

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
60V	36mΩ@10V	4.5A



合肥矽普半导体

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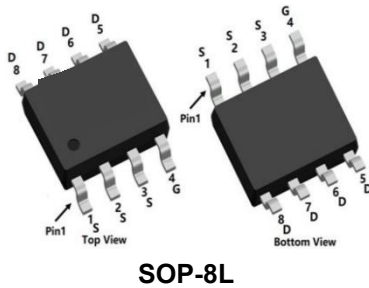
Feature

- Fast Switching
- Low Gate Charge and Rdson
- 100% Single Pulse avalanche energy Test

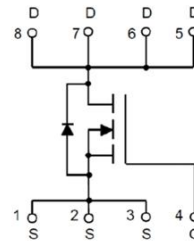
Applications

- Power Switching Application
- Hard switched and high frequency circuits
- Uninterruptible Power Supply

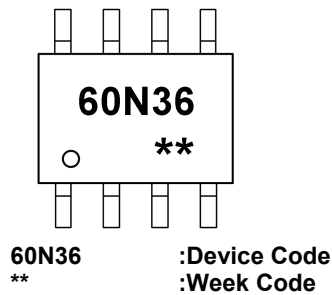
Package



Circuit Diagram



Marking



Order Information

Device	Package	Unit/Tape
SP60N36P8	SOP-8L	4000

Absolute maximum ratings (Ta=25°C, unless otherwise noted)

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current (Ta=25°C)	I_D	4.5	A
Continuous Drain Current (Ta=100°C)	I_D	3	A
Pulsed Drain Current	I_{DM}	18	A
Single pulsed avalanche energy ¹	E_{AS}	19	mJ
Power Dissipation (Ta=25°C)	P_D	2	W
Power Dissipation (Ta=100°C)	P_D	0.8	W
Thermal Resistance Junction-to-Ambient	$R_{\theta JA}$	62.5	°C/W
Storage Temperature Range	T_{STG}	-55 to 150	°C
Operating Junction Temperature Range	T_J	-55 to 150	°C

Electrical characteristics (Ta=25°C, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	VGS=0V , ID=250uA	60	-	-	V
Drain-Source Leakage Current	IDSS	VDS=48V , VGS=0V	-	-	1	uA
Gate-Source Leakage Current	IGSS	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	VGS(th)	VGS=VDS , ID=250uA	1.2	2.0	2.5	V
Static Drain-Source On-Resistance	RDS(ON)	VGS=10V , ID=2A	-	36	45	mΩ
Gate Resistance	RG	VDS=30V , VGS=0V , f=1MHz	-	1.44	-	Ω
Dynamic characteristics						
Input Capacitance	Ciss	VDS=30V , VGS=0V , f=1MHz	-	450	-	pF
Output Capacitance	Coss		-	60	-	
Reverse Transfer Capacitance	Crss		-	25	-	
Total Gate Charge	Qg	VDS=30V , VGS=10V , ID=2A	-	8.5	-	nC
Gate-Source Charge	Qgs		-	1.6	-	
Gate-Drain Charge	Qgd		-	2.2	-	
Gate Plateau Voltage	Vplateau		-	3	-	V
Switching Characteristics						
Turn-On Delay Time	Td(on)	VDD=30V , VGS=10V , RG=3Ω , ID=2A	-	4.7	-	nS
Rise Time	Tr		-	2.3	-	
Turn-Off Delay Time	Td(off)		-	15.7	-	
Fall Time	Tf		-	1.9	-	
Diode Characteristics						
Diode Forward Voltage	VSD	VGS=0V , IS=1A , TJ=25℃	-	-	1.2	V
Maximum Body-Diode Continuous Current	IS		-	-	4.5	A
Reverse Recovery Time	Trr	IS=2A , di/dt=100A/us , TJ=25℃	-	25	-	nS
Reverse Recovery Charge	Qrr		-	35	-	nC

Note:

