

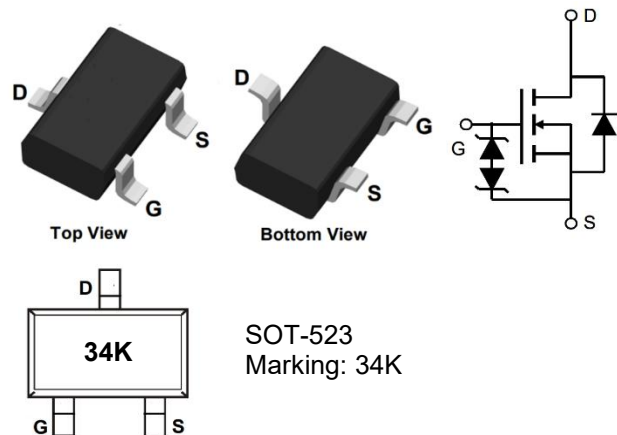
N-Channel Enhancement Mode MOSFET

Features

- Advanced Trench Process Technology
- Low Threshold Voltage
- Fast Switching Speed
- Halogen-Free & Lead-Free
- N-Channel Switch with Low $R_{DS(on)}$

Application

- Load Switch for Portable Devices
- Voltage controlled small signal switch



Absolute Maximum Ratings (at $T_a = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	20	V
Gate-Source Voltage	V_{GS}	± 12	V
Continuous Drain Current	I_D	0.5	A
Peak Drain Current, Pulsed ¹⁾	I_{DM}	3.0	A
Power Dissipation ²⁾	P_{tot}	0.2	W
Operating Junction	T_J	150	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-55~150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Ambient ²⁾	$R_{\theta JA}$	633	$^\circ\text{C/W}$

Note:

¹⁾ Pulse width $\leq 100\mu\text{s}$, duty cycle $\leq 1\%$, limited by T_{Jmax}

²⁾ Device mounted on FR-4 substrate PC board, 2ozcopper, with 1-inch square copper plate in still air.

Characteristics at $T_a = 25^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at $I_D = 250\ \mu\text{A}$	BV_{DSS}	20			V
Drain-Source Leakage Current at $V_{DS} = 20\ \text{V}$	I_{DSS}			1	μA
Gate Leakage Current at $V_{GS} = \pm 10\ \text{V}$	I_{GSS}			± 10	μA
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	$V_{GS(th)}$	0.35		1.1	V
Drain-Source On-State Resistance at $V_{GS} = 4.5\ \text{V}$, $I_D = 0.65\ \text{A}$ at $V_{GS} = 2.5\ \text{V}$, $I_D = 0.55\ \text{A}$ at $V_{GS} = 1.8\ \text{V}$, $I_D = 0.45\ \text{A}$	$R_{DS(on)}$		190 260 390	380 450 800	m Ω
DYNAMIC PARAMETERS					
Forward Transconductance at $V_{DS} = 10\ \text{V}$, $I_D = 800\text{mA}$	g_{fs}	1.0			S
Input Capacitance at $V_{GS} = 0\ \text{V}$, $V_{DS} = 16\ \text{V}$, $f = 1\ \text{MHz}$	C_{iss}		79		pF
Output Capacitance at $V_{GS} = 0\ \text{V}$, $V_{DS} = 16\ \text{V}$, $f = 1\ \text{MHz}$	C_{oss}		13		pF
Reverse Transfer Capacitance at $V_{GS} = 0\ \text{V}$, $V_{DS} = 16\ \text{V}$, $f = 1\ \text{MHz}$	C_{rss}		9		pF
Gate charge total at $V_{DS} = 10\ \text{V}$, $I_D = 0.9\ \text{A}$, $V_{GS} = 4.5\ \text{V}$	Q_g		1		nC
Gate to Source Charge at $V_{DS} = 10\ \text{V}$, $I_D = 0.9\ \text{A}$, $V_{GS} = 4.5\ \text{V}$	Q_{gs}		0.28		nC
Gate to Drain Charge at $V_{DS} = 10\ \text{V}$, $I_D = 0.9\ \text{A}$, $V_{GS} = 4.5\ \text{V}$	Q_{gd}		0.22		nC
Turn-On Delay Time at $V_{GS} = 4.5\ \text{V}$, $V_{DS} = 10\ \text{V}$, $I_D = 0.5\ \text{A}$, $R_g = 10\ \Omega$	$t_{d(on)}$		6.7		ns
Turn-On Rise Time at $V_{GS} = 4.5\ \text{V}$, $V_{DS} = 10\ \text{V}$, $I_D = 0.5\ \text{A}$, $R_g = 10\ \Omega$	t_r		4.8		ns
Turn-Off Delay Time at $V_{GS} = 4.5\ \text{V}$, $V_{DS} = 10\ \text{V}$, $I_D = 0.5\ \text{A}$, $R_g = 10\ \Omega$	$t_{d(off)}$		17.3		ns
Turn-Off Fall Time at $V_{GS} = 4.5\ \text{V}$, $V_{DS} = 10\ \text{V}$, $I_D = 0.5\ \text{A}$, $R_g = 10\ \Omega$	t_f		7.4		ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $I_F = 150\ \text{mA}$, $V_{GS} = 0\ \text{V}$	V_{DS}			1.2	V
Body Diode Reverse Recovery Time at $I_F = 3.6\ \text{A}$, $di/dt = 100\ \text{A} / \mu\text{s}$	t_{rr}		7.5		ns
Body Diode Reverse Recovery Charge at $I_F = 3.6\ \text{A}$, $di/dt = 100\ \text{A} / \mu\text{s}$	Q_{rr}		2.5		nC

