SDP04N40
SDF04N40

SamHop Microelectronics Corp.

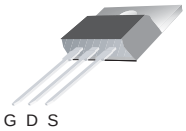
Ver 1.3

N-Channel Enhancement Mode Field Effect Transistor

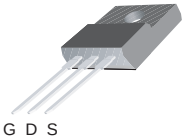
PRODUCT SUMMARY		
V_{DSS}	I_D	$R_{DS(ON)}$ (Ω) Typ
400V	4A	3.0 @ VGS=10V

FEATURES

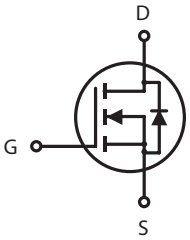
- Super high dense cell design for low $R_{DS(ON)}$.
- Rugged and reliable.
- TO-220 and TO-220F Package.



SDP SERIES
TO-220



SDF SERIES
TO-220F



ORDERING INFORMATION

Ordering Code	Package	Marking Code	Delivery Mode	RoHS Status
SDP04N40HZ	TO-220	SDP04N40	Tube	Halogen Free
SDP04N40PZ	TO-220	04N40	Tube	Pb Free
SDF04N40HZ	TO-220F	SDF04N40	Tube	Halogen Free
SDF04N40PZ	TO-220F	04N40	Tube	Pb Free

ABSOLUTE MAXIMUM RATINGS (T_C=25°C unless otherwise noted)

Symbol	Parameter		SDP04N40	SDF04N40	Units
V_{DS}	Drain-Source Voltage		400		V
V_{GS}	Gate-Source Voltage		±30	±30	V
I_D	Drain Current-Continuous [a]	T_C=25°C	4	4	A
		T_C=100°C	2.8	2.8	A
I_{DM}	-Pulsed [a]		11	11	A
E_{AS}	Single Pulse Avalanche Energy [c]		81		mJ
P_D	Maximum Power Dissipation	T_C=25°C	75	25	W
		T_C=100°C	37.5	12.5	W
T_J, T_{STG}	Operating Junction and Storage Temperature Range		-55 to 175		°C

THERMAL CHARACTERISTICS

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2	6	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	°C/W

ELECTRICAL CHARACTERISTICS (T_C=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
OFF CHARACTERISTICS						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	400			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=320V , V_{GS}=0V			1	uA
I_{GSS}	Gate-Body Leakage Current	V_{GS}= ±30V , V_{DS}=0V			±100	nA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS} , I_D=250uA	2	3	4	V
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=10V , I_D=2A		3.0	3.9	ohm
g_{FS}	Forward Transconductance	V_{DS}=10V , I_D=2A		1.3		S
DYNAMIC CHARACTERISTICS [b]						
C_{ISS}	Input Capacitance	V_{DS}=25V,V_{GS}=0V f=1.0MHz		183		pF
C_{OSS}	Output Capacitance			30		pF
C_{RSS}	Reverse Transfer Capacitance			6		pF
SWITCHING CHARACTERISTICS [b]						
$t_{D(ON)}$	Turn-On Delay Time	V_{DD}=200V I_D=1A V_{GS}=10V R_{GEN}= 6 ohm		9.5		ns
tr	Rise Time			10		ns
$t_{D(OFF)}$	Turn-Off Delay Time			15.4		ns
tf	Fall Time			5.2		ns
Q_g	Total Gate Charge	V_{DS}=200V,I_D=1A,V_{GS}=10V		2.8		nC
Q_{gs}	Gate-Source Charge	V_{DS}=200V,I_D=1A, V_{GS}=10V		0.95		nC
Q_{gd}	Gate-Drain Charge			0.92		nC
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
V_{SD}	Diode Forward Voltage	V_{GS}=0V,I_S=1A		0.82	1.4	V

Notes

a.Drain current limited by maximum junction temperatrue.
b.Guaranteed by design, not subject to production testing.
c.Starting T_J=25°C,L=50mH,V_{DD} = 50V.(See Figure12)

