

General Description

This series of power MOSFET use N channel Multi-EPI Super-Junction technology and design to provide better characteristics, such as fast switching time, low Ciss and Crss, low on resistance and excellent avalanche characteristics, making it especially suitable for applications which require superior power density and outstanding efficiency.

Features

- Low on-resistance
- Ultra low gate charge and input capacitance
- 100% avalanche tested
- Rohs compliant

Mechanical Data

- Case: TO-220, ITO-220, TO-263, TO-247, TO-3P, TO-263-7L Package

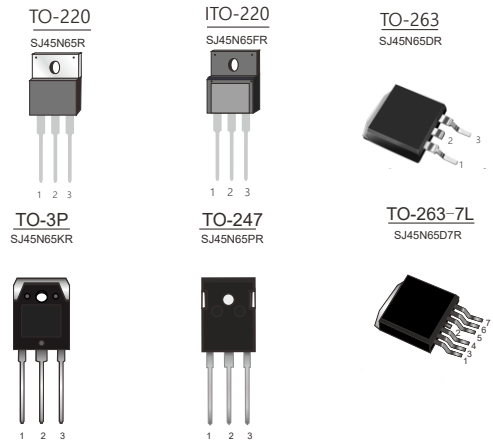
Application

- Switching applications

Ordering Information

Part No.	Package Type	Package	Quality(box)
SJ45N65R	TO-220	Tube	1000
SJ45N65FR	ITO-220	Tube	1000
SJ45N65DR	TO-263	Tape & Reel	800
SJ45N65PR	TO-247	Tube	600
SJ45N65KR	TO-3P	Tube	600
SJ45N65D7R	TO-263-7	Tape & Reel	800

Product Summary			
V _{DS}	R _{DS(on)} (mΩ)Typ	I _D (A)	Q _g (Typ)
650V	75 @ 10V, 23A	45	190nc



Block Diagram

Pin Definition:
 1. Gate
 2. Drain
 3/4/5/6/7. Source

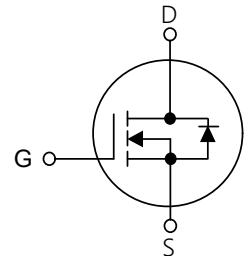


Table1 Absolute Maximum Ratings (T_c=25°C, unless otherwise specified)

Parameters	Symbol	SJ45N65R SJ45N65DR SJ45N65D7R		SJ45N65PR SJ45N65KR	SJ45N65FR	Unit
Drain-Source Voltage	V _{DS}	650				V
Gate-Source Voltage	V _{GS}	±30				V
Contionous Drain Current	T _C =25°C	45		45 [*]	24 [*]	A
	T _C =100°C	24				
Pulsed Drain Current (Note 1)	I _{DM}	130				A
Single Pulse Avalanche Energy(Note 2)	E _{AS}	1050				mJ
Avalanche Current(Note 1)	I _{AR}	9.5				A
Repetitive Avalanche Energy(Note 1)	E _{AR}	1.6				mJ
Reverse Diode Recovery dv/dt(Note 3)	dv/dt	15				V/ns
Drain Source Voltage Slope (V _{DS} =480V)	dv/dt	50				V/ns
Power Dissipation T _C =25°C	P _D	391		50		W
Operating Junction and Storage Temperature	T _J /T _{STG}	-55 ~ +150				°C

* limited by maximum junction temperature

Table 2. Thermal Characteristics

Parameters	Symbol	SJ45N65R SJ45N65DR SJ45N65D7R	SJ45N65PR SJ45N65KR	SJ45N65FR	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62		82	$^{\circ}\text{C}/\text{W}$
Thermal resistance Junction to Case	$R_{\theta JC}$	0.32		2.5	$^{\circ}\text{C}/\text{W}$

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

Parameters	Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu\text{A}$	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	$V_{GS(TH)}$	$V_{DS}=V_{GS}, I_D=250\mu\text{A}$	2.5		4.5	V
Static Drain-Source On-State Resistance	$R_{DS(ON)}$	$V_{GS}=10V, I_D=23A$		75	85	m Ω
Dynamic Characteristics(Note 5)						
Input Capacitance	C_{ISS}	$V_{DS}=25V, V_{GS}=0V, f=1\text{MHz}$		2800		pF
Output Capacitance	C_{OSS}			138		pF
Reverse Transfer Capacitance	C_{RSS}			5		pF
Switching Characteristics (Note 5)						
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=480V, I_D=23A,$ $V_{GS}=10V, R_G=20\Omega$		19		ns
Turn-On Rise Time	t_r			10		ns
Turn-Off Delay Time	$t_{d(off)}$			87		ns
Turn-Off Fall Time	t_f			5		ns
Total Gate Charge	Q_G	$V_{DS}=480V, I_D=23A,$ $V_{GS}=10V$		190		nC
Gate-Source Charge	Q_{GS}			30		nC
Gate-Drain Charge	Q_{GD}			95		nC
Drain-Source Diode Characteristics and Maximum Ratings						
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS}=0V, I_S=23A$		0.9	1.5	V
Maximum Continuous Drain-Source Diode Forward Current(Note 4)	I_S				45	A
Reverse Recovery Time	t_{rr}	$V_{GS}=0V, I_S=23A$ $di/dt=100A/\mu\text{s}$ (Note 4)		180		ns
Reverse Recovery Charge	Q_{RR}			17		μC