Electrical Characteristics Curves

Fig. 1 - Output Characteristics

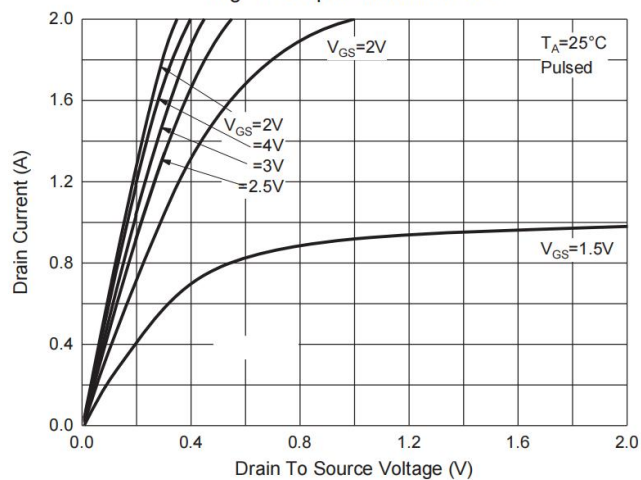


Fig. 2 - Transfer Characteristics

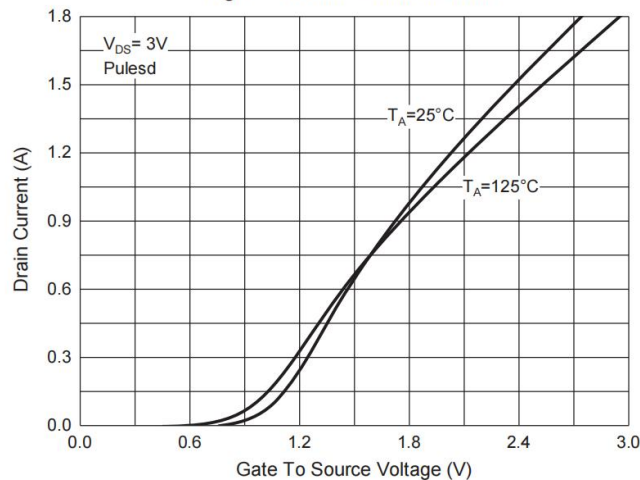


Fig. 3 - $R_{DS(ON)} - I_D$