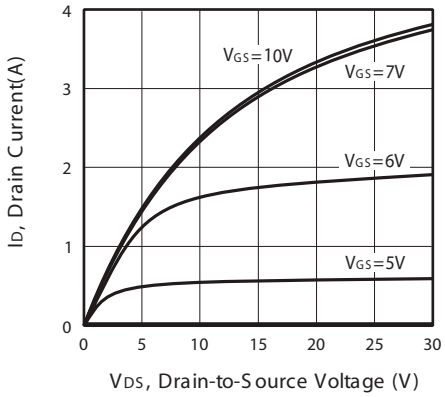


Figure 1. Output Characteristics

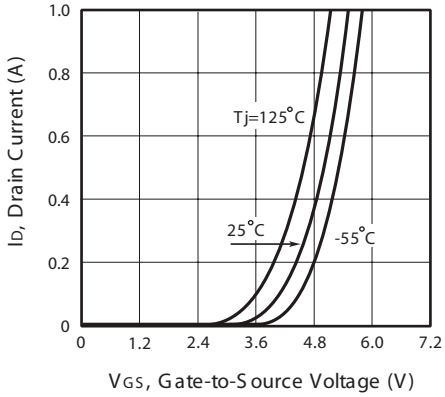


Figure 2. Transfer Characteristics

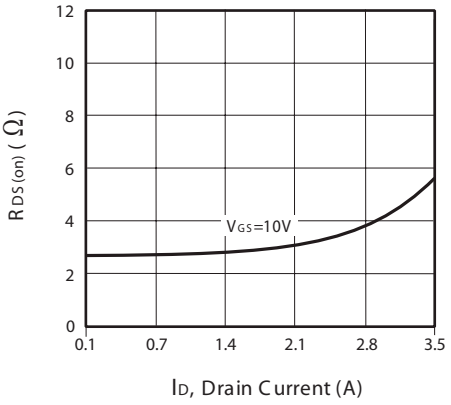


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

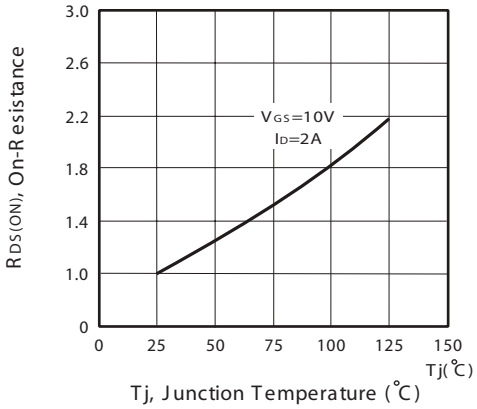


Figure 4. On-Resistance Variation with Drain Current and Temperature

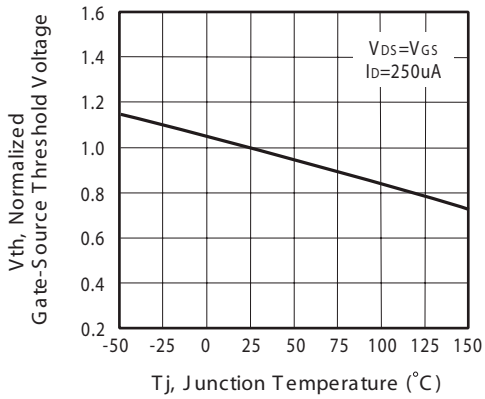


Figure 5. Gate Threshold Variation with Temperature

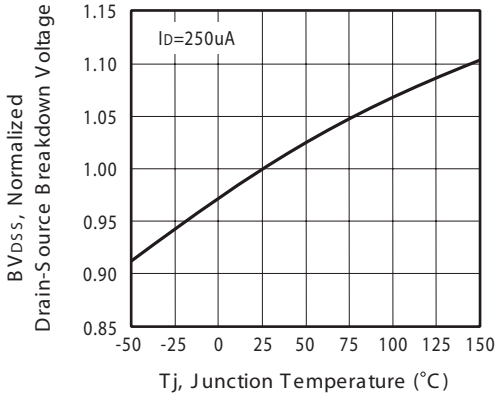


Figure 6. Breakdown Voltage Variation with Temperature

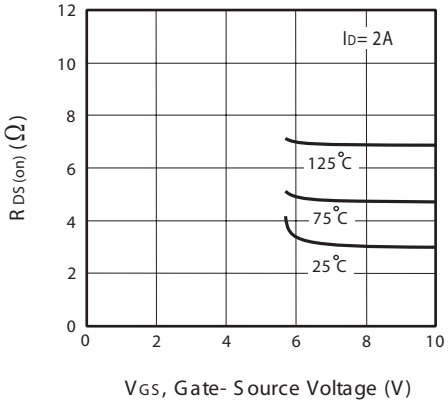


