

## 1. Description

The SOP-8 has been modified through a customized leadframe for enhanced thermal characteristics and multiple-die capability making it ideal in a variety of power applications.

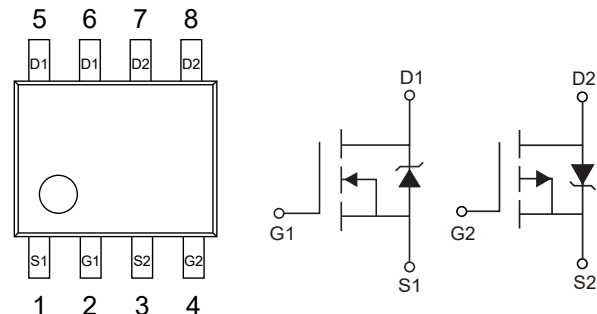
## 2.2 Features(N-Ch)

- $V_{DS(V)}=30$
- $I_D=7.3A$
- $R_{DS(ON)}<29m\Omega(V_{GS}=10V)$
- $R_{DS(ON)}<46m\Omega(V_{GS}=4.5V)$

## 3. Pinning Information

Pin	Symbol	Description
2,4	G1,G2	GATE
1,3	S1,S2	SOURCE
5,6,7,8	D1,D2	DRAIN

SOP-8



## 2.1 Features

- Generation V Technology
- Ultra Low On-Resistance
- Complimentary Half Bridge
- Surface Mount
- Fully Avalanche Rated
- Lead-Free

## 2.3 Features(P-Ch)

- $V_{DS(V)}=-30V$
- $I_D=-5.3A$
- $R_{DS(ON)}<58\Omega(V_{GS}=-10V)$
- $R_{DS(ON)}<98m\Omega(V_{GS}=-4.5V)$



30V N-Channel MOSFET  
-30V P-Channel MOSFET

#### 4. Absolute Maximum Ratings

Parameter		Symbol	N-Channel	P-Channel	Units
Drain-Source Voltage		$V_{DS}$	30	-30	V
Gate-Source Voltage		$V_{GS}$	$\pm 20$	$\pm 20$	V
Continuous Drain Current ⑤	$T_A = 25^\circ\text{C}$	$I_D$	7.3	-5.3	A
	$T_A = 70^\circ\text{C}$		5.9	-4.2	A
Pulsed Drain Current		$I_{DM}$	30	-30	A
Continuous Source Current (Diode Conduction)		$I_S$	2.5	-2.5	A
Maximum Power Dissipation ⑤	$T_A = 25^\circ\text{C}$	$P_D$	2.5		W
	$T_A = 70^\circ\text{C}$		1.6		W
Single Pulse Avalanche Energy		$E_{AS}$	82	140	mJ
Avalanche Current		$I_{AR}$	4	-2.8	A
Repetitive Avalanche Energy		$E_{AR}$	0.2	0.2	mJ
Peak Diode Recovery $dv/dt$ ②		$dv/dt$	3.8	-2.2	V/ns
Junction and Storage Temperature Range		$T_J, T_{STG}$	-55 to 150	-55 to 150	$^\circ\text{C}$

#### 5. Thermal Characteristics

Parameter	Symbol	Max.	Units
Maximum Junction-to-Ambient ⑤	$R_{\theta JA}$	62.5	$^\circ\text{C/W}$



