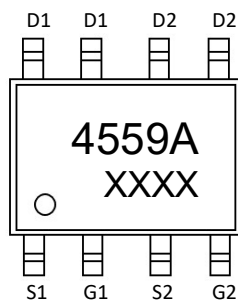


Features

- High power and current handling capability
- Lead free product is acquired
- Surface mount package

Application

- Battery protection
- Load switch
- Power management

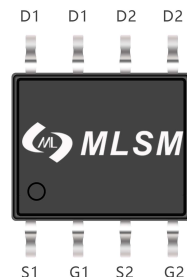


Marking and pin assignment

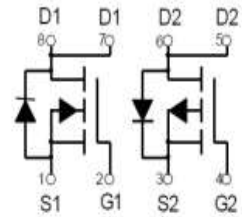
4559A : Device code
XXXX : Code

Product Summary

V_{DS}	$R_{DS(ON)}$ MAX	I_D MAX
60V	35mΩ@10V	6A
	45mΩ@4.5V	
-60V	85mΩ@-10V	-5A
	115mΩ@-4.5V	



SOP-8 top view



Schematic diagram



Halogen-Free

Absolute Maximum Ratings (TA=25°C unless otherwise noted)

Symbol	Parameter	N-Channel	P-Channel	Unit
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Common Ratings (TC=25°C Unless Otherwise Noted)

V_{DS}	Drain-Source Breakdown Voltage	60	-60	V
V_{GS}	Gate-Source Voltage	±20	±20	V
T_J	Maximum Junction Temperature	150	150	°C
T_{STG}	Storage Temperature Range	-55 to 150	-55 to 150	°C
I_S	Diode Continuous Forward Current	$T_C=25^{\circ}C$		A
		6	-5	

Mounted on Large Heat Sink

I_{DM}	Pulse Drain Current Tested	$T_C=25^{\circ}C$	11	-8.5	A
I_D	Continuous Drain Current	$T_C=25^{\circ}C$	6	-5	A
P_D	Maximum Power Dissipation	$T_C=25^{\circ}C$	2	2	W
$R_{\theta JA}$	Thermal Resistance Junction-Ambient		85	85	°C/W

Ordering Information (Example)

Type	Package	Marking	Minimum Package(pcs)	Inner Box Quantity(pcs)	Outer Carton Quantity(pcs)	Delivery Mode
MLSQ4559A	SOP-8	4559A	3,000	6,000	42,000	13"reel

