SEMICONDUCTOR

D50N04 Series
50A 40V N-Channel Enhancement Mode Power MOSFET

Genaral Description

These N-channel enhanced VDMOSFETS Used advanced trench technology design, provided excellent Rdson and low gate charge. Which accords with the RoHS standard.

Product Summary			
V_{DS}	$R_{DS(on)}$ (mΩ) Typ	I_D (A)	Qg (Typ)
40V	14. 5 @ 10V	50	37nc

Features

- Fast switching
- Low on-resistance
- Low gate charge and input capacitance
- 100% avalanche tested

Mechanical Data

- Case:TO-220,ITO-220,TO-263,TO-262,TO-251,TO-252 Package

Application

- Switching applications

Ordering Information

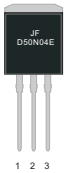
Part No.	Package Type	Package	Quality(box)
D50N04	TO-220	Tube	1000
D50N04F	ITO-220	Tube	1000
D50N04D	TO-263	Tape & Reel	800
D50N04E	TO-262	Tube	1000
D50N04N	TO-251	Tube	1000
D50N04M	TO-252	Tape & Reel	3000

TO-220 D50N04

ITO-220 D50N04F

TO-263 D50N04D

TO-262 D50N04E



TO-251 D50N04N

TO-252 D50N04M

Block Diagram

Pin Definition:

1. Gate
2. Drain
3. Source

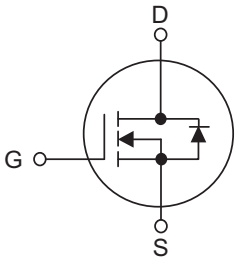


Table1 Absolute Maximum Ratings (T_C=25 C, unless otherwise specified)

Parameter		Symbol	D50N04/D50N04D/D50N04E D50N04M/D50N04N	D50N04F	Unit
Drain-Source Voltage		V_{DS}	40		V
Gate-Source Voltage		V_{GS}	±20		V
Continuous Drain Current	T_C=25°C	I_D	50		A
	T_C=100°C		32		
Pulsed Drain Current (Note 1)		I_{DM}	200		A
Single Pulse Avalanche Energy(Note 2)		E_{AS}	121		mJ
Avalanche Current(Note 1)		I_{AR}	22		A
Power Dissipation	T_C=25°C	P_D	52	20	W
Operating Junction and Storage Temperature		T_J/T_{STG}	-55 ~ +175		C

Table 2.Thermal Characteristics

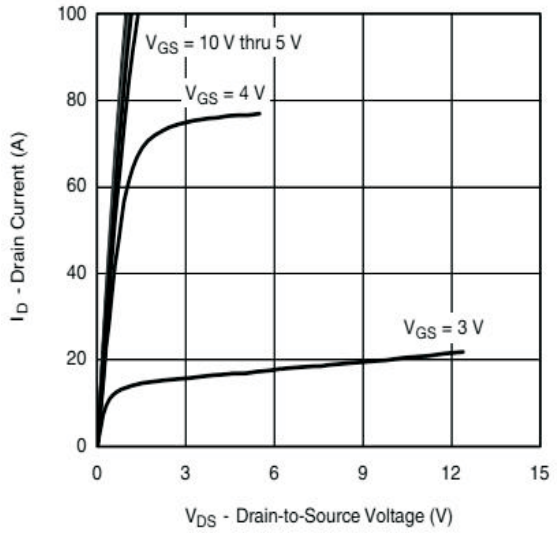
Parameter	Symbol	D50N04/D50N04D/D50N04E D50N04M/D50N04N	D50N04F	Unit
Thermal resistance Junction to Ambient	$R_{\theta JA}$	62.5	62.5	C/W
Thermal resistance Junction to Case	$R_{\theta JC}$	2. 4	6. 25	C/W

Table 3. Electrical Characteristics (T_J=25 C, unless otherwise specified)