- Notes: 1 Repetitive Rating:Pulse width limited by maximum junction temperature
 2 Pulse width t_p limited by $T_{j,max}$
 3 $V_{DD} \leq BV_{DSS}$, starting $T_J=25^{\circ}\text{C}$
 4 Pulse Test: Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
 5 Guaranteed by design, not subject to production

Typical Characteristics Diagrams

Figure 1. Output Characteristics

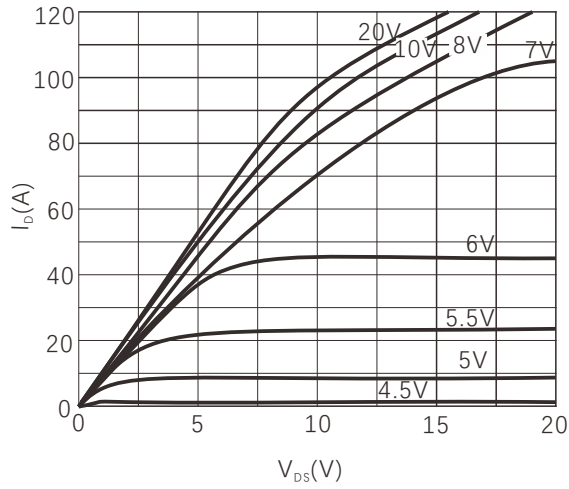


