

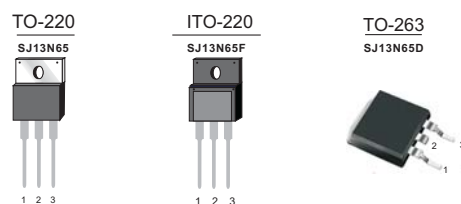
FEATURES

- $R_{DS(ON)} < 0.38\Omega @ V_{GS} = 10V$
- 100% avalanche tested
- RoHS compliant

Product Summary			
V _{DS}	R _{DS(on)} (Ω) Typ	I _D (A)	Q _g (Typ)
650V	0.34@10V	13	34nc

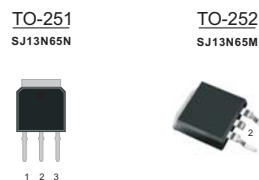
MECHANICAL DATA

- Case: TO-220, ITO-220, TO-251, TO-252, TO-263 package



Ordering Information

Part No.	Package Type	Package	Quality(box)
SJ13N65	TO-220	Tube	1000
SJ13N65F	ITO-220	Tube	1000
SJ13N65D	TO-263	Tape & Reel	800
SJ13N65M	TO-252	Tape & Reel	3000
SJ13N65N	TO-251	Tube	1000



Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

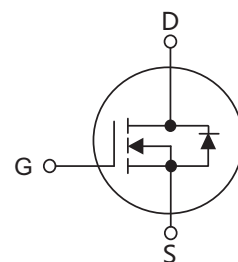


Table1 Absolute Maximum Ratings (T_c=25°C, unless otherwise specified)

Parameter	Symbol	TO-220/TO-263	ITO-220	Unit
		TO-251/TO-252		
Drain-Source Voltage	V _{DS}	650		V
Gate-Source Voltage	V _{GS}	±30		V
Continuous Drain Current	I _D	T _c =25°C	13	A
		T _c =100°C	9	
Pulsed Drain Current (Note 1)	I _{DM}	46		A
Single Pulse Avalanche Energy(Note 2)	E _{AS}	280		mJ
Avalanche Current(Note 1)	I _{AR}	2.3		A
Repetitive Avalanche Energy(Note 1)	E _{AR}	1.2		mJ
Peak Diode Recovery dv/dt(Note 3)	dv/dt	15		V/ns
Drain Source voltage slope(V _{DS} =480V)	dV _{DS} /dt	50		V/ns
Power Dissipation T _c =25°C	P _D	151	35	W
Operating Junction and Storage Temperature	T _J /T _{STG}	-55 ~ +150		°C
Maximum Temperature for soldering	T _L	300		°C

SJ13N65 Series

Table 2. Thermal Characteristics

Parameter	Symbol	TO-220/TO-263	ITO-220	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62	62	$^{\circ}C/W$
Thermal resistance Junction to Case	$R_{\theta JC}$	0.82	3.57	$^{\circ}C/W$

Table 3. Electrical Characteristics ($T_J=25^{\circ}C$, unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	650	--	--	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$	--	--	1	μA
Gate- Source Leakage Current	Forward	I_{GSS}	--	--	100	nA
	Reverse				-100	nA
On Characteristics(Note 4)						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2.5	--	4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=6.5A$	--	0.34	0.38	Ω
Dynamic Characteristics(Note 5)						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1MHz$	--	780	--	pF
Output Capacitance	C_{OSS}		--	23	--	pF
Reverse Transfer Capacitance	C_{RSS}		--	1.9	--	pF
Switching Characteristics (Note 5)						
Turn-On Delay Time	$t_d(on)$	$V_{DD}=400V, I_D=6.5A,$ $R_G=20\Omega$	--	17	--	ns
Turn-On Rise Time	t_R		--	12	--	ns
Turn-Off Delay Time	$t_d(off)$		--	130	--	ns
Turn-Off Fall Time	t_f		--	10	--	ns
Total Gate Charge	Q_G	$V_{DS}=400V, I_D=6.5A,$ $V_{GS}=10V$	--	34	--	nC
Gate-Source Charge	Q_{GS}		--	4.5	--	nC
Gate-Drain Charge	Q_{GD}		--	19	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=6.5A$	--	--	1.5	V
Maximum Continuous Drain-Source Diode Forward Current	I_S		--	--	10	A
Reverse Recovery Time	t_{rr}	$V_{GS}=0V, I_F=6.5A$ $di/dt=100A/\mu s$ (Note 1)	--	300	--	ns
Reverse Recovery Charge	Q_{RR}		--	3500	--	nC