Figure 7. On-Resistance vs. Gate-Source Voltage

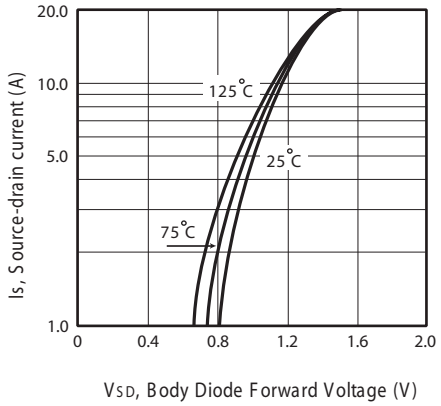


Figure 8. Body Diode Forward Voltage Variation with Source Current

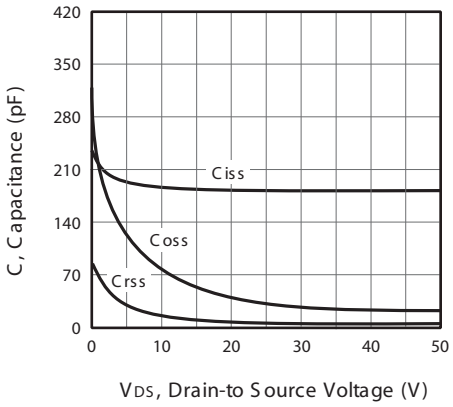


Figure 9. Capacitance

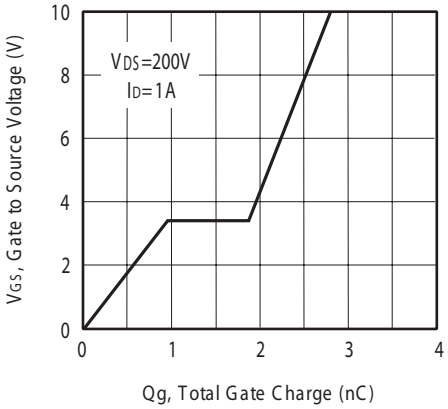


Figure 10. Gate Charge

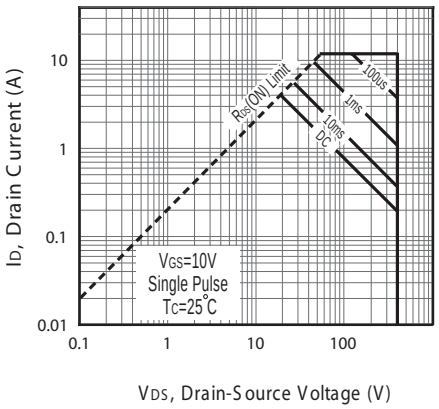


Figure 11a. Maximum Safe Operating Area for SDP04N40

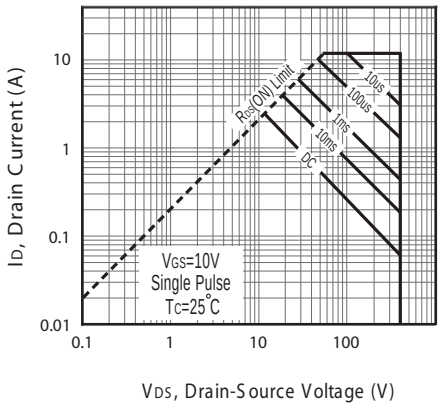
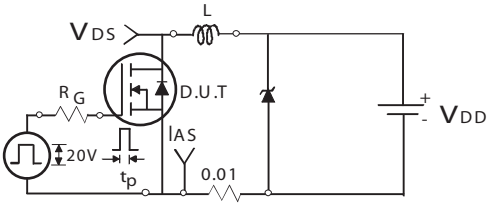
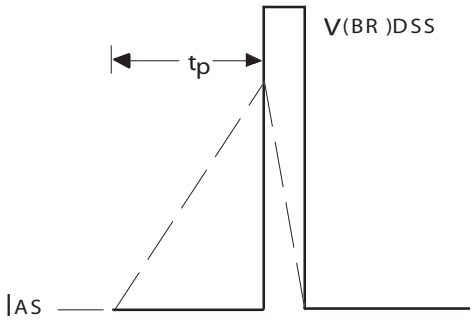


Figure 11b. Maximum Safe Operating Area for SDF04N40



Unclamped Inductive Test Circuit

Figure 12a.



