

-20V, -12A P-Channel Power MOSFET

GENERAL DESCRIPTION

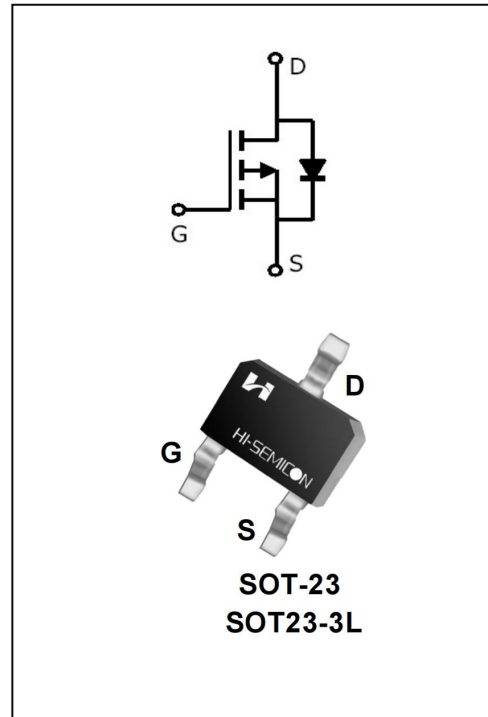
The Power MOSFET has extremely low on resistance, making it especially suitable for applications which require superior power density and outstanding efficiency.

Features

- ◆ $V_{DS} = -20V$, $I_D = -12A$
- ◆ $R_{DS(ON)}$
 TYP: $15m\Omega @ V_{GS} = -4.5V$
 TYP: $19m\Omega @ V_{GS} = -2.5V$

Applications

- ◆ Load Switch
- ◆ PWM Application
- ◆ Power Management



ORDERING INFORMATION

Part No.	Package	Marking	Material	Packing
SFS2012PT	SOT-23 SOT-23-3L	2012PT	Pb Free	Reel

ABSOLUTE MAXIMUM RATINGS ($T_J=25^{\circ}\text{C}$ unless otherwise noted)

Characteristics		Symbol	Ratings	Unit
Drain-Source Voltage		V_{DS}	-20	V
Gate-Source Voltage		V_{GS}	± 12	V
Drain Current	$T_C = 25^{\circ}\text{C}$	I_D	-12	A
	$T_C = 75^{\circ}\text{C}$		-7.8	
Drain Current Pulsed(Note 1)		I_{DM}	-60	A
Power Dissipation($T_C=25^{\circ}\text{C}$) -Derate above 25°C		P_D	2.6	W
Operation Junction Temperature Range		T_J	-55~+150	$^{\circ}\text{C}$
Storage Temperature Range		T_{stg}	-55~+150	$^{\circ}\text{C}$
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		TL	300	$^{\circ}\text{C}$

THERMAL CHARACTERISTICS

Characteristics	Symbol	MAX	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	49	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	96	$^{\circ}\text{C}/\text{W}$

ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain -Source Breakdown Voltage	$B_{V_{DS}}$	$V_{GS}= 0\text{V}, I_D= -250\mu\text{A}$	-20	--	--	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}= -20\text{V}, V_{GS}= 0\text{V}$	--	--	1	μA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}= 12\text{V}, V_{DS}= 0\text{V}$	--	--	100	nA
Gate-Source Leakage Current	I_{GSS}	$V_{GS}= -12\text{V}, V_{DS}= 0\text{V}$	--	--	-100	
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}= V_{DS}, I_D= -250\mu\text{A}$	-0.4	0.8	-1.0	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	$V_{GS}= -4.5\text{V}, I_D= -6.0\text{A}$	--	15	18	m Ω
		$V_{GS}= -2.5\text{V}, I_D= -3.0\text{A}$	--	19	23	
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}= -10\text{V}$ $V_{GS}= 0\text{V}$ $f=1.0\text{MHZ}$	--	1797	--	pF
Output Capacitance	C_{oss}		--	213	--	
Reverse Transfer Capacitance	C_{rss}		--	180	--	
Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}= -10\text{V}, V_{GS}= -4.5\text{V}$ $R_G= 3\Omega, I_b=-10\text{A}$ (Note 2.3)	--	8	--	nS
Turn-on Rise Time	t_r		--	35	--	
Turn-off Delay Time	$t_{d(off)}$		--	71	--	
Turn-off Fall Time	t_f		--	70	--	
Total Gate Charge	Q_g	$V_{DS}=-10\text{V}, I_D=-10\text{A}$ $V_{GS}=-4.5\text{V}$	--	16	--	nC
Gate-Source Charge	Q_{gs}		--	4	--	
Gate-Drain Charge	Q_{gd}		--	3	--	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N Junction Diode in the MOSFET	--	--	-12	A
Pulsed Source Current	I_{SM}		--	--	-36	
Diode Forward Voltage	V_{SD}	$I_S = -9A, V_{GS} = 0V$	--	-0.8	-1.2	V
Body Diode Reverse Recovery Time	T_{rr}	$I_F = -10A, di/dt = 100A/\mu s$	--	10	--	ns
Body Diode Reverse Recovery Charge	Q_{rr}		--	3	--	nC