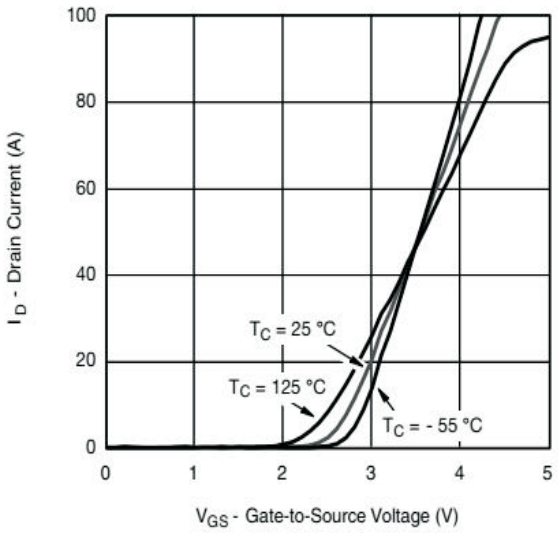
Parameter		Symbol	Test Conditions	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V,I_D=250μA	40			V
Drain-Source Leakage Current		I_{DSS}	V_{DS}=40V,V_{GS}=0V			1	μA
Gate- Source Leakage Current	Forward	I_{GSS}	V_{GS}=20V,V_{DS}=0V			100	nA
	Reverse		V_{GS}=-20V,V_{DS}=0V			-100	nA
On Characteristics(Note 4)							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS}=V_{GS},I_D=250μA	1.0		2.0	V
Static Drain-Source On-State Resistance		$R_{DS(ON)}$	V_{GS}=10V,I_D=25A		14.5	20	mΩ
Dynamic Characteristics(Note 5)							
Input Capacitance		C_{ISS}	V_{DS}=25V,V_{GS}=0V,f=1MHz		1287		pF
Output Capacitance		C_{OSS}			91		pF
Reverse Transfer Capacitance		C_{RSS}			71		pF
Switching Characteristics (Note 5)							
Turn-On Delay Time		td(on)	V_{DS}=20V,I_D=20A, V_{GS}=10V,R_G=1Ω		30		ns
Turn-On Rise Time		t_R			15		ns
Turn-Off Delay Time		td(off)			45		ns
Turn-Off Fall Time		tf			15		ns
Total Gate Charge		Q_G	V_{DS}=20V,I_D=20A, V_{GS}=10V		37		nC
Gate-Source Charge		Q_{GS}			4.5		nC
Gate-Drain Charge		Q_{GD}			6.5		nC
Drain-Source Diode Characteristics and Maximum Ratings							
Drain-Source Diode Forward Voltage		V_{SD}	V_{GS}=0V, I_S=30A		0.92	1.2	V
Maximum Continuous Drain-Source Diode Forward Current		I_S				50	A
Reverse Recovery Time		trr	V_{GS}=0V, I_F=20A dI$_F$/dt=100A/μs (Note 1)		36		ns
Reverse Recovery Charge		Q_{RR}			14		nC

Notes : 1 Repetitive Rating:Pulse width limited by maximum junction temperature
2 L=0.5mH, I_D=22A,V_{DD}=30V,Starting T_J=25°C
4 Pulse Test: Pulse width ≤300μS, Duty cycle≤2%
5 Guaranteed by design,not subject to production