Figure 2. Transfer Characteristics

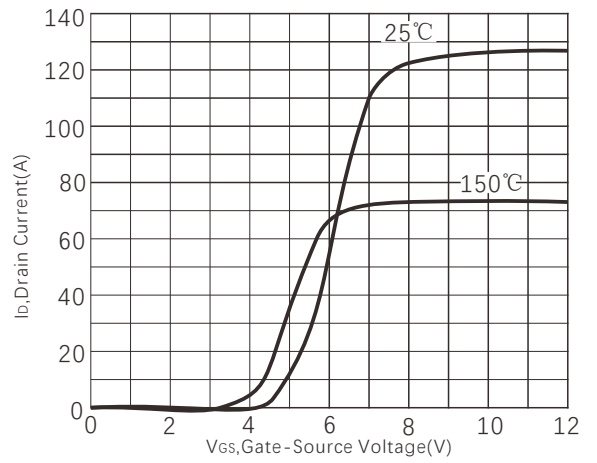


Figure 3. On-Resistance vs. Drain Current

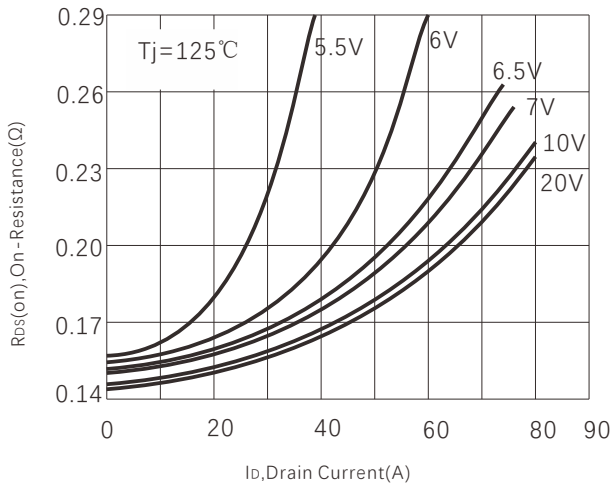


Figure 4. Capacitance

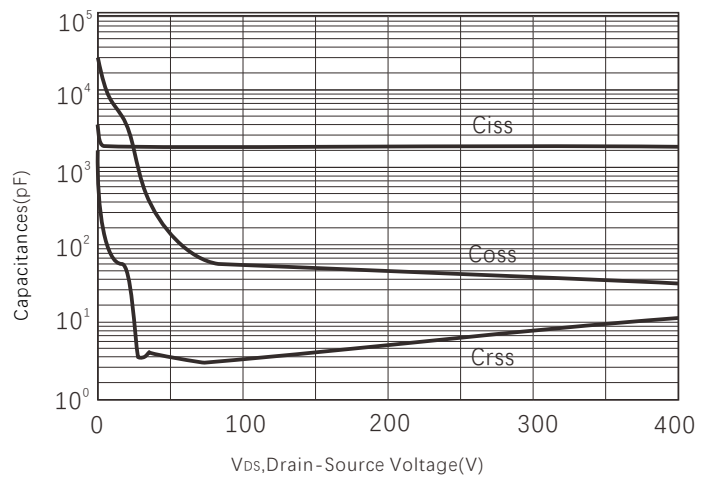


Figure 5. Gate charge

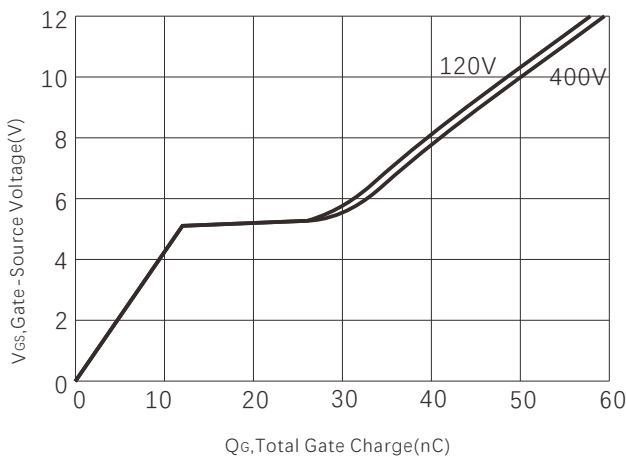


Figure 6. Source-Drain Diode Forward Voltage

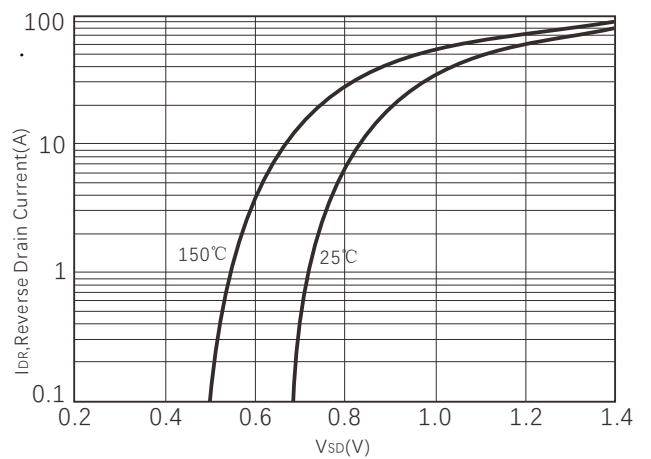