Notes : 1 Repetitive Rating: Pulse width limited by maximum junction temperature

2 $L=60mH, I_{AS}=3A, V_{DD}=150V$, Starting $T_J=25^{\circ}C$

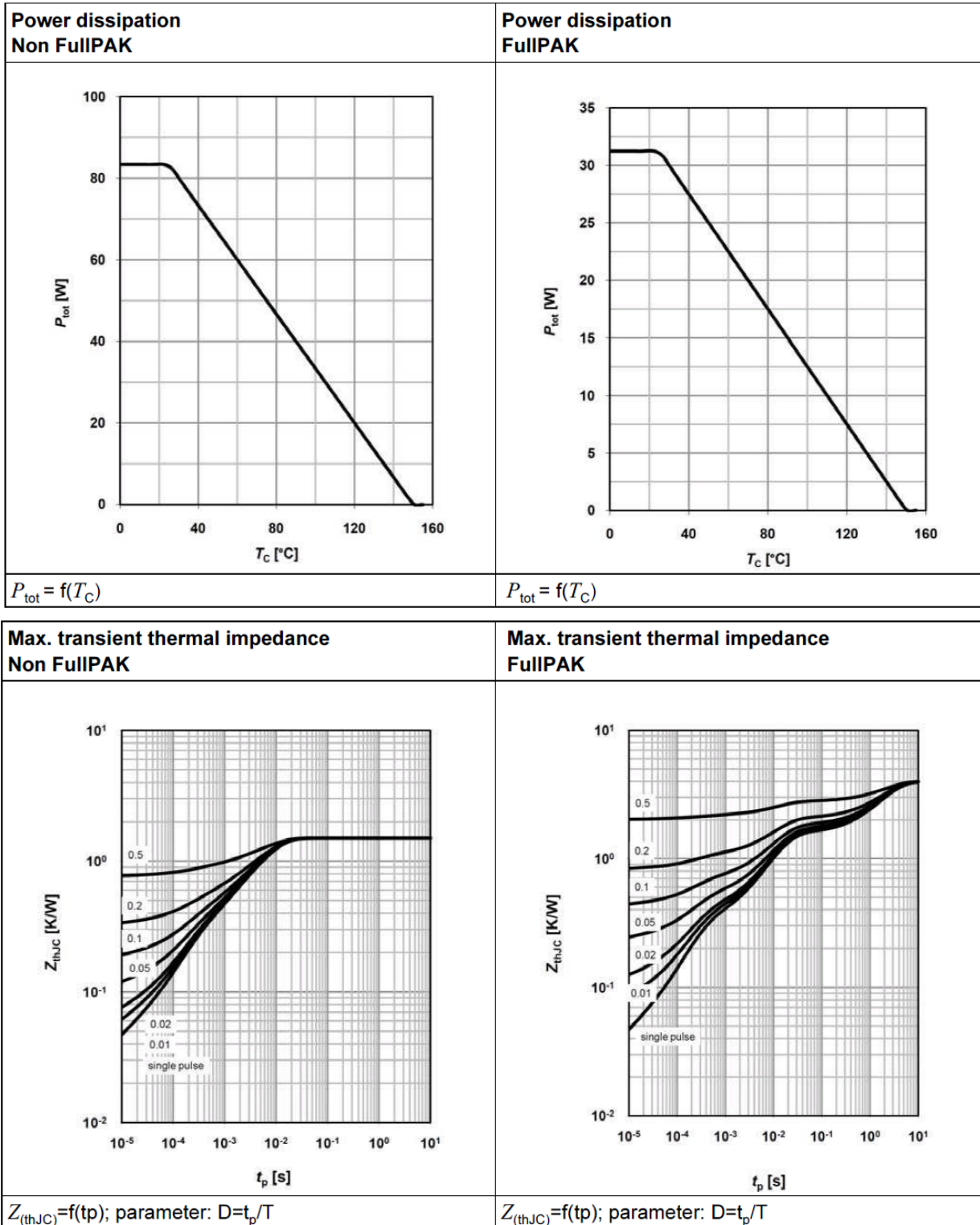
3 $I_{SD}\leq 4.5A, di/dt\leq 200A/\mu s, V_{DD}\leq BVDSS$, Starting $T_J=25^{\circ}C$

4 Pulse Test: Pulse width $\leq 300\mu s$, Duty cycle $\leq 2\%$

5 Guaranteed by design, not subject to production

SJ13N65 Series

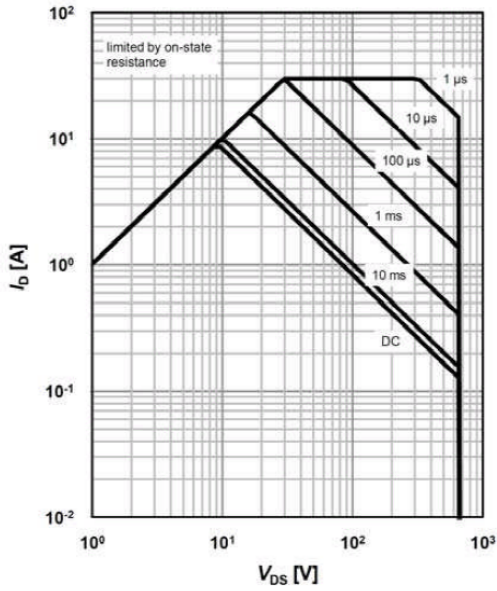
Typical characteristics Diagrams



SJ13N65 Series

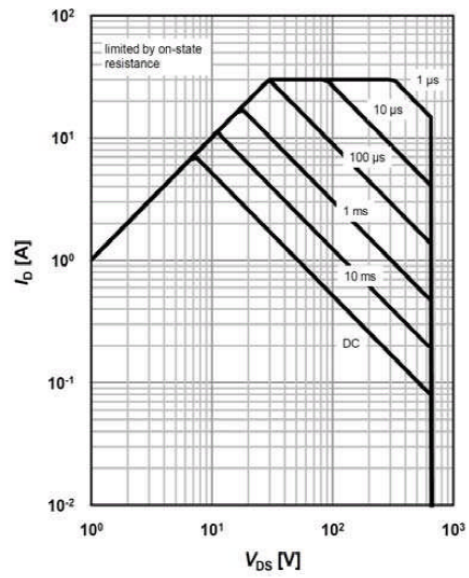
Typical characteristics Diagrams

**Safe operating area $T_C=25\text{ }^\circ\text{C}$
Non FullPAK**



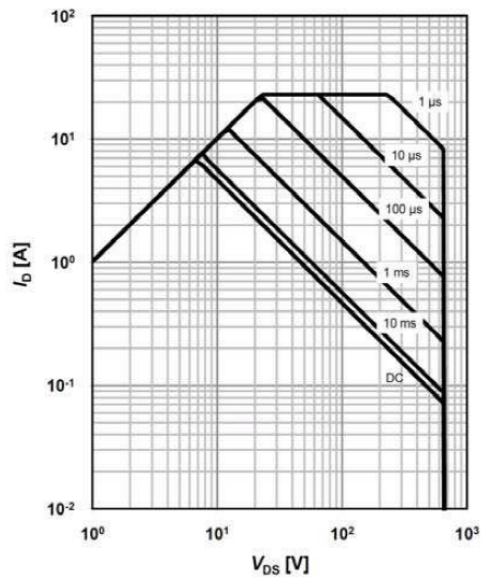
$I_D=f(V_{DS}); T_C=25\text{ }^\circ\text{C}; V_{GS} > 7\text{V}; D=0; \text{parameter } t_p$