1. The EAS Test condition is $V_{DD}=30V, V_{GS}=10V, L=0.5mH, R_G=25\Omega$

Typical Characteristics

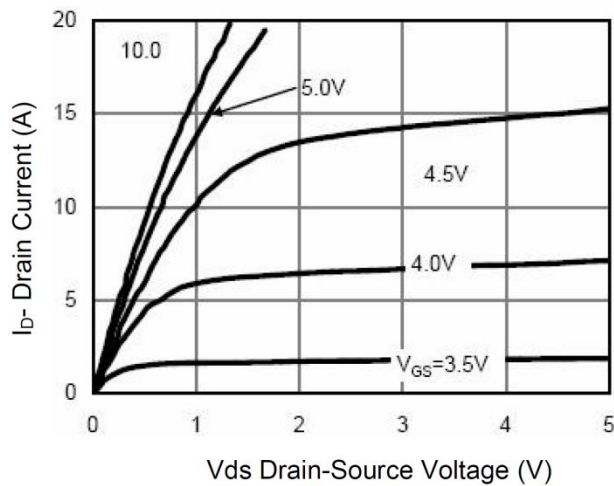


Figure 1 Output Characteristics

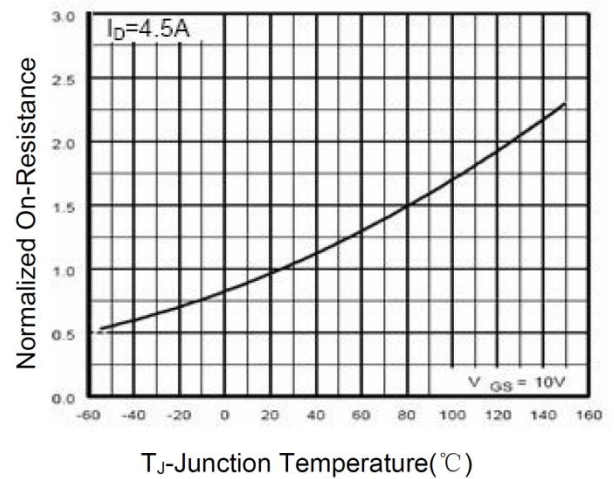


Figure 4 Rdson-Junction Temperature

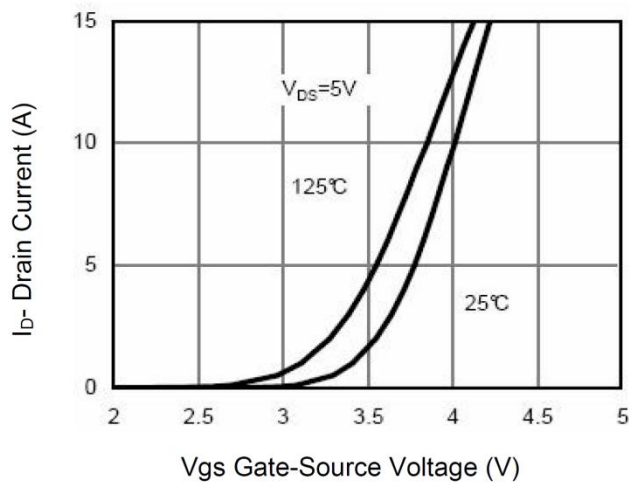