## 6. Electrical Characteristics $T_J=25^\circ\text{C}$

Parameter	Symbol		Conditions	Min	Typ	Max	Units
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	N-Ch	$I_D=250\mu\text{A}, V_{GS}=0\text{V}$	30			V
		P-Ch	$I_D=-250\mu\text{A}, V_{GS}=0\text{V}$	-30			V
Breakdown Voltage Temp Coefficient Current	$\frac{\Delta V_{(BR)DSS}}{\Delta T_J}$	N-Ch	$I_D=1\text{mA}, \text{Reference to } 25^\circ\text{C}$		0.022		$\text{V}/^\circ\text{C}$
		P-Ch	$I_D=-1\text{mA}, \text{Reference to } 25^\circ\text{C}$		0.022		$\text{V}/^\circ\text{C}$
Static Drain-to-Source On-Resistance	$R_{DS(ON)}$	N-Ch	$V_{GS}=10\text{V}, I_D=5.8\text{A}$ ④		23	29	m $\Omega$
		N-Ch	$V_{GS}=4.5\text{V}, I_D=4.7\text{A}$ ④		32	46	m $\Omega$
		P-Ch	$V_{GS}=-10\text{V}, I_D=-4.9\text{A}$ ④		42	58	m $\Omega$
		P-Ch	$V_{GS}=-4.5\text{V}, I_D=-3.6\text{A}$ ④		76	98	m $\Omega$
Gate Threshold Voltage	$V_{GS(th)}$	N-Ch	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	1			V
		P-Ch	$V_{DS}=V_{GS}, I_D=-250\mu\text{A}$	-1			V
Forward Transconductance	$g_{fs}$	N-Ch	$V_{DS}=15\text{V}, I_D=5.8\text{A}$ ④		14		S
		P-Ch	$V_{DS}=-15\text{V}, I_D=-4.9\text{A}$ ④		7.7		S
Drain-to-Source Leakage Current	$I_{DSS}$	N-Ch	$V_{DS}=24\text{V}, V_{GS}=0\text{V}$			1	$\mu\text{A}$
		P-Ch	$V_{DS}=-24\text{V}, V_{GS}=0\text{V}$			-1	$\mu\text{A}$
		N-Ch	$V_{DS}=24\text{V}, V_{GS}=0\text{V}, T_J=55^\circ\text{C}$			25	$\mu\text{A}$
		P-Ch	$V_{DS}=-24\text{V}, V_{GS}=0\text{V}, T_J=55^\circ\text{C}$			-25	$\mu\text{A}$
Gate-to-Source Forward Leakage	$I_{GSS}$	N-P	$V_{GS}=\pm 20\text{V}$			$\pm 100$	nA
Total Gate Charge	$Q_g$	N-Ch			22	33	nC
		P-Ch	N-Ch: ④		23	34	nC
Gate-to-Source Charge	$Q_{gs}$	N-Ch	$I_D=5.8\text{A}, V_{DS}=15\text{V}, V_{GS}=10\text{V}$		2.6	3.9	nC
		P-Ch	P-Ch:		3.8	5.7	nC
Gate-to-Drain ("Miller") Charge	$Q_{gd}$	N-Ch	$I_D=-4.9\text{A}, V_{DS}=-15\text{V}, V_{GS}=-10\text{V}$		6.4	9.6	nC
		P-Ch			5.9	8.9	nC
Turn-On Delay Time	$t_{D(on)}$	N-Ch			8.1	12	ns
		P-Ch	N-Ch: ④		13	19	ns
Rise Time	$t_r$	N-Ch	$V_{DD}=15\text{A}, I_D=1\text{A}$		8.9	13	ns
		P-Ch	$R_G=6\Omega, R_D=15\Omega$		13	20	ns



