

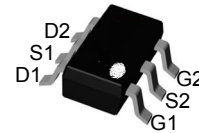
Features

- **N Channel**
60V/4.2A,
 $R_{DS(ON)} = 75m\Omega$ (typ.) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 95m\Omega$ (typ.) @ $V_{GS} = 4.5V$
- **P Channel**
-60V/-3.8A,
 $R_{DS(ON)} = 165m\Omega$ (typ.) @ $V_{GS} = -10V$
 $R_{DS(ON)} = 200m\Omega$ (typ.) @ $V_{GS} = -4.5V$
- 100% UIS + R_g Tested
- Reliable and Rugged
- Lead Free Available (RoHS Compliant)
- ESD Protection

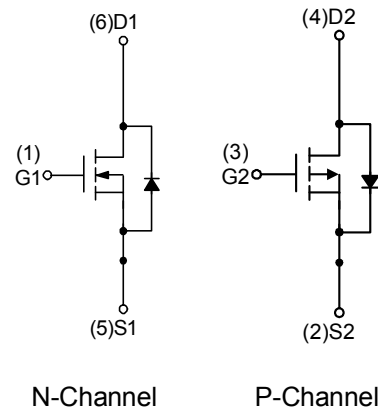
Applications

- DC Motor Control.

Pin Description



Top View of SOT-23-6



Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter		N Channel	P Channel	Unit
Common Ratings					
V _{DSS}	Drain-Source Voltage		60	-60	V
V _{GSS}	Gate-Source Voltage		±20		
T _J	Maximum Junction Temperature		150		°C
T _{STG}	Storage Temperature Range		-55 to 150		
I _S	Diode Continuous Forward Current	T _A =25°C	4.2	-3.8	A
I _D	Continuous Drain Current	T _A =25°C	4.2	-3.8	A
		T _A =70°C	3.15	-2.85	
I _{DM} ^a	Pulsed Drain Current	T _A =25°C	12.6	-11.4	A
P _D ^b	Maximum Power Dissipation	T _A =25°C	2.1	2.1	W
		T _A =70°C	1.3	1.3	
R _{θJA} ^c	Thermal Resistance-Junction to Ambient	t ≤ 10s	60		°C/W
		Steady State	100		°C/W
I _{AS} ^d	Avalanche Current, Single pulse	L=0.5mH	15	-13	A
E _{AS} ^d	Avalanche Energy, Single pulse	L=0.5mH	56	42	mJ

Note a : Pulse width limited by max. junction temperature.

Note b : $t < 10\text{sec}$.

Note c : $R_{\theta JA}$ steady state $t=999\text{s}$. $R_{\theta JA}$ is measured with the device mounted on 1in^2 , FR-4 board with 2oz. Copper.

Note d : UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature $T_J=25^\circ\text{C}$).

N Channel Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	N Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	60	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =48V, V _{GS} =0V	-	-	1	μA
		T _J =85°C	-	-	30	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	1	1.3	2.5	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^e	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =2.5A	-	75	100	mΩ
		V _{GS} =4.5V, I _{DS} =2A	-	95	120	mΩ
Diode Characteristics						
V _{SD} ^e	Diode Forward Voltage	I _{SD} =2A, V _{GS} =0V	-	0.8	1.3	V
t _{rr}	Reverse Recovery Time	I _{SD} =2.5A, dI _{SD} /dt=100A/μs	-	23	-	ns
Q _{rr}	Reverse Recovery Charge		-	26	-	nC
Dynamic Characteristics ^f						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz	-	2.5	5	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =12V, Frequency=1.0MHz	-	410	600	pF
C _{oss}	Output Capacitance		-	50	-	
C _{rss}	Reverse Transfer Capacitance		-	40	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =30V, R _L =30Ω, I _{DS} =1A, V _{GEN} =10V, R _G =6Ω	-	7	13	ns
t _r	Turn-on Rise Time		-	8	15	
t _{d(OFF)}	Turn-off Delay Time		-	16	29	
t _f	Turn-off Fall Time		-	3	6	
Gate Charge Characteristics ^f						
Q _g	Total Gate Charge	V _{DS} =50V, V _{GS} =4.5V, I _{DS} =2.5A	-	5	-	nC
Q _g	Total Gate Charge	V _{DS} =50V, V _{GS} =10V, I _{DS} =2.5A	-	10	14	
Q _{gs}	Gate-Source Charge		-	1.7	-	
Q _{gd}	Gate-Drain Charge		-	2.3	-	

Note e : Pulse test ; pulse width≤300μs, duty cycle≤2%.

Note f : Guaranteed by design, not subject to production testing.