Figure 2 Transfer Characteristics

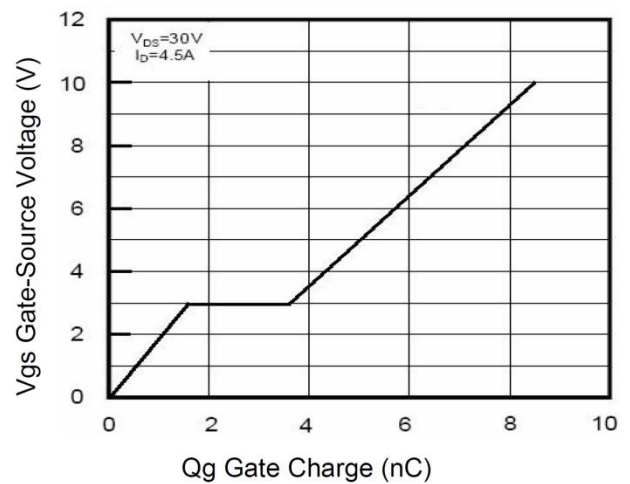


Figure 5 Gate Charge

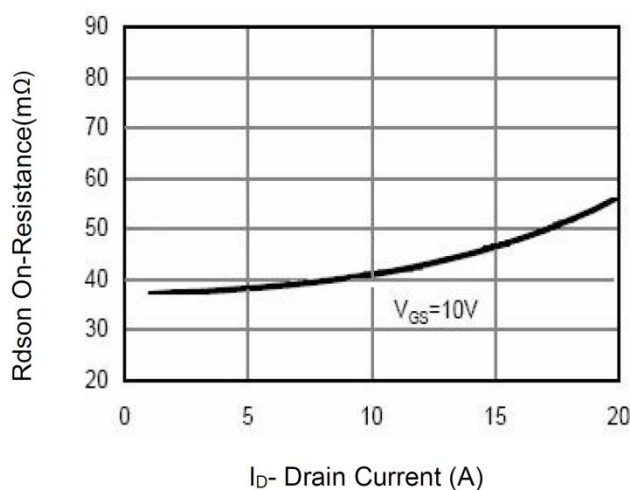


Figure 3 Rdson- Drain Current

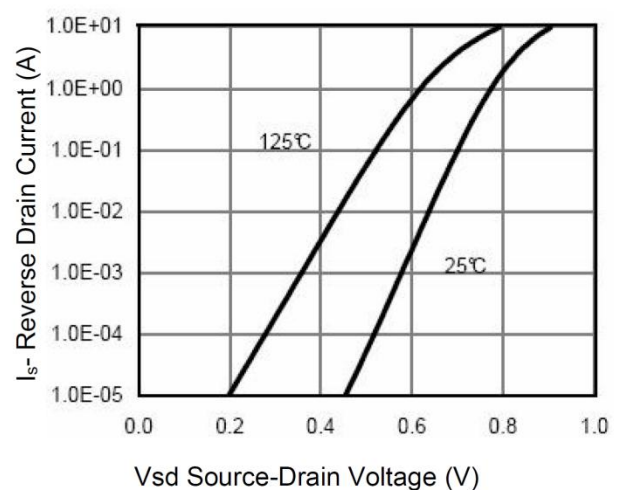
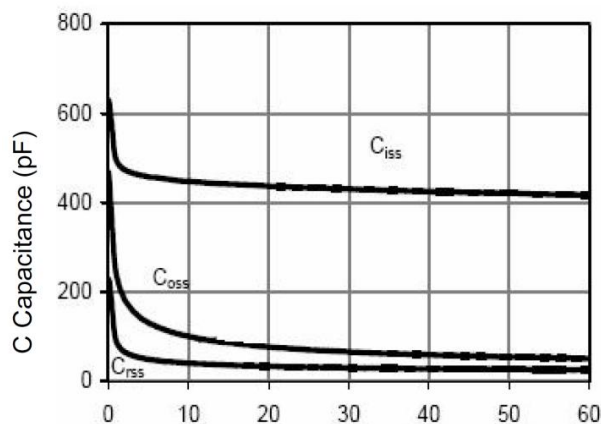
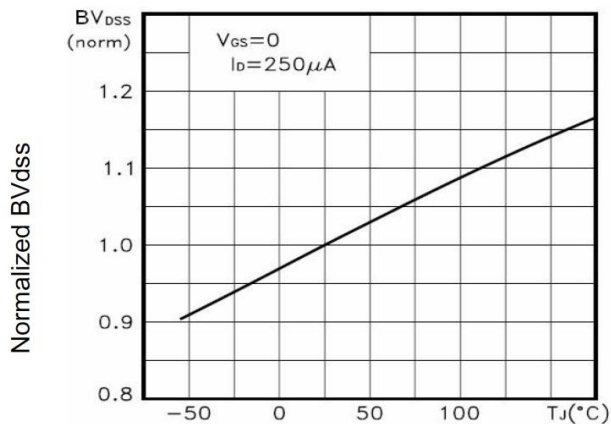


