤
t_{rr}	Reverse Recovery Time	—	27	—	ns	T_J = 25°C V_R = 51V,
		—	32	—		T_J = 125°C I_F = 50A
Q_{rr}	Reverse Recovery Charge	—	31	—	nC	T_J = 25°C di/dt = 100A/µs ⑤
		—	43	—		T_J = 125°C
I_{RRM}	Reverse Recovery Current	—	2.1	—	A	T_J = 25°C
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				



Notes:

① Calcuted continuous current based on maximum allowable junction temperature Bond wire current limit is 50A. Note that current limitation arising from heating of the device leds may occur with some lead mounting arrangements.

② Repetitive rating; pulse width limited by max. junction temperature.

③ Limited by T_{Jmax}, starting T_J = 25°C, L = 0.136 mH R_G = 25Ω, I_{AS} = 50A, V_{GS} =10V. Part not recommended for use above this value .

④ I_{SD} ≤ 50A, di/dt ≤ 1109 A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 175°C.

⑤ Pulse width ≤ 400µs; duty cycle ≤ 2%.

⑥ C_{oss} eff. (TR) is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

⑦ C_{oss} eff. (ER) is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

⑧ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniquea refer to applocation note # AN- 994 echniques refer to application note #AN-994.

⑨ R_θ is measured at T_J approximately 90°C.

Qualification Information†

Qualification Level		Automotive (per AEC-Q101) ††	
		Comments: This part number(s) passed Automotive qualification. IR's Industrial and Consumer qualification level is granted by extension of the higher Automotive level.	
Moisture Sensitivity Level		D-PAK	MSL1
ESD	Machine Model	Class M4 (+/- 600V)††† AEC-Q101-002	
	Human Body Model	Class H1C (+/- 2000V)††† AEC-Q101-001	
	Charged Device Model	Class C5 (+/- 2000V)††† AEC-Q101-005	
RoHS Compliant		Yes	

† Qualification standards can be found at International Rectifier's web site: http//www.irf.com/

†† Exceptions (if any) to AEC-Q101 requirements are noted in the qualification report.

††† Highest passing voltage.