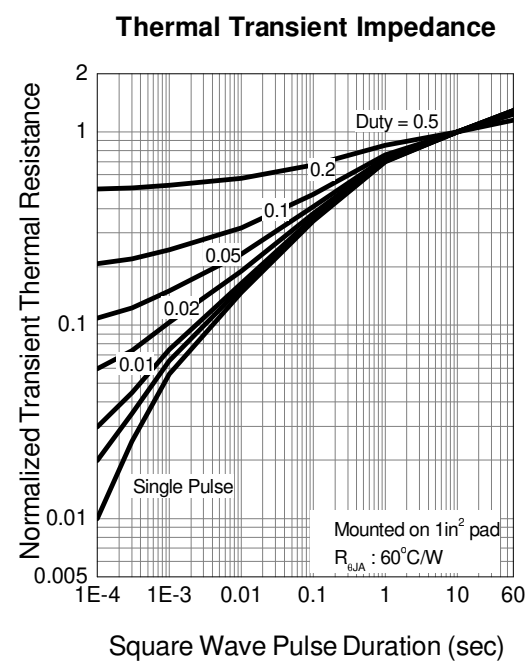
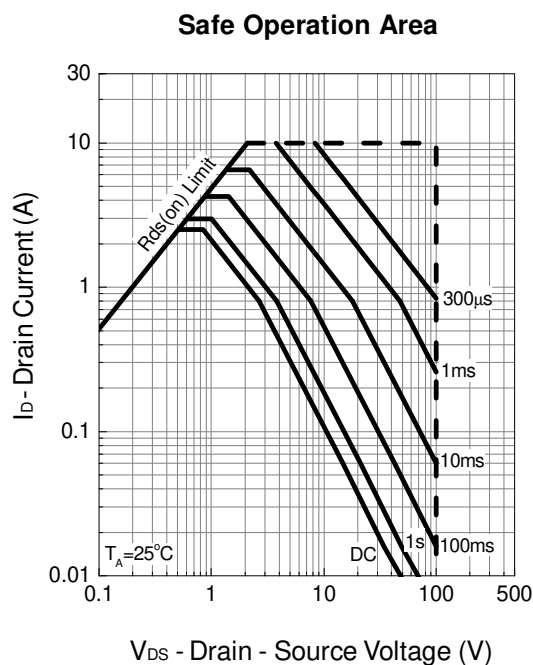
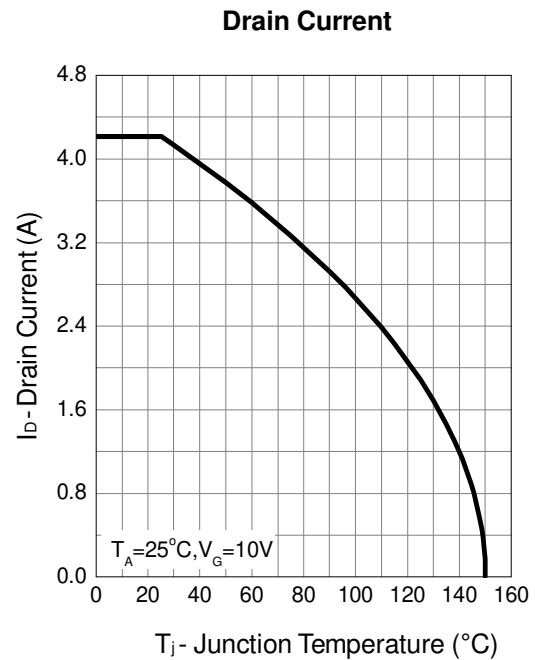
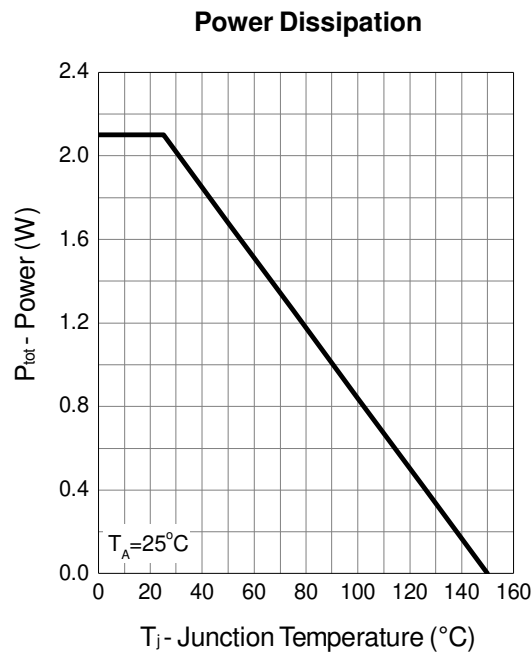
P Channel Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	P Channel			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =-250μA	-60	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-48V, V _{GS} =0V	-	-	-1	μA
		T _J =85°C	-	-	-30	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =-250μA	-1	-1.7	-2.5	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^e	Drain-Source On-state Resistance	V _{GS} =-10V, I _{DS} =-2.2A	-	165	200	mΩ
		V _{GS} =-4.5V, I _{DS} =-1.6A	-	200	250	mΩ
Diode Characteristics						
V _{SD} ^e	Diode Forward Voltage	I _{SD} =-1A, V _{GS} =0V	-	-0.75	-1	V
t _{rr}	Reverse Recovery Time	I _{SD} =-2.2A,	-	26	-	ns
Q _{rr}	Reverse Recovery Charge	dl _{SD} /dt=100A/μs	-	30	-	nC
Dynamic Characteristics ^f						
R _G	Gate Resistance	V _{GS} =0V,V _{DS} =0V,f=1MHz	-	10	20	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =-15V, Frequency=1.0MHz	-	450	610	pF
C _{oss}	Output Capacitance		-	55	-	
C _{rss}	Reverse Transfer Capacitance		-	37	-	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =-30V, R _L =30Ω, I _{DS} =-1A, V _{GEN} =-10V, R _G =6Ω	-	8	14	ns
t _r	Turn-on Rise Time		-	5	9	
t _{d(OFF)}	Turn-off Delay Time		-	38	68	
t _f	Turn-off Fall Time		-	32	58	
Gate Charge Characteristics ^f						
Q _g	Total Gate Charge	V _{DS} =-50V, V _{GS} =-4.5V, I _{DS} =-2.2A	-	8	-	nC
Q _g	Total Gate Charge	V _{DS} =-50V, V _{GS} =-10V, I _{DS} =-2.2A	-	17	24	
Q _{gs}	Gate-Source Charge		-	2.3	-	
Q _{gd}	Gate-Drain Charge		-	3.7	-	

Note e : Pulse test ; pulse width≤300μs, duty cycle≤2%.