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Turn-Off Delay Time	$t_{D(off)}$	N-Ch	P-Ch: ④ $V_{DD}=-15A, I_D=-1A$		26	39	ns
		P-Ch			34	51	ns
Fall Time	$t_f$	N-Ch	$R_G=6\Omega, R_D=15\Omega$		17	26	ns
		P-Ch			32	48	ns
Input Capacitance	$C_{iss}$	N-P	N-Ch:		650		pF
		N-P			710		pF
Output Capacitance	$C_{oss}$	N-Ch	$V_{GS}=0V, V_{DS}=25V, f=1MHz$		320		pF
		P-Ch	P-Ch:		380		pF
Reverse Transfer Capacitance	$C_{rss}$	N-Ch	$V_{GS}=0V, V_{DS}=-25V, f=1MHz$		130		pF
		P-Ch			180		pF
Continuous Source Current (Body Diode)	$I_S$	N-Ch				2.5	A
		P-Ch				-2.5	A
Pulsed Source Current (Body Diode) ①	$I_{SM}$	N-Ch				30	A
		P-Ch				-30	A
Diode Forward Voltage	$V_{SD}$	N-Ch	$T_J=25^\circ C, I_S=1.7A, V_{GS}=0V$ ③		0.78	1	V
		P-Ch	$T_J=25^\circ C, I_S=-1.7A, V_{GS}=0V$ ③		-0.78	-1	V
Reverse Recovery Time	$t_{rr}$	N-Ch	N-Ch: $T_J=25^\circ C$		45	68	ns
		P-Ch	$I_F=1.7A, di/dt=100A/\mu s$		44	66	ns
Reverse Recovery Charge	$Q_{rr}$	N-Ch	P-Ch: $T_J=25^\circ C$		58	87	nC
		P-Ch	$I_F=-1.7A, di/dt=100A/\mu s$ ④		42	63	nC

## Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 22)
- ② N-Channel  $I_{SD} \leq 4A, di/dt \leq 74A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ C$ .  
P-Channel  $I_{SD} \leq -2.8A, di/dt \leq 150A/\mu s, V_{DD} \leq V_{(BR)DSS}, T_J \leq 150^\circ C$ .
- ③ N-Channel Starting  $T_J=25^\circ C, L=10mH, R_G=25\Omega, I_{AS}=4.0A$ . (See Figure 12)  
P-Channel Starting  $T_J=25^\circ C, L=35mH, R_G=25\Omega, I_{AS}=-2.8A$ .
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- ⑤ Surface mounted on FR-4 board,  $t_s \leq 10sec$ .