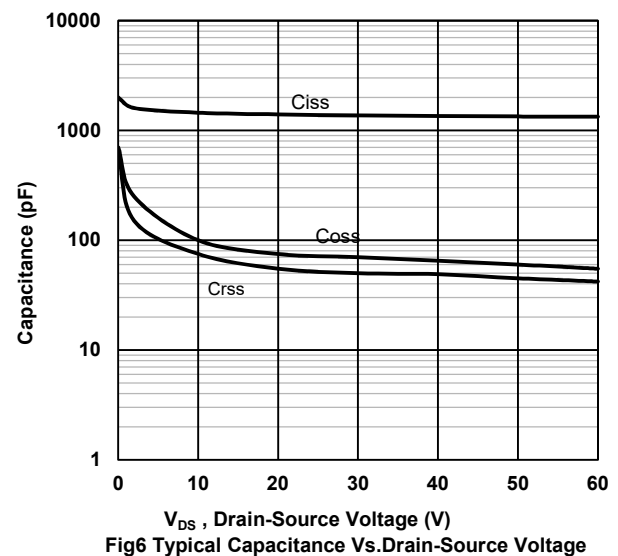
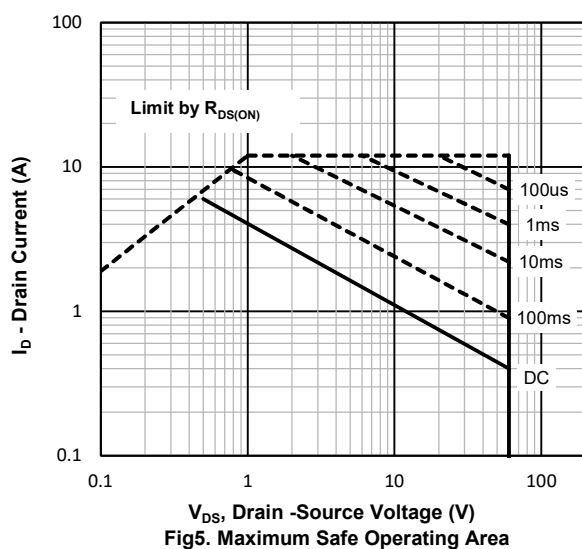
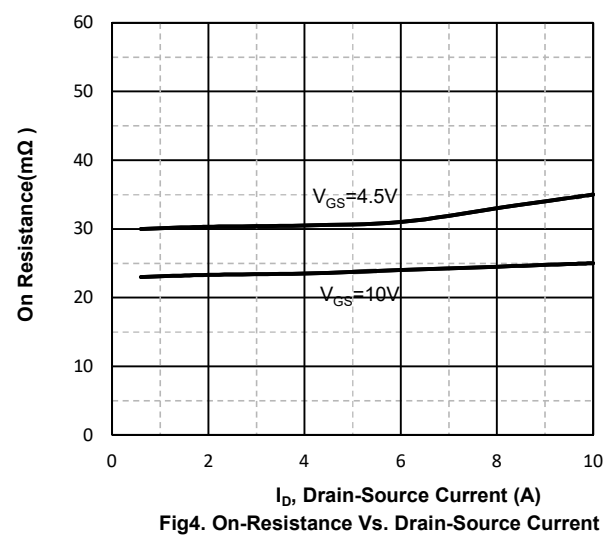
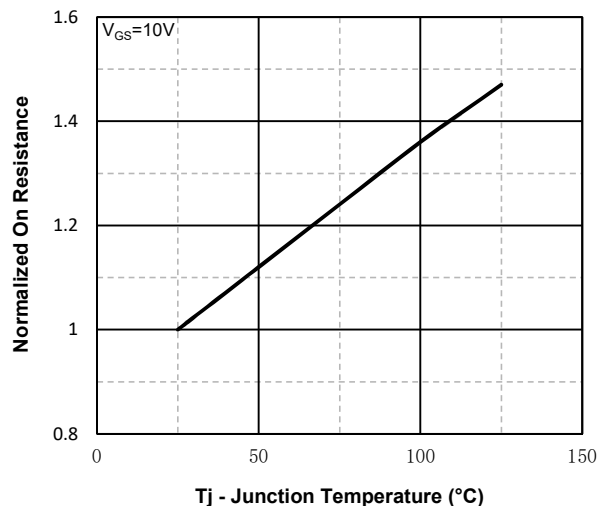
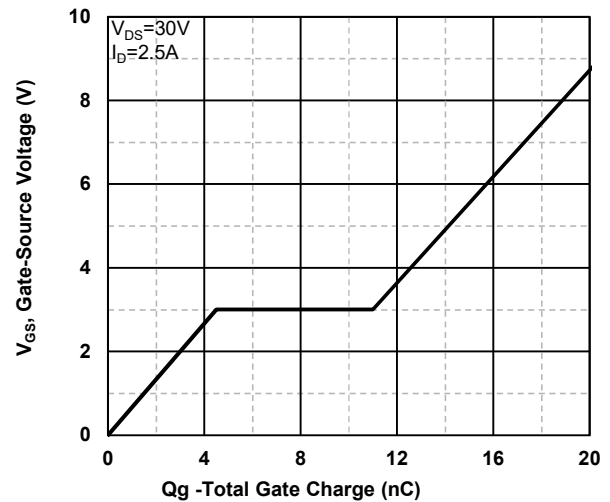
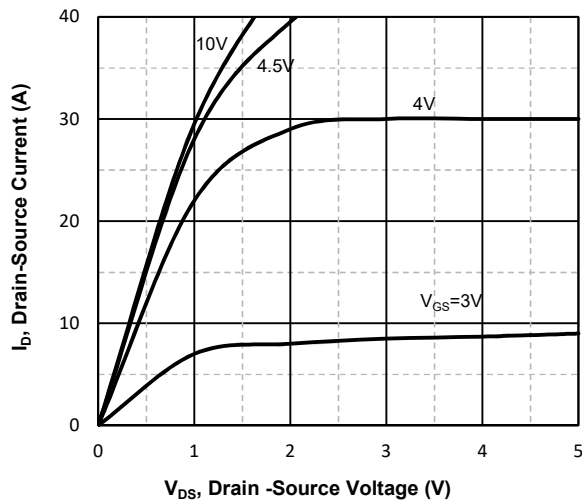