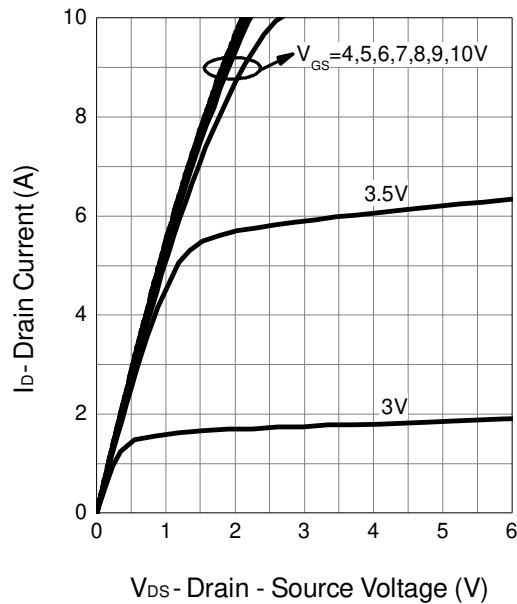
Note f : Guaranteed by design, not subject to production testing.

N Channel Typical Operating Characteristics

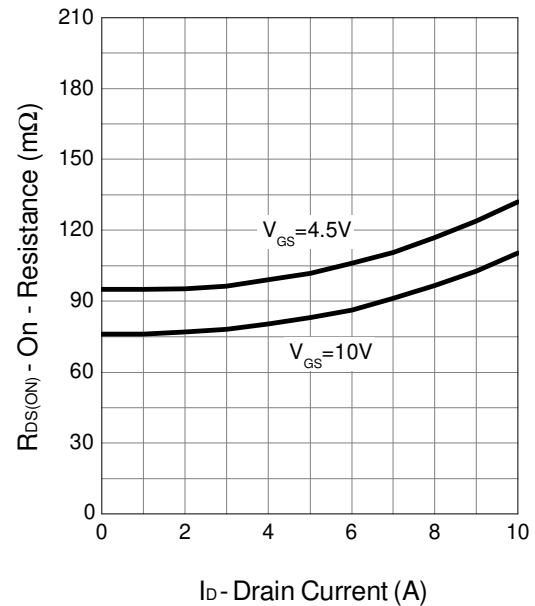


N Channel Typical Operating Characteristics (Cont.)