Unclamped Inductive Waveforms

Figure 12b.

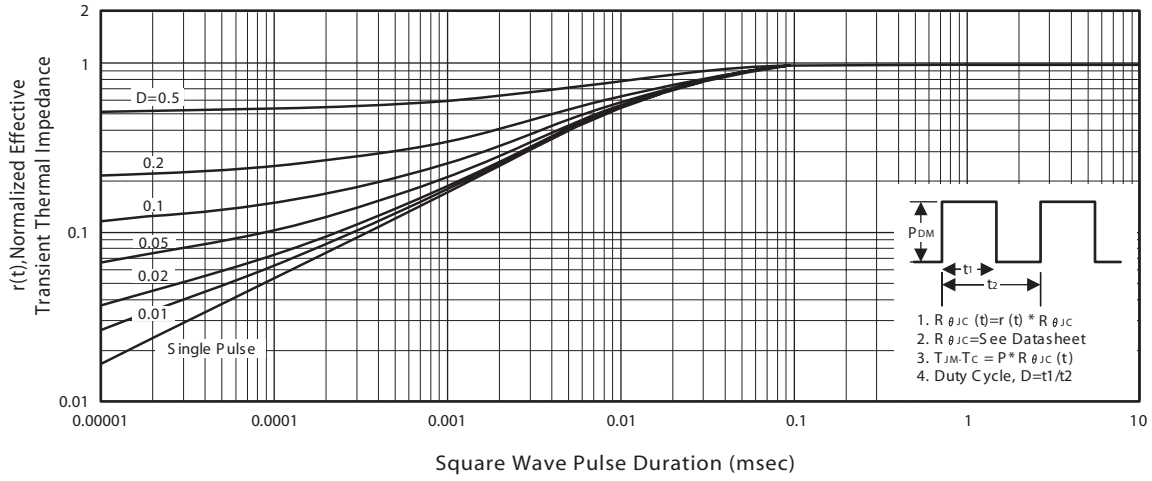


Figure 13a. Normalized Thermal Transient Impedance Curve for SDP04N40

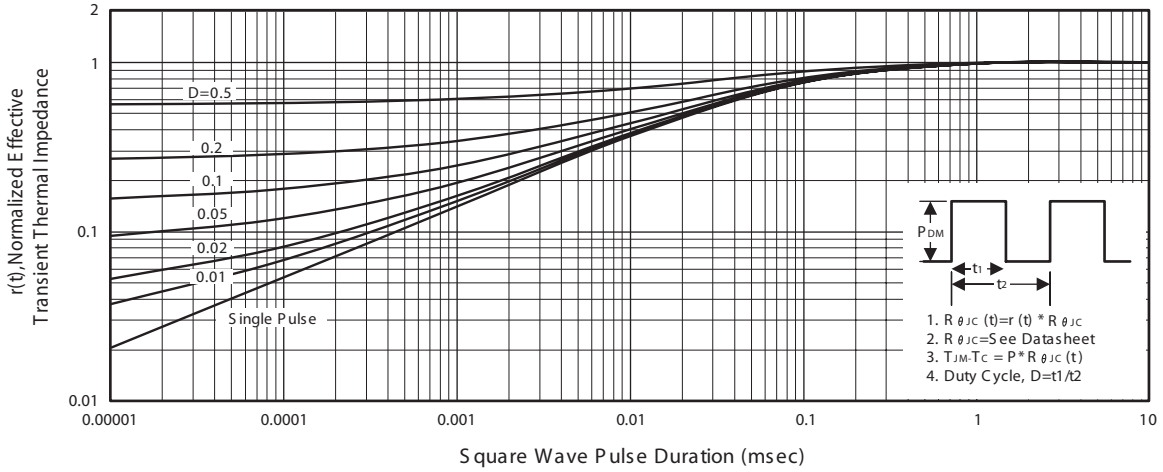
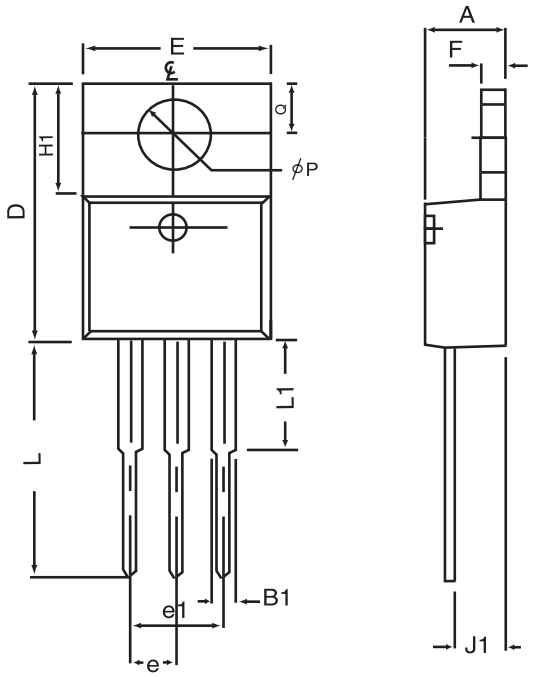