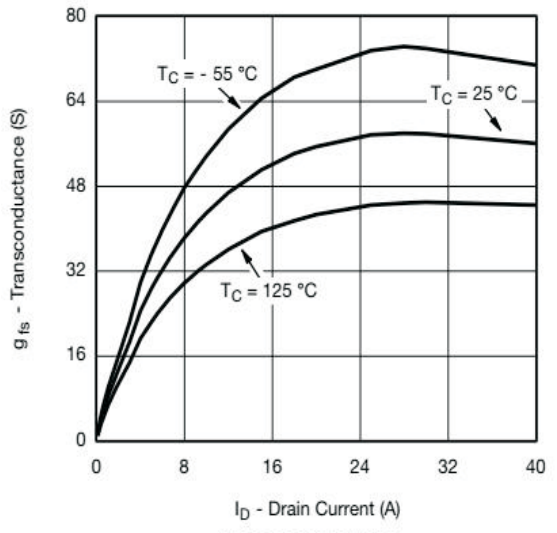
Typical Characteristics Diagrams



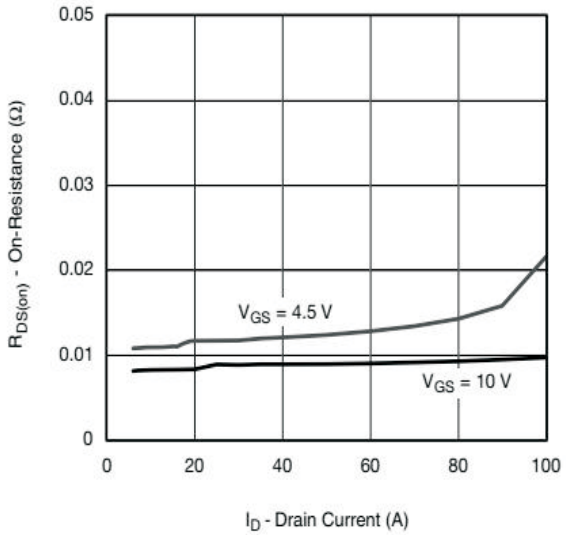
Output Characteristics



Transfer Characteristics

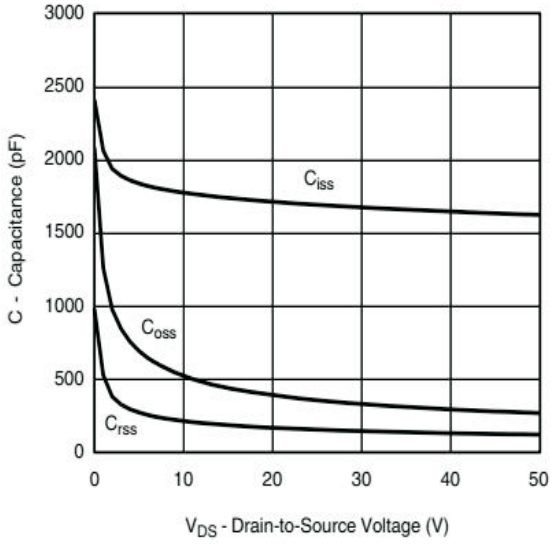


Transconductance

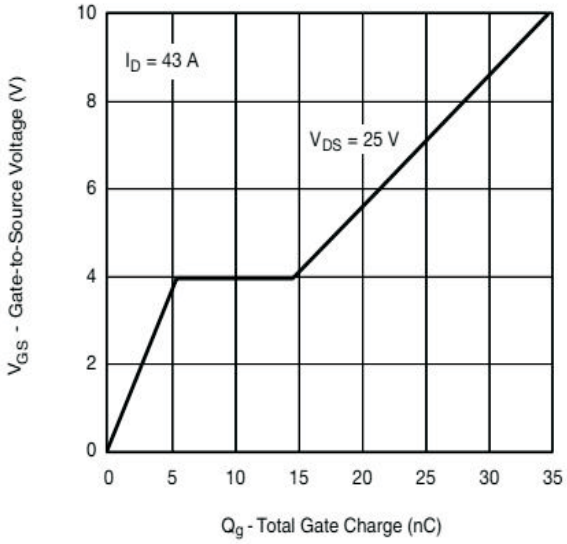


On-Resistance vs. Drain Current

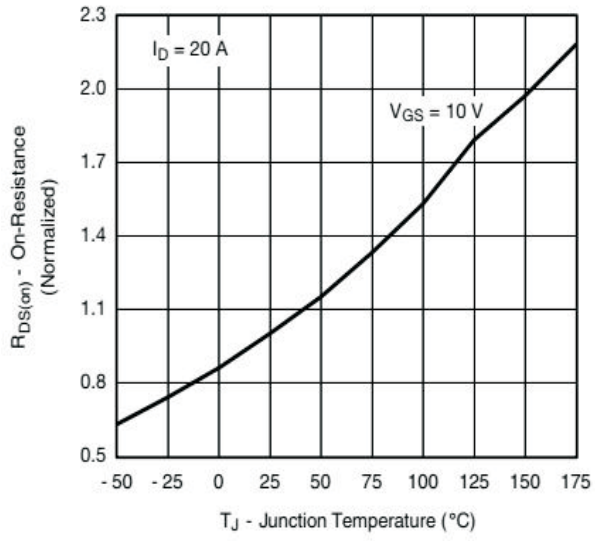
Typical Characteristics Diagrams