**Safe operating area $T_C=25\text{ }^\circ\text{C}$
FullPAK**



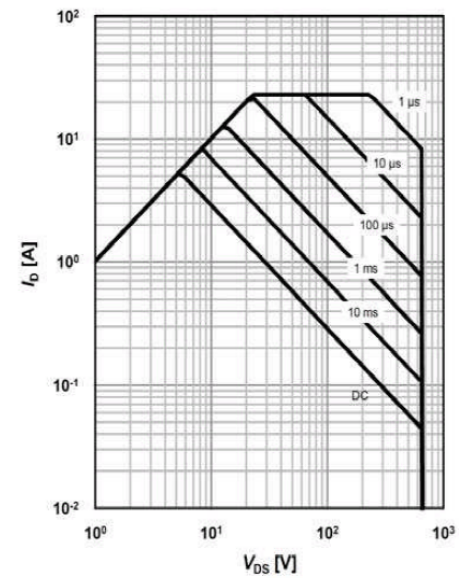
$I_D=f(V_{DS}); T_C=25\text{ }^\circ\text{C}; V_{GS} > 7\text{V}; D=0; \text{parameter } t_p$

**Safe operating area $T_C=80\text{ }^\circ\text{C}$
Non FullPAK**



$I_D=f(V_{DS}); T_C=80\text{ }^\circ\text{C}; V_{GS} > 7\text{V}; D=0; \text{parameter } t_p$

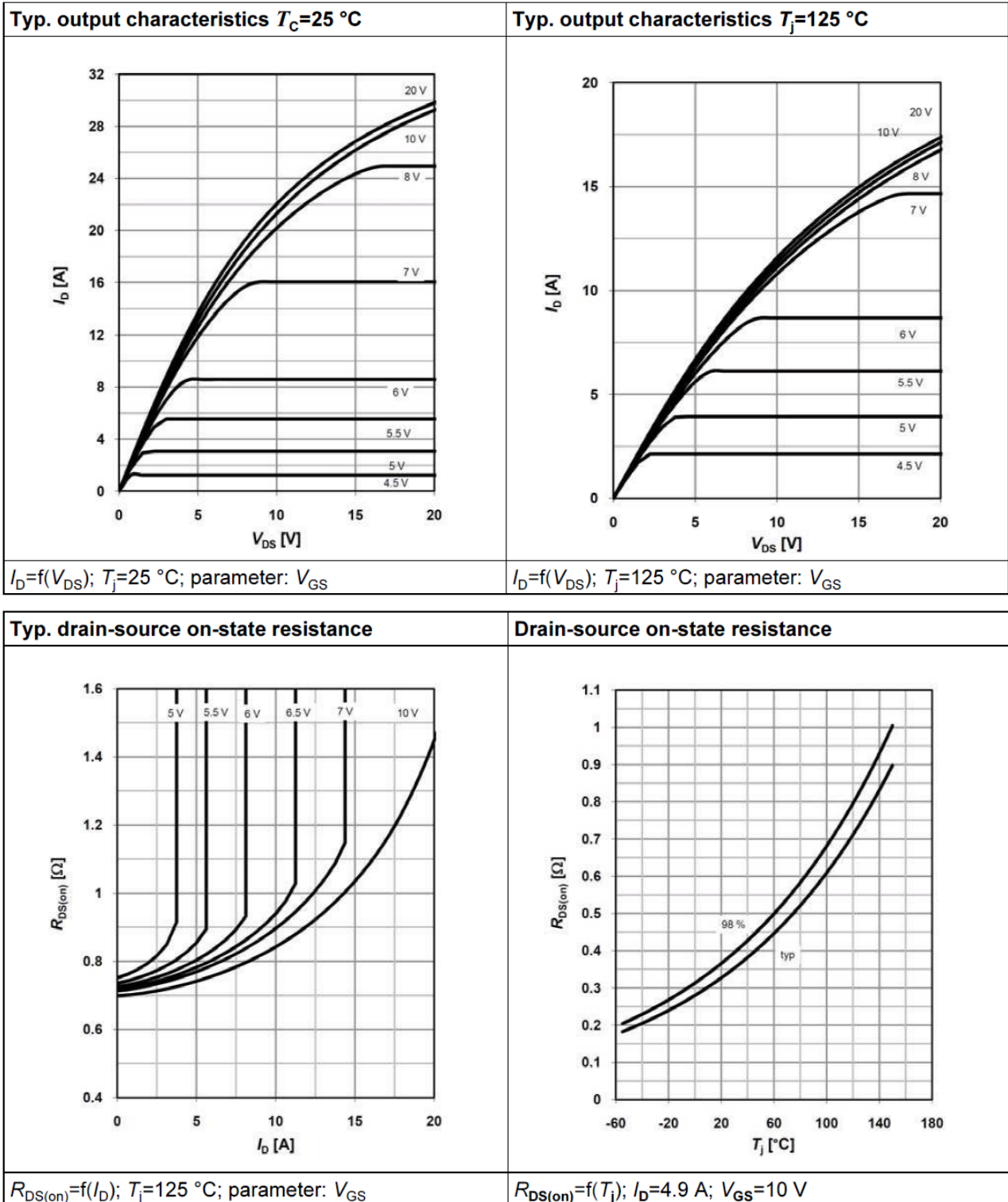
**Safe operating area $T_C=80\text{ }^\circ\text{C}$
FullPAK**



$I_D=f(V_{DS}); T_C=80\text{ }^\circ\text{C}; V_{GS} > 7\text{V}; D=0; \text{parameter } t_p$