Figure 7. Normalized $R_{DS(ON)}$ vs Junction Temperature

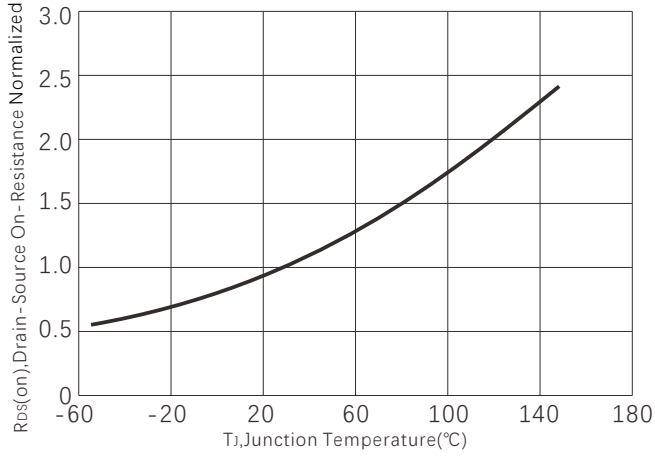


Figure 8. BV_{DSS} vs Junction Temperature

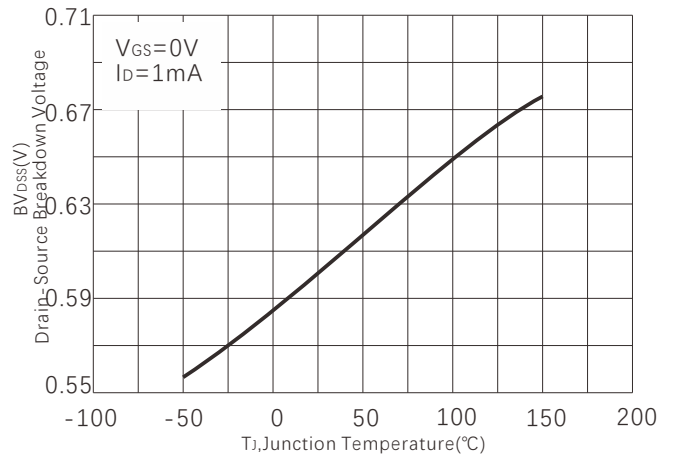


Figure 9. Safe operating area

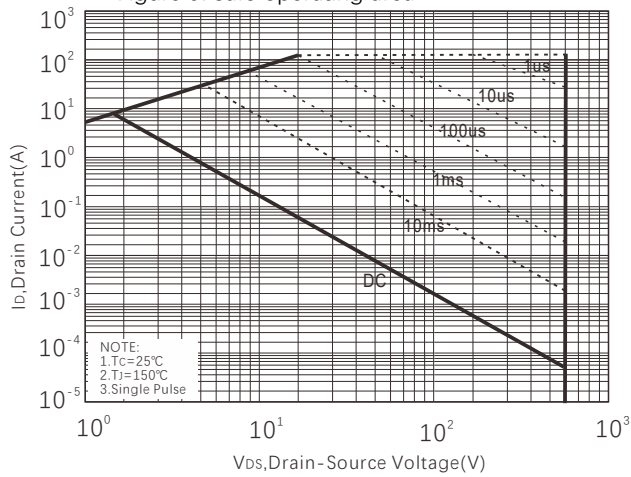


Figure 10. Power dissipation

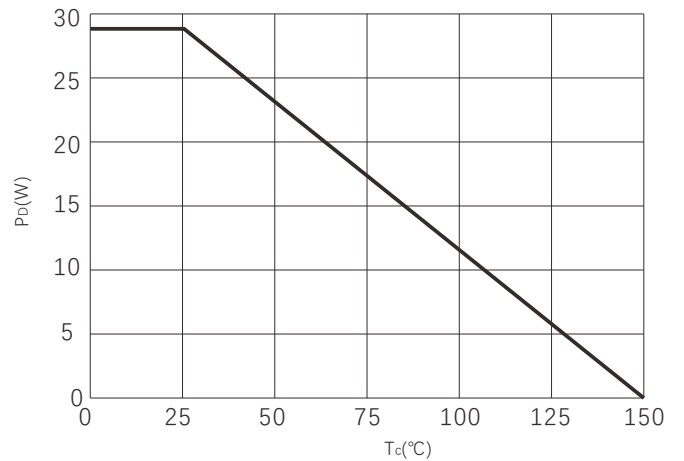
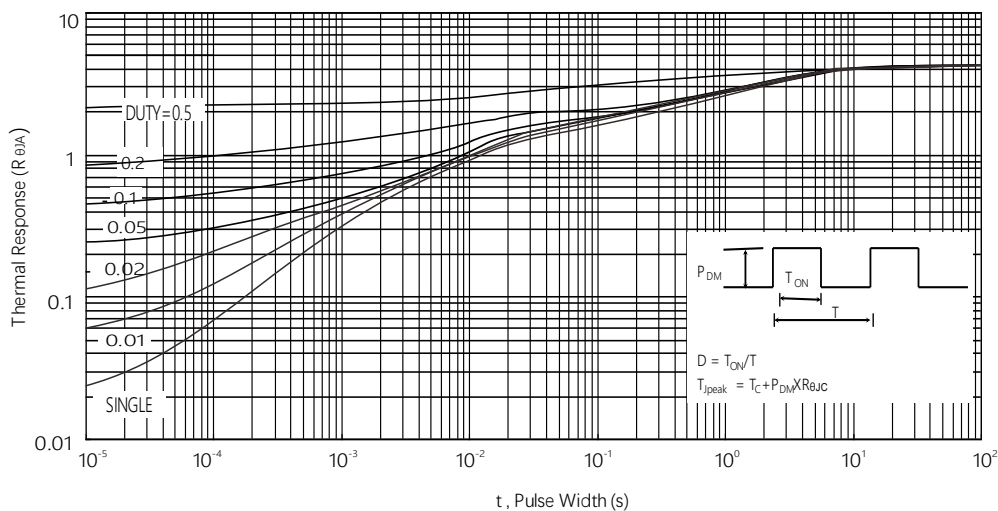
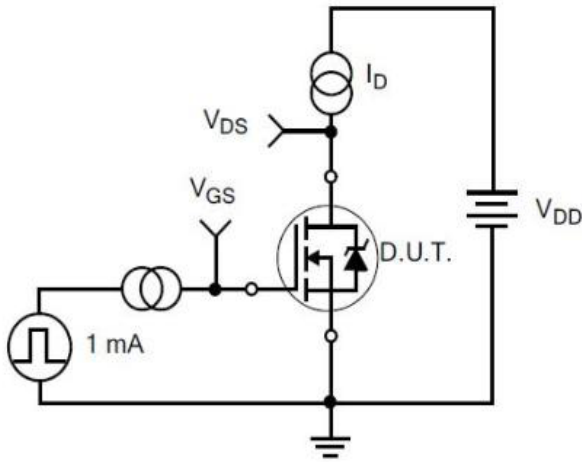