N-Ch Electrical Characteristics (TJ=25°C unless otherwise noted)						
Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Electrical Characteristics @ TJ = 25°C (unless otherwise stated)						
BV(BR)DSS	Drain-Source Breakdown Voltage	VGS=0V, ID=250μA	60	--	--	V
IDSS	Zero Gate Voltage Drain Current	VDS=60V, VGS=0V	--	--	1	μA
IGSS	Gate-Body Leakage Current	VGS=±20V, VDS=0V	--	--	±100	nA
VGS(th)	Gate Threshold Voltage	VDS=VGS, ID=250μA	1.0	1.5	2.2	V
RDS(on)	Drain-Source On-State Resistance	VGS=10V, ID=5A	--	23	35	mΩ
		VGS=4.5V, ID=3A	--	30	45	mΩ
Dynamic Electrical Characteristics @ TJ = 25°C (unless otherwise stated)						
CISS	Input Capacitance	VDS=30V, VGS=0V, f=1MHz	--	1350	--	pF
COSS	Output Capacitance		--	60	--	pF
CRSS	Reverse Transfer Capacitance		--	50	--	pF
Switching Characteristics						
Qg	Total Gate Charge	VDD=30V, ID=6A, VGS=10V	--	22	--	nC
Qgs	Gate Source Charge		--	4.2	--	nC
Qgd	Gate Drain Charge		--	6.9	--	nC
tD(on)	Turn-on Delay Time	VDD=30V, ID=6A, VGS=10V, RG=3Ω	--	6.4	--	nS
tR	Turn-on Rise Time		--	15.3	--	nS
tD(off)	Turn-Off Delay Time		--	25	--	nS
tF	Turn-Off Fall Time		--	7.6	--	nS
Source- Drain Diode Characteristics						
VSD	Forward on voltage	TJ=25°C, IS=6A	--	--	1.2	V



P-Ch Electrical Characteristics (TJ=25°C unless otherwise noted)						
Symbol	Parameter	Condition	Min	Typ	Max	Unit
Static Electrical Characteristics @ TJ = 25°C (unless otherwise stated)						
BV _{(BR)DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250μA	-60	–	–	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-60V, V _{GS} =0V	--	--	-1	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±20V, V _{DS} =0V	--	--	±100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =-250μA	-1.2	–	-2.5	V
R _{DS(on)}	Drain-Source On-State Resistance	V _{GS} =-10V, I _D =-3.5A	--	73	85	mΩ
		V _{GS} =-4.5V, I _D =-3.1A	--	95	115	mΩ
Dynamic Electrical Characteristics @ TJ = 25°C (unless otherwise stated)						
C _{ISS}	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, f=1MHz	--	960	–	pF
C _{OSS}	Output Capacitance		--	100	–	pF
C _{RSS}	Reverse Transfer Capacitance		--	33	–	pF
Switching Characteristics						
Q _g	Total Gate Charge	V _{DS} =-30V, I _D =-5A, V _{GS} =-4.5V	--	10	–	nC
Q _{gs}	Gate Source Charge		--	6.3	–	nC
Q _{gd}	Gate Drain Charge		--	5	–	nC
t _{d(on)}	Turn-on Delay Time	V _{DD} =-15V, I _D =-5A, V _{GS} =-10V, R _G =3.3Ω	--	35	–	nS
t _r	Turn-on Rise Time		--	16	–	nS
t _{d(off)}	Turn-Off Delay Time		--	53	–	nS
t _f	Turn-Off Fall Time		--	6	–	nS
Source- Drain Diode Characteristics						
V _{SD}	Forward on voltage	Tj=25°C, Is=-5A	--	--	-1.2	V