NOTE:

1. Pulse width limited by maximum junction temperature
2. Pulse Test: Pulse width $\leq 300\mu s$, Duty cycles $\leq 2\%$
3. Essentially independent of operating temperature

Typical Performance Characteristics

Figure 1. Output Characteristics

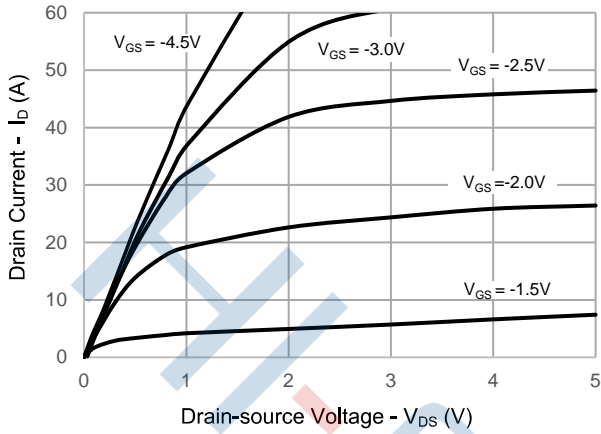


Figure 2. Transfer Characteristics

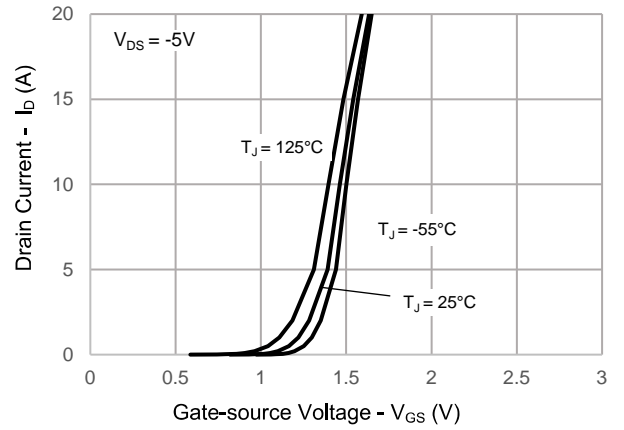


Figure 3. On-resistance vs. Drain Current

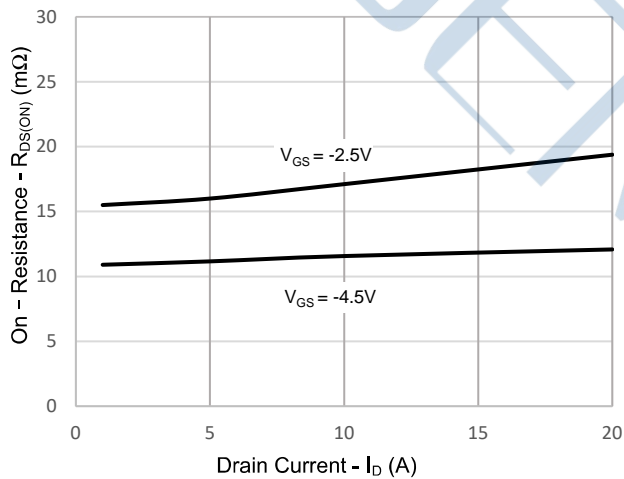


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

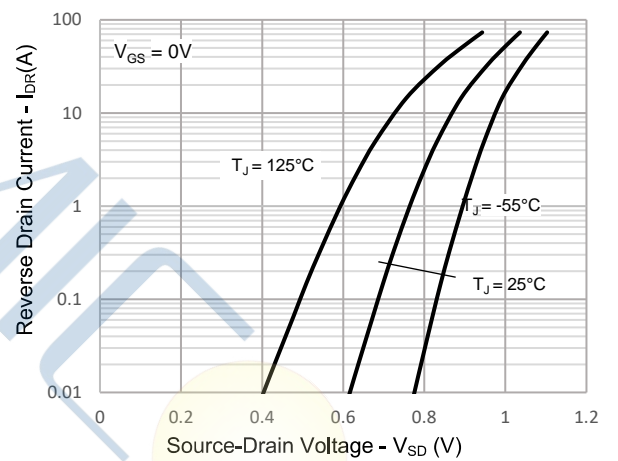


Figure 5. Capacitance Characteristics

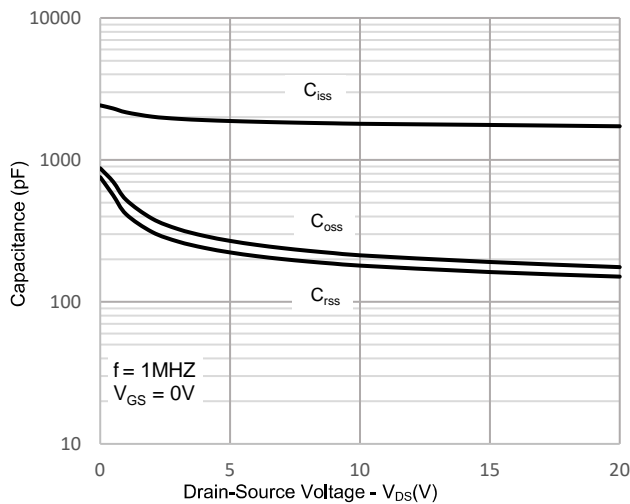
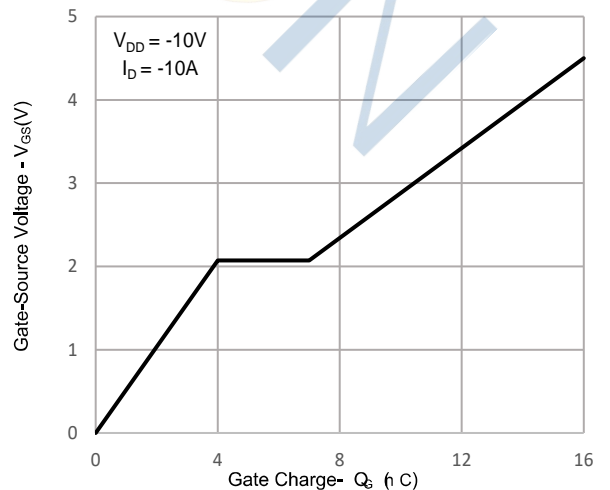