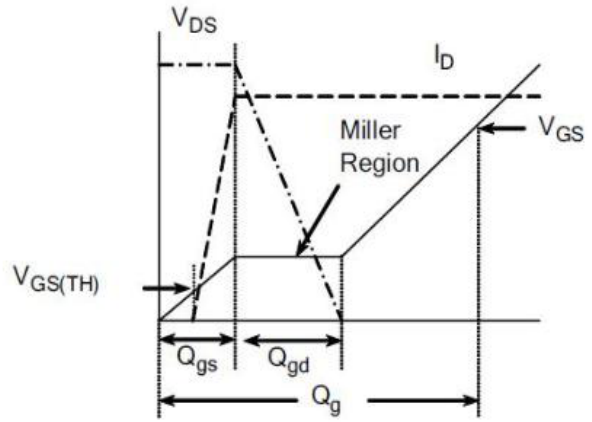
Figure 11. Maximum Transient Thermal Impedance



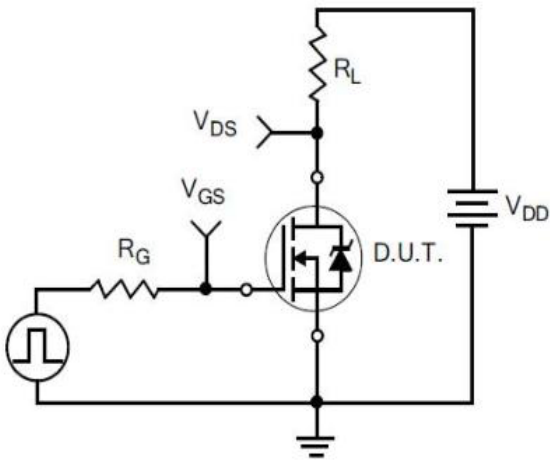
Typical Test Circuit



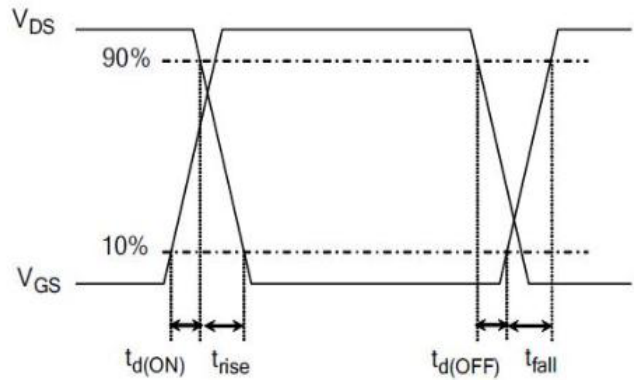
1) Gate Charge Test Circuit



2) Gate Charge Waveform

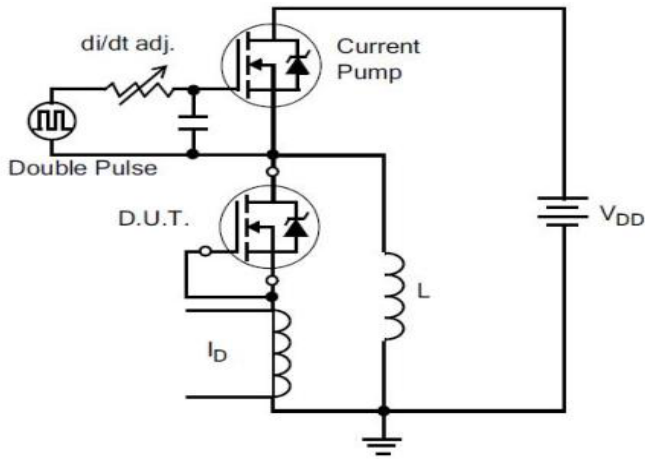


3) Resistive Switching Test Circuit

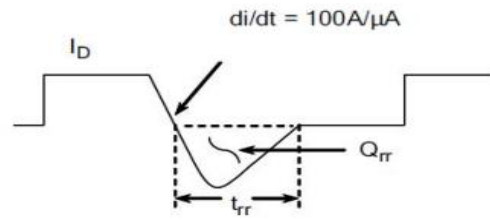


4) Resistive Switching Waveforms

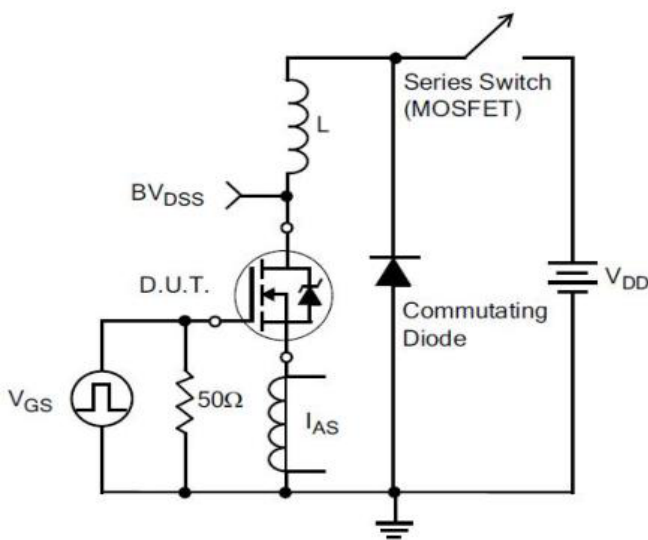
Typical Test Circuit



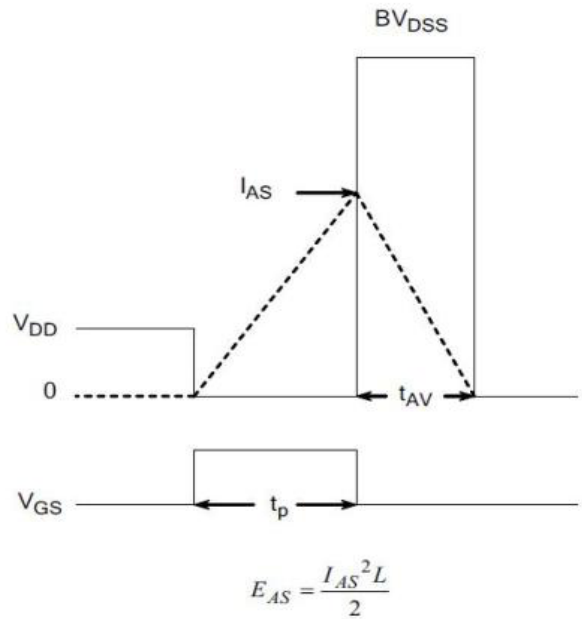
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