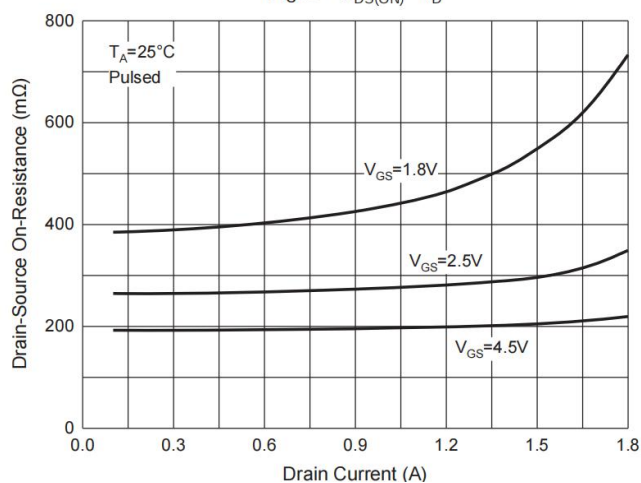


Fig. 4 - $R_{DS(ON)} - V_{GS}$

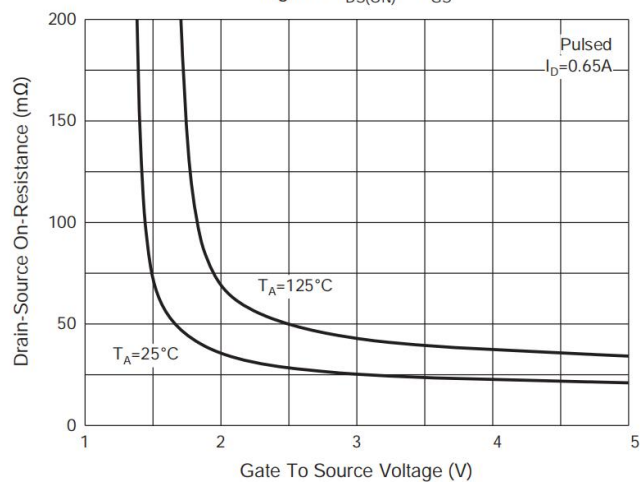


Fig. 5 - $I_S - V_{SD}$

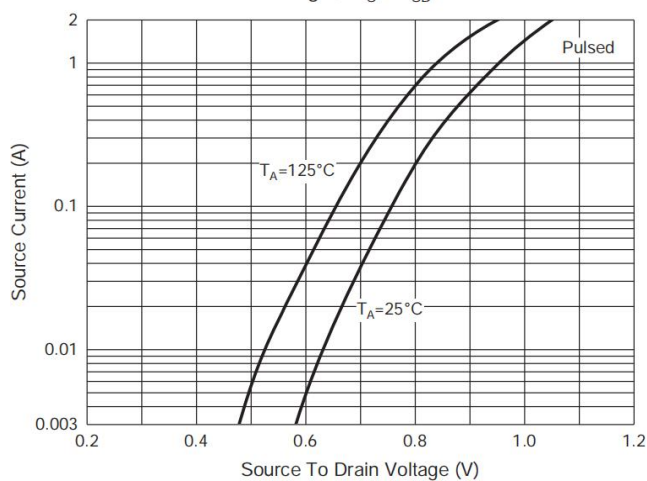
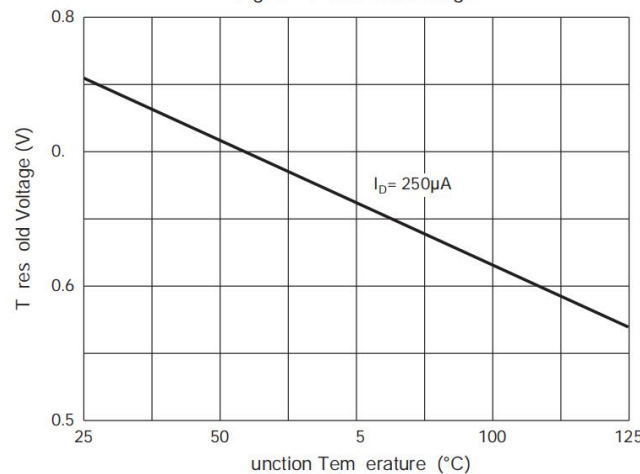