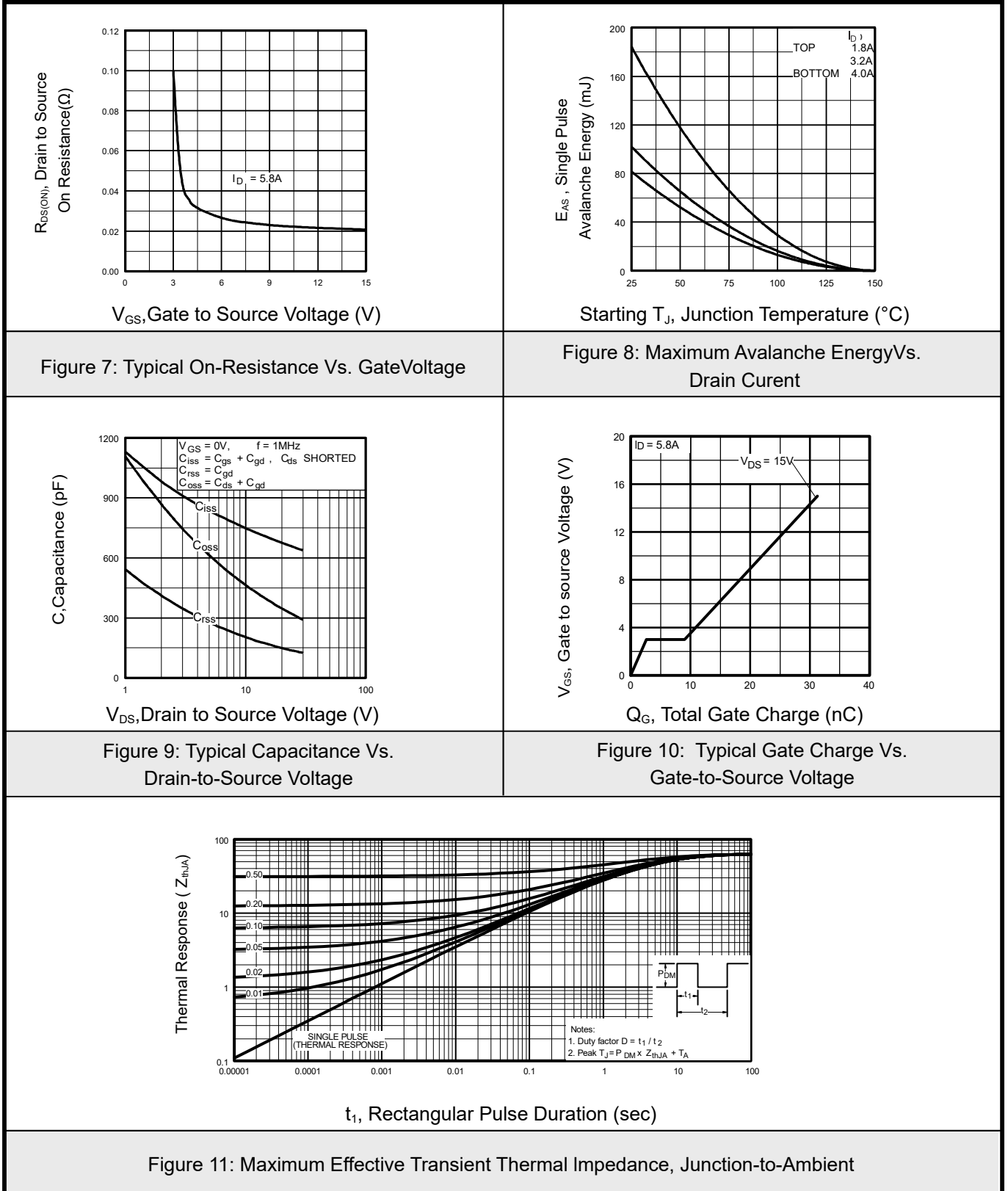


## 7.1 Typical Characteristics (N-Channel)

<p>Figure 1: Typical Output Characteristics</p>	<p>Figure 2: Typical Output Characteristics</p>
<p>Figure 3: Typical Output Characteristics</p>	<p>Figure 4: Typical Source-Drain Diode Forward Voltage</p>
<p>Figure 5: Normalized On-Resistance VS. Temperature</p>	<p>Figure 6: Typical On-Resistance Vs. Drain Current</p>