Figure 13b. Normalized Thermal Transient Impedance Curve for SDF04N40

PACKAGE OUTLINE DIMENSIONS

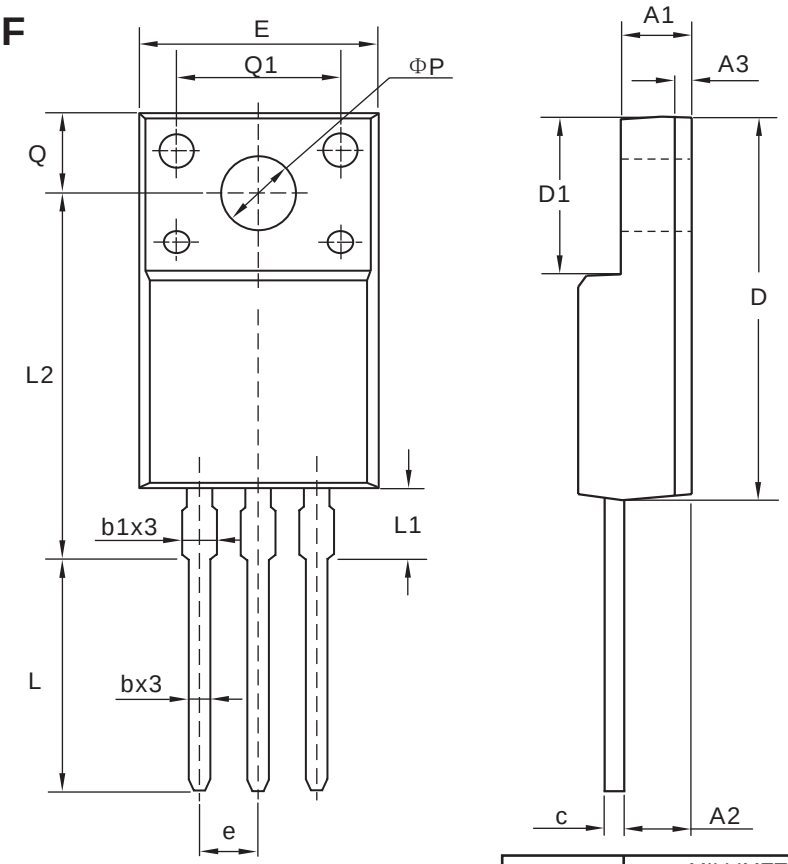
TO-220

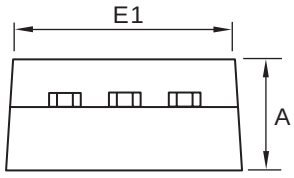


SYMBOLS	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.32	4.80	0.170	0.189
B1	1.27	1.65	0.050	0.630
D	14.6	16.00	0.575	0.610
E	9.70	10.41	0.382	0.410
e	2.34	2.74	0.092	0.108
e1	4.68	5.48	0.184	0.216
F	1.14	1.40	0.045	0.055
H1	5.97	6.73	0.235	0.265
J1	2.20	2.79	0.087	0.110
L	12.88	14.22	0.507	0.560
L1	3.00	6.35	0.120	0.250
φP	3.50	3.94	0.138	0.155
Q	2.54	3.05	0.100	0.120

