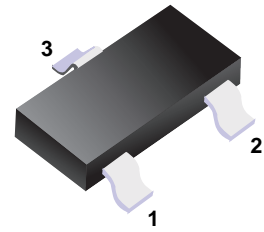


■ P-Channel Power MOSFET



- 1. Gate
- 2. Source
- 3. Drain

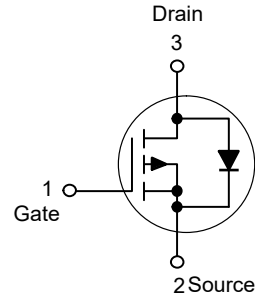
■ Features

- $V_{DS} = -60V$   $I_D = -2.0A$
- $R_{DS(ON)} = 200m\Omega(max) @ -10V$
- Halogen and Antimony Free

■ Applications

- Load Switch and in PWM Applications
- Power Management

■ Simplified outline(SOT-23)



■ Marking Code:2309

■ Absolute Maximum Ratings  $T_a = 25^\circ C$

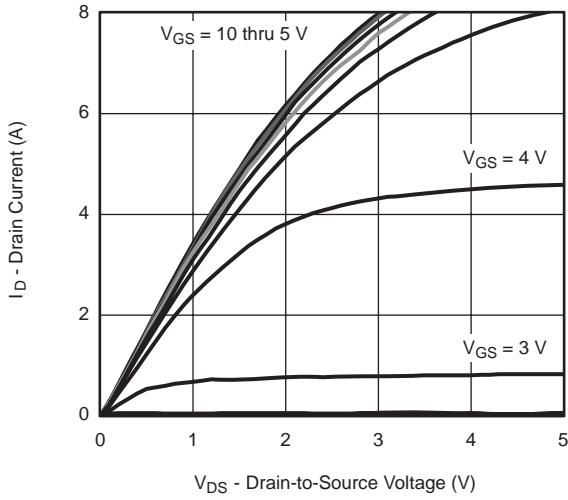
Parameter	Symbol	Value	Units
Drain-Source Voltage	$-V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current	$-I_D$	2	A
Power Dissipation	$P_D$	0.9	W
Junction and Storage Temperature Range	$T_J, T_{STG}$	150, -55 to 150	$^\circ C$
<b>Thermal Characteristics</b>			
Parameter	Symbol	Typ.	Units
Maximum Junction-to-Ambient <sup>Note1</sup>	$R_{\theta JA}$	139	$^\circ C/W$

**■ Electrical Characteristics Ta = 25°C**

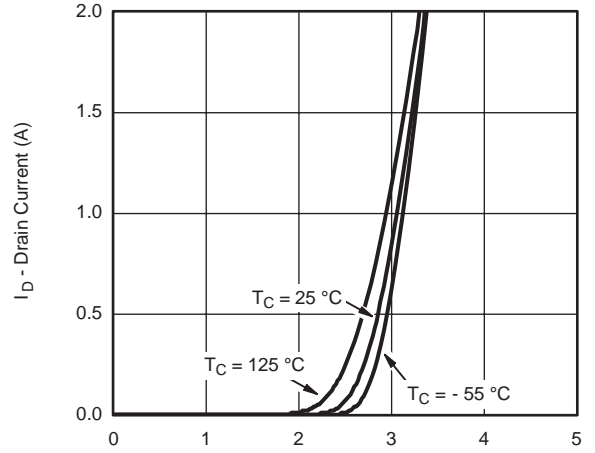
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Units
<b>Static Characteristics</b>						
Drain-source breakdown voltage	$-V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	60	--	--	V
Drain to Source Leakage Current	$-I_{DSS}$	$V_{DS} = -60V, V_{GS} = 0V$	--	--	1	$\mu A$
Gate-body leakage current	$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$	--	--	$\pm 100$	nA
Gate threshold voltage <sup>Note2</sup>	$-V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	1.5	--	3	V
Drain-source on-resistance <sup>Note2</sup>	$R_{DS(on)}$	$V_{GS} = -10V, I_D = -2A$	--	--	200	m $\Omega$
		$V_{GS} = -4.5V, I_D = -1A$	--	--	400	m $\Omega$
Forward transconductance <sup>Note2</sup>	$g_{FS}$	$V_{DS} = -5V, I_D = -2A$	--	6	--	S
<b>Dynamic characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS} = -30V, V_{GS} = 0V, f = 1MHz$	--	850	--	pF
Output Capacitance	$C_{oss}$		--	65	--	
Reverse Transfer Capacitance	$C_{rss}$		--	28	--	
<b>Switching Characteristics</b>						
Turn-on delay time	$t_{d(on)}$	$I_D = -1A, V_{DD} = -30V,$ $V_{GS} = -10V, R_{GEN} = 3\Omega,$ $R_L = 7.5\Omega,$	--	7	--	ns
Turn-on rise time	$t_r$		--	3	--	
Turn-off delay time	$t_{d(off)}$		--	28	--	
Turn-off fall time	$t_f$		--	5.5	--	
Total gate charge	$Q_g$	$V_{DD} = -30V, V_{GS} = -10V, I_D = -2A$	--	22	--	nC
Gate-source charge	$Q_{gs}$		--	2.5	--	
Gate-drain charge	$Q_{gd}$		--	6	--	
<b>Source-Drain Diode characteristics</b>						
Continuous Source-Drain Diode Current	$-I_S$		--	--	1.4	A
Diode Forward voltage	$-V_{DS}$	$V_{GS} = 0V, I_S = -2A$	--	--	1.2	V

