

FEATURES

- $R_{DS(ON)} < 0.19\Omega @ V_{GS} = 10V$
- 100% avalanche tested
- RoHS compliant

MECHANICAL DATA

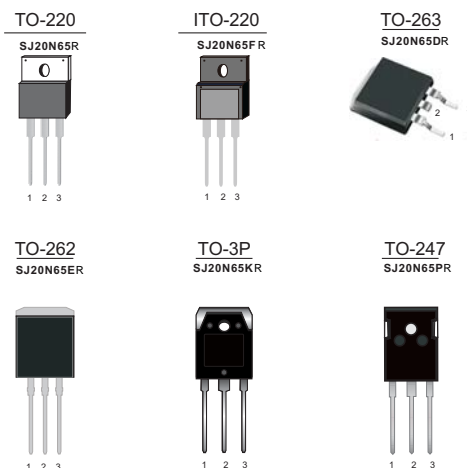
- Case: TO-220, ITO-220, TO-3P, TO-247, TO-262, TO-263 package

Ordering Information

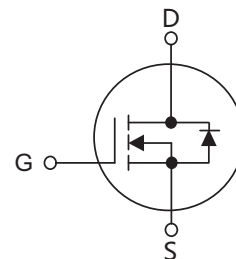
Part No.	Package Type	Package	Quality(box)
SJ20N65R	TO-220	Tube	1000
SJ20N65FR	ITO-220	Tube	1000
SJ20N65ER	TO-262	Tube	1000
SJ20N65DR	TO-263	Tape & Reel	800
SJ20N65KR	TO-3P	Tube	360
SJ20N65PR	TO-247	Tube	360

PRODUCT SUMMARY

$V_{DS}(V)$	$R_{DS(on)} (\Omega)$ Typ	$I_D(A)$
650	0.17@ $V_{GS}=10V$	20



Block Diagram



Pin Definition:

1. Gate
2. Drain
3. Source

ABSOLUTE MAXIMUM RATINGS $(T_C=25^\circ C, \text{ unless otherwise specified})$

PARAMETER		SYMBOL	TO-220/TO-263/TO-247/TO-3P / TO-262	ITO-220	UNIT
Drain-Source Voltage		V_{DS}	650		V
Gate-Source Voltage		V_{GS}	± 30		V
Continuous Drain Current		I_D	20	20*	A
Pulsed Drain Current (Note 1)		I_{DM}	45		A
Avalanche Energy(Note 2)		E_{AS}	485		mJ
Avalanche Current(Note 1)		I_{AR}	3.5		A
Repetitive Avalanche Energy(Note 1)		E_{AR}	1		mJ
Power Dissipation	TO-220/TO-263/TO-262 TO-251/TO-252	P_D	151		W
	ITO-220		35		
Junction Temperature.		T_J	+150		$^\circ C$
Storage Temperature		T_{STG}	-55 ~ +150		$^\circ C$

* limited by maximum junction temperature

THERMAL DATA

PARAMETER		SYMBOL	RATING	UNIT
Junction to Ambient	TO-220/TO-3P/TO-247 TO-262/TO-263	R _{θJA}	62	°C/W
	ITO-220		82	
Junction to Case	TO-220/TO-263/TO-262 TO-3P/TO-247	R _{θJC}	1.2	°C/W
	ITO-220		4.1	

ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise specified)