## 7.2 Typical Characteristics (N-Channel)



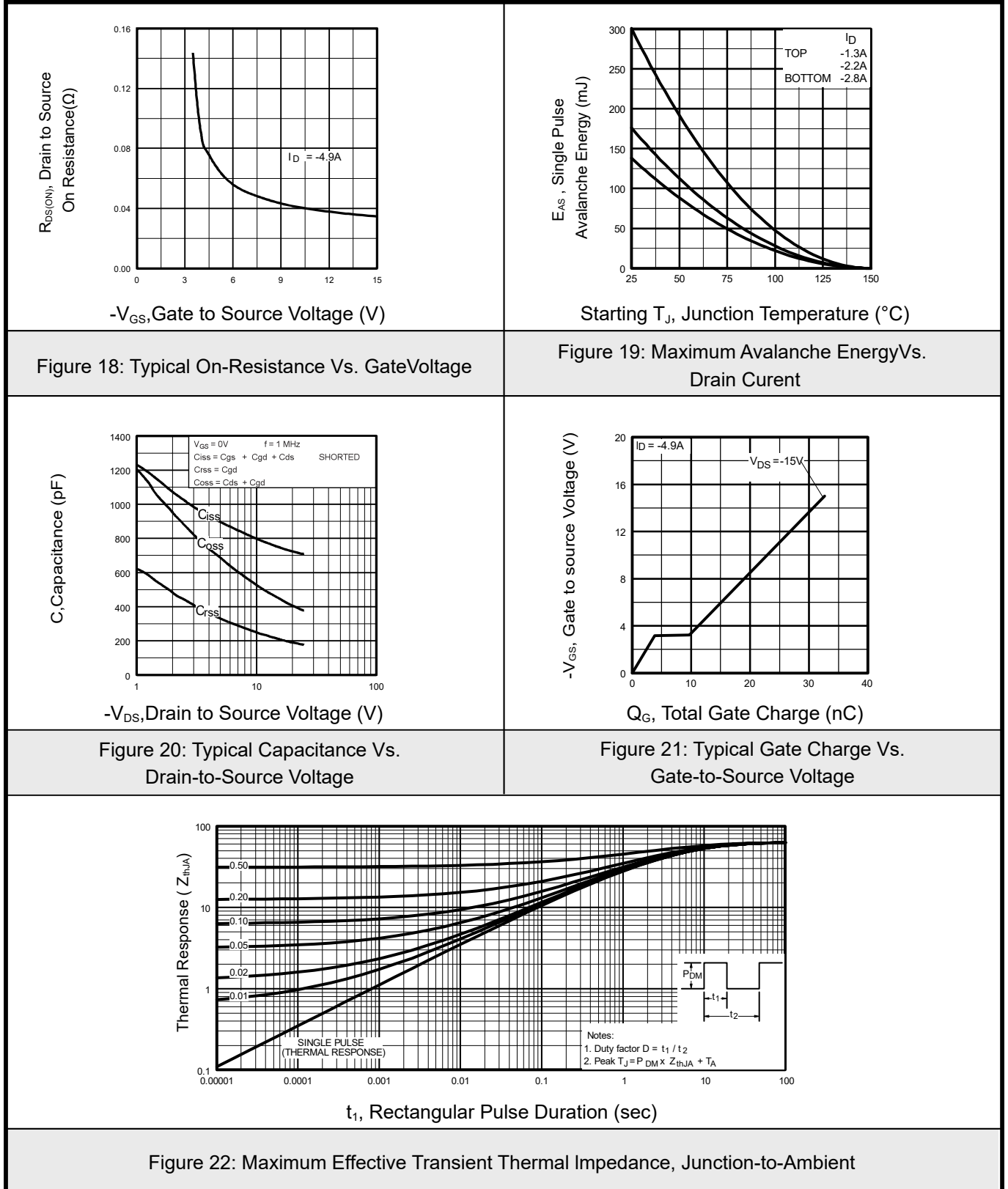


## 7.3 Typical Characteristics (P-Channel)

<p>-I<sub>b</sub>, Drain-to-Source Current (A)</p> <p>-V<sub>DS</sub>, Drain-to-Source Voltage (V)</p> <p>20µs PULSE WIDTH T<sub>J</sub> = 25°C</p>	<p>-I<sub>b</sub>, Drain-to-Source Current (A)</p> <p>-V<sub>DS</sub>, Drain-to-Source Voltage (V)</p> <p>20µs PULSE WIDTH T<sub>J</sub> = 150°C</p>
<p>Figure 12: Typical Output Characteristics</p>	<p>Figure 13: Typical Output Characteristics</p>
<p>-I<sub>b</sub>, Drain-to-Source Current (A)</p> <p>-V<sub>GS</sub>, Gate-to-Source Voltage (V)</p> <p>V<sub>DS</sub> = -10V 20µs PULSE WIDTH</p> <p>T<sub>J</sub> = 25°C T<sub>J</sub> = 150°C</p>	<p>-I<sub>SD</sub>, Reverse Drain Current (A)</p> <p>-V<sub>SD</sub>, Source to Drain Voltage (V)</p> <p>V<sub>GS</sub> = 0V</p> <p>T<sub>J</sub> = 150°C T<sub>J</sub> = 25°C</p>
<p>Figure 14: Typical Output Characteristics</p>	<p>Figure 15: Typical Source-Drain Diode Forward Voltage</p>
<p>R<sub>DS(on)</sub>, Drain to Source On Resistance (Normalized)</p> <p>T<sub>J</sub>, Junction Temperature (°C)</p> <p>I<sub>D</sub> = 4.9A V<sub>GS</sub> = 10V</p>	<p>R<sub>DS(on)</sub>, Drain to Source On Resistance (Ω)</p> <p>-I<sub>D</sub>, Drain Current (A)</p> <p>V<sub>GS</sub> = -4.5V V<sub>GS</sub> = -10V</p>
<p>Figure 16: Normalized On-Resistance VS. Temperature</p>	<p>Figure 17: Typical On-Resistance Vs. Drain Current</p>