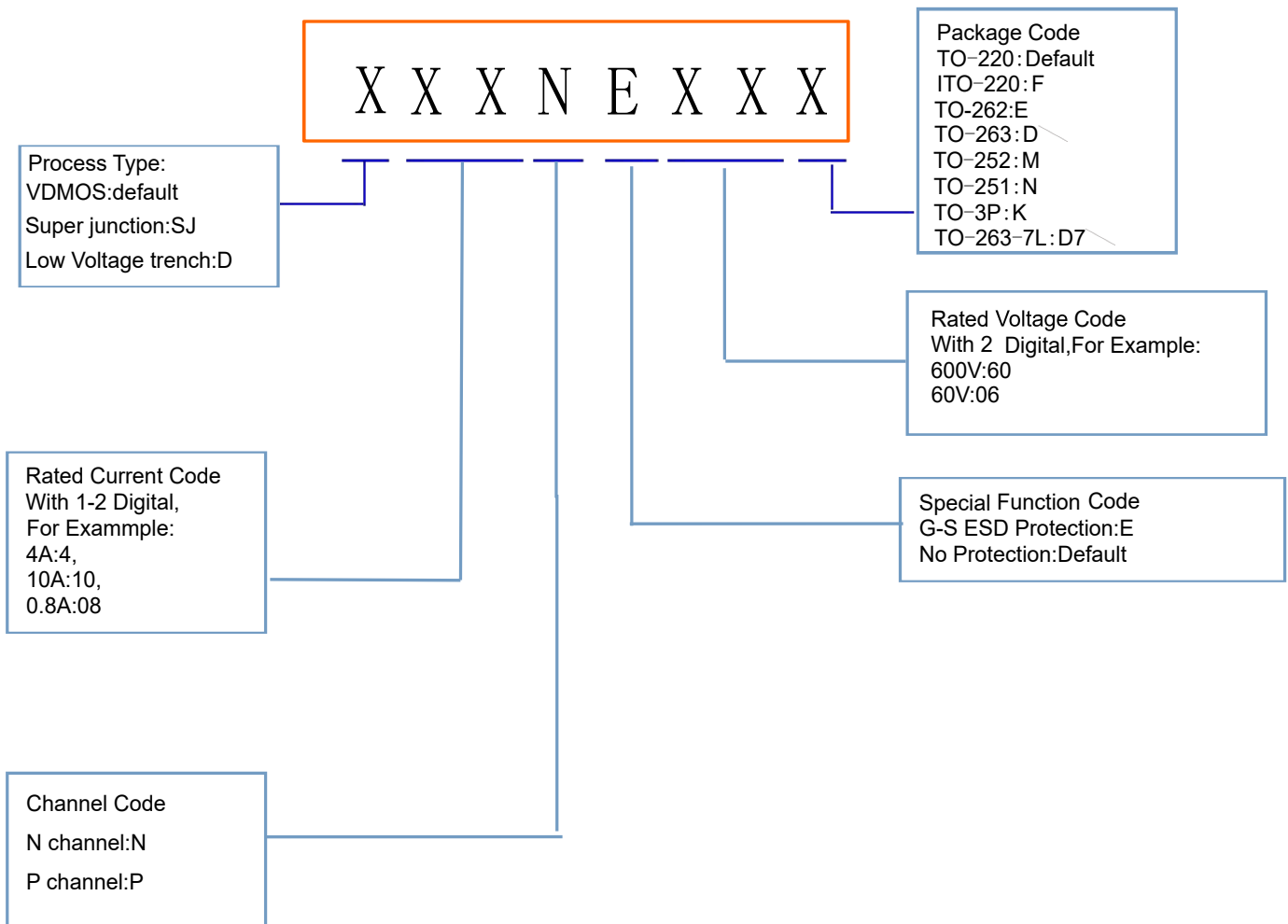


7) . Unclamped Inductive Switching Test Circuit



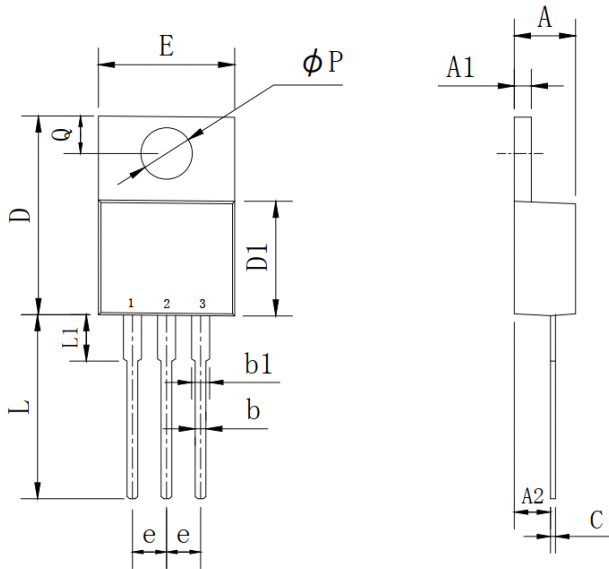
8) Unclamped Inductive Switching Waveforms