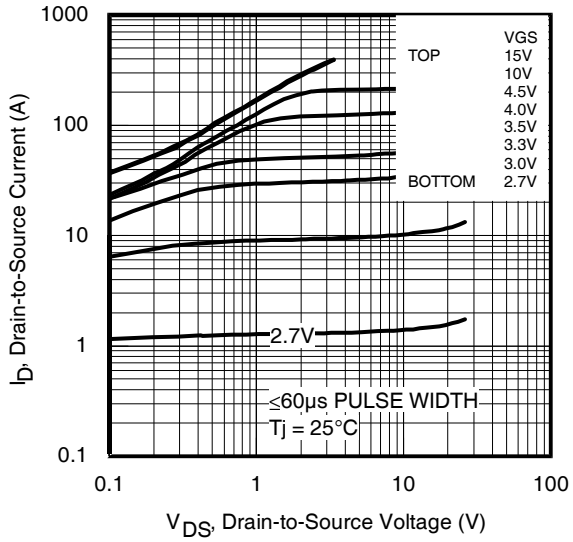


Fig 1. Typical Output Characteristics

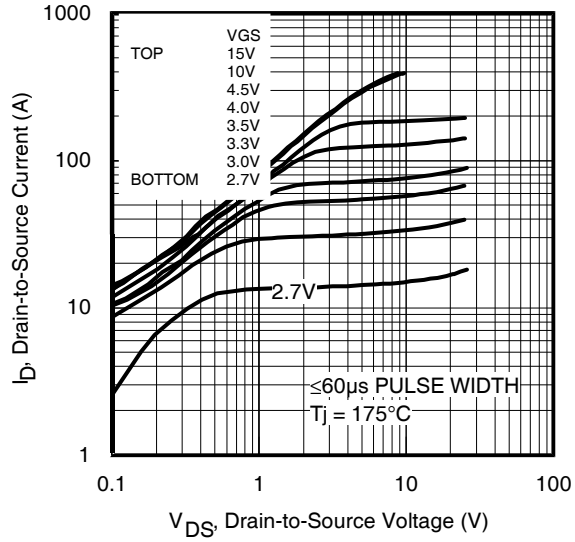


Fig 2. Typical Output Characteristics

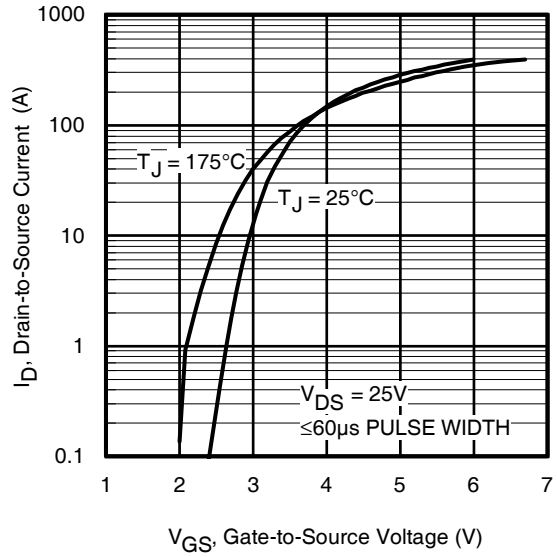


Fig 3. Typical Transfer Characteristics

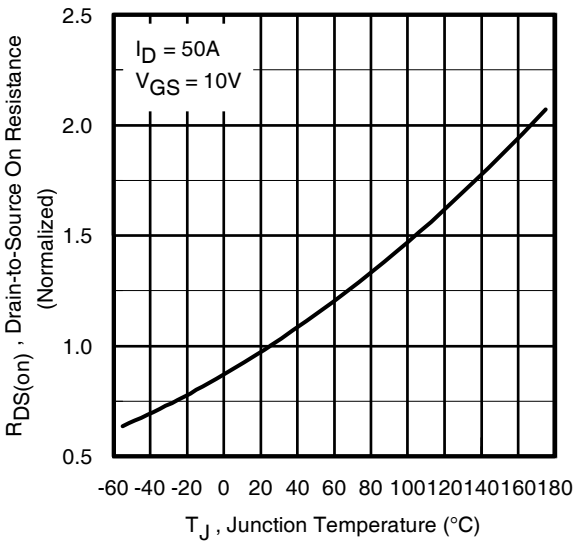


Fig 4. Normalized On-Resistance vs. Temperature

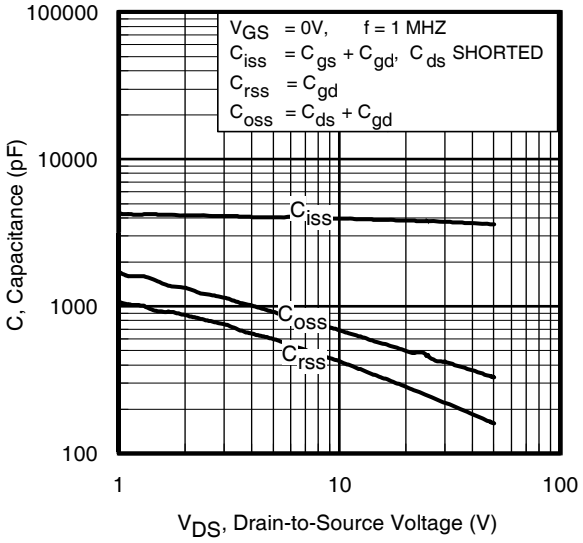


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

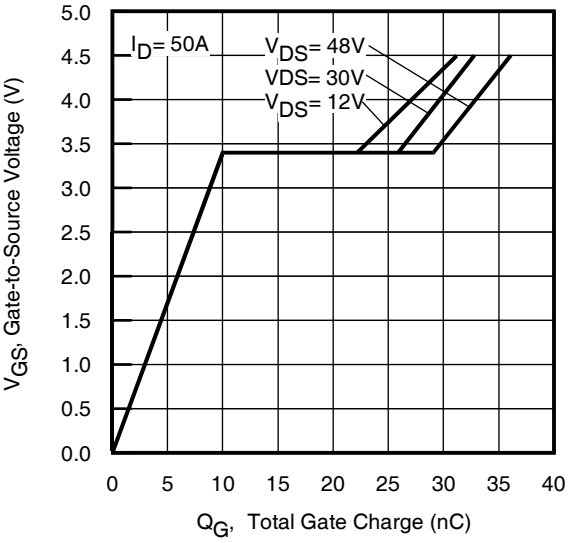


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

Ordering Information

Base part number	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
AUIRLR3636	Dpak	Tube	75	AUIRLR3636
		Tape and Reel	2000	AUIRLR3636TR
		Tape and Reel Left	3000	AUIRLR3636TRL
		Tape and Reel Right	3000	AUIRLR3636TRR