 Notes: 1. Surface mounted on FR4 board,  $t \leq 10$  sec.

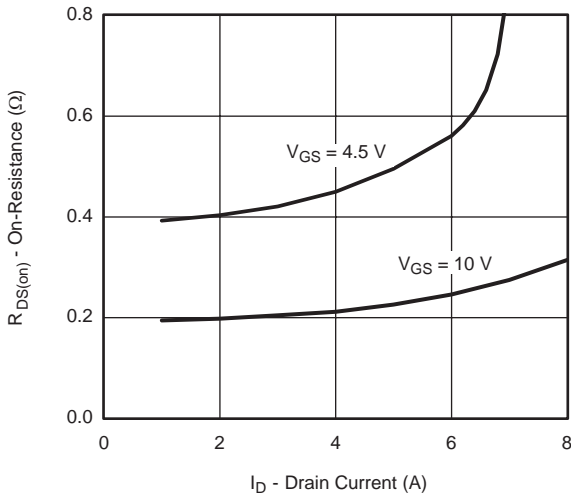
 2. Pulse test ; pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .



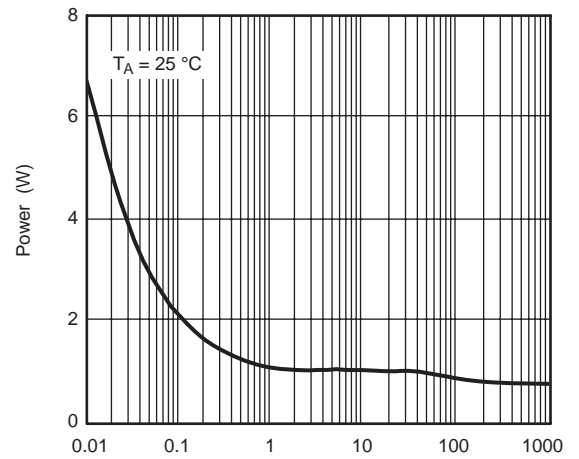
**Output Characteristics**



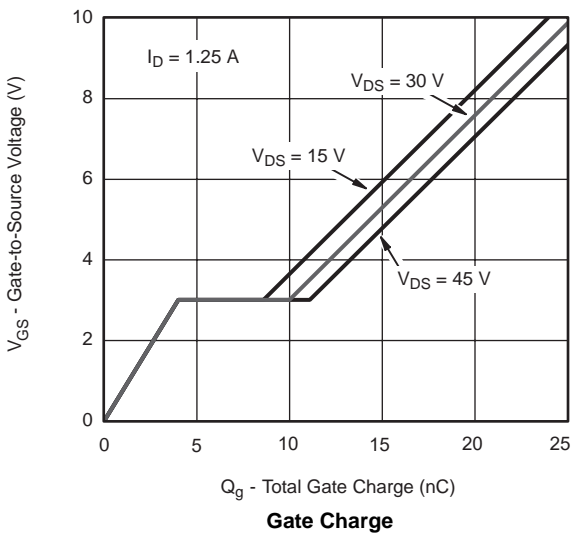
**Transfer Characteristics**



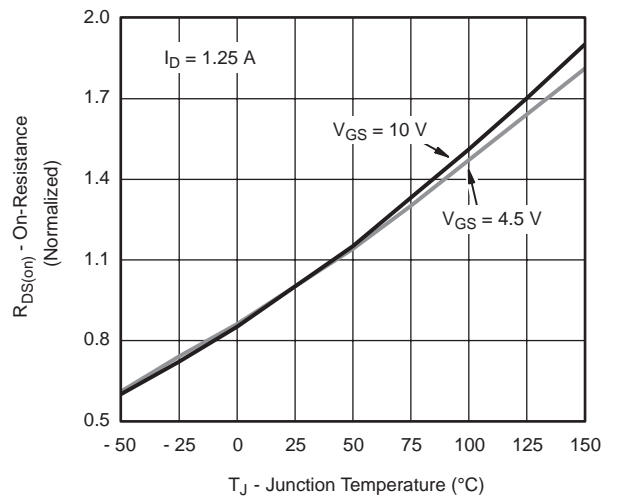
**On-Resistance vs. Drain Current and Gate Voltage**