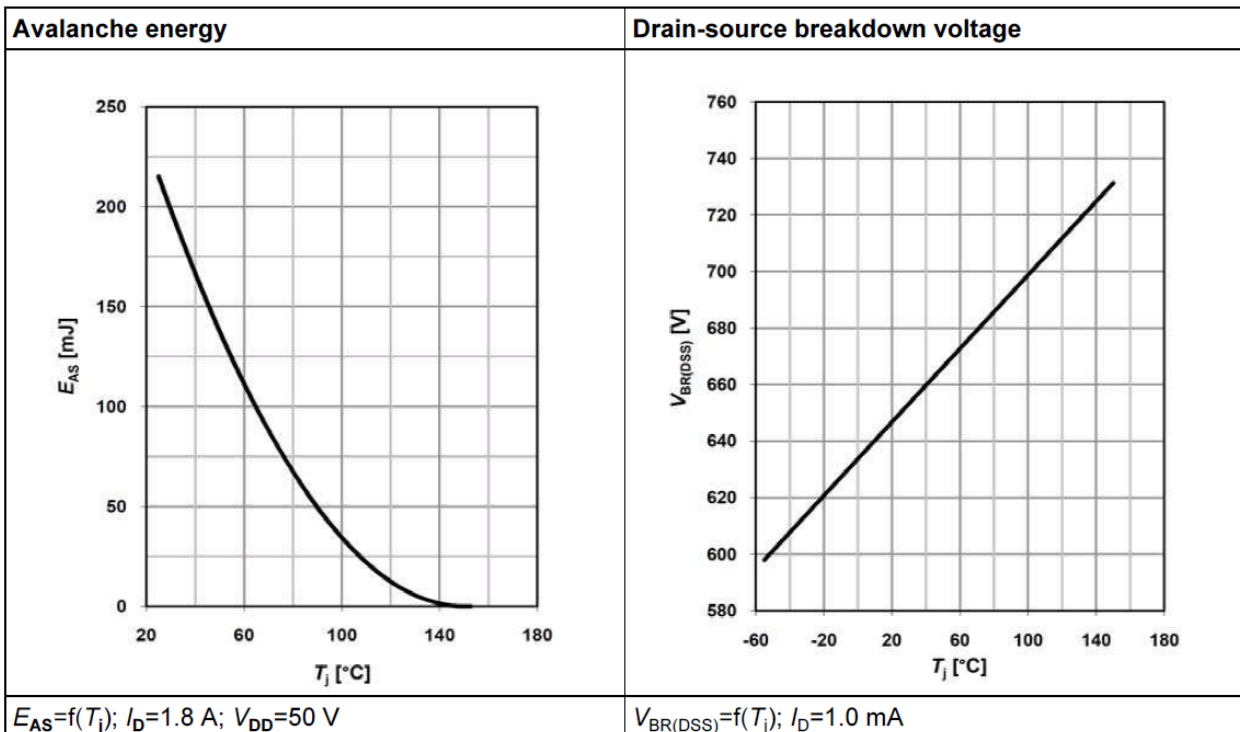
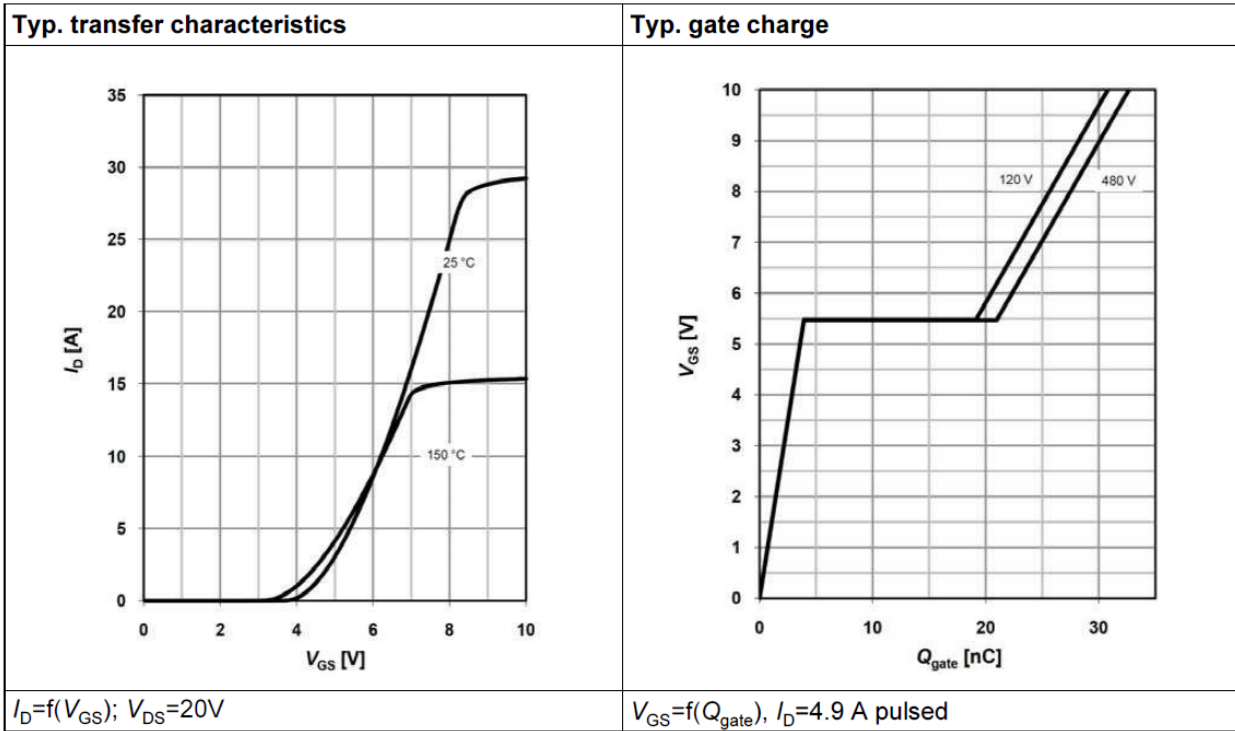
SJ13N65 Series

Typical characteristics Diagrams



SJ13N65 Series

Typical characteristics Diagrams



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Typical characteristics Diagrams