N-Channel Typical Operating Characteristics



P-Channel Typical Operating Characteristics

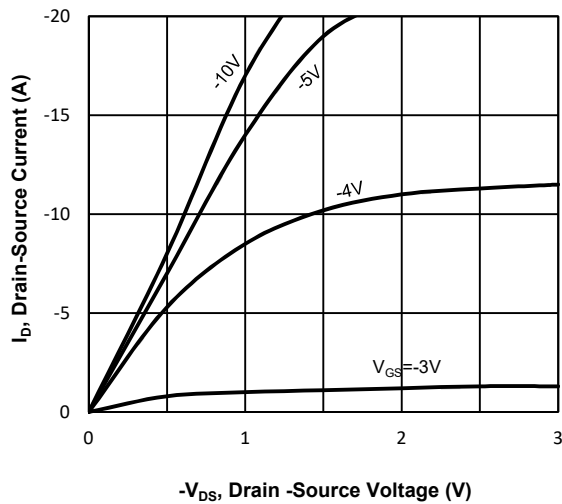


Fig7. Typical Output Characteristics

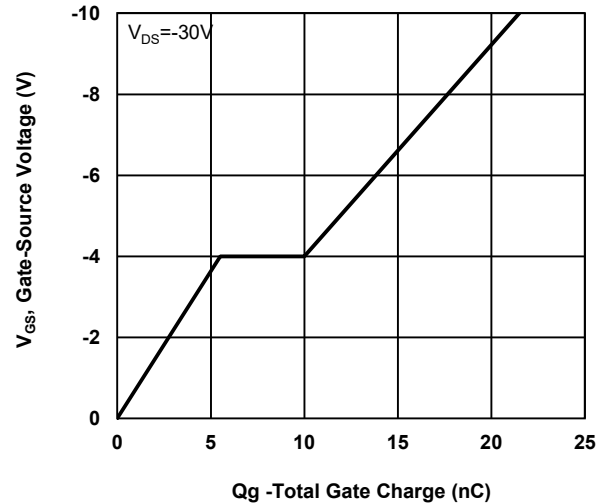


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

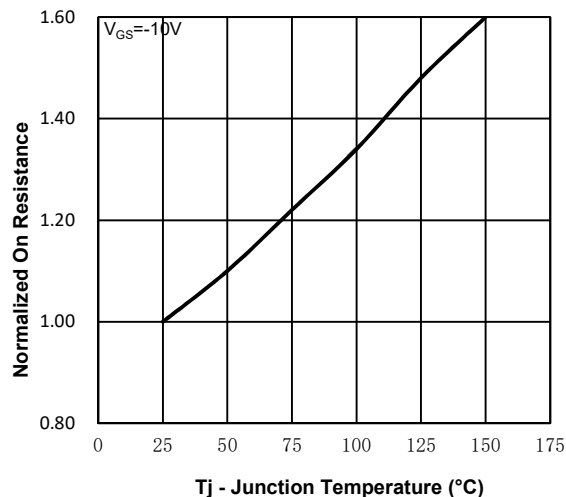


Fig9. Normalized On-Resistance Vs. Temperature

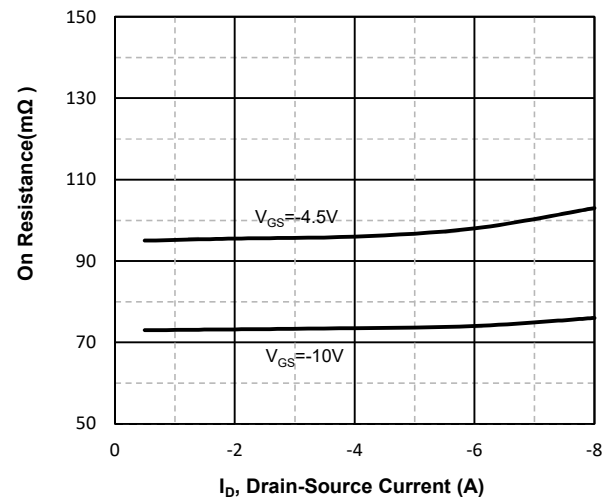


Fig10. On-Resistance Vs. Drain-Source Current

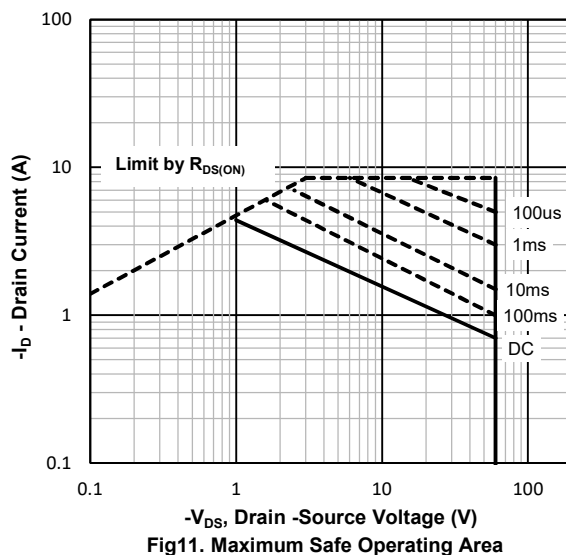


Fig11. Maximum Safe Operating Area