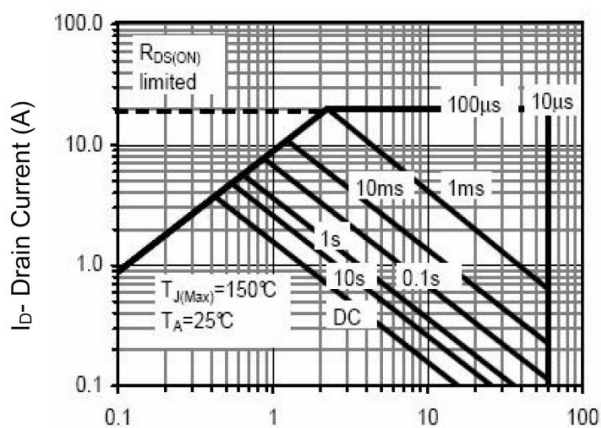
Figure 6 Source- Drain Diode Forward



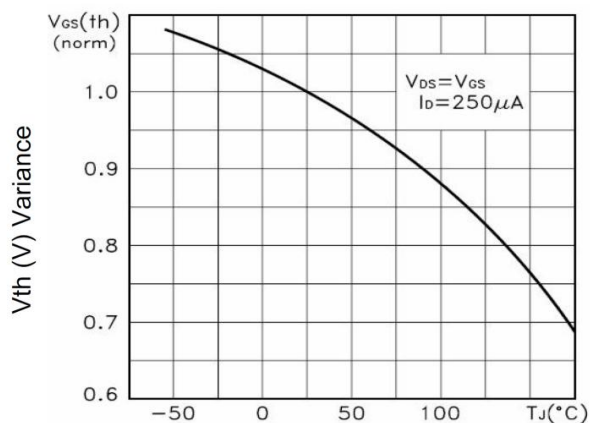
Vds Drain-Source Voltage (V)
Figure 7 Capacitance vs Vds



TJ-Junction Temperature(°C)
Figure 9 BV_{DSS} vs Junction Temperature



Vds Drain-Source Voltage (V)
Figure 8 Safe Operation Area



TJ-Junction Temperature(°C)
Figure 10 V_{GS(th)} vs Junction Temperature

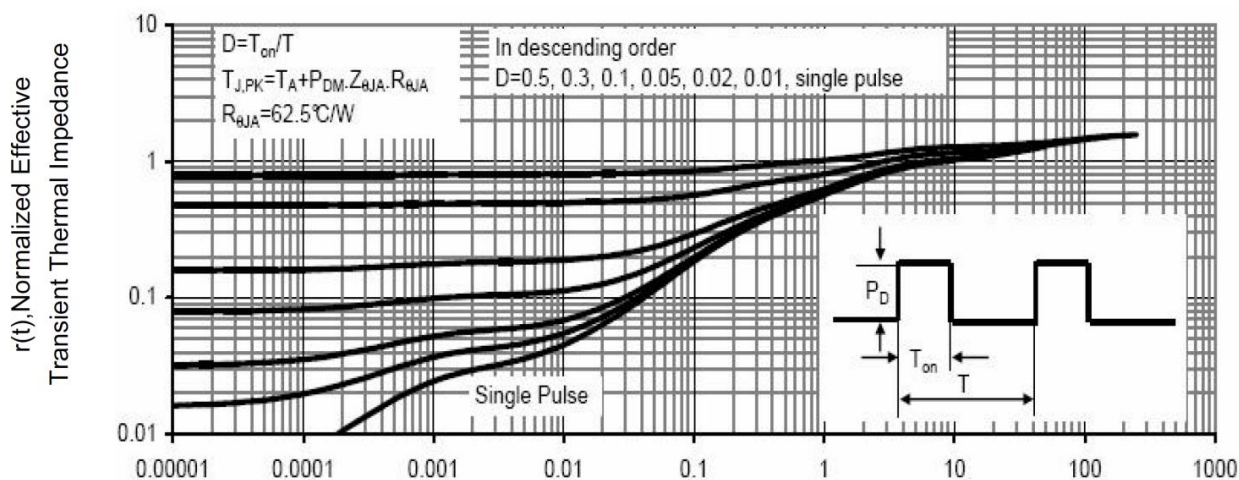
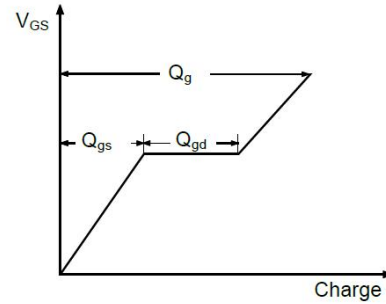
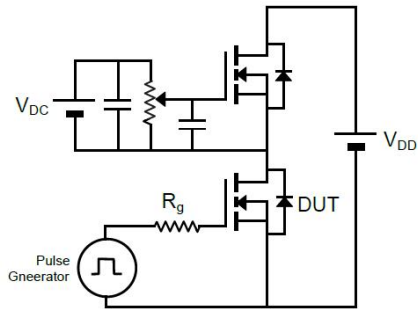