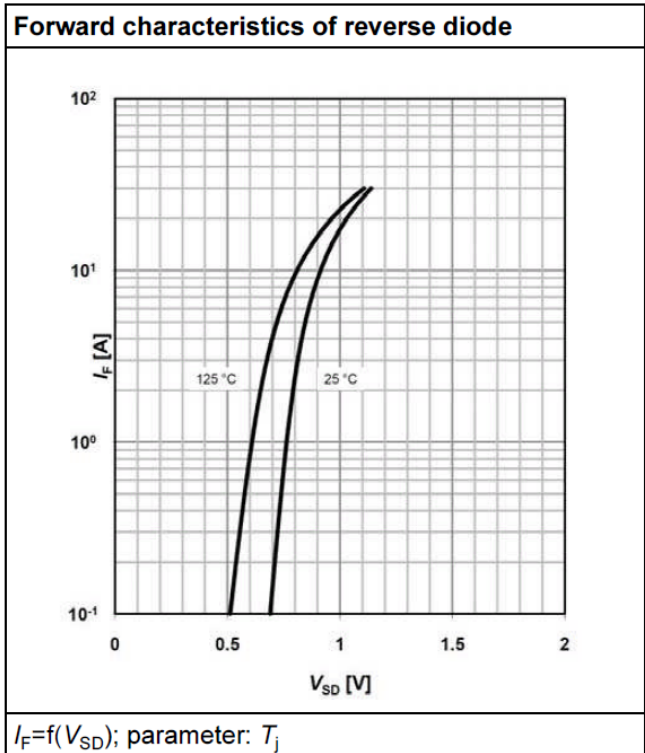
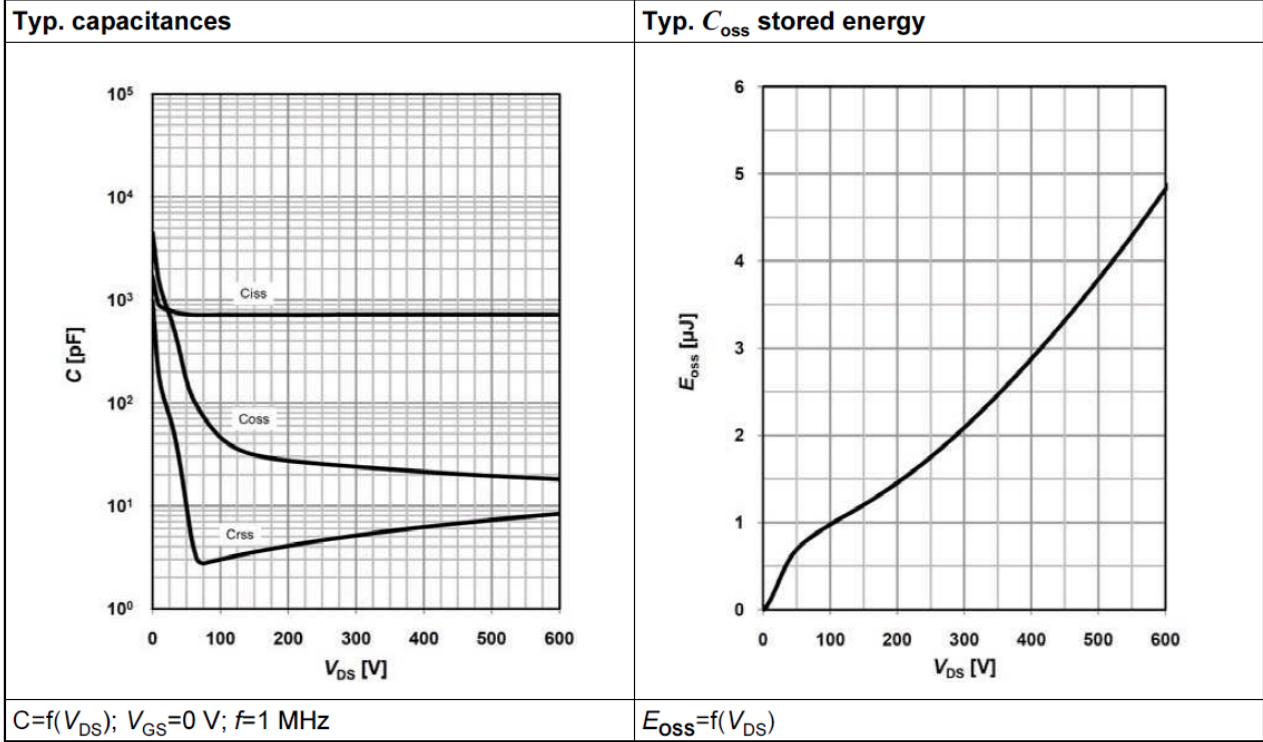