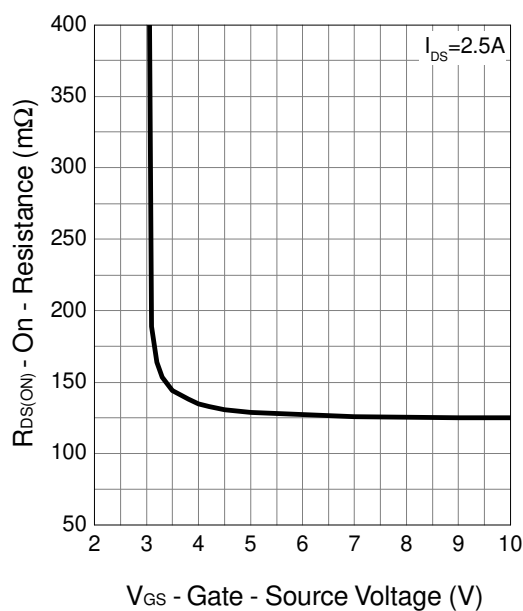
Output Characteristics



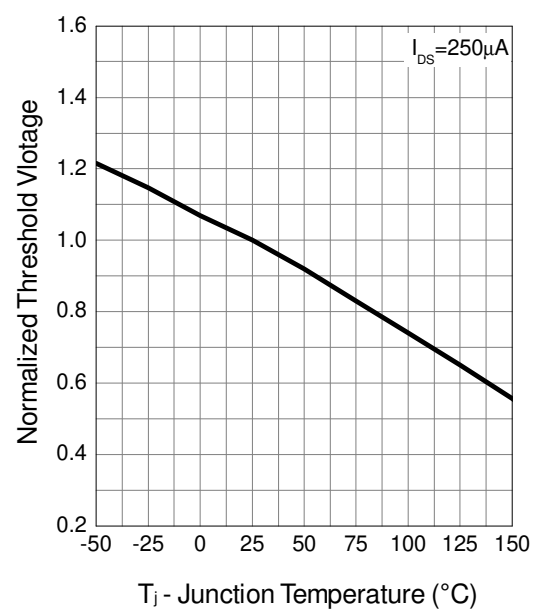
Drain-Source On Resistance



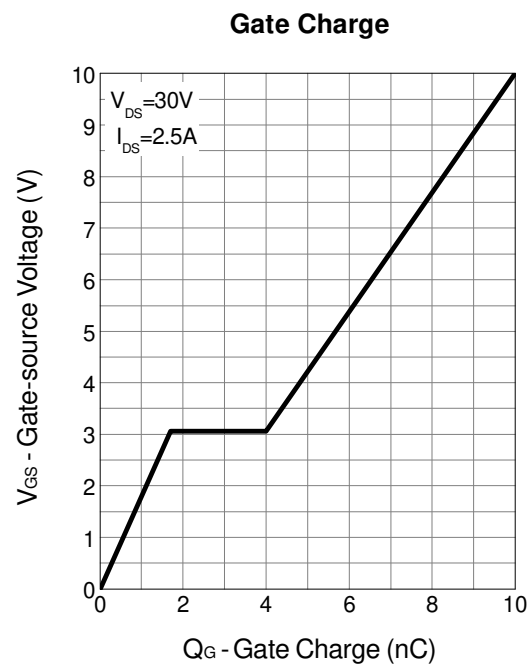
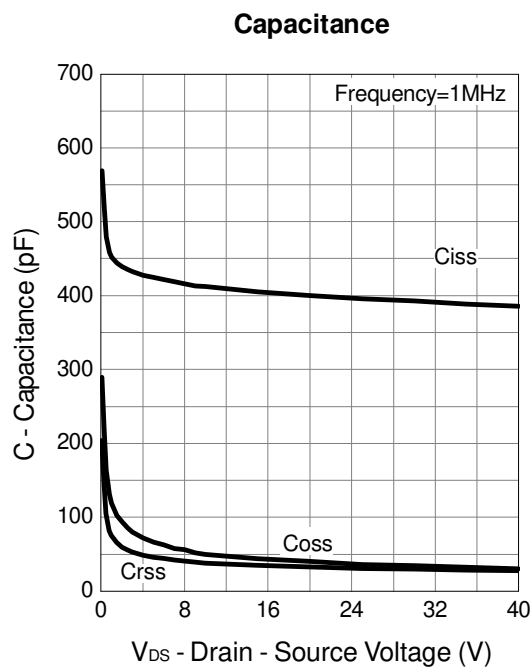
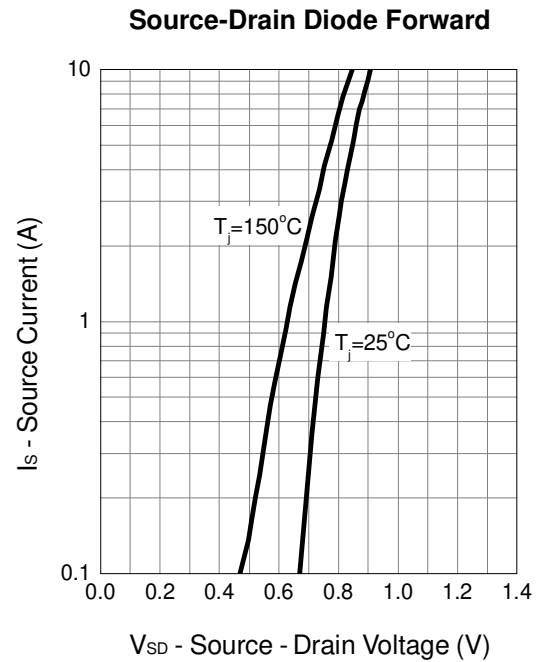
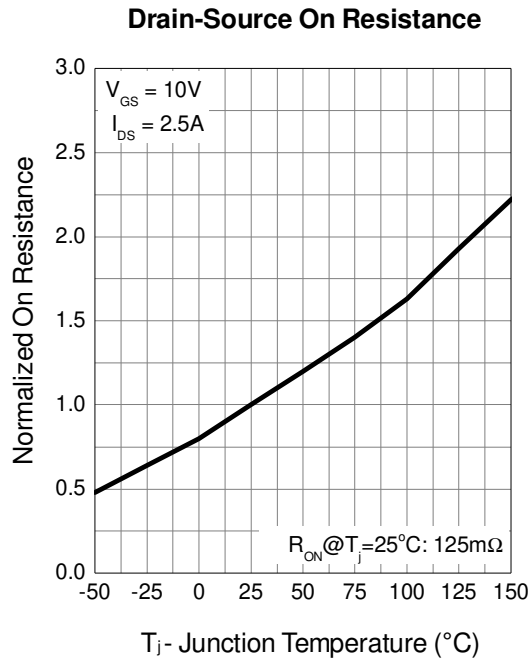
Gate-Source On Resistance