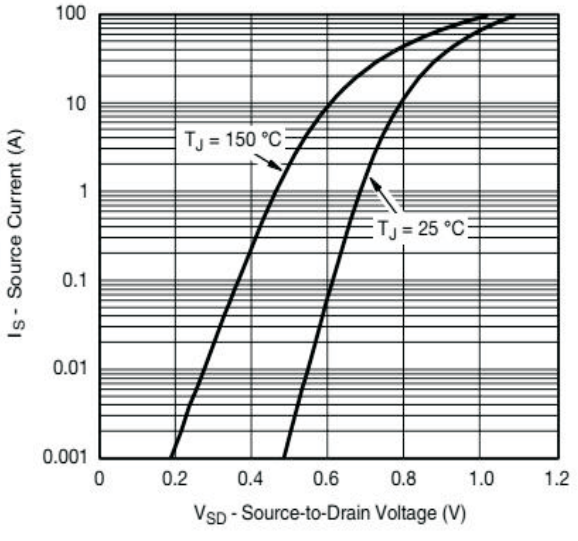
Capacitance



Gate Charge

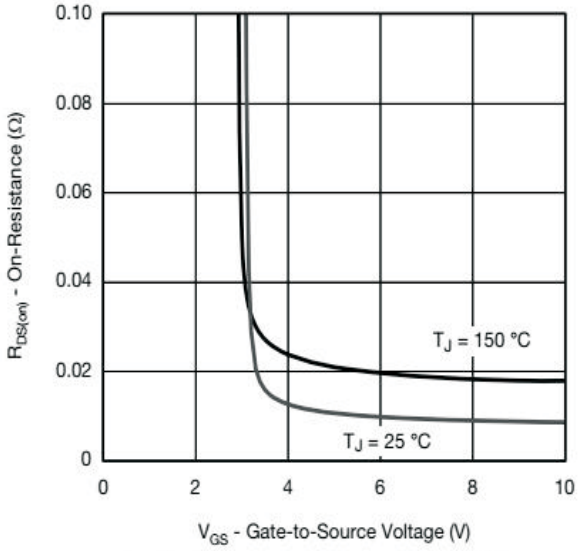


On-Resistance vs. Junction Temperature

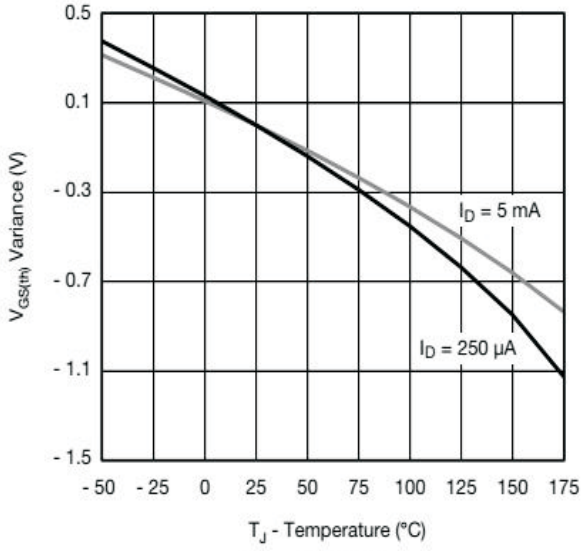


Source Drain Diode Forward Voltage

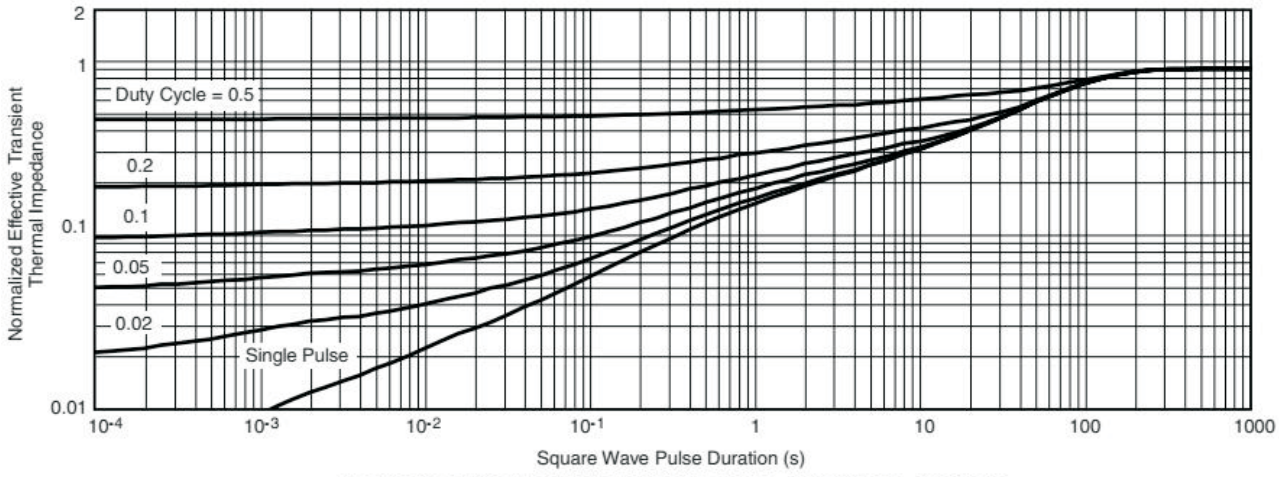
Typical Characteristics Diagrams



On-Resistance vs. Gate-to-Source Voltage