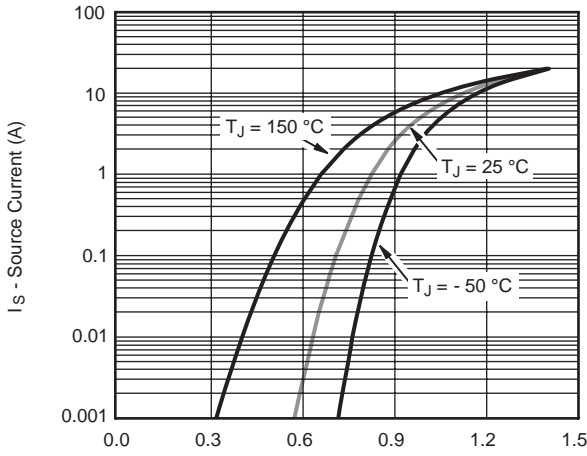
**Single Pulse Power, Junction-to-Ambient**



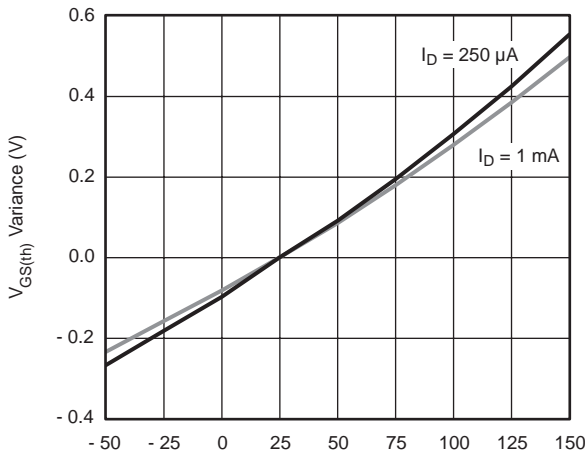
**Gate Charge**



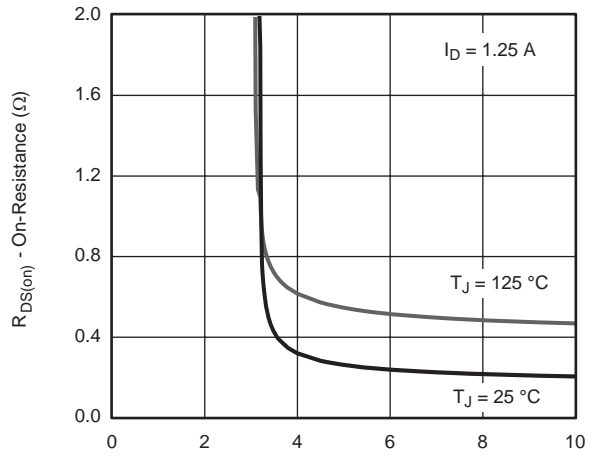
**On-Resistance vs. Junction Temperature**