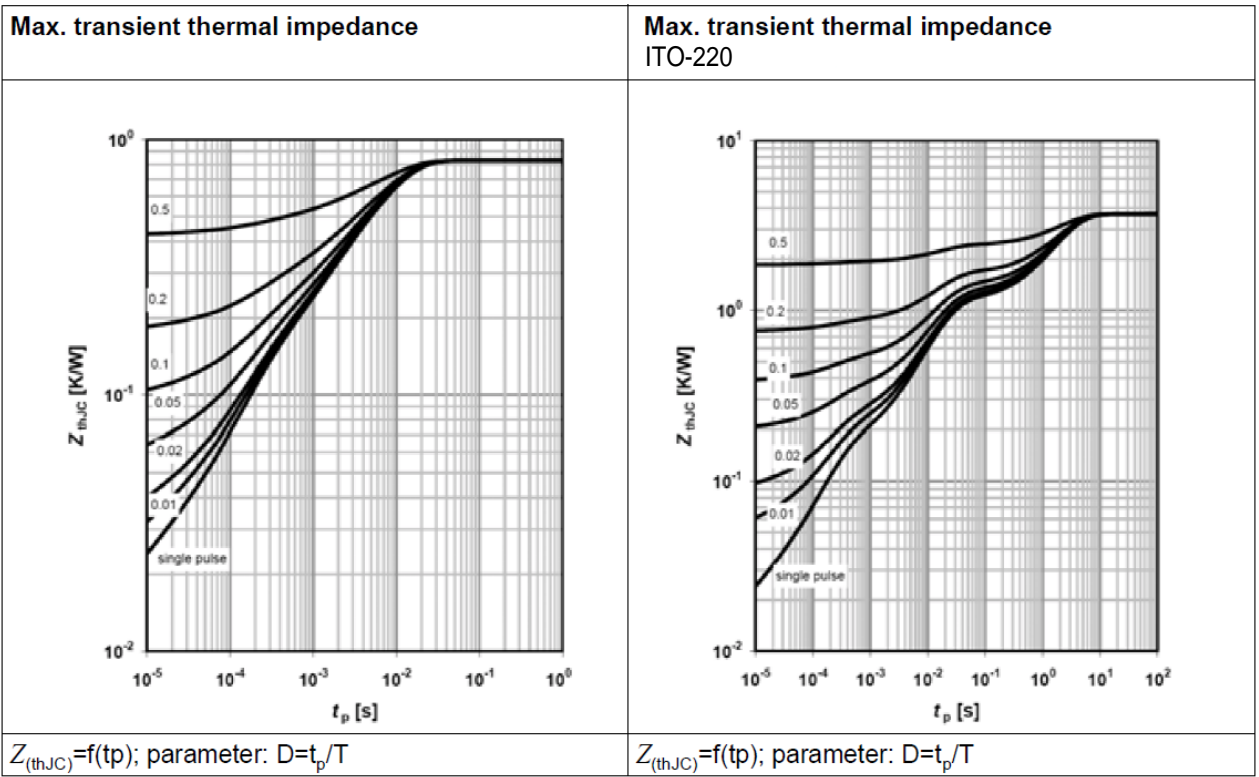
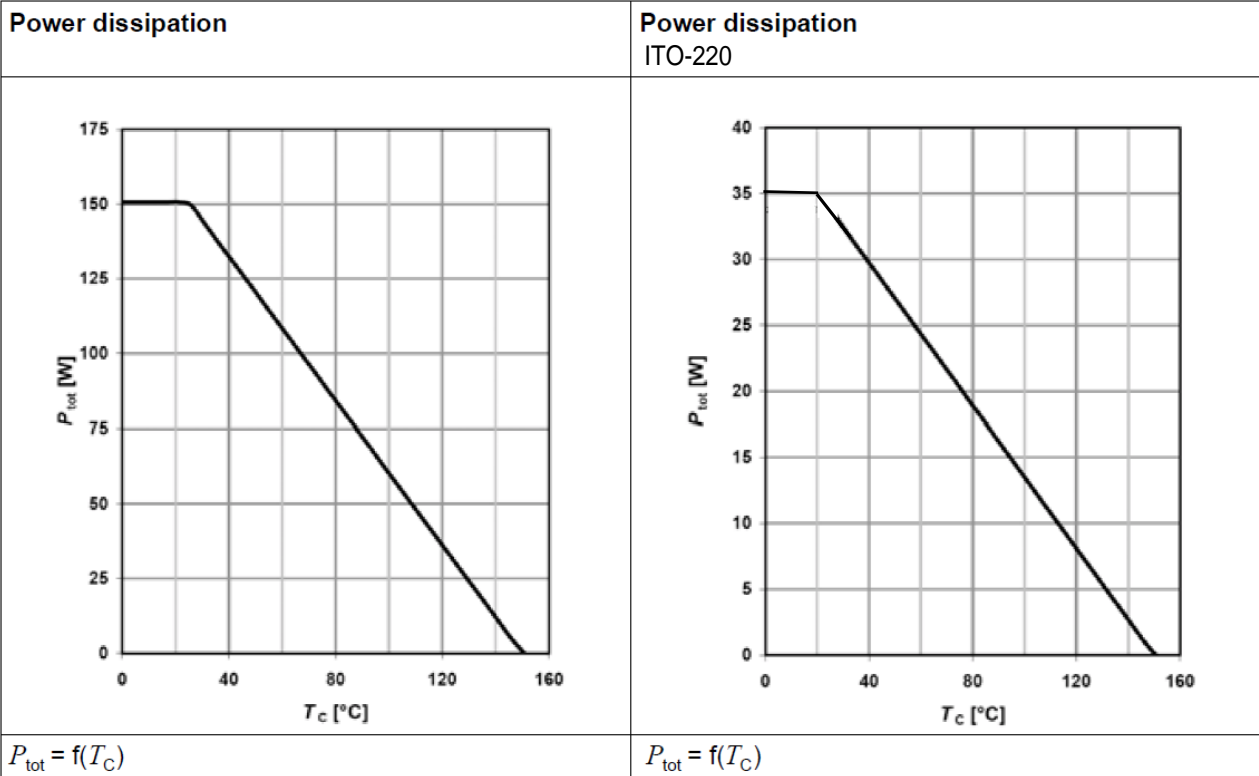
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
OFF CHARACTERISTICS								
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V, I _D =250μA	650			V	
Drain-Source Leakage Current		I _{DSS}	V _{DS} =650V, V _{GS} =0V			1	μA	
Gate- Source Leakage Current	Forward	I _{GSS}	V _{GS} =30V, V _{DS} =0V			100	nA	
	Reverse		V _{GS} =-30V, V _{DS} =0V			-100	nA	
ON CHARACTERISTICS(Note 3)								
Gate Threshold Voltage		V _{GS(TH)}	V _{DS} =V _{GS} , I _D =250μA	2		4	V	
DRAIN-SOURCE ON-RESISTANCE		R _{DS(ON)}	V _{GS} =10V, I _D =10A		0.17	0.19	Ω	
DYNAMIC CHARACTERISTICS								
Input Capacitance		C _{ISS}	V _{DS} =25V, V _{GS} =0V, f=1MHz		1510		pF	
Output Capacitance		C _{OSS}				75		pF
Reverse Transfer Capacitance		C _{RSS}				6		pF
SWITCHING CHARACTERISTICS								
Turn-On Delay Time		t _{D(ON)}	V _{DD} =520V, I _D =10A, R _G =20Ω		25		ns	
Turn-On Rise Time		t _r				17		ns
Turn-Off Delay Time		t _{D(OFF)}				130		ns
Turn-Off Fall Time		t _f				11		ns
Total Gate Charge		Q _G				90	120	nC
Gate-Source Charge		Q _{GS}	V _{DS} =520V, I _D =10A, V _{GS} =10V		8.5		nC	
Gate-Drain Charge		Q _{GD}			13		nC	
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS								
Drain-Source Diode Forward Voltage		V _{SD}	V _{GS} =0V, I _S =10A		0.9	1.5	V	
Maximum Continuous Drain-Source Diode Forward Current		I _S				20	A	
Reverse Recovery Time		t _{rr}	V _{GS} =0V, I _S =10A		170		ns	
Reverse Recovery Charge		Q _{RR}	dI _F /dt=100A/μs (Note 1)		5.8		μC	