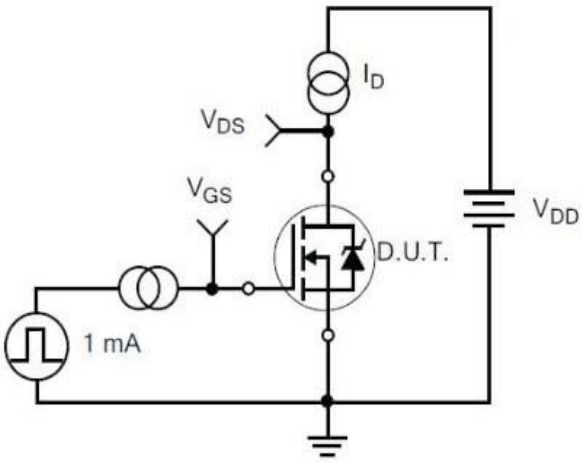


Threshold Voltage

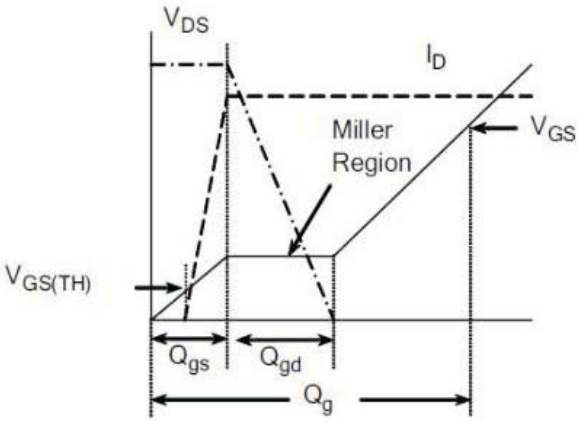


Normalized Thermal Transient Impedance, Junction-to-Ambient

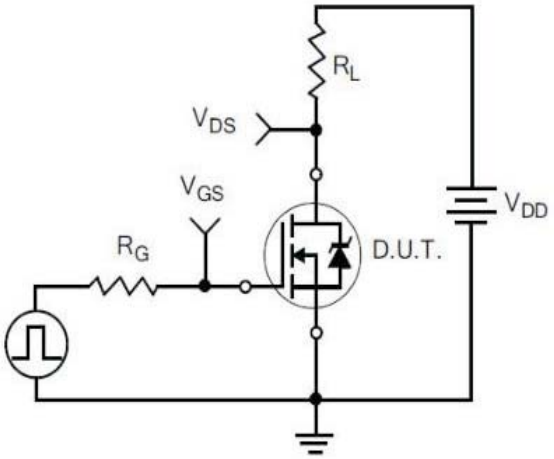
Typical Test Circuit



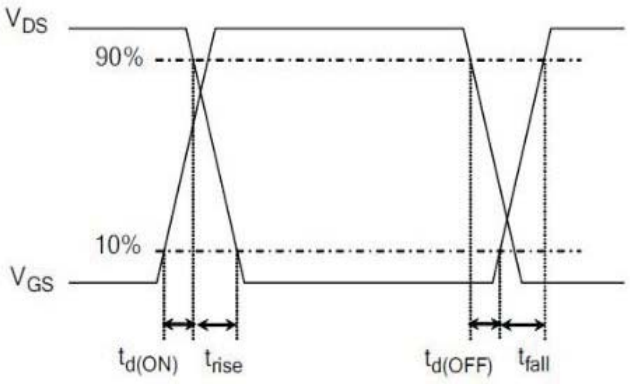
1) Gate Charge Test Circuit



2) . Gate Charge Waveform

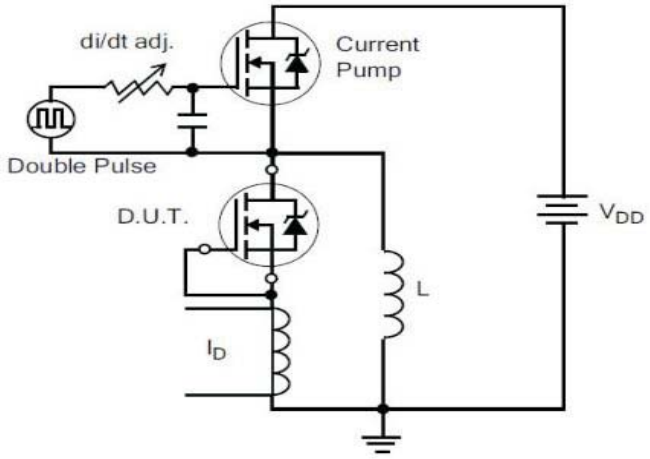