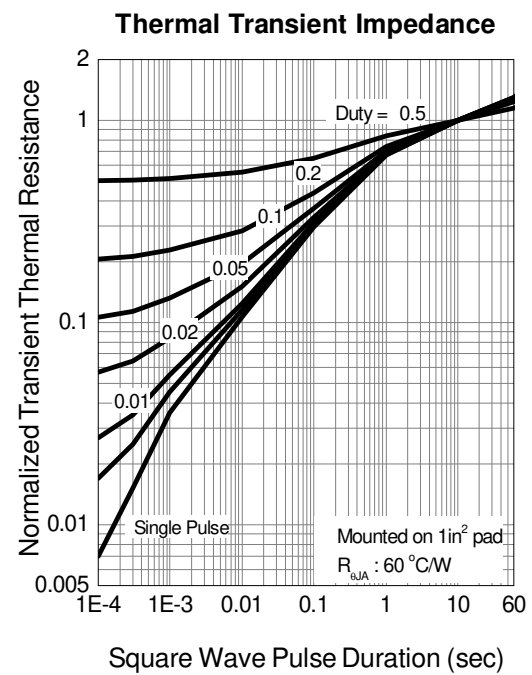
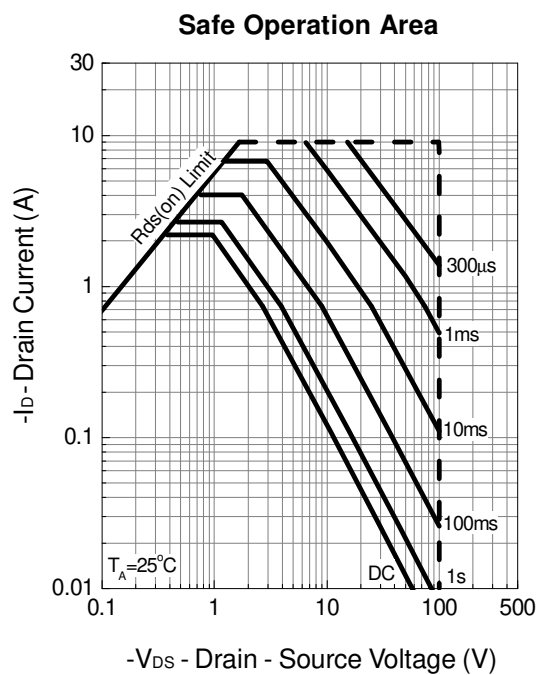
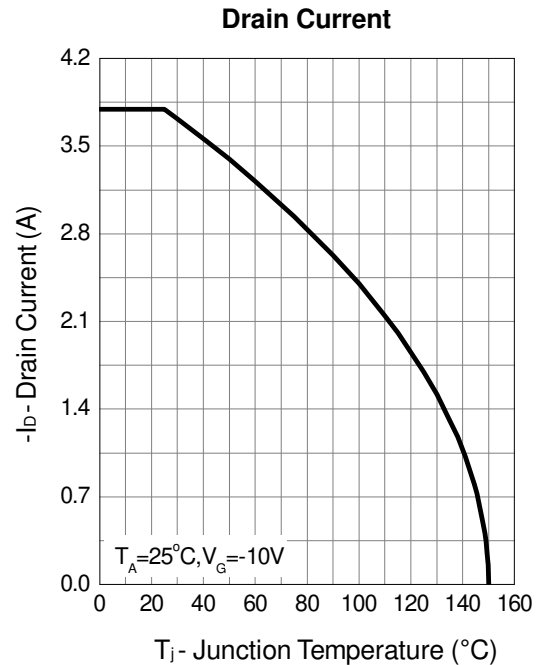
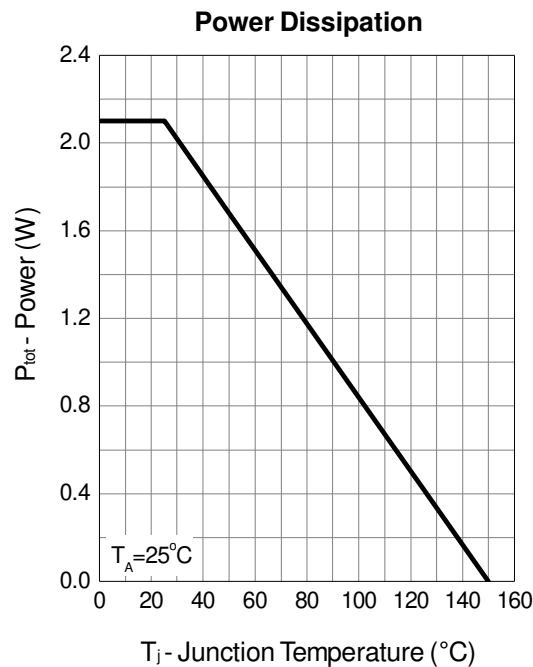
Gate Threshold Voltage