Note:1. Repetitive Rating : Pulse width limited by maximum junction temperature

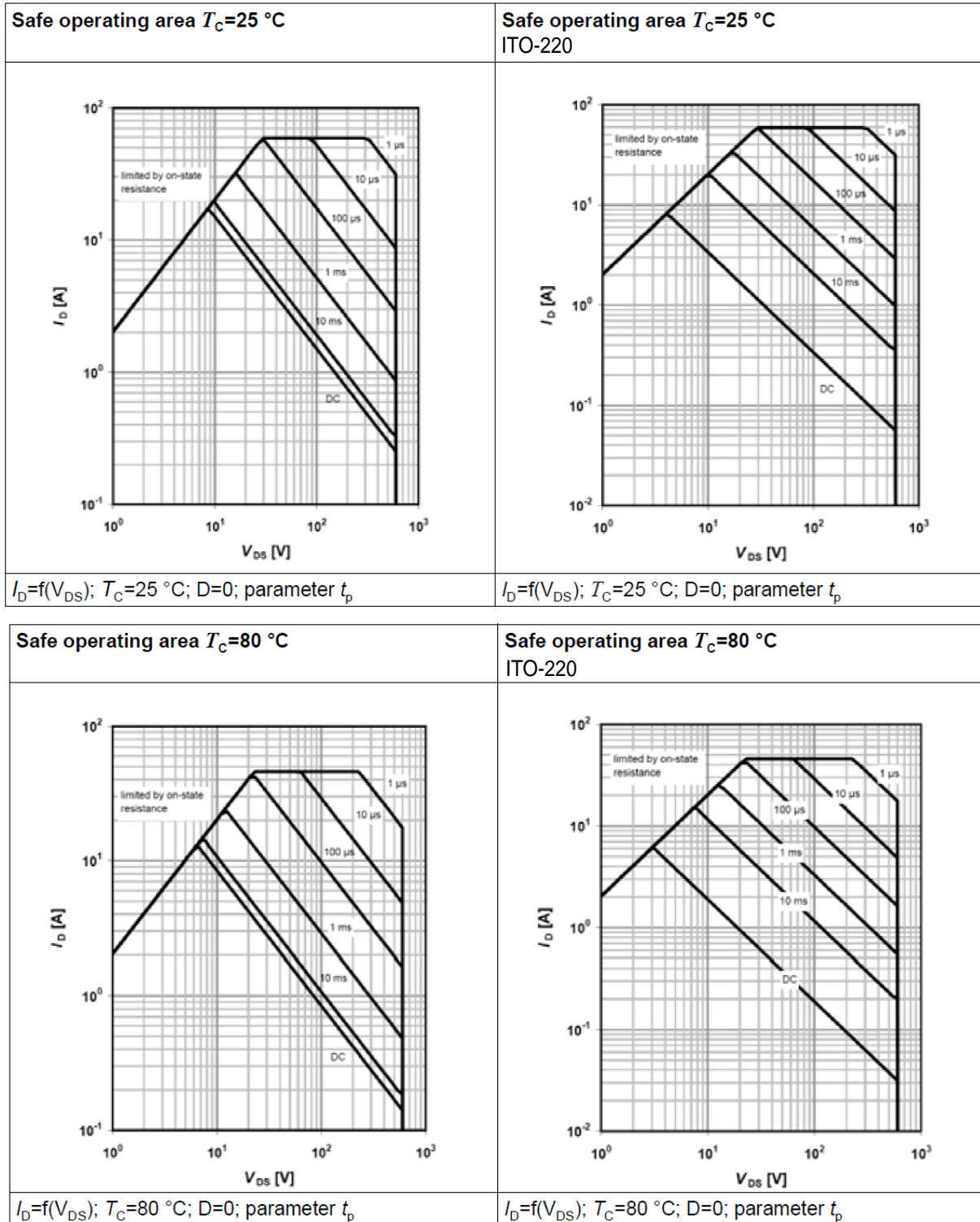
2. L=60mH, I_{AS}=3A, V_{DD}=150V, Starting T_J=25 C