PACKAGE OUTLINE DIMENSIONS

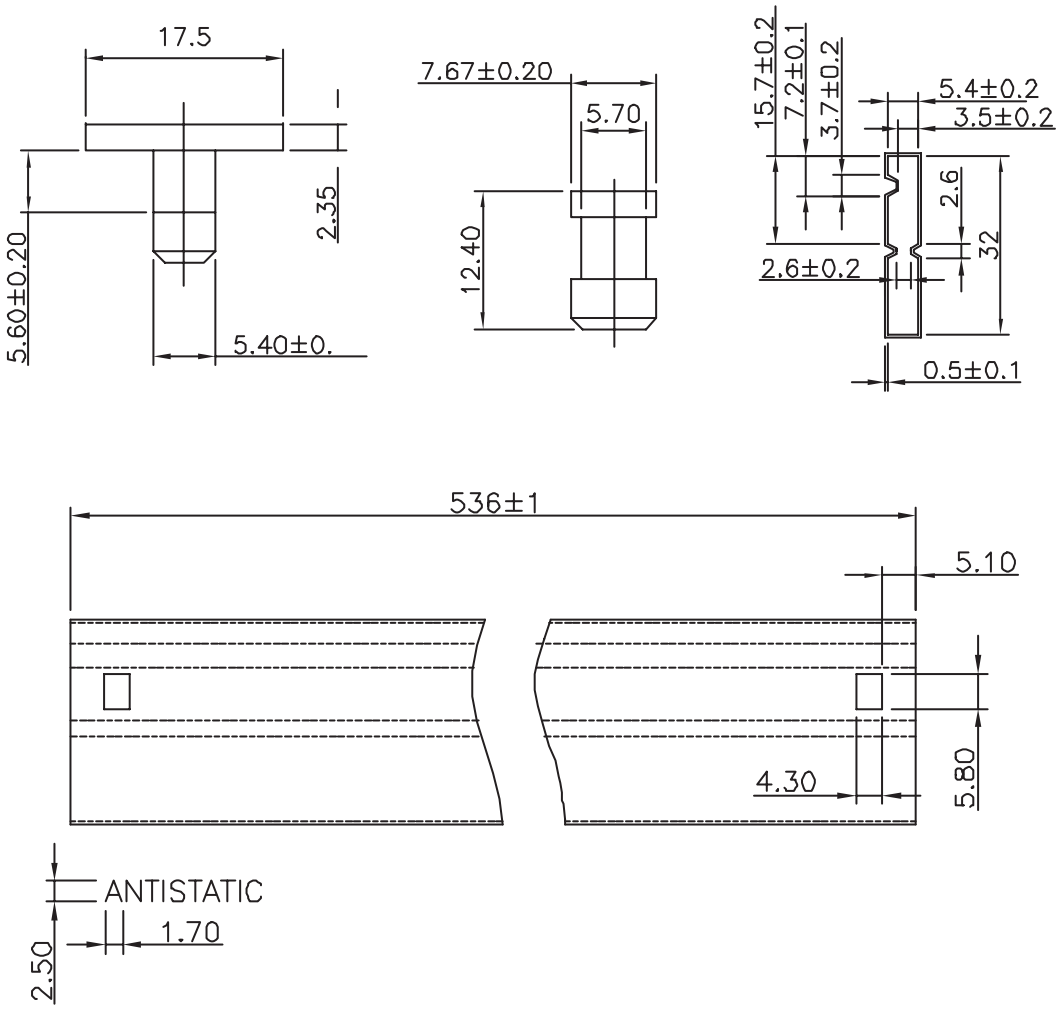
TO-220F



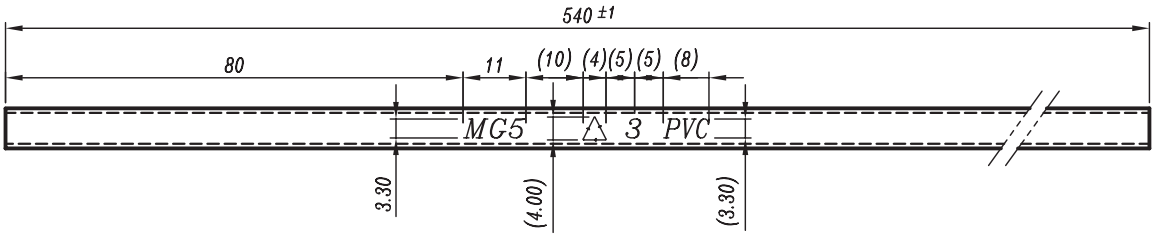


SYMBOL	MILLIMETERS	
	MIN	MAX
A	4.50	4.90
A1	2.35	2.75
A2	2.15	2.92
A3	0.50	0.65
b	0.70	0.90
b1	1.15	1.55
c	0.45	0.70
D	15.30	16.30
D1	6.67	6.77
E	9.90	10.32
E1	9.20	9.40
e	2.54 REF.	
L	9.45	10.05
L1	2.79	3.60
L2	15.60	16.00
Q	3.20	3.40
Q1	6.90	7.10
ΦP	2.90	3.55