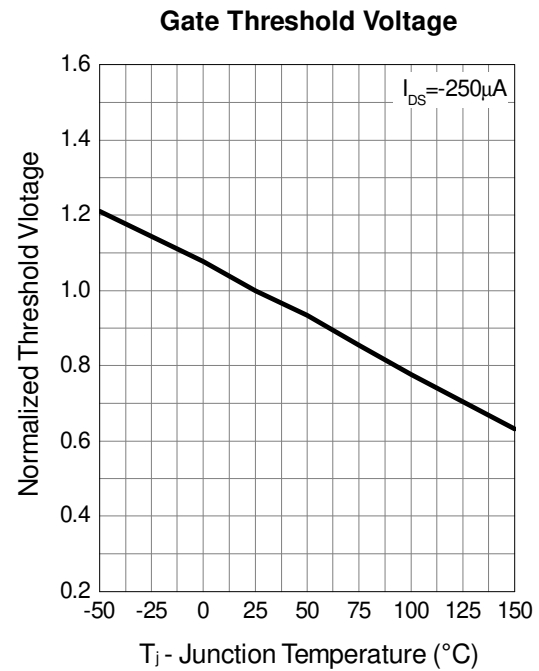
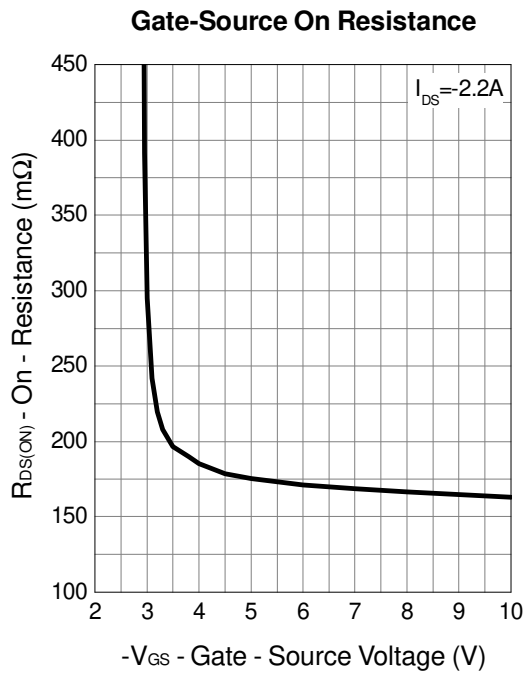
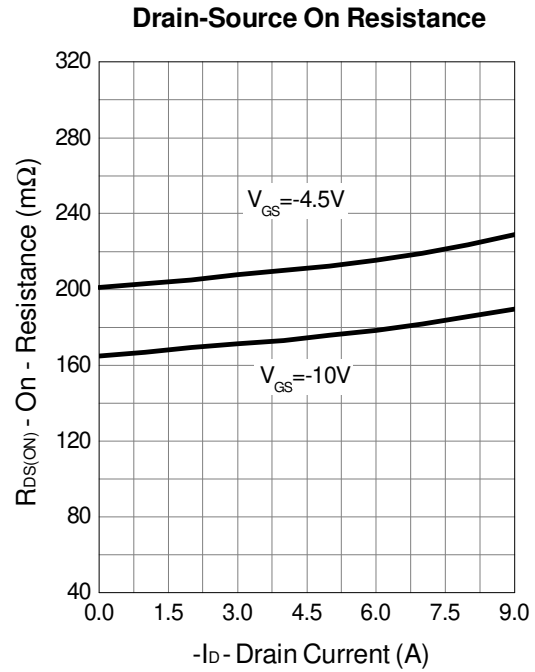
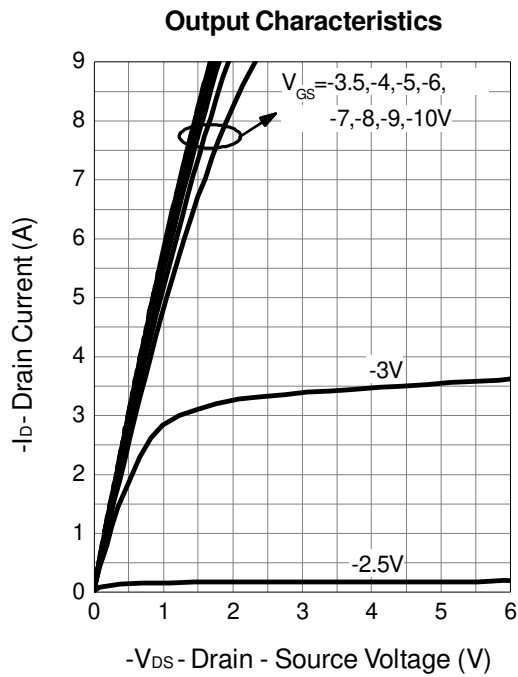
N Channel Typical Operating Characteristics (Cont.)