Table 20 Switching times test circuit and waveform for inductive load

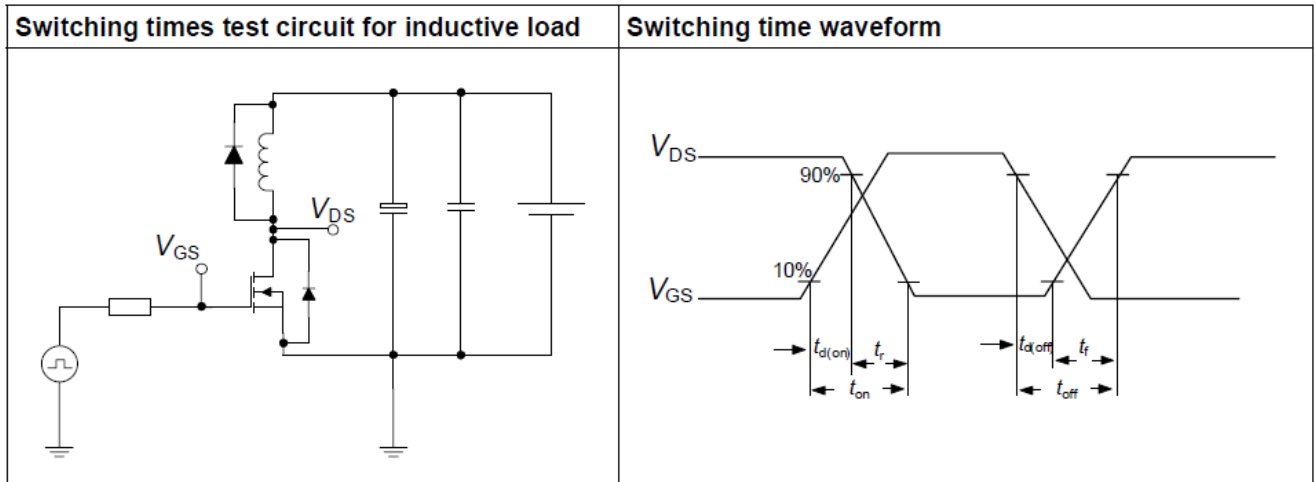


Table 21 Unclamped inductive load test circuit and waveform

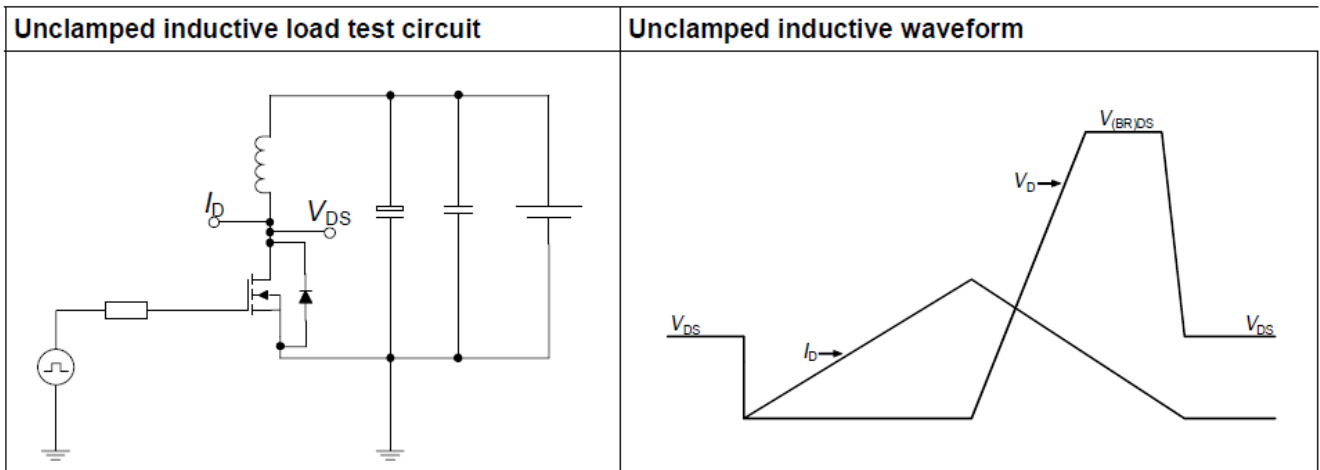
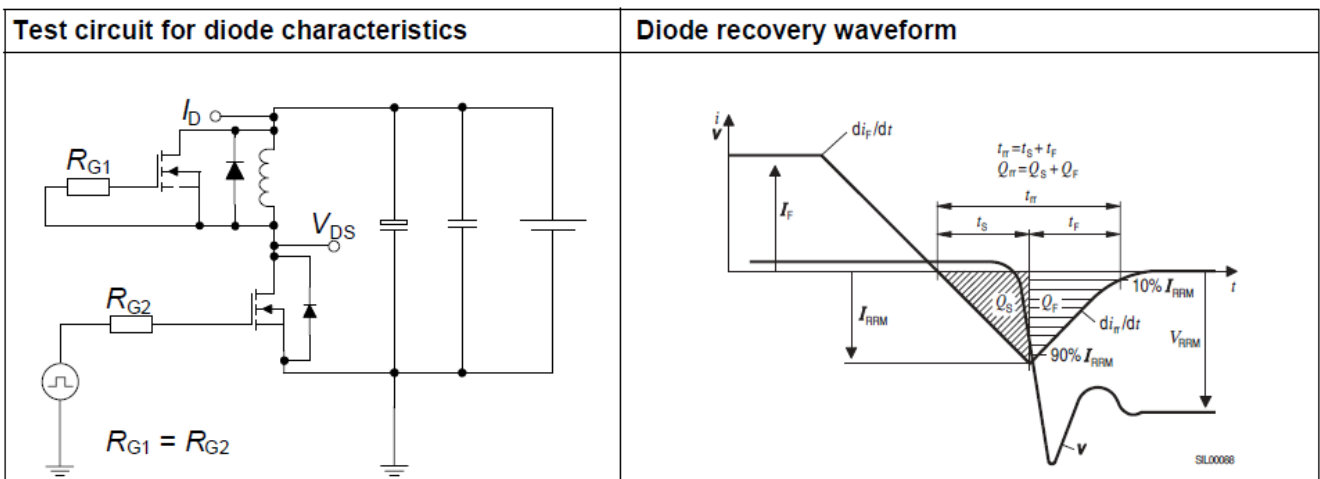
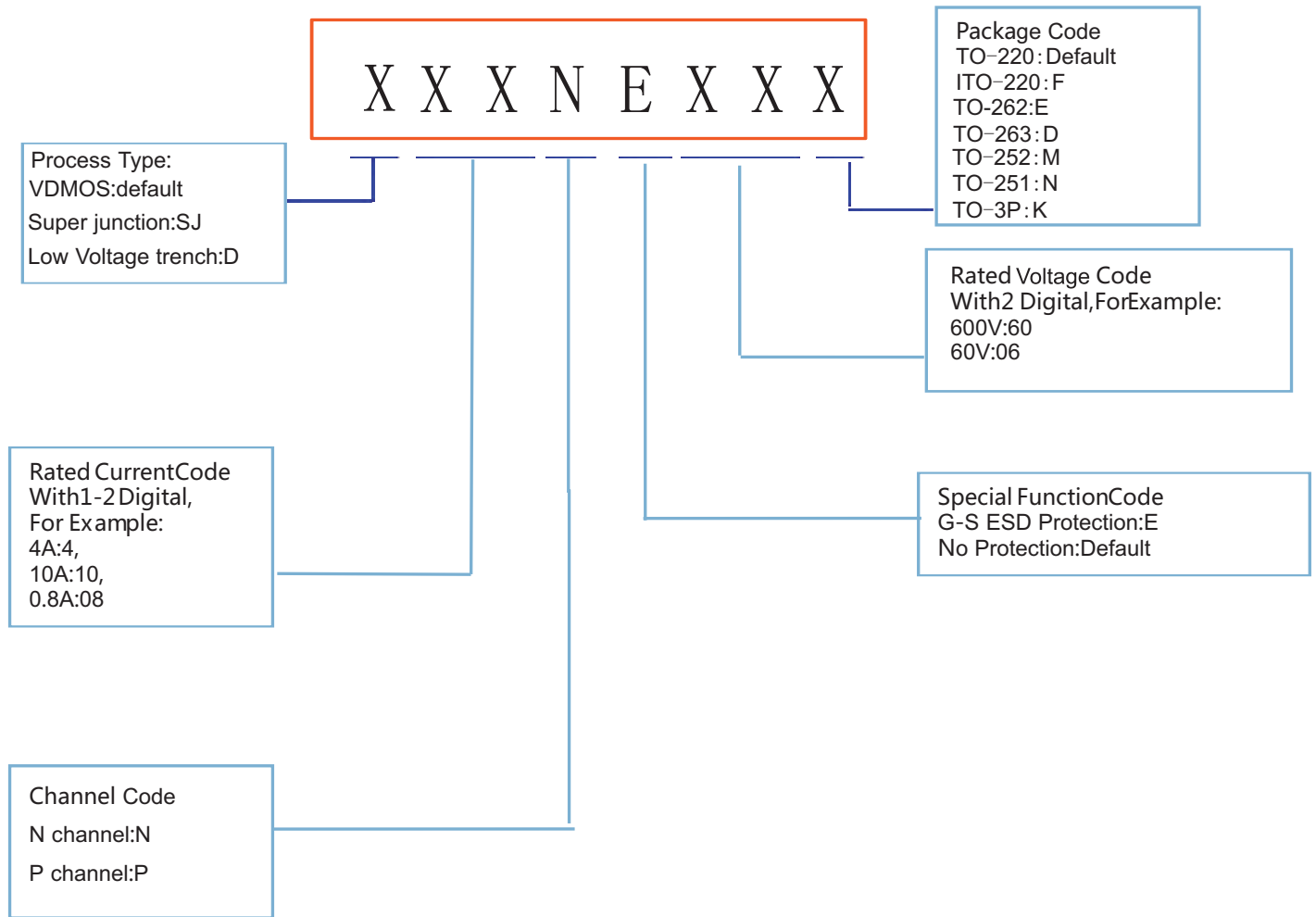