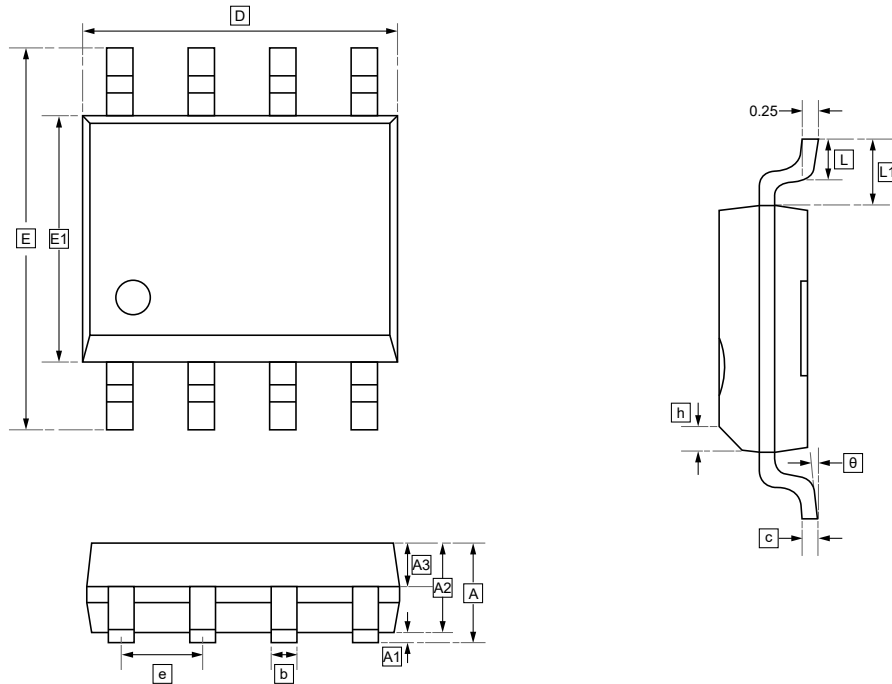
## 7.4 Typical Characteristics (P-Channel)





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## 8.SOP-8 Package Outline Dimensions



### DIMENSIONS (mm are the original dimensions)

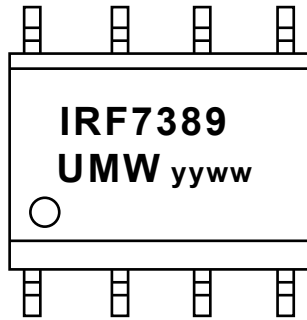
Symbol	A	A1	A2	A3	b	c	D	E	E1	e	h	L
Min	-	0.05	1.30	0.60	0.39	0.20	4.80	5.80	3.80	1.24	0.30	0.50
Max	1.75	0.20	1.50	0.70	0.47	0.24	5.00	6.20	4.00	1.30	0.50	0.80

Symbol	L1	$\theta$
Min	1.00	0°
Max	1.10	8°



30V N-Channel MOSFET  
-30V P-Channel MOSFET

## 9. Ordering information



yy: Year Code  
ww: Week Code

Order Code	Package	Base QTY	Delivery Mode
UMW IRF7389TR	SOP-8	3000	Tape and reel



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