3) Resistive Switching Test Circuit

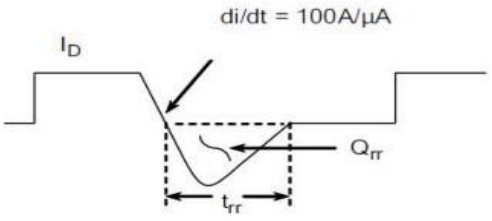


4) Resistive Switching Waveforms

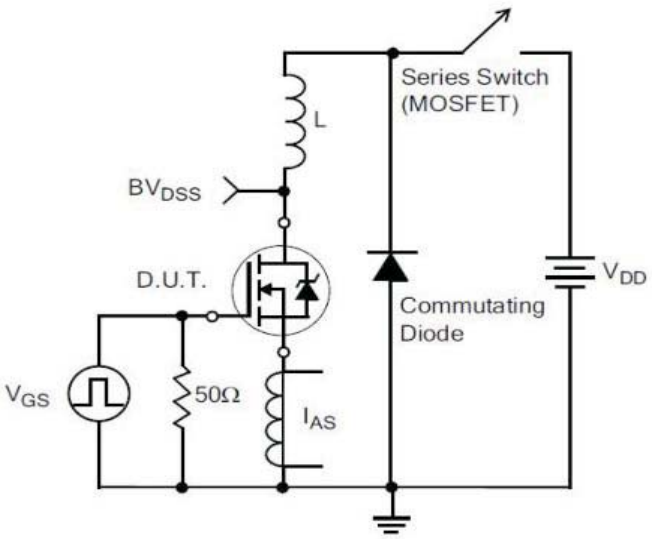
Typical Test Circuit



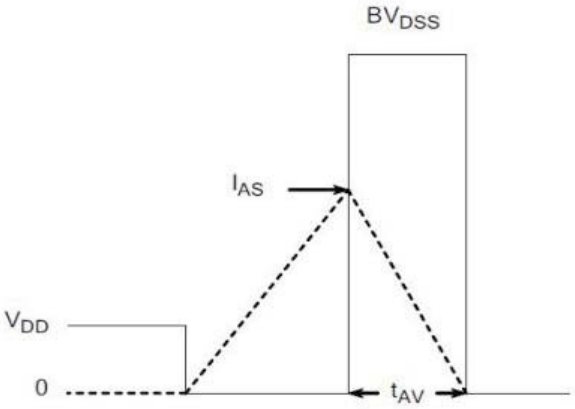
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform



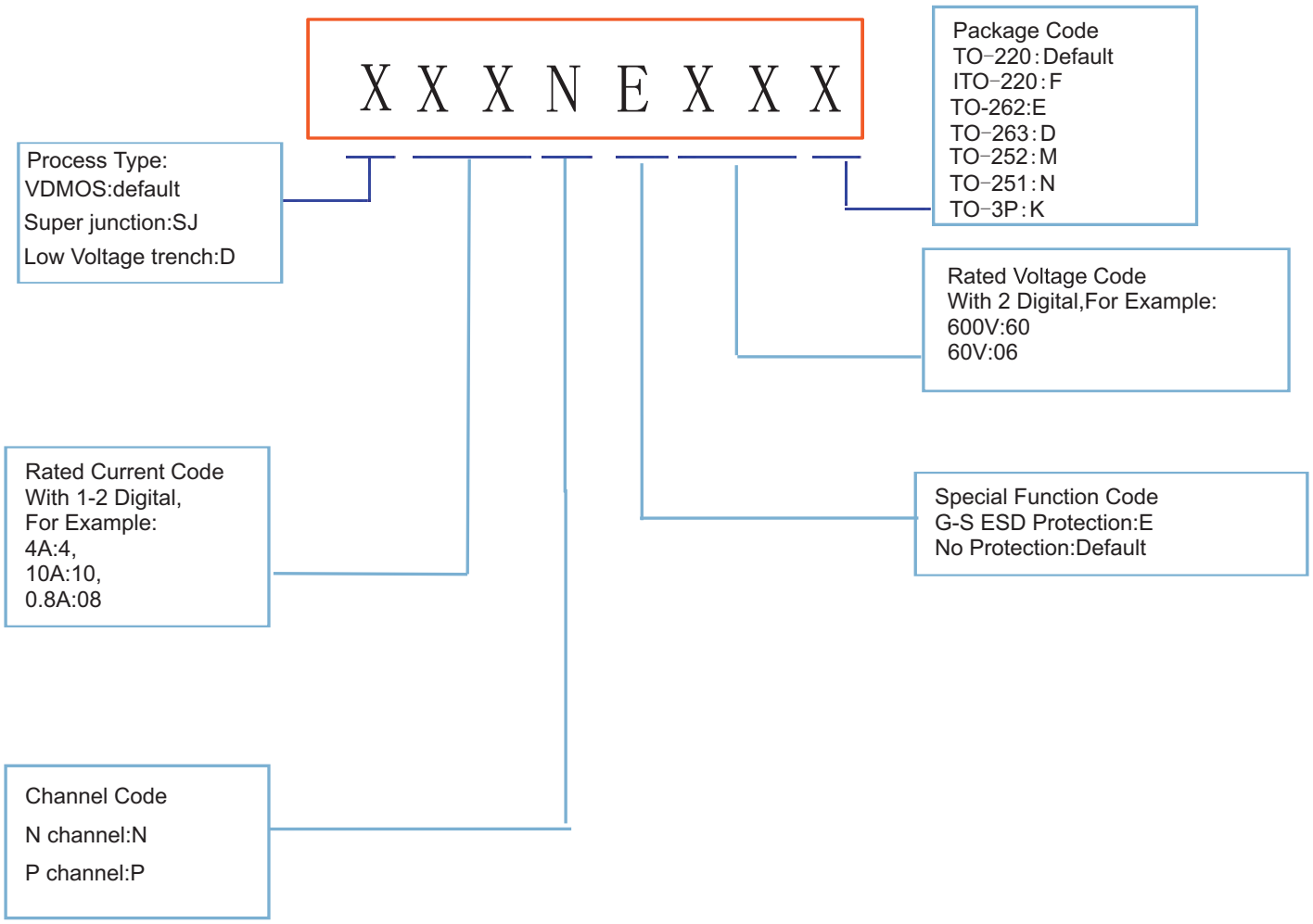
7) . Unclamped Inductive Switching Test Circuit