Figure 6. Gate Charge



Typical Performance Characteristics

Figure 7. Breakdown Voltage vs. Temperature Characteristics

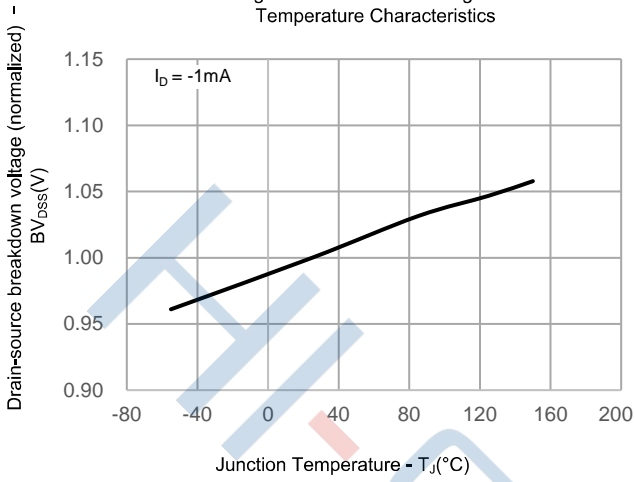


Figure 8. On-resistance vs. Temperature Characteristics

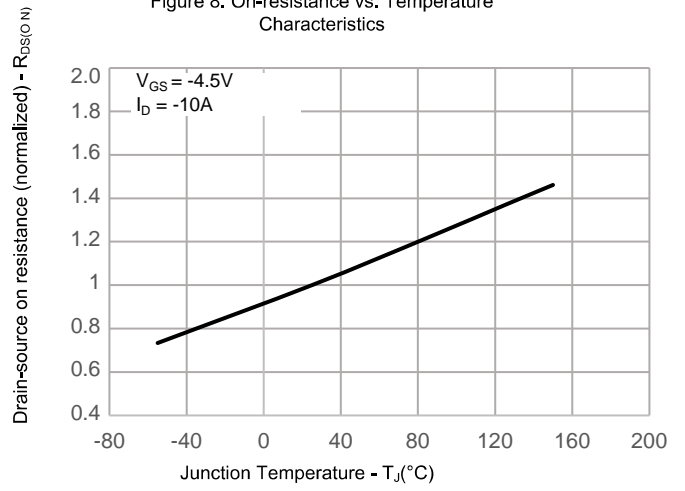
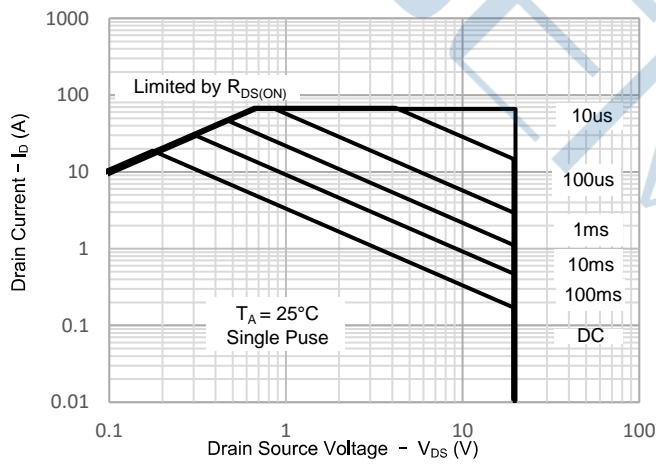
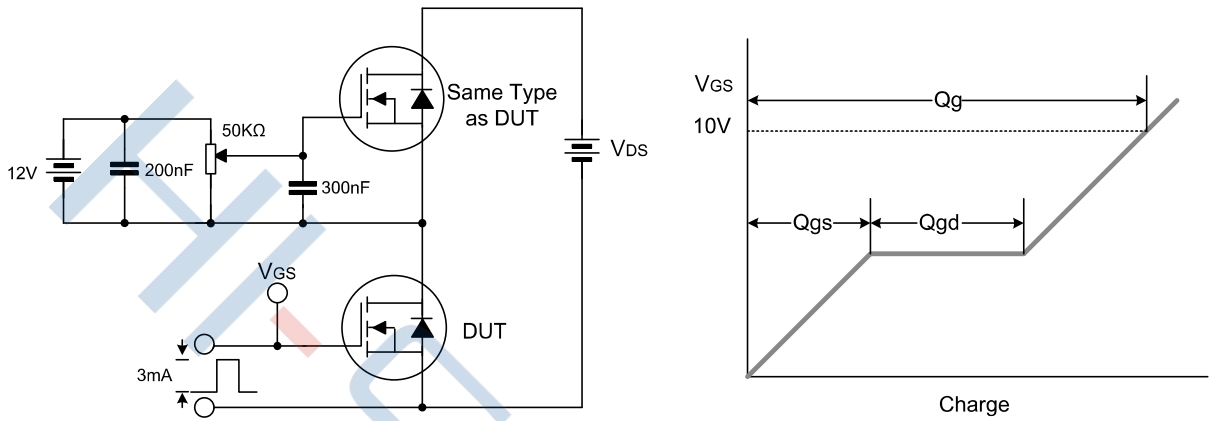