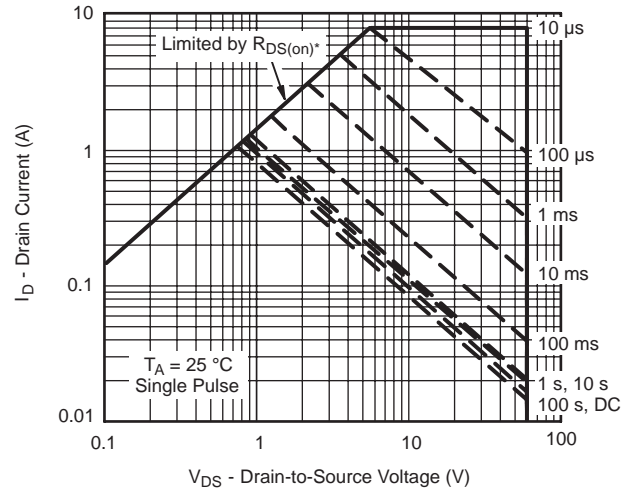
**Source-Drain Diode Forward Voltage**



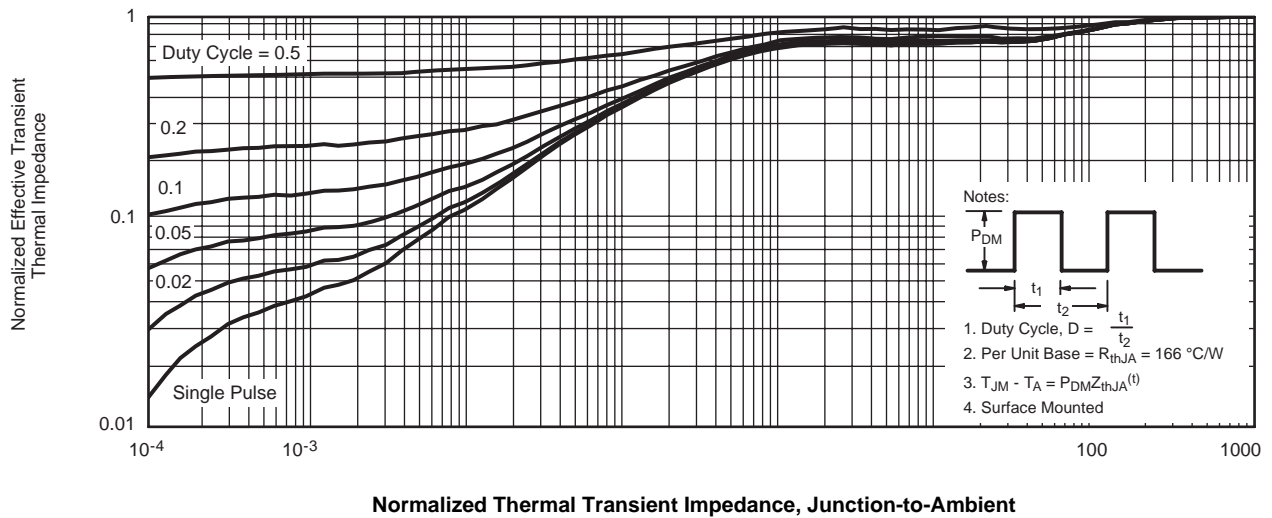
**Threshold Voltage**



**On-Resistance vs. Gate-to-Source Voltage**

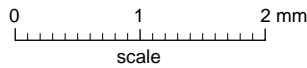
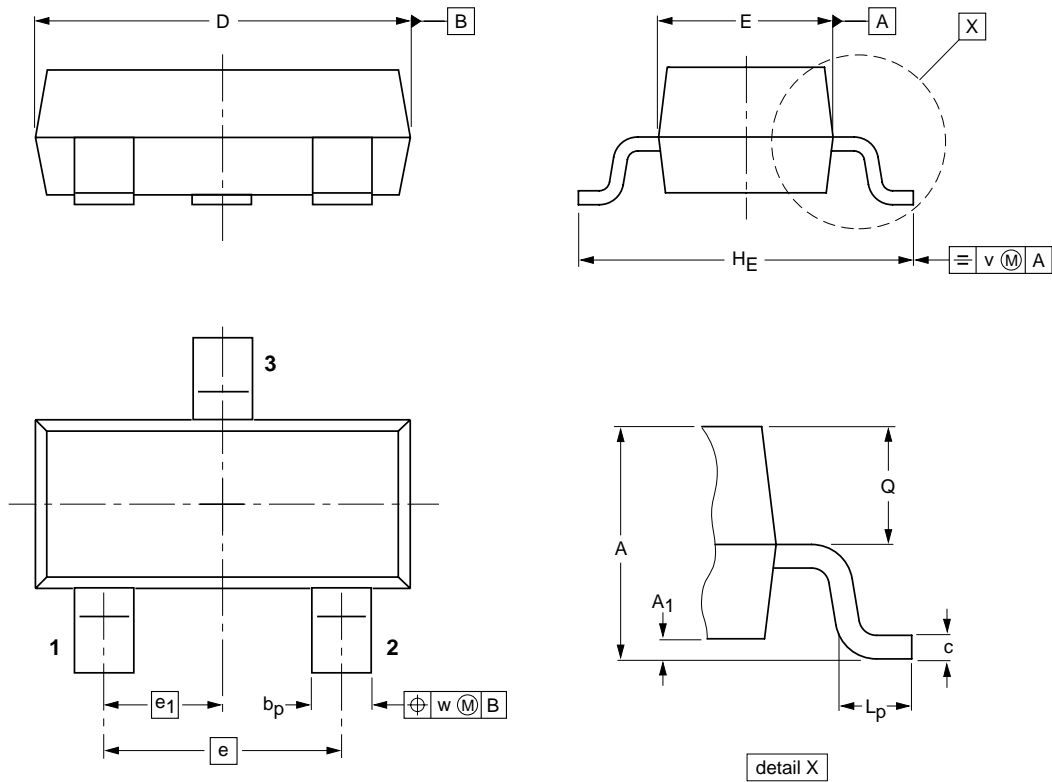


**Safe Operating Area, Junction-to-Ambient**



**Package Outline**

**SOT-23**



**DIMENSIONS (mm are the original dimensions)**

UNIT	A	A <sub>1</sub> max.	b <sub>p</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	Q	v	w
mm	1.1 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

**Summary of Packing Options**

Package	Packing Description	Packing Quantity	Industry Standard
SOT-23	Tape/Reel, 7" reel	3000	EIA-481-1