$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

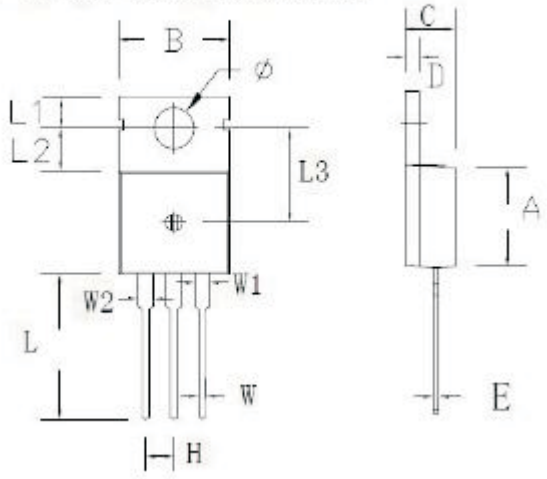
8) Unclamped Inductive Switching Waveforms

Product Names Rules



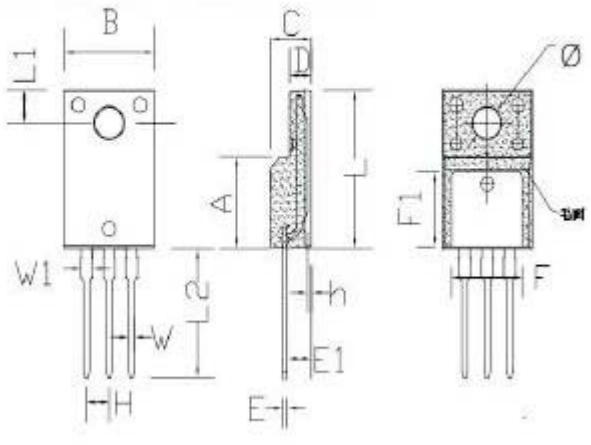
Dimensions

TO-220 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	8.80	9.30	0.346	0.366
B	9.70	10.30	0.382	0.406
C	4.25	4.75	0.167	0.187
D	1.20	1.45	0.047	0.057
E	0.40	0.60	0.016	0.024
H	2.54 TYP		0.100 TYP	
W	0.60	0.95	0.024	0.037
W1	1.05	1.45	0.041	0.057
W2	1.20	1.60	0.047	0.063
L	12.60	13.40	0.496	0.528
L1	2.45	2.95	0.096	0.116
L2	3.45	3.95	0.136	0.156
L3	8.15	8.65	0.321	0.341
Φ	3.50	3.90	0.138	0.154