Product Names Rules



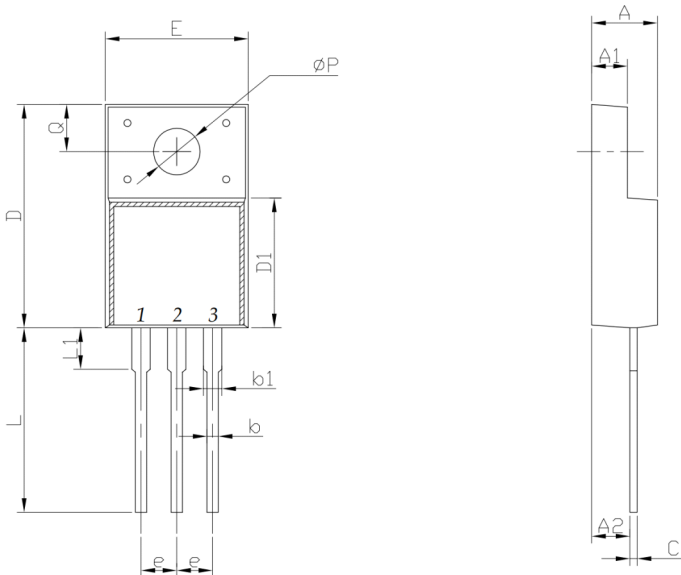
Dimensions

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

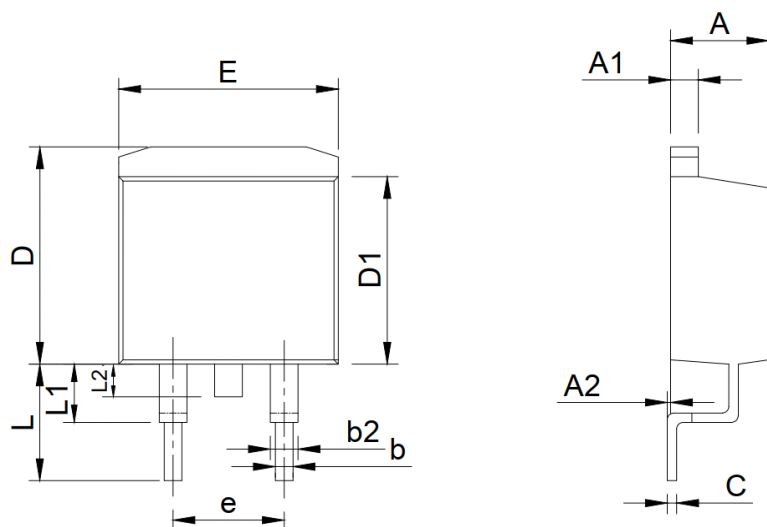
ITO-220 PACKAGE OUTLINE DIMENSIONS



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

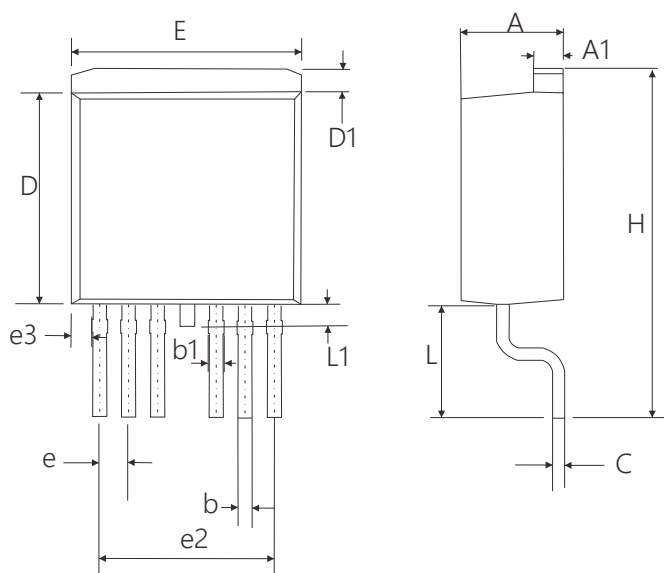
Dimensions

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

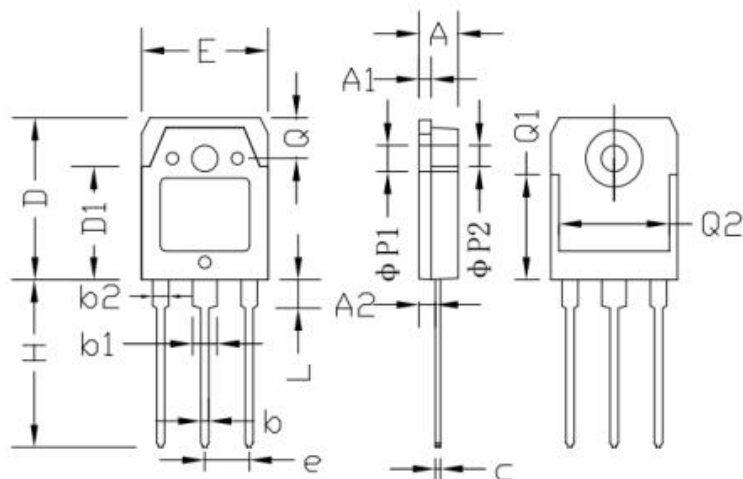
TO-263-7L PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	4.25	4.75	0.167	0.187