Fig. 6 - Thermal Resistance



Test Circuits

Fig.1-1 Switching times test circuit

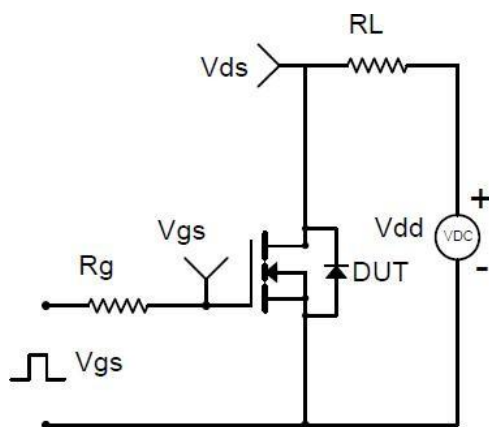


Fig.1-2 Switching Waveform

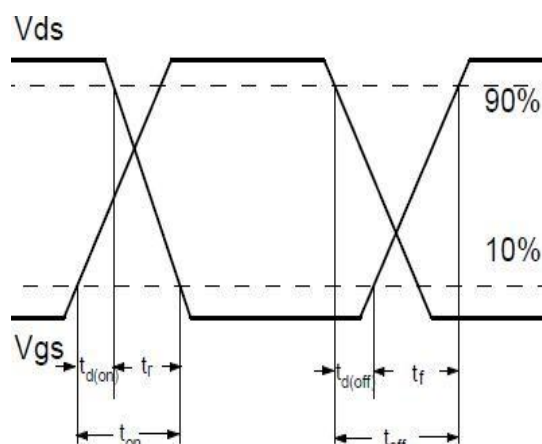


Fig.2-1 Gate charge test circuit

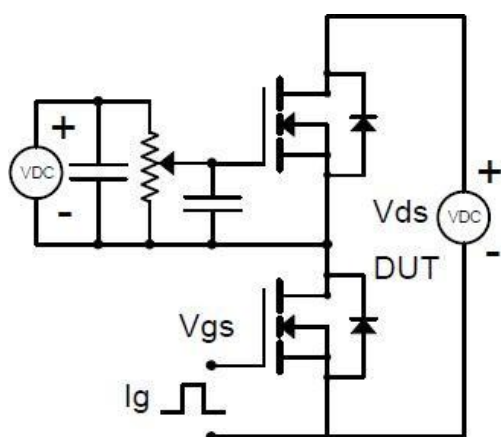


Fig.2-2 Gate charge waveform

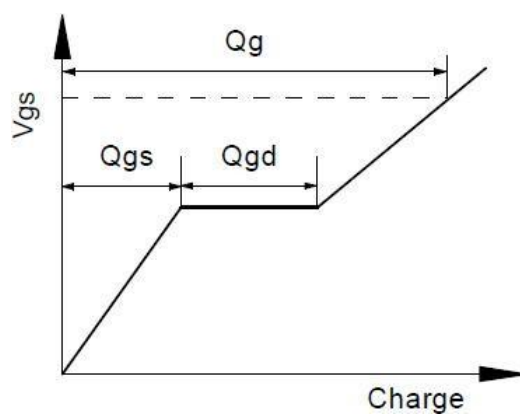


Fig.3-1 Avalanche test circuit

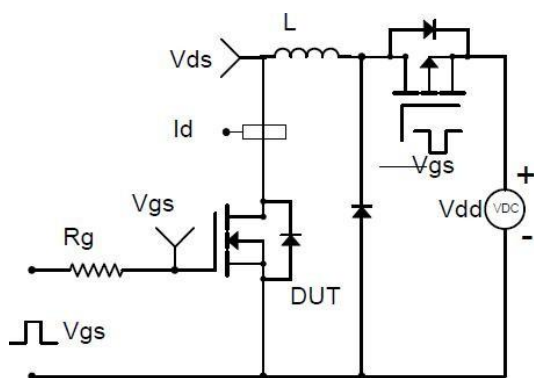
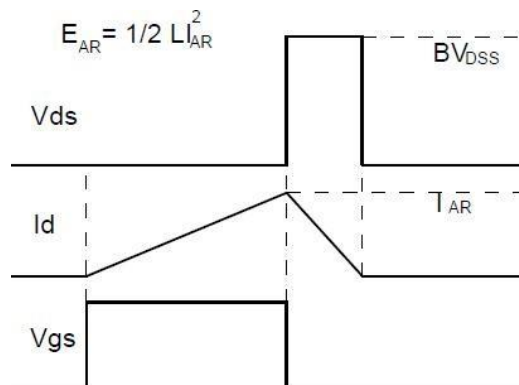
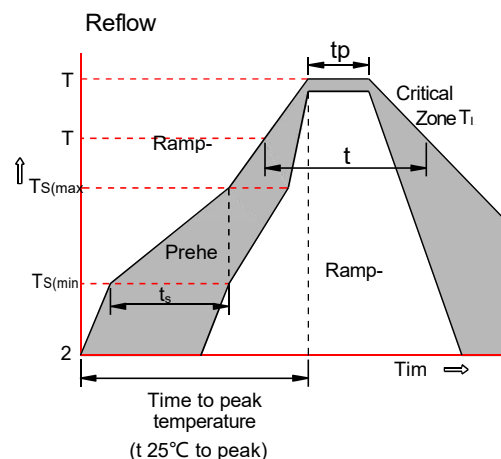


Fig.3-2 Avalanche waveform



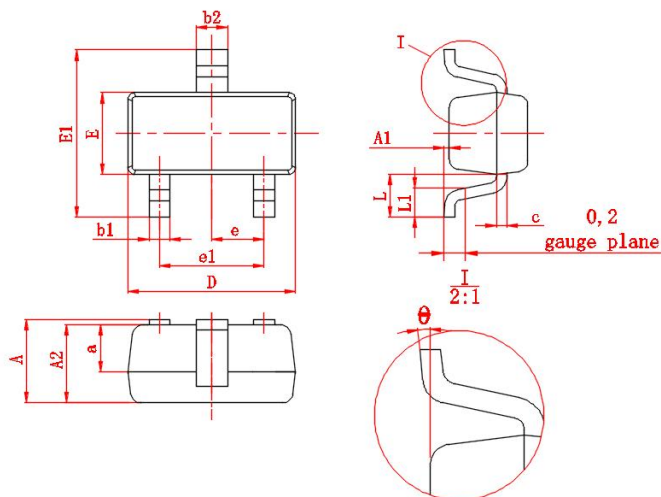
Soldering parameters

Reflow Condition		Pb-Free assembly (see as below)
Pre Heat	-Temperature Min ($T_{s(min)}$)	+150°C
	-Temperature Max($T_{s(max)}$)	+200°C
	-Time (Min to Max) (t_s)	60-180 secs.
Average ramp up rate (Liquid us Temp (T_L) to peak)		3°C/sec. Max
$T_{s(max)}$ to T_L - Ramp-up Rate		3°C/sec. Max
Reflow	-Temperature(T_L)(Liquid us)	+217°C
	-Temperature(T_L)	60-150 secs.
Peak Temp (T_p)		+260(+0/-5)°C
Time within 5°C of actual Peak Temp (t_p)		30 secs. Max
Ramp-down Rate		6°C/sec. Max
Time 25°C to Peak Temp (T_p)		8 min. Max
Do not exceed		+260°C



Package Outline Dimensions (Units: mm)

SOT-523



符号	尺寸		符号	尺寸		符号	尺寸	
	Min	Max		Min	Max		Min	Max
A	0.7	0.9	E	0.7	0.9	b2	0.25	0.35
A1	0	0.1	E1	1.45	1.75	c	0.08	0.15
A2	0.7	0.8	e	(0.5)		L	(0.4)	
a	(0.45)		e1	0.9	1.1	L1	0.2	0.4
D	1.5	1.7	b1	0.15	0.25	θ	0°	8°