Figure 9. Max. Safe Operating Area

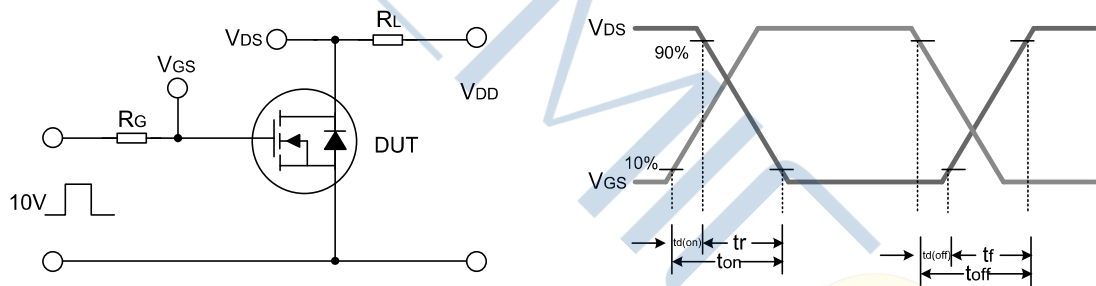


Test Circuit

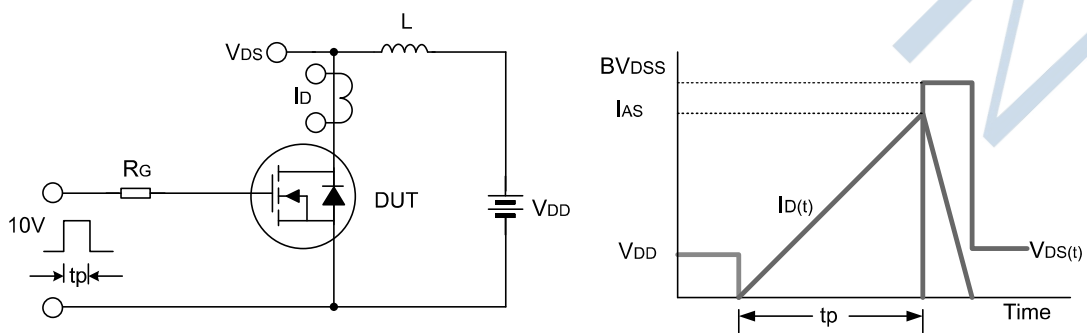
Gate Charge Test Circuit & Waveform



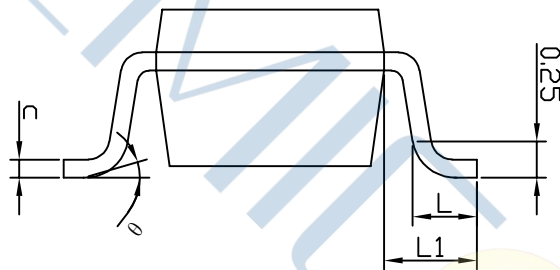
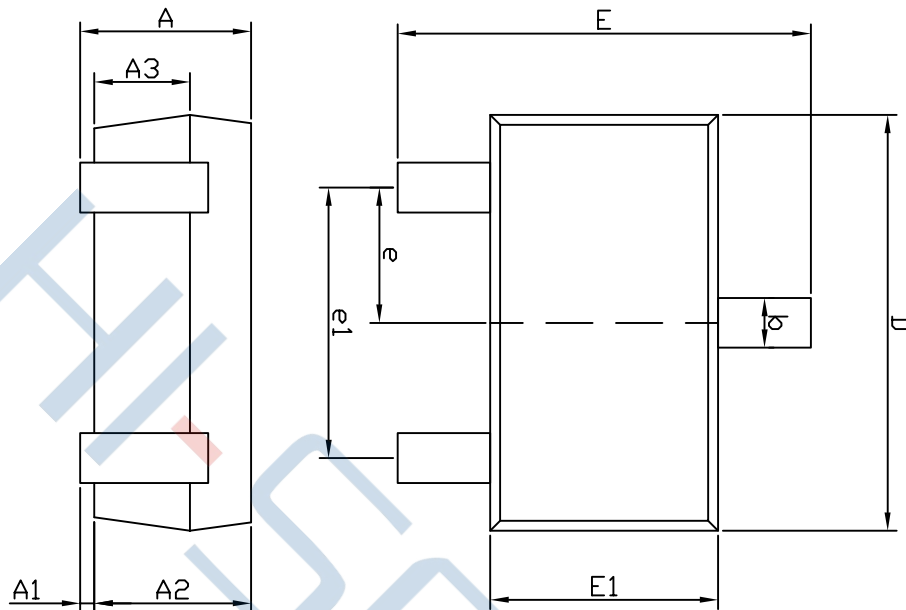
Resistive Switching Test Circuit & Waveform