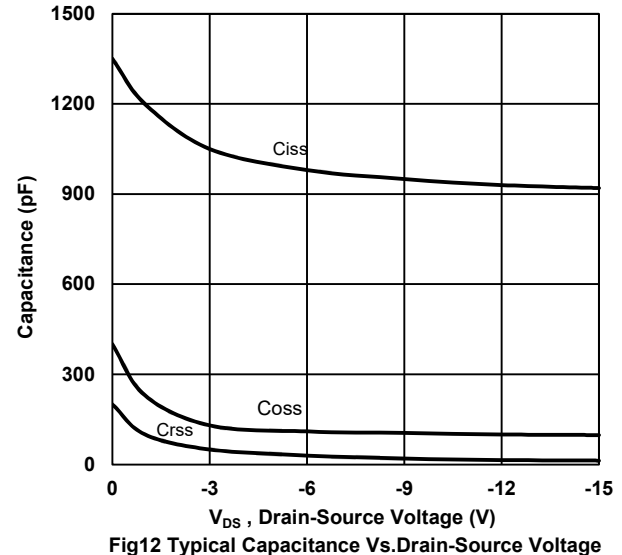
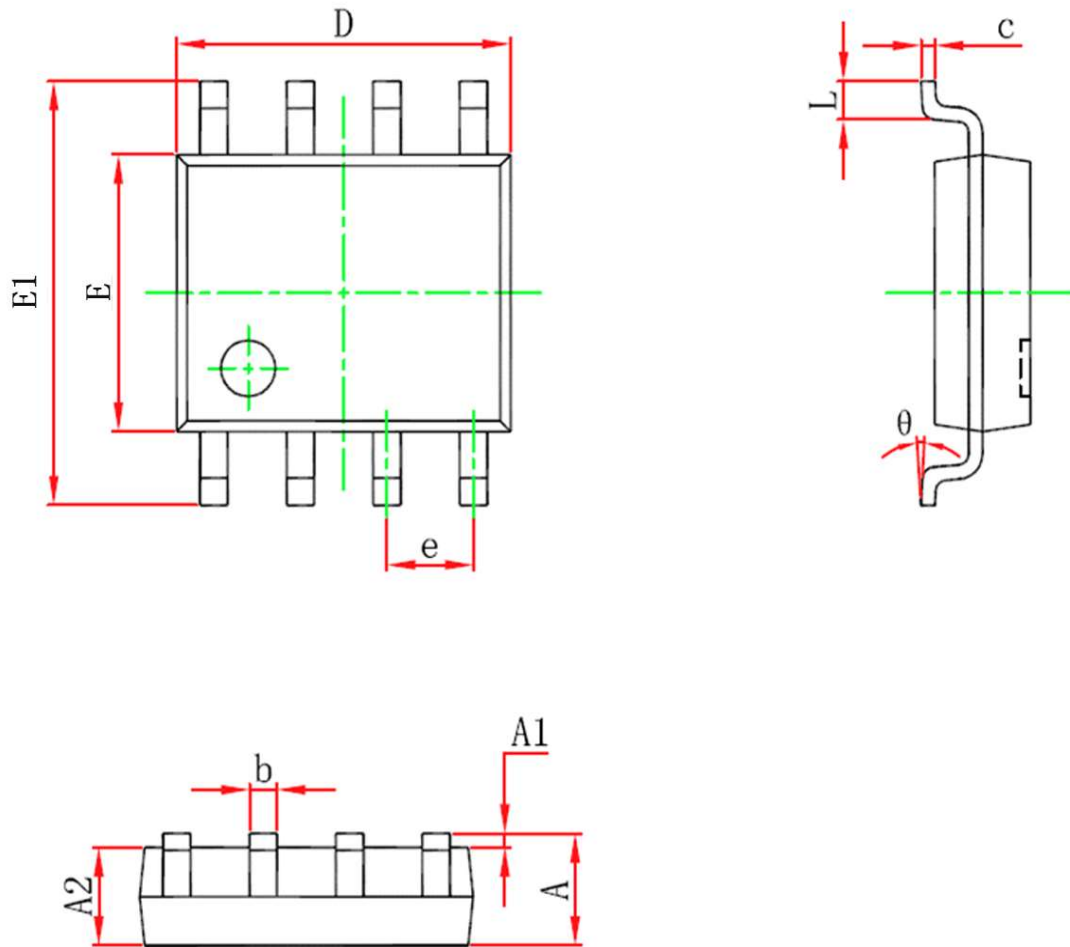


Fig12 Typical Capacitance Vs. Drain-Source Voltage

SOP-8 Package information



Symbol	Dimensions in Millimeters(mm)		Dimensions In Inches	
	Min	Max	Min	Max
A	1.450	1.750	0.057	0.068
A1	0.100	0.250	0.003	0.009
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.012	0.020
c	0.170	0.250	0.006	0.009
D	4.700	5.100	0.185	0.200
e	1.270(BSC)		0.050(BSC)	
E	3.800	4.000	0.149	0.157
E1	5.800	6.200	0.228	0.244
L	0.400	1.270	0.015	0.050
θ	0°	8°	0°	8°