3. Pulse Test: Pulse width ≤300μs, Duty cycle≤1%.

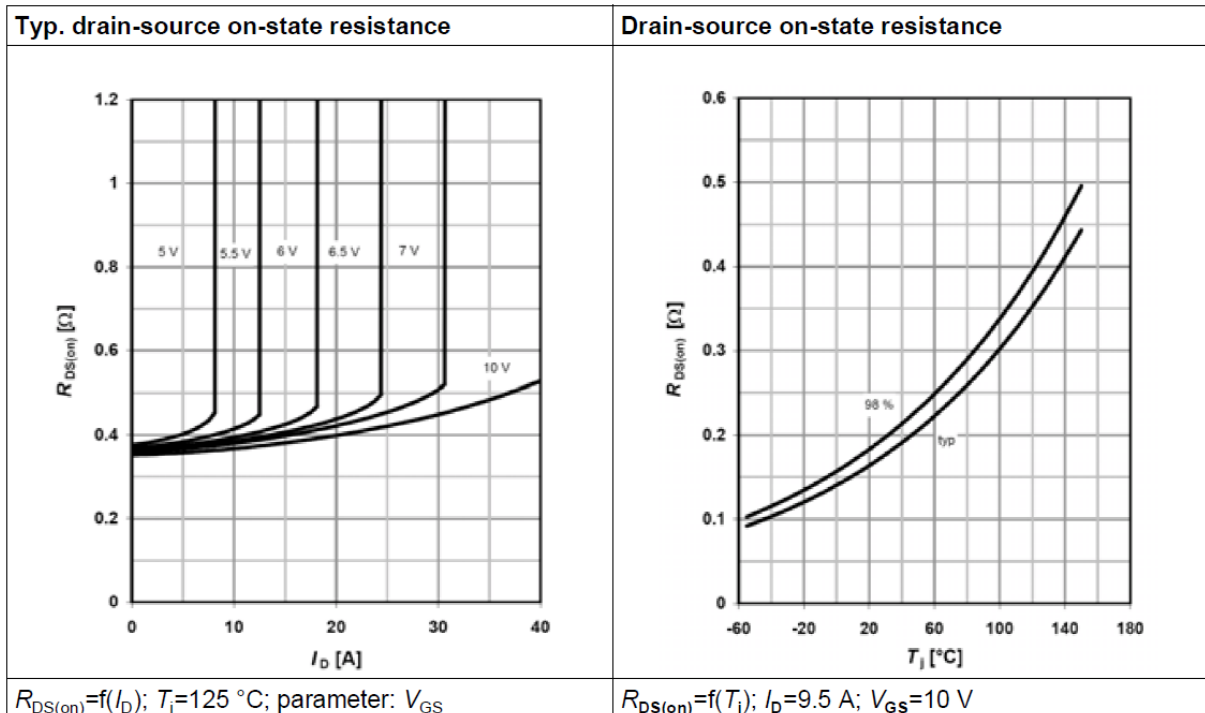
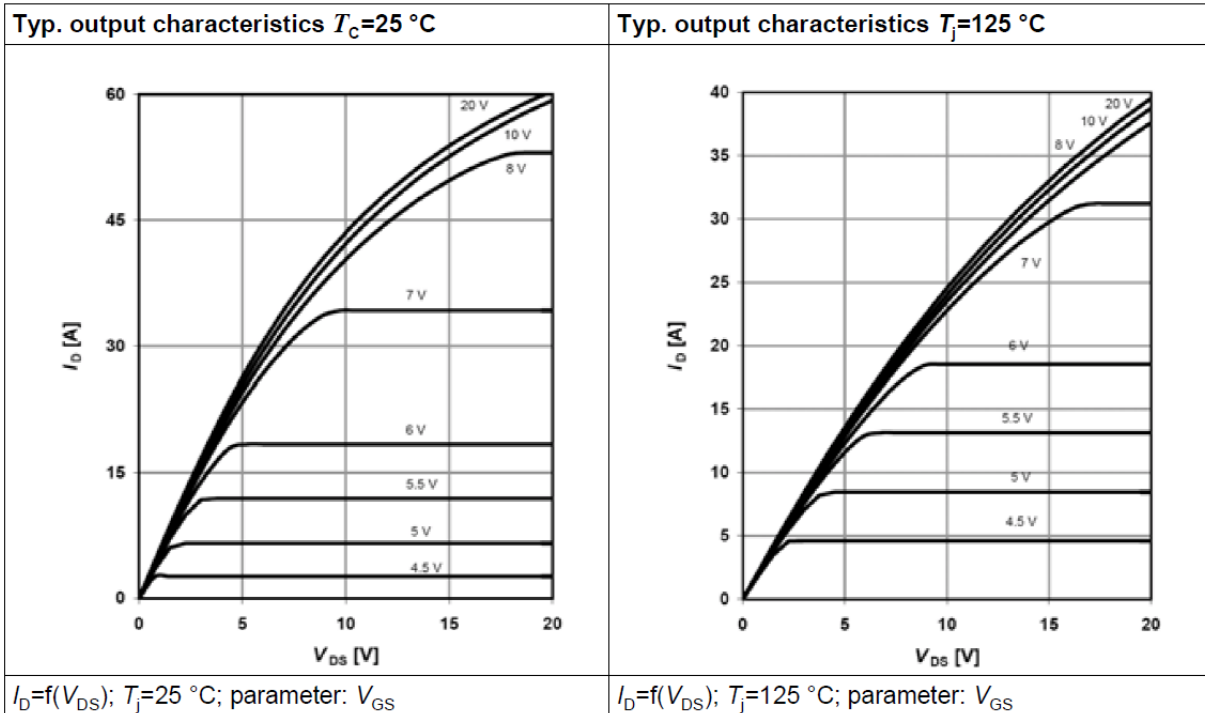
Typical characteristics Diagrams