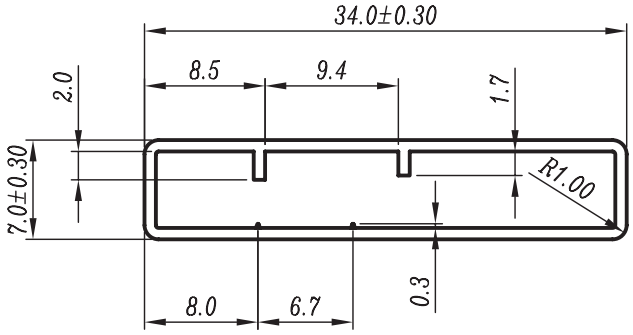
TO-220 Tube


17.5
2.35
5.60±0.20
5.40±0.
7.67±0.20
5.70
12.40
15.7±0.2
7.2±0.1
3.7±0.2
5.4±0.2
3.5±0.2
2.6
32
2.6±0.2
0.5±0.1
536±1
5.10
4.30
5.80
ANTISTATIC
1.70
2.50

TO-220F Tube



t=0.8 ±0.15



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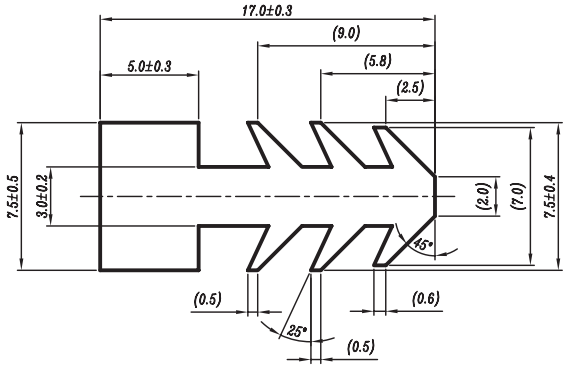
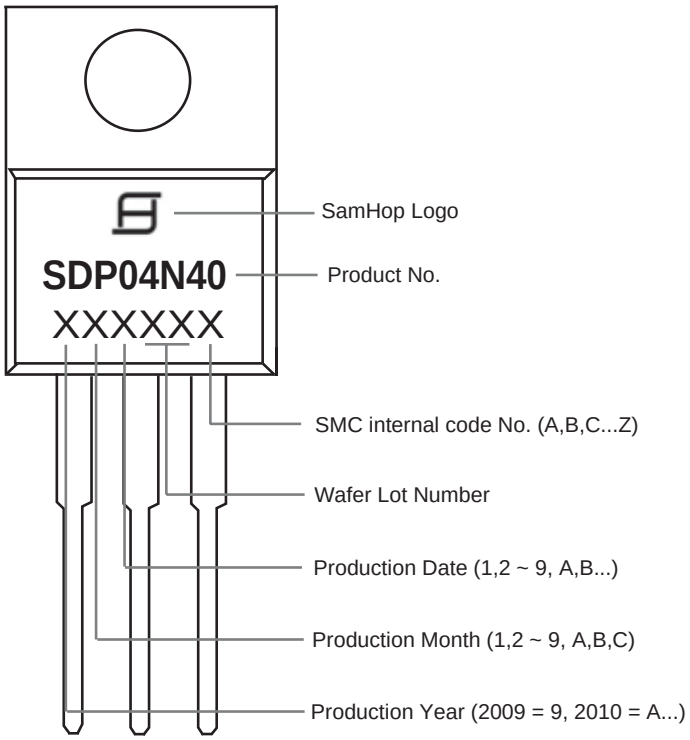


