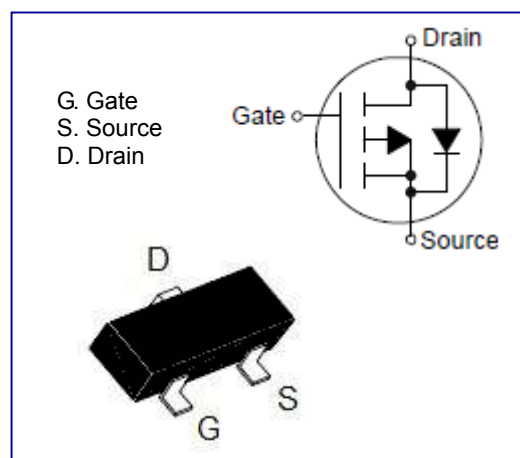


-20V P-Channel Enhancement-Mode MOSFET

General Description

- $I_D = -3.0A$
- $R_{DS(on)} = 68m\Omega(Typ.) @ V_{GS} = -4.5V$
- $R_{DS(on)} = 85m\Omega(Typ.) @ V_{GS} = -2.5V$
- *Extremely low $R_{ds(on)}$*
- *Advanced trench cell design*
- *Low Gate charge*
- *Application:*
 - *Portable appliance*
 - *Battery management*
 - *High speed switch*
- *Lead free and green devices are available*
- *Package: SOT-23-3*



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

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

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V _{DS}	-20	V
Gate-Source Voltage		V _{GS}	±12	V
Drain Current ^a	T _C =25°C	I _D	-3.0	A
	T _C =70°C		-2	
Drain Current –Pulsed ^a		I _{DM}	-16.8	A
Power Dissipation (T _C =25°C)		P _D	1.56	W
Power Dissipation – Derate above 25°C			0.012	W/°C
Storage Temperature Range		T _{STG}	-55 ~ +150	°C
Operating Junction Temperature Range		T _J	-55 ~ +150	°C
Thermal Resistance, Junction-to-Ambient ¹		R _{θJA}	90	°C/W

Electrical Characteristics ($T_A = 25^\circ C$ unless otherwise noted)

Parameter		Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =-250μA	30	-30*	---	V
Zero Gate Voltage Drain Current	T _J =25°C	I _{DSS}	V _{DS} =-24V, V _{GS} =0V	---	---	-1	μA
Gate-Body Leakage		I _{GSS}	V _{GS} =±12V, V _{DS} =0V	---	---	±100	nA
On Characteristics ^a							
Gate Threshold Voltage		V _{GS(th)}	V _{DS} =V _{GS} , I _D =-250μA	-0.3	---	-1.3	V
Drain-Source On-State Resistance		R _{DS(on)}	V _{GS} =-4.5V, I _D =-3.0A	---	68	82	mΩ
			V _{GS} =-2.5V, I _D =-2A	---	80	100	mΩ
Forward Transconductance		g _{fs}	V _{DS} =-10V, I _D =-3A	---	5.5	---	S
Drain-Source Diode Characteristics ^a							
Continuous Source Current		I _S	V _G =V _D =0V, Force Current	---	---	-3.2	A

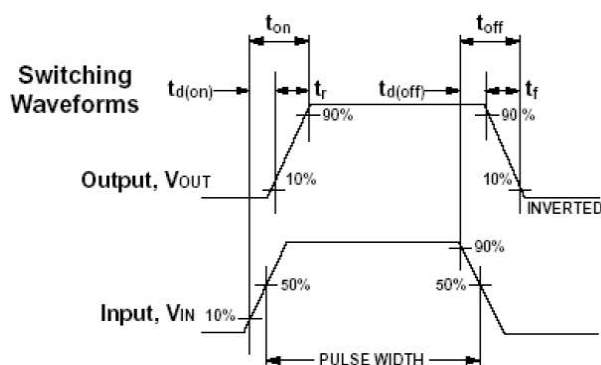
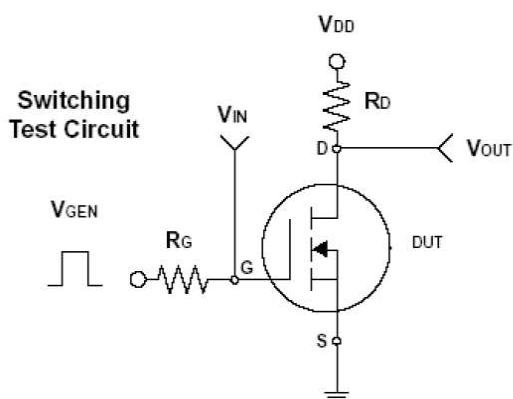
Pulsed Source Current	I _{SM}		---	---	-16.8	A
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =-1.0A, T _J =25℃	---	---	-1.0	V
Dynamic Characteristics ^b						
Input Capacitance	C _{iss}	V _{DS} =-10V, V _{GS} =0V, F=1MHz	---	515	745	pF
Output Capacitance	C _{oss}		---	55	80	pF
Reverse Transfer Capacitance	C _{rss}		---	20	30	pF
Switching Characteristics ^b						
Total Gate Charge	Q _g	V _{DS} =-10V, V _{GS} =-4.5V, I _D =-3A	---	6.4	9	nC
Gate-Source Charge	Q _{gs}		---	0.9	1	nC
Gate-Drain Charge	Q _{gd}		---	1.6	3	nC
Turn-On Delay Time	T _{d(on)}	V _{DD} =-10V, V _{GS} =-4.5V, R _G =25Ω, I _D =-1A	---	5	9	ns
Rise Time	Tr		---	17.4	33	ns
Turn-Off Delay Time	T _{d(off)}		---	40.7	80	ns
Fall Time	T _f		---	11.4	23	ns