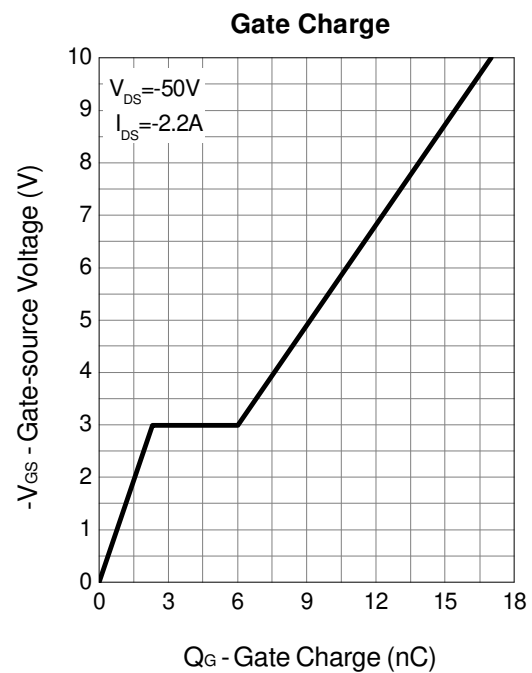
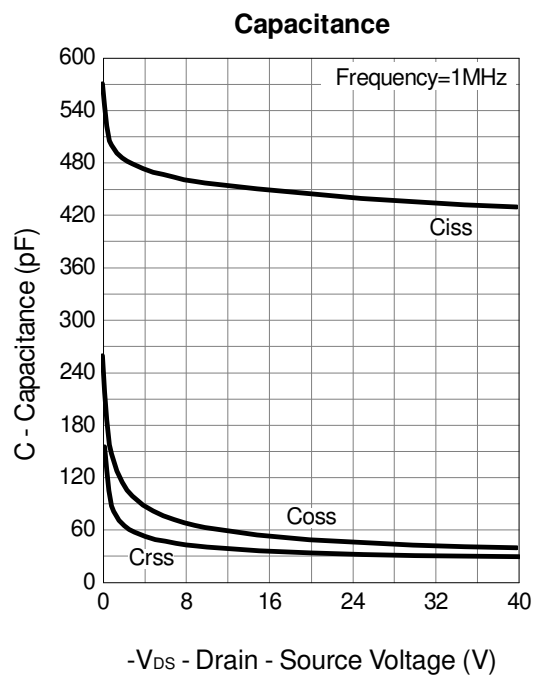
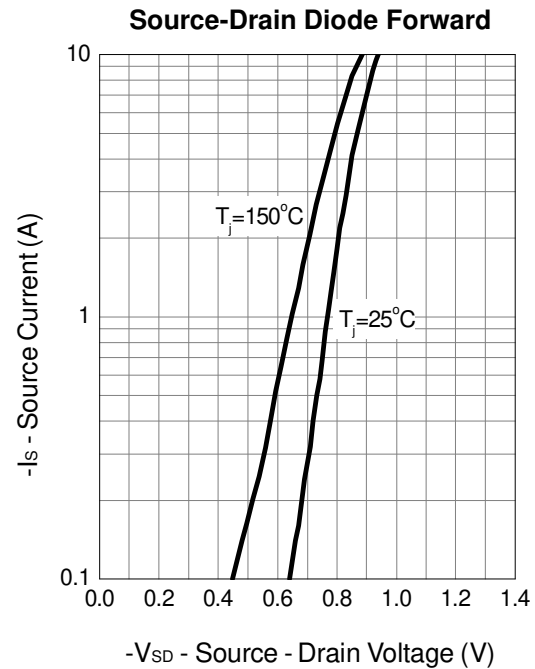
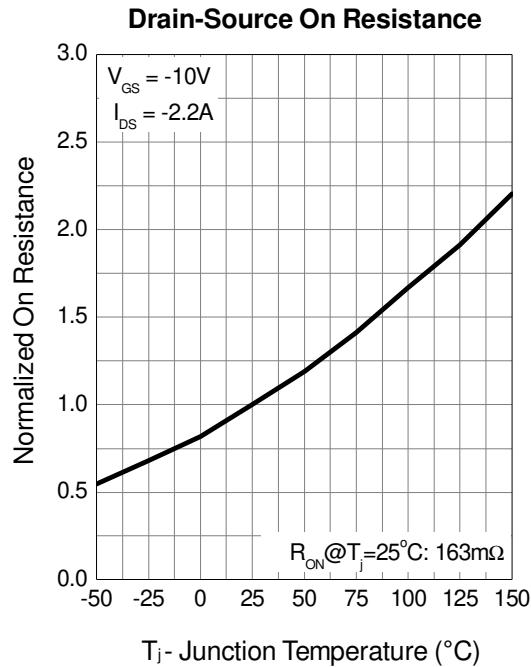
P Channel Typical Operating Characteristics



P Channel Typical Operating Characteristics (Cont.)

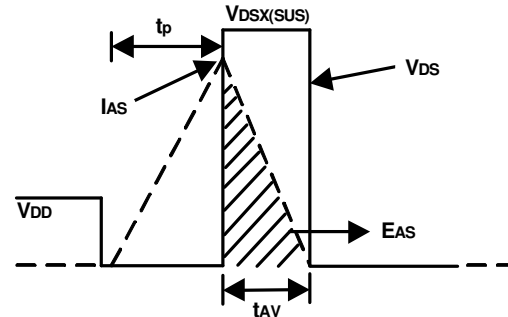
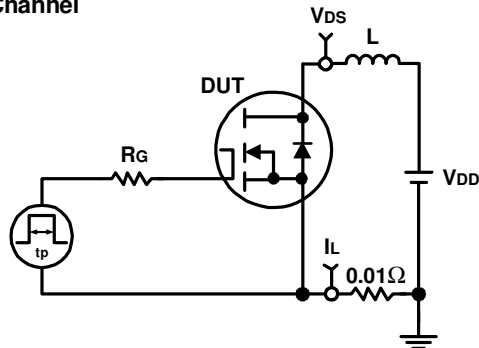


P Channel Typical Operating Characteristics (Cont.)

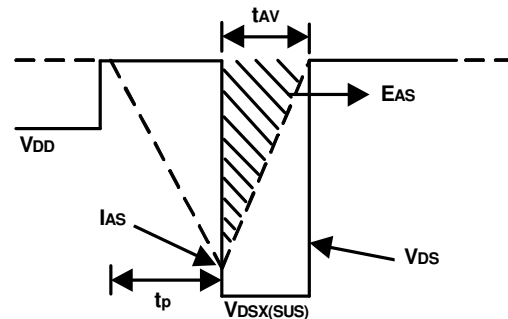
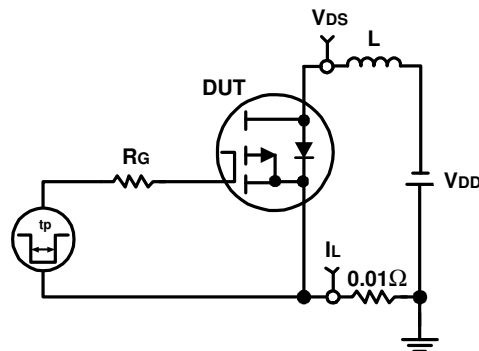