Undamped Inductive Switching Test Circuit & Waveform



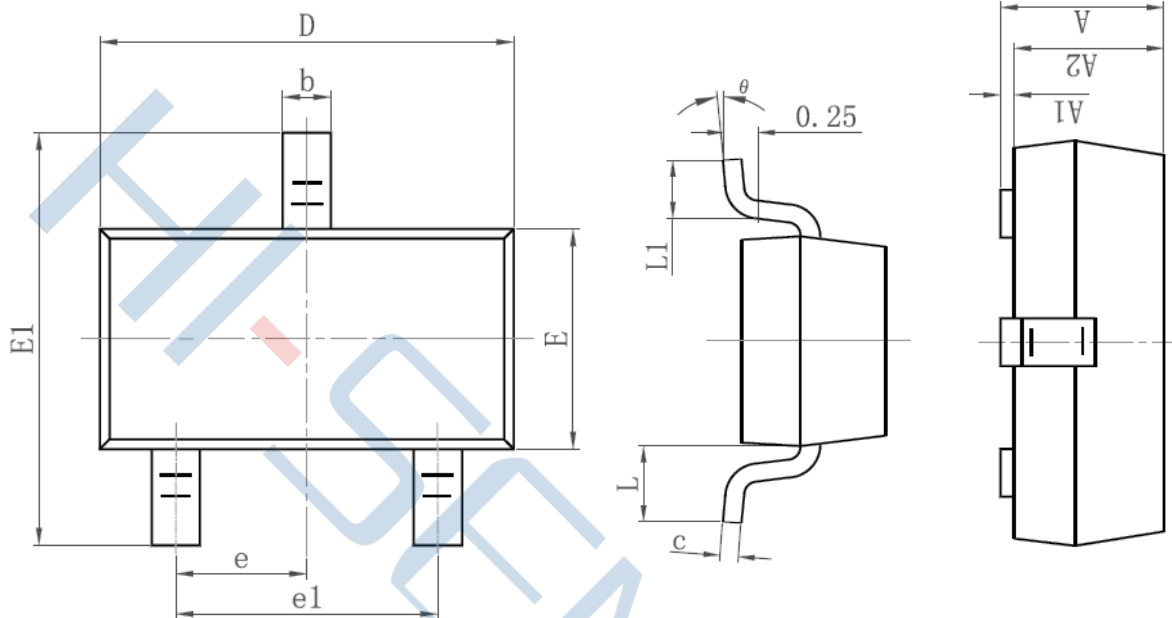
Package Dimensions of SOT-23-3L



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	-	-	1.25
A1	0.04	-	0.10
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.33	-	0.41
c	0.11	-	0.20
D	2.82	2.92	3.02
E	2.60	2.80	3.00
E1	1.50	1.60	1.70
e	0.95BSC		
e1	1.90BSC		
L	0.30	-	0.60
L1	0.60REF		
θ	0°	-	8°

Package Dimensions of SOT-23



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
theta	0°	8°

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