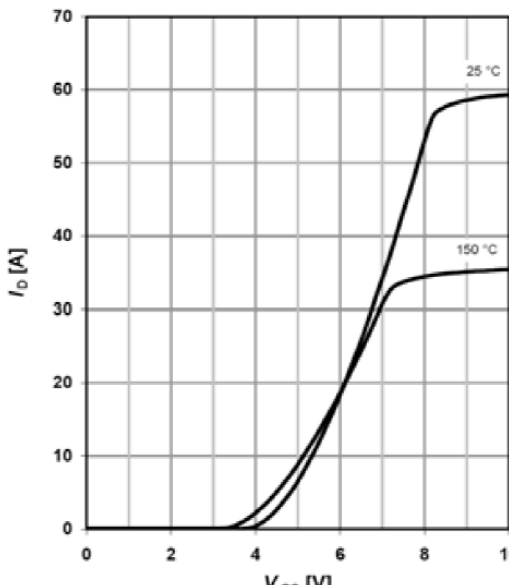
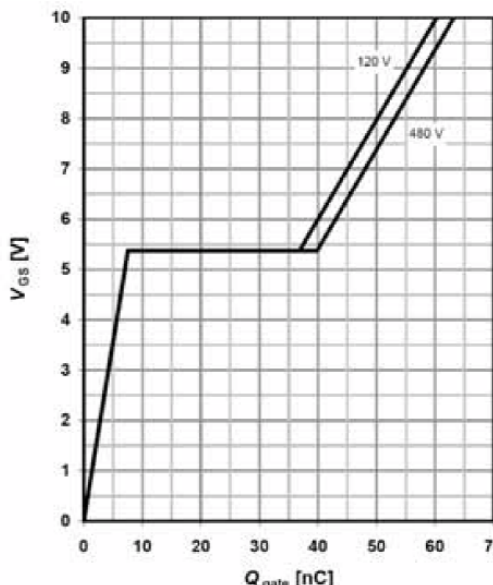
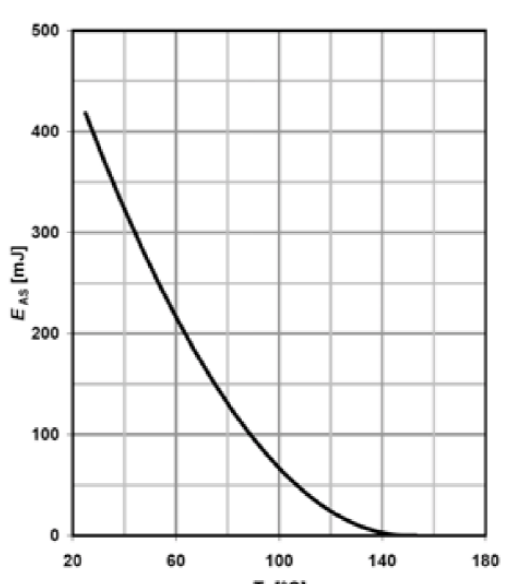
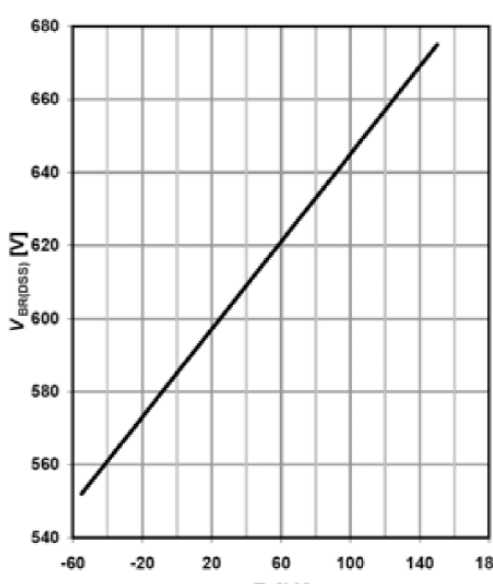
Typical characteristics Diagrams



Typical characteristics Diagrams



Typical characteristics Diagrams

<p>Typ. transfer characteristics</p> 	<p>Typ. gate charge</p> 
<p>$I_D=f(V_{GS}); V_{DS}=20V$</p>	<p>$V_{GS}=f(Q_{gate}), I_D=9.5A$ pulsed</p>
<p>Avalanche energy</p> 	<p>Drain-source breakdown voltage</p> 
<p>$E_{AS}=f(T_j); I_D=3.4 A; V_{DD}=50 V$</p>	<p>$V_{BR(DSS)}=f(T_j); I_D=0.25 mA$</p>