L=8.0 $^{+0.5}_{-1}$

TOP MARKING DEFINITION

TO-220 (Halogen Free)



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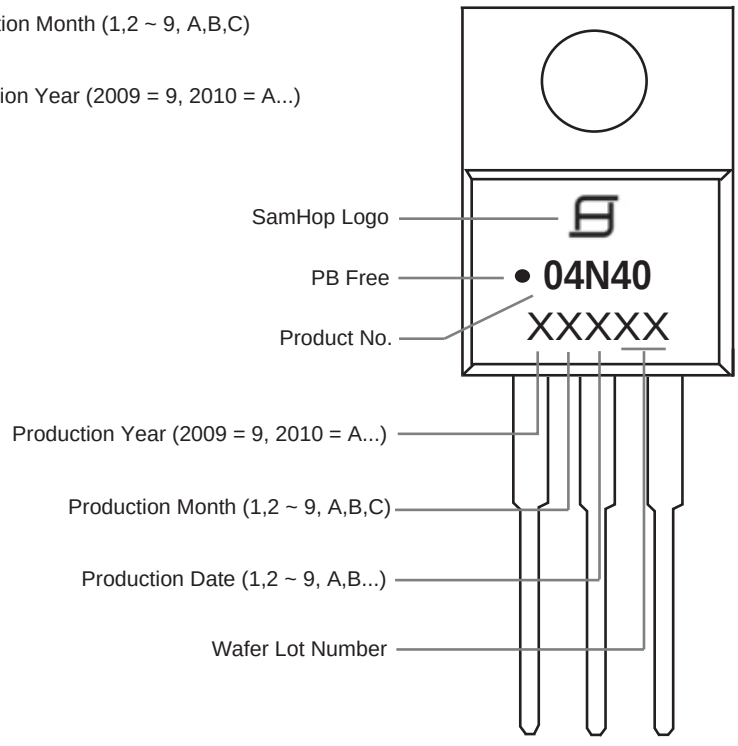
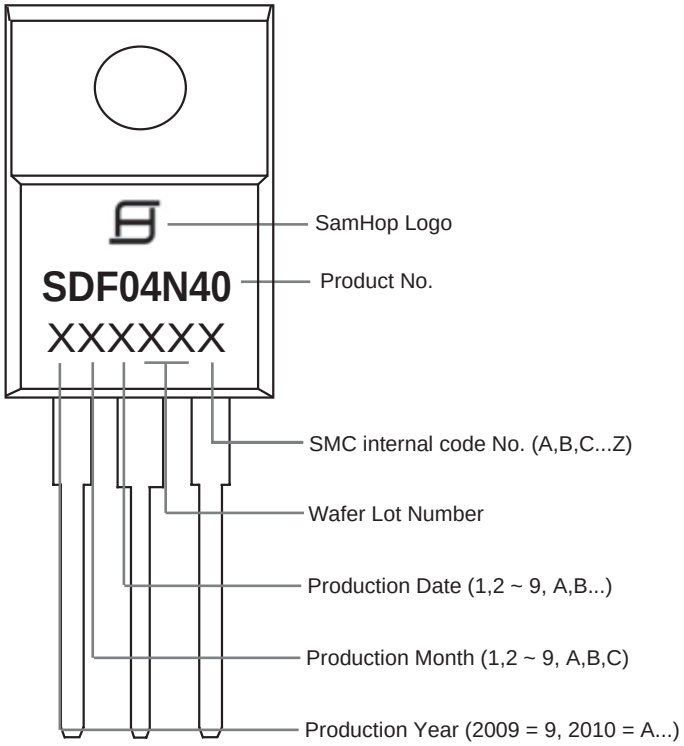


TOP MARKING DEFINITION

TO-220F (Halogen Free)



TO-220F (Pb Free)