Avalanche Test Circuit and Waveforms

N Channel

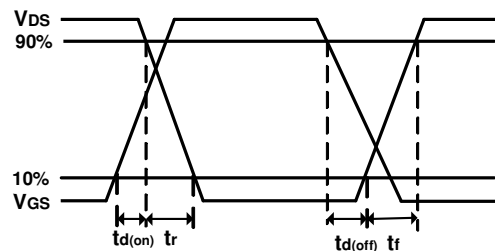
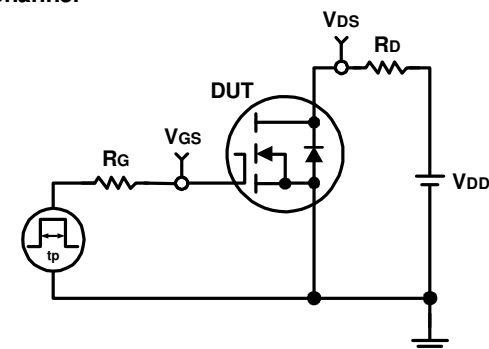


P Channel

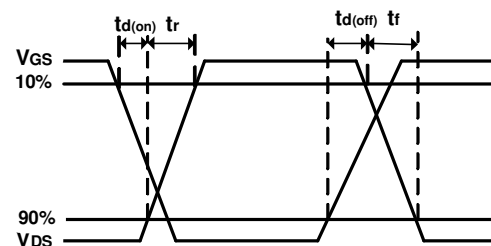
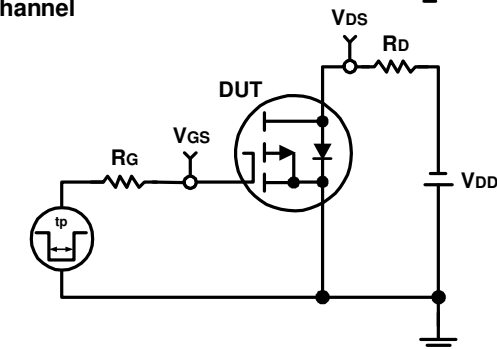


Switching Time Test Circuit and Waveforms

N Channel

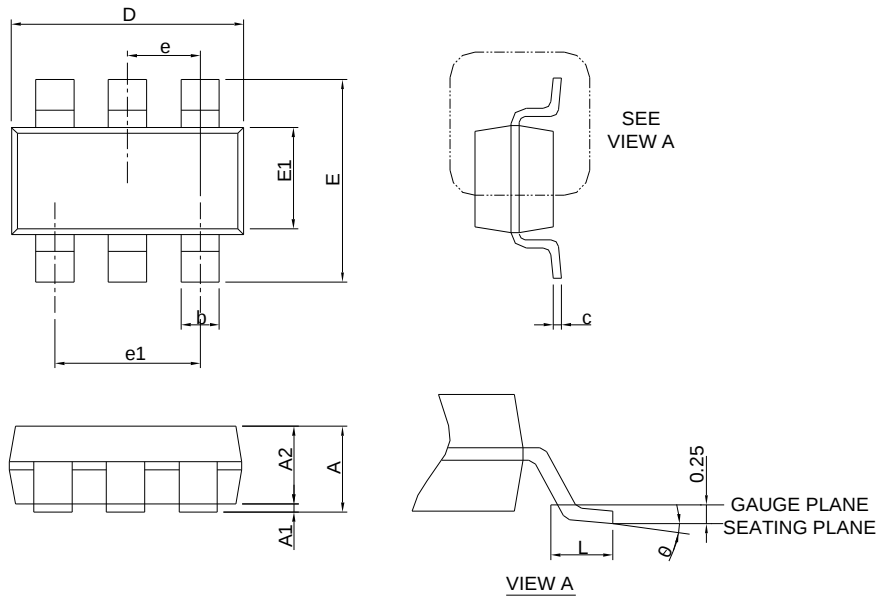


P Channel



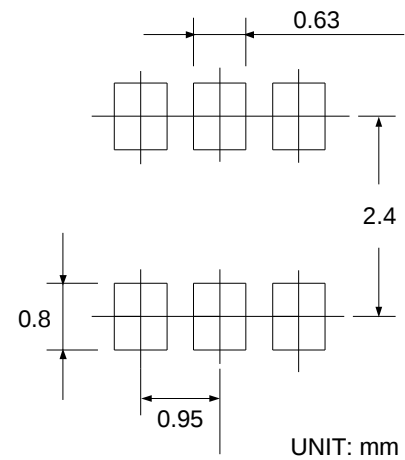
Package Information

SOT-23-6



SYMBOL	SOT-23-6			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	-	1.25	-	0.049
A1	0.00	0.05	0.000	0.002
A2	0.90	1.20	0.035	0.047
b	0.30	0.50	0.012	0.020
c	0.08	0.22	0.003	0.009
D	2.70	3.10	0.106	0.122
E	2.60	3.00	0.102	0.118
E1	1.40	1.80	0.055	0.071
e	0.95 BSC		0.037 BSC	
e1	1.90 BSC		0.075 BSC	
L	0.30	0.60	0.012	0.024
θ	0°	8°	0°	8°

RECOMMENDED LAND PATTERN



- Note : 1. Follow JEDEC TO-178 AB.
 2. Dimension D and E1 do not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 10 mil per side.