TYPICAL TEST CIRCUIT

Table 20 Switching times test circuit and waveform for inductive load

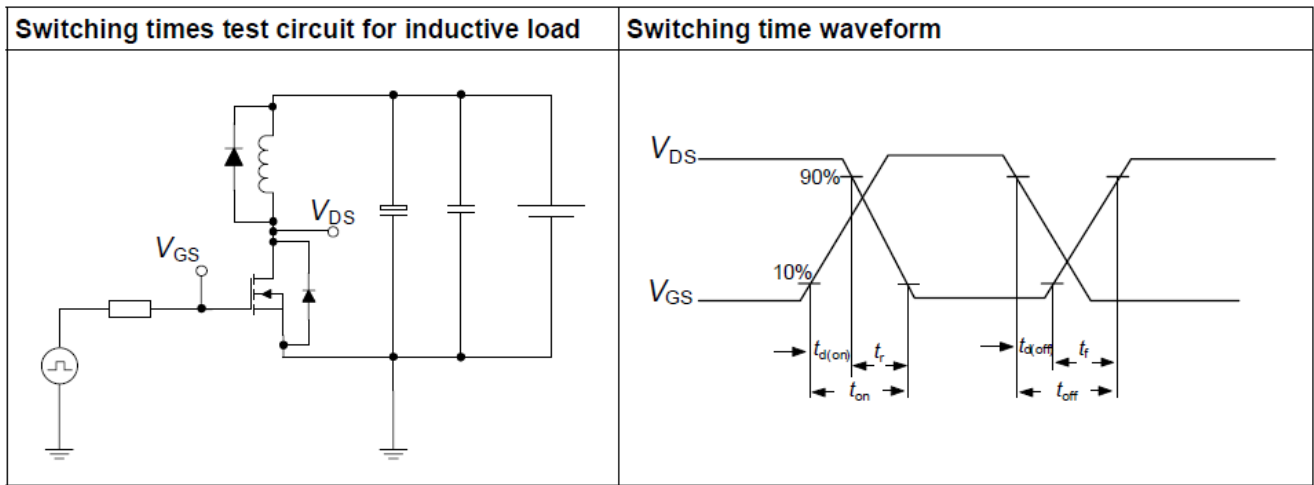


Table 21 Unclamped inductive load test circuit and waveform

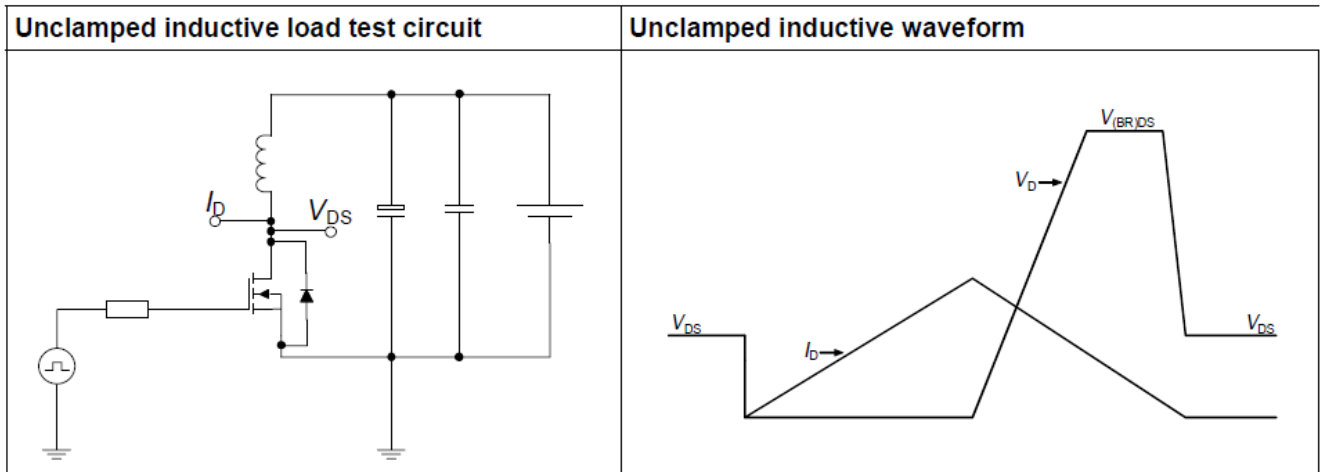
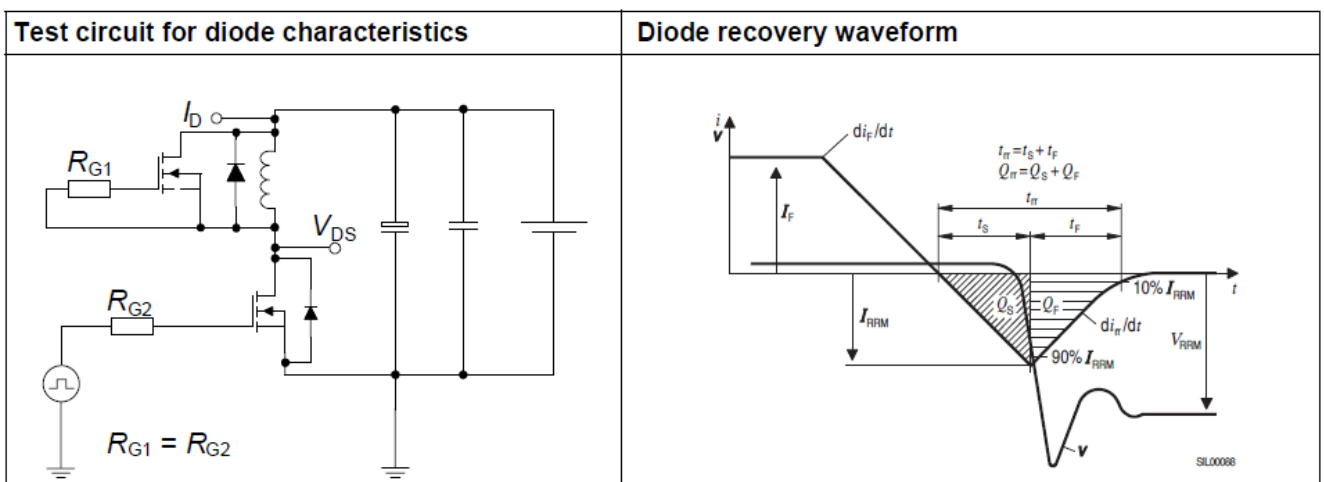
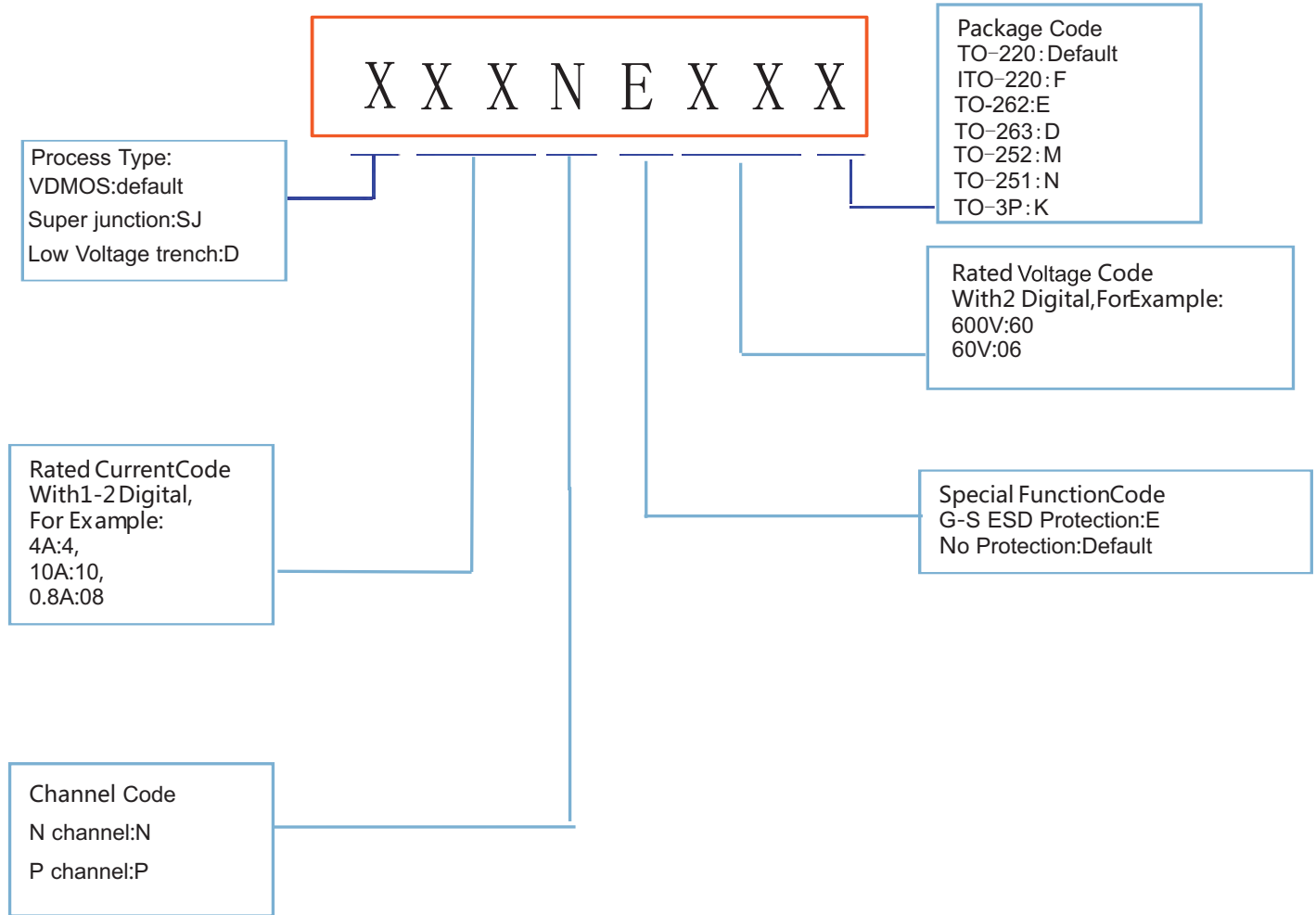