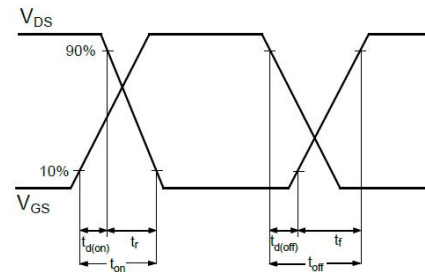
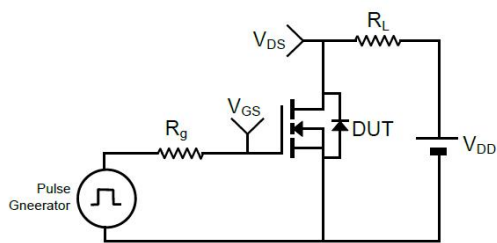
Figure 11 Normalized Maximum Transient Thermal Impedance

Test Circuit

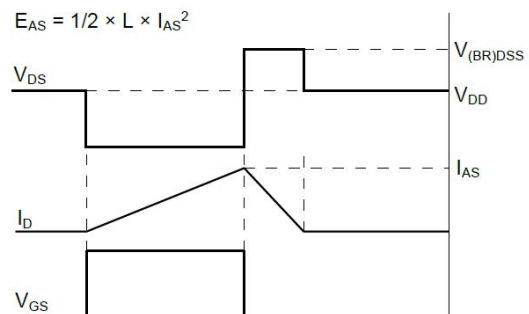
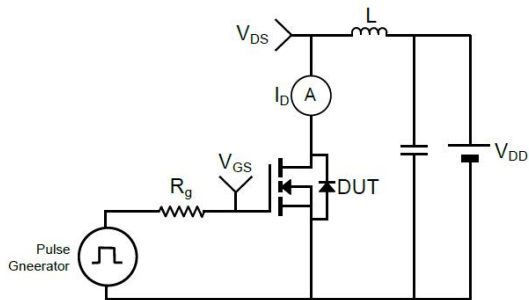
Gate Charge



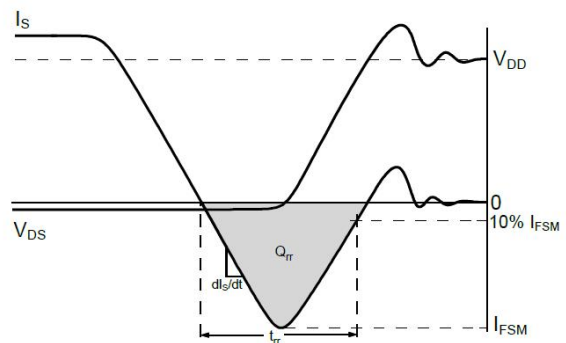
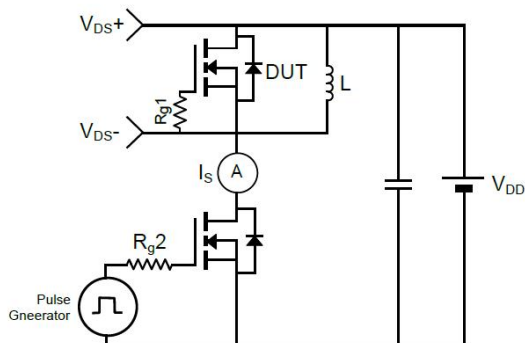
Resistive Load Switching Time