A1	1.2	1.4	0.047	0.055
b	0.5	0.7	0.020	0.028
b1	0.5	0.9	0.020	0.035
C	0.4	0.6	0.016	0.024
D	9.05	9.45	0.356	0.372
D1	0.7	1.3	0.028	0.051
E	9.8	10.2	0.386	0.402
e	1.07	1.47	0.042	0.058
e2	7.32	7.92	0.288	0.312
e3	0.64	1.04	0.025	0.041
H	14.65	15.65	0.577	0.616
L	4.47	5.47	0.176	0.215
L1	0.90	1.50	0.035	0.059

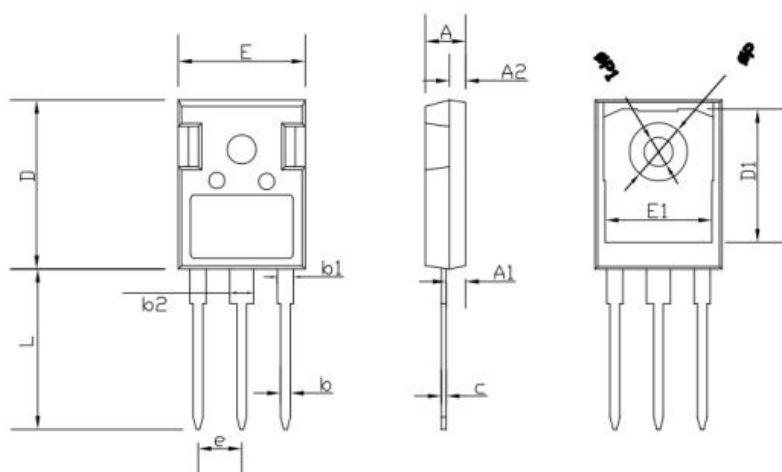
Dimensions

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

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