Table 22 Test circuit and waveform for diode characteristics

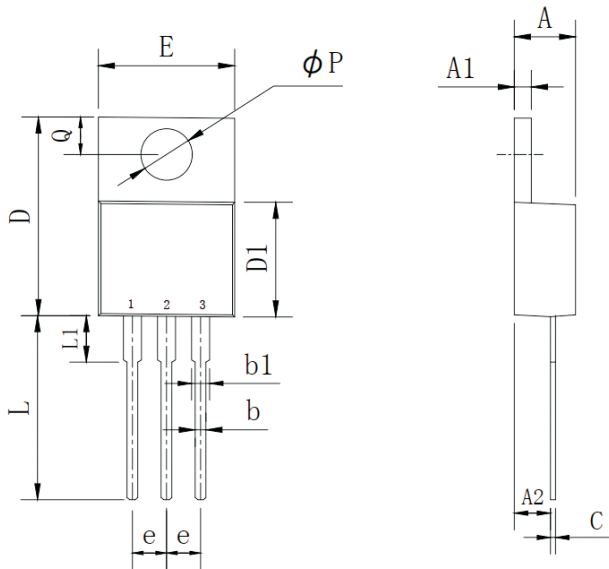


Product Names Rules



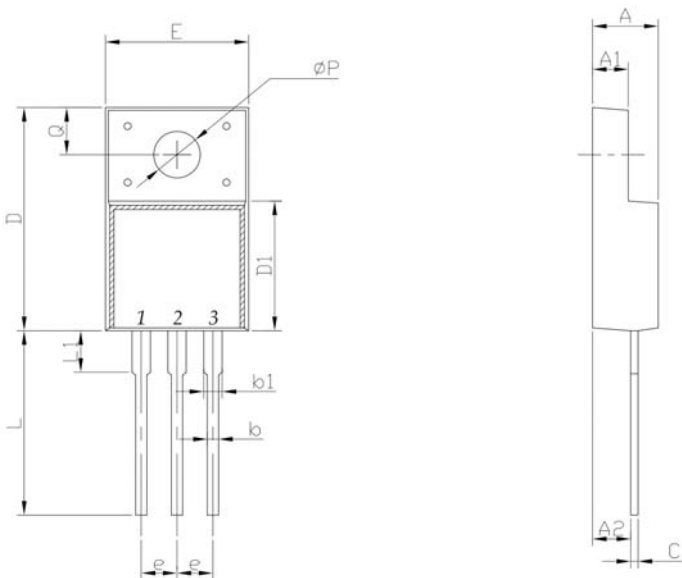
Dimensions

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

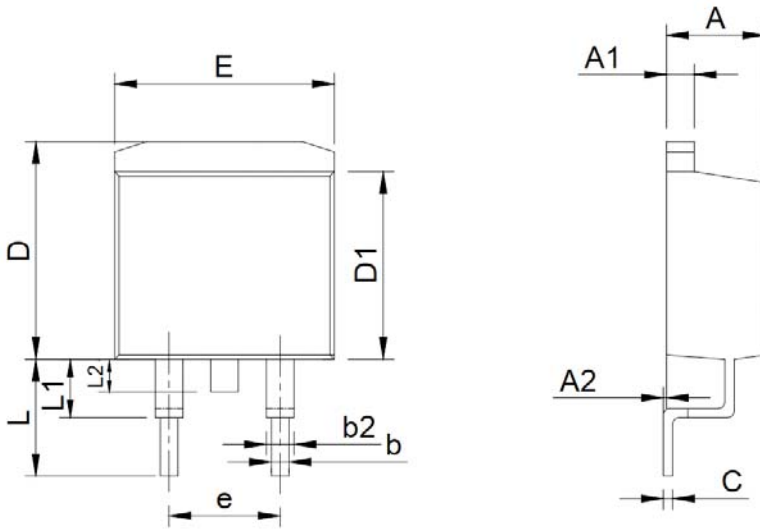
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