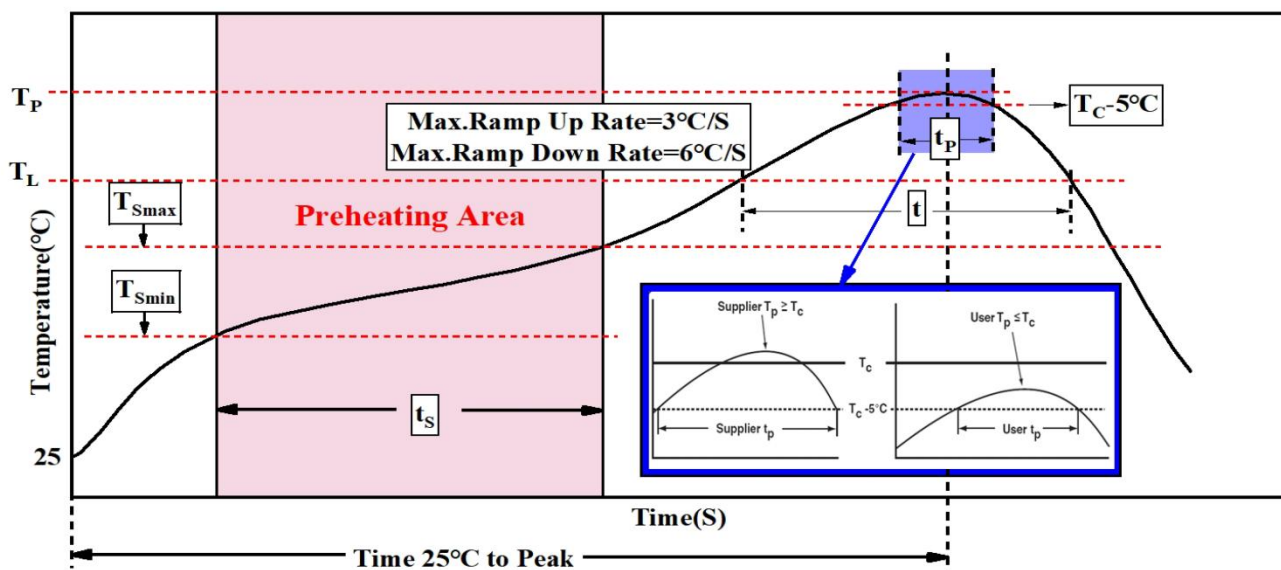
Un-clamped Inductive Load Switching



Drain-Source Body Diode Reverse Recovery



Temperature Profile for IR Reflow Soldering



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{Smin})	100°C	150°C
Temperature max (T_{Smax})	150°C	200°C
Time (T_{Smin} to T_{Smax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{Smax} to T_P)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L)	183 °C	217°C
Time at liquidous (t_L)	60-150 seconds	60-150 seconds
Peak package body Temperature e (T_P)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_P)** within 5°C of the specified classification temperature (T_C)	20** seconds	30** seconds
Average ramp-down rate (T_P to T_{Smax})	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (T_P) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (t_P) is defined as a supplier minimum and a user maximum		

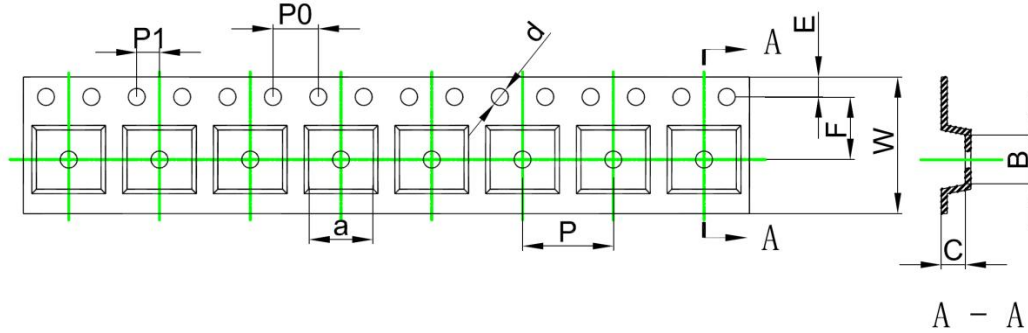
Table 1. SnPb Eutectic Process – Classification Temperatures (T_C)

Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2. Pb-free Process – Classification Temperatures (T_C)

Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

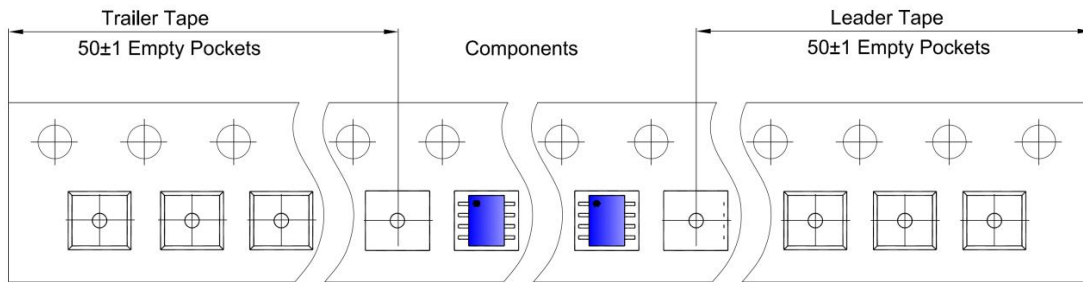
SOP8 Embossed Carrier Tape



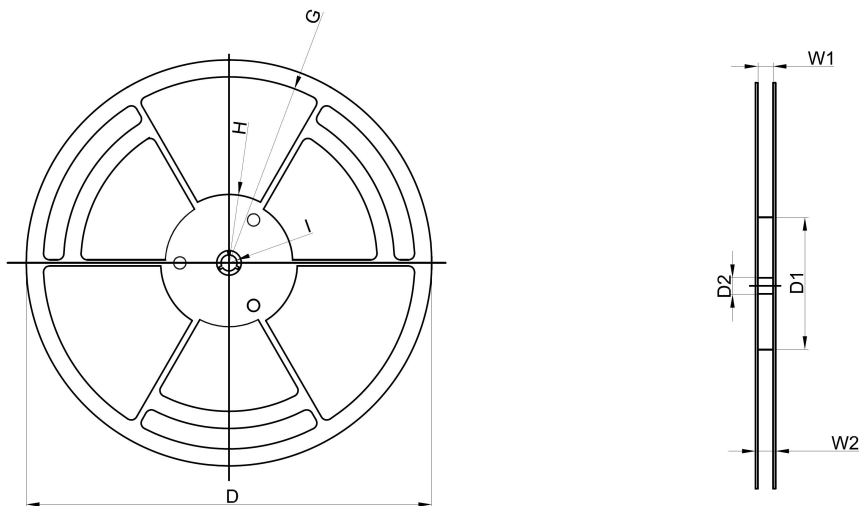
Dimensions are in millimeter

Pkg type	a	B	c	d	E	F	P0	P	P1	W
SOP-8	6.40	5.40	2.10	Φ1.50	1.75	5.50	4.00	8.00	2.00	12.00