Table 22 Test circuit and waveform for diode characteristics



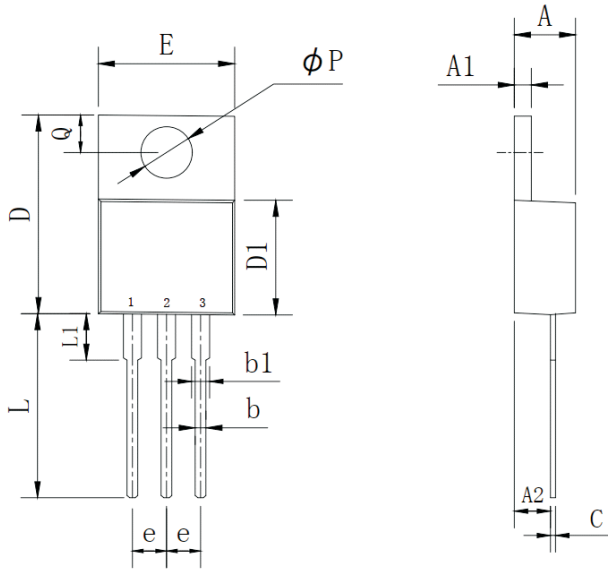
Product Names Rules



SJ13N65 Series

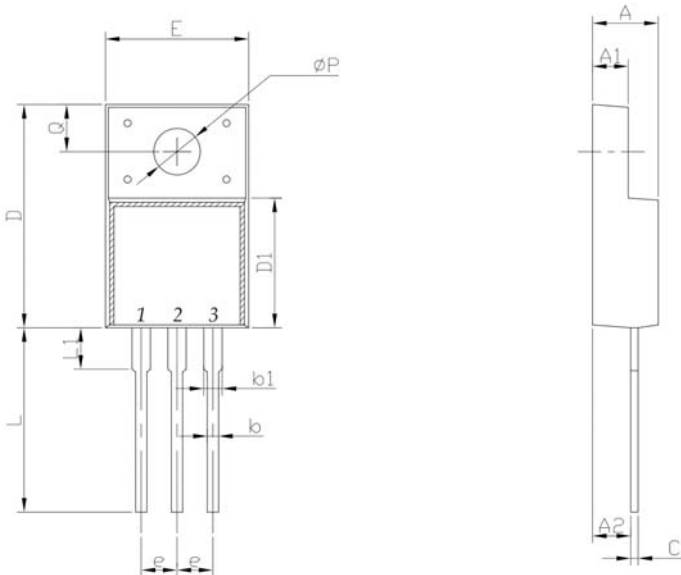
Dimensions

TO-220 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.87	0.167	0.192
A1	1.07	1.47	0.042	0.058
A2	2.03	2.92	0.080	0.115
b	0.51	1.11	0.020	0.044
b1	0.97	1.6	0.038	0.063
C	0.3	0.7	0.012	0.028
D	14.6	15.9	0.575	0.626
D1	8.04	9.3	0.317	0.366
E	9.57	10.57	0.377	0.416
e	2.34	2.74	0.092	0.108
L	12.58	14.3	0.495	0.563
L1	2.8	4.2	0.110	0.165
P	3.4	4.14	0.134	0.163
Q	2.45	3	0.096	0.118