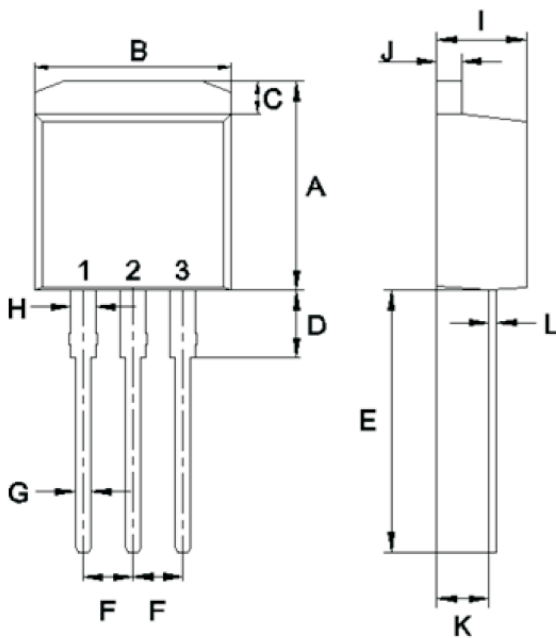
Dimensions

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

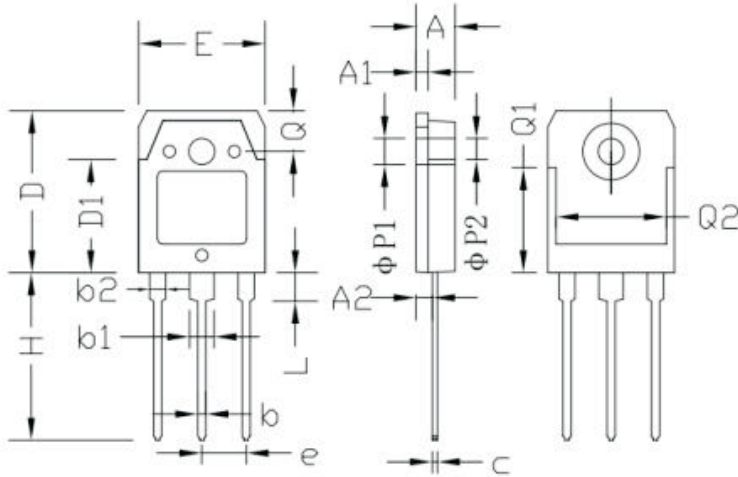
TO-262 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	10.14	11.14	0.399	0.439
B	9.57	10.57	0.377	0.416
C	1.15	1.84	0.045	0.072
D	2.95	3.95	0.116	0.156
E	12.25	13.75	0.482	0.541
F	2.34	2.74	0.092	0.108
G	0.51	1.11	0.020	0.044
H	0.97	1.57	0.038	0.062
I	4.25	4.87	0.167	0.192
J	1.07	1.47	0.042	0.058
K	2.03	2.92	0.080	0.115
L	0.3	0.6	0.012	0.024

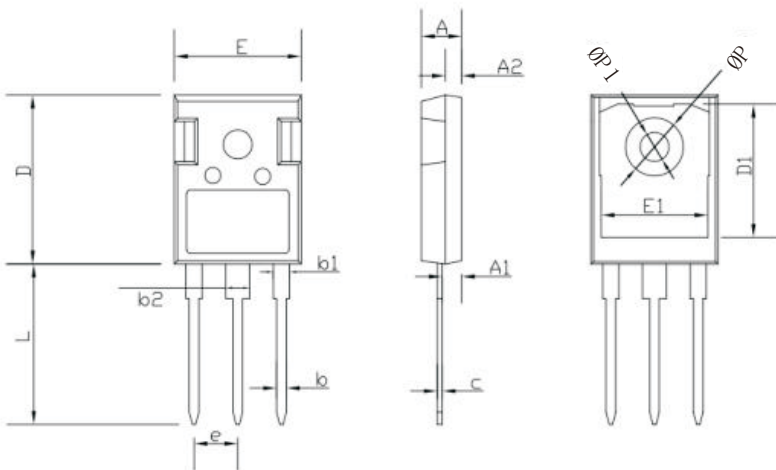
Dimensions

TO-3P PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	4.60	5.00	0.181	0.197
A1	1.45	1.65	0.057	0.065
A2	2.20	2.60	0.087	0.102
b	0.80	1.20	0.032	0.047
b1	2.80	3.20	0.110	0.126
b2	1.80	2.20	0.071	0.087
C	0.55	0.75	0.022	0.030
D	19.20	19.70	0.756	0.776
D1	13.10	14.70	0.516	0.578
E	15.40	15.80	0.607	0.623
e	5.45 TYP		0.215 TYP	
H	19.80	20.20	0.780	0.826
L	3.30	3.70	0.130	0.146
ΦP1	3.20 TYP		0.126 TYP	
ΦP2	3.50 TYP		0.138 TYP	
Q	5.00 TYP		0.197 TYP	
Q1	12.40 TYP		0.488 TYP	
Q2	12.6	-	0.496	-

TO-247 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	4.90	5.10	0.193	0.201
A1	2.31	2.51	0.091	0.099
A2	1.90	2.10	0.075	0.083
b	1.16	1.26	0.046	0.050
b1	1.96	2.06	0.0772	0.0812
b2	2.96	3.06	0.117	0.121
c	0.59	0.66	0.0232	0.0260
D	20.90	21.10	0.8235	0.8313
D1	16.25	16.85	0.6403	0.6639
E	15.70	15.90	0.6186	0.6265
E1	13.10	13.50	0.5161	0.5319
e	5.44		0.2143	
L	19.80	20.10	0.7801	0.7919
ΦP	3.50	3.70	0.1379	0.1458
ΦP1	0	7.30	0	0.2876

Friendship Reminder

■ JiNan JingHeng (hereinafter referred to as JH) reserves the right to make changes to this document and its products and specifications at anytime without notice.

■ Customers should obtain and confirm the latest product information and specifications before final design, purchase or use.

■ JH makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does JH assume any liability for application assistance or customer product design.

■ JH does not warrant or accept any liability with products which are purchased or used for any unintended or unauthorized application.

■ No license is granted by implication or otherwise under any intellectual property rights of JH.

■ JH's products are not authorized for use as critical components in life support devices or systems without express written approval of JH.