SOP8 Tape Leader and Trailer



SOP8 Reel

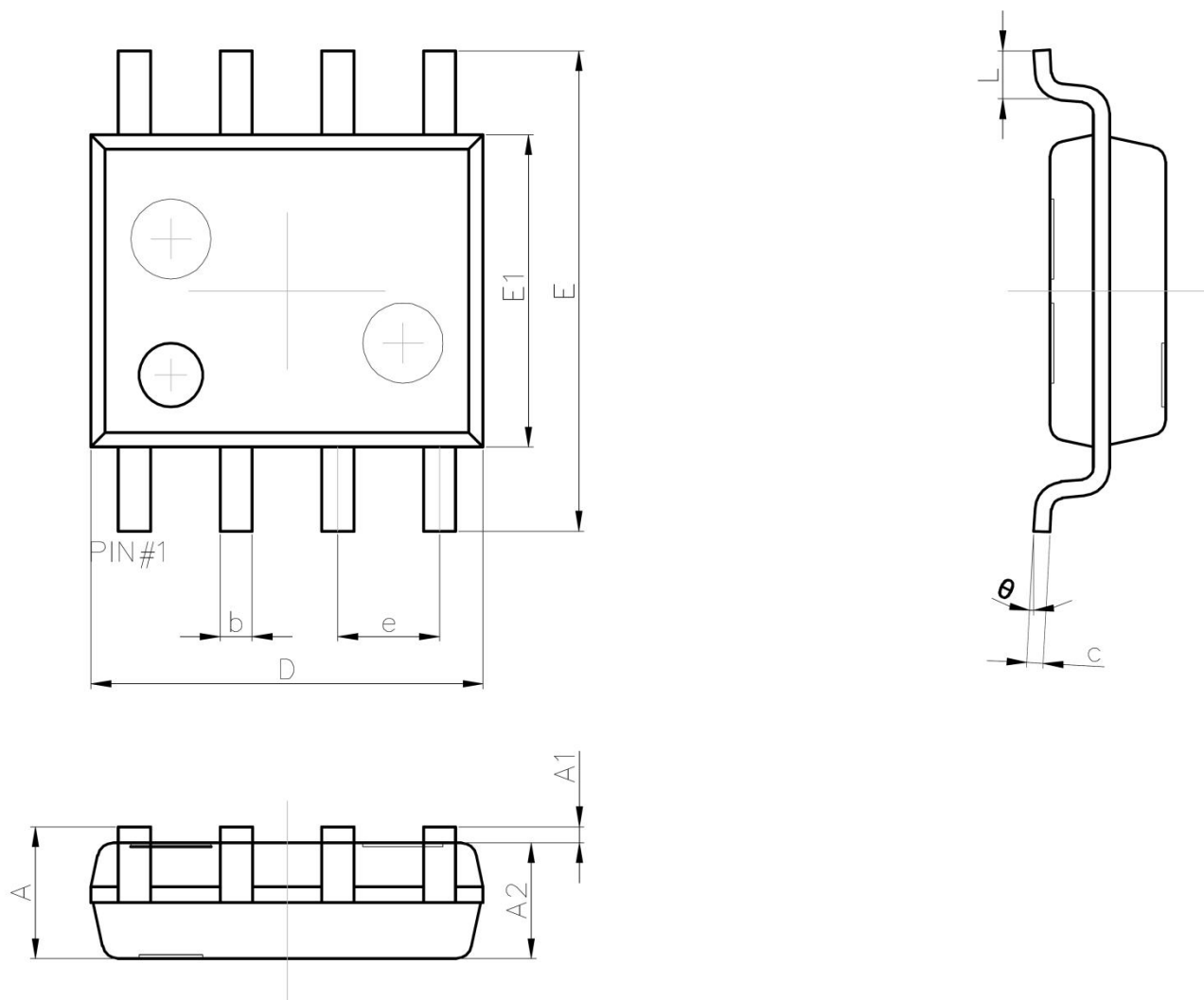


Dimensions are in millimeter

Reel Option	D	D1	D2	G	H	I	W1	W2
13" Dia	Ø330.00	100.00	13.00	R151.00	R56.00	R6.50	12.40	17.60

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
4,000 pcs	13 inch	8,000 pcs	360×360×65	40,000 pcs	565×380×390	

SOP-8L Package Information



Symbol	Dimensions In Millimeters	
	Min.	Max.
A	1.35	1.75
A1	0.10	0.25
A2	1.35	1.55
b	0.33	0.51
c	0.17	0.25
D	4.80	5.00
e	1.27 REF.	
E	5.80	6.20
E1	3.80	4.00
L	0.40	1.27
θ	0°	8°