Notes: a. Repetitive Rating: Pulsed width limited by maximum junction temperature.

b. Pulse test: pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$. Essential independent of operating temperature.

c. Guaranteed by design, not subject to production testing.

Switching Time Test Circuit and Waveforms



Soldering Methods For Products

1. Storage environment : Temperature=10°C ~ 35°C, Humidity=65% ± 15%
2. Reflow soldering of surface mount devices

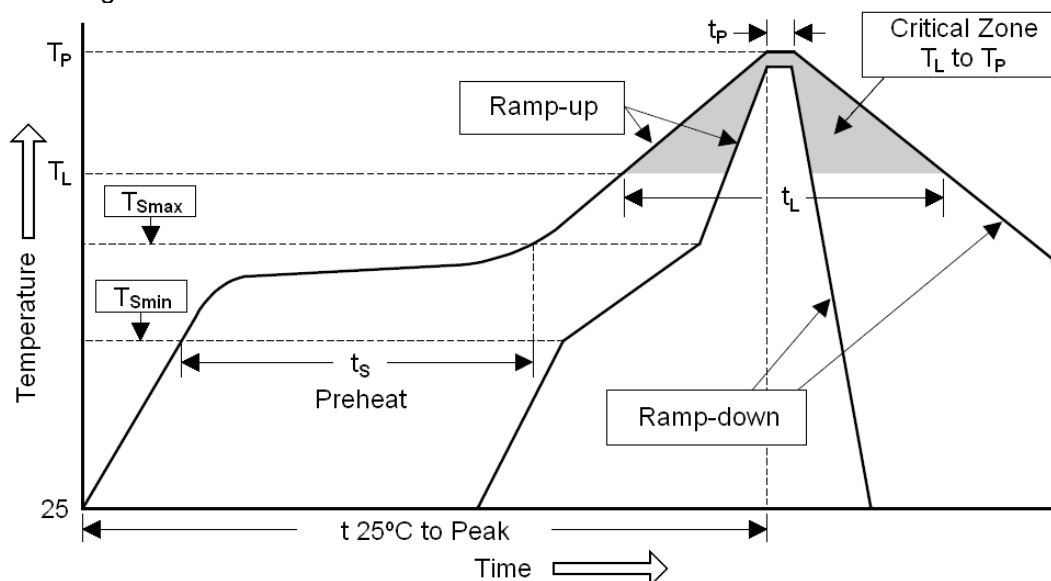


Figure : Temperature Profile

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	< 3°C/sec	< 3°C/sec
Preheat		
- Temperature Min (T_{Smin})	100°C	100°C
- Temperature Max (T_{Smax})	150°C	200°C
- Time (Min to Max) (t_s)	60 ~ 120 sec	60 ~ 180 sec
T_{Smax} to T_L		
- Ramp-up rate	< 3°C/sec	< 3°C/sec
Time maintained above:		
- Temperature (T_L)	183°C	217°C
- Time (t_L)	60 ~ 150 sec	60 ~ 150 sec
Peak Temperature (T_P)	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t_P)	10 ~ 30 sec	20 ~ 40 sec
Ramp-down rate	< 6°C/sec	< 6°C/sec
Time 25°C to Peak Temperature	< 6 minutes	< 8 minutes

3. Flow (wave) soldering (solder dipping)

Product	Peak Temperature	Dipping Time
Pb devices	245°C ±5°C	5sec ±1sec
Pb-Free devices	260°C +0/-5°C	5sec ±1sec