ITO-220 PACKAGE OUTLINE DIMENSIONS

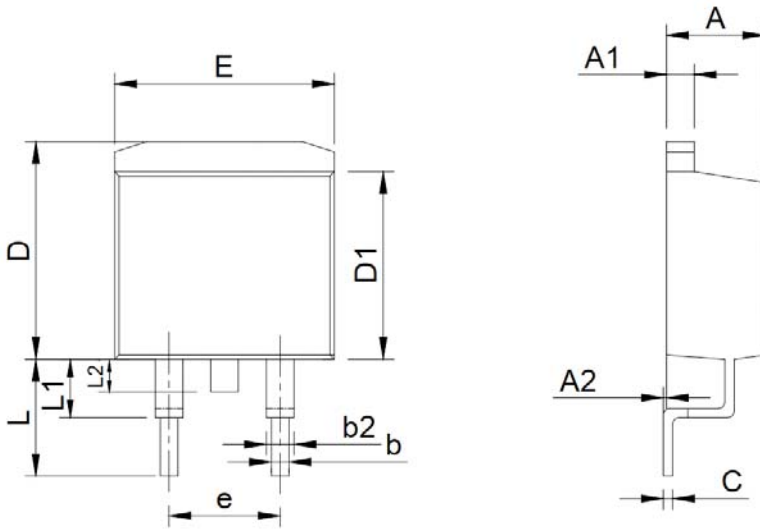


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.24	4.9	0.167	0.193
A1	2.3	2.92	0.091	0.115
A2	2.61	2.81	0.103	0.111
b	0.3	1	0.012	0.039
b1	0.9	1.55	0.035	0.061
C	0.3	0.7	0.012	0.028
D	14.5	16.36	0.571	0.644
D1	8.8	9.41	0.346	0.370
E	9.5	10.5	0.374	0.413
e	2.3	2.75	0.091	0.108
L	12.6	14	0.496	0.551
L1	2.45	4.3	0.096	0.169
P	2.9	3.8	0.114	0.150
Q	2.5	3.55	0.098	0.140

SJ13N65 Series

Dimensions

TO-263 PACKAGE OUTLINE DIMENSIONS

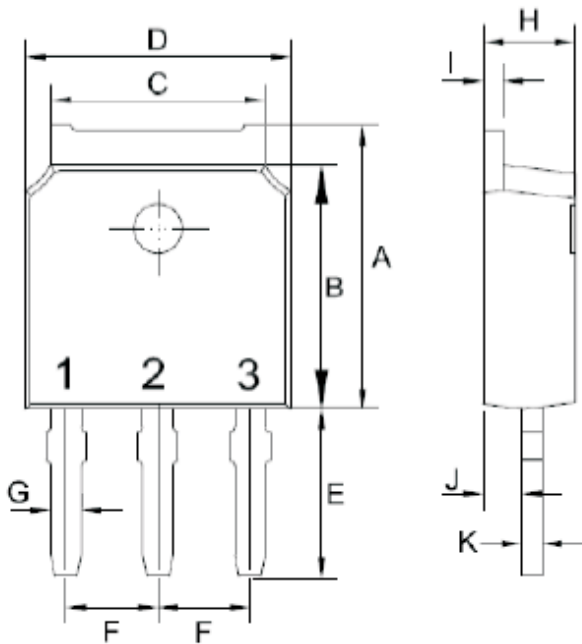


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.87	0.167	0.192
A1	1.07	1.47	0.042	0.058
A2	0	0.25	0.000	0.010
b	0.61	1.01	0.024	0.040
b1	1.2	1.34	0.047	0.053
C	0.3	0.6	0.012	0.024
D	9.48	10.84	0.373	0.427
D1	8.49	9.3	0.334	0.366
E	9.7	10.31	0.382	0.406
e	4.88	5.28	0.192	0.208
L	4.46	5.85	0.176	0.230
L1	1.33	2.33	0.052	0.092
L2	0	2.2	0.000	0.087

SJ13N65 Series

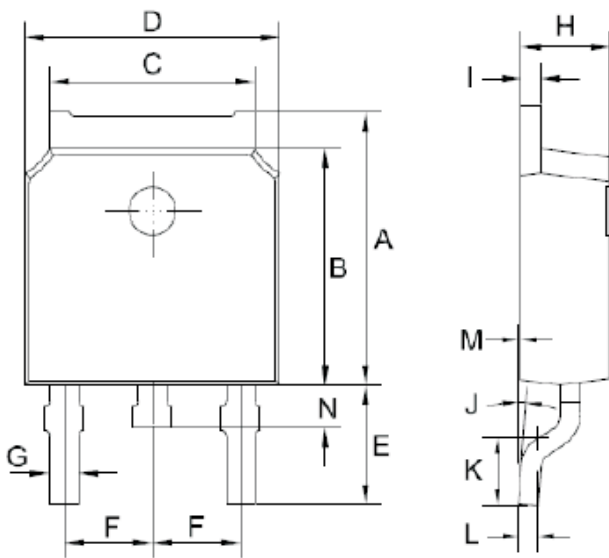
Dimensions

TO-251 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	6.85	7.25	0.270	0.285
B	5.8	6.3	0.228	0.248
C	5	5.53	0.197	0.218
D	6.3	6.8	0.248	0.268
E	3.5	4.35	0.138	0.171
F	2.19	2.39	0.086	0.094
G	0.45	0.85	0.018	0.033
H	2.2	2.4	0.087	0.094
I	0.41	0.61	0.016	0.024
J	0.71	1.31	0.028	0.052
K	0.41	0.61	0.016	0.024

TO-252 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	6.85	7.25	0.270	0.285
B	5.8	6.3	0.228	0.248
C	5	5.53	0.197	0.218
D	6.3	6.8	0.248	0.268
E	2.6	3.3	0.102	0.130
F	2.19	2.39	0.086	0.094
G	0.45	0.85	0.018	0.033
H	2.2	2.4	0.087	0.094
I	0.41	0.61	0.016	0.024
J	0	8	0	8
K	1.45	1.85	0.057	0.073
L	0.41	0.61	0.016	0.024
M	0	0.12	0.000	0.005
N	0.6	1	0.024	0.039

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