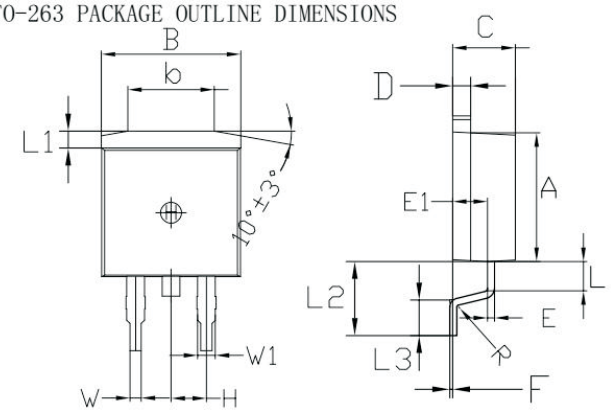
ITO-220 PACKAGE OUTLINE DIMENSIONS



Symbol	DimensionsIn Millimeters		DimensionsIn Inches	
	min.	max.	min.	max.
A	8.80	9.30	0.346	0.366
B	10.00	10.50	0.394	0.413
C	4.30	4.90	0.169	0.193
D	2.30	2.70	0.091	0.106
L	15.55	16.15	0.612	0.636
h	0.40	0.60	0.016	0.024
L1	3.15	3.55	0.124	0.140
L2	12.65	13.35	0.498	0.526
W	0.70	0.90	0.028	0.035
W1	1.15	1.55	0.045	0.061
H	2.54 TYP		0.100 TYP	
E	0.48	0.53	0.019	0.021
ϕ	2.90	3.40	0.114	0.134
E1	2.40	2.90	0.094	0.114
F	7.75	8.25	0.305	0.325
F1	7.35	7.85	0.289	0.309

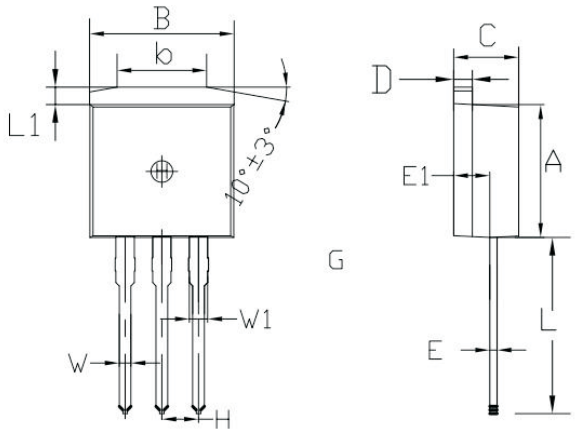
Dimensions

TO-263 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	8.80	9.30	0.346	0.366
B	9.70	10.30	0.382	0.406
C	4.25	4.75	0.167	0.187
D	1.20	1.45	0.047	0.057
E	0.40	0.60	0.016	0.024
L	1.90	2.30	0.075	0.091
L1	1.15	1.45	0.045	0.057
R	0.24	0.26	0.0095	0.0102
W	0.80	0.82	0.0315	0.0323
W1	1.20	1.30	0.047	0.051
H	2.54 TYP		0.200 TYP	
b	5.50	6.50	0.216	0.256
E1	2.4	2.6	0.0946	0.1024
L2	5.20	5.80	0.205	0.228
L3	2.20	3.20	0.087	0.126
F	0.03	0.23	0.0012	0.0091

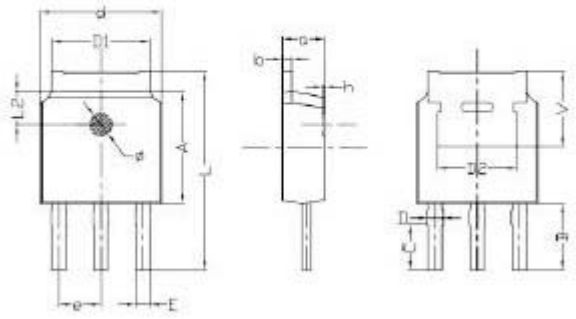
TO-262 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
A	8.80	9.30	0.346	0.366
B	9.70	10.30	0.382	0.406
C	4.25	4.75	0.167	0.187
D	1.20	1.45	0.047	0.057
E	0.40	0.60	0.016	0.024
L	12.25	13.75	0.482	0.541
L1	1.15	1.45	0.045	0.057
E1	2.4	2.6	0.0945	0.1024
W	0.80	0.82	0.0315	0.034
W1	1.20	1.30	0.047	0.051
H	2.54 TYP		0.200 TYP	
b	5.50	6.50	0.216	0.256

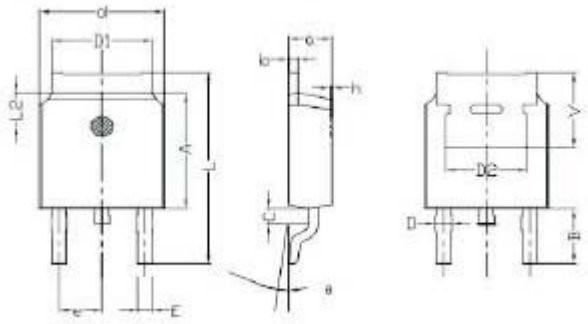
Dimensions

TO-251 PACKAGE OUTLINE DIMENSIONS



Symbol	DimensionsIn Millimeters		DimensionsIn Inches	
	min.	max.	min.	max.
a	2.20	2.40	0.087	0.0946
b	0.46	0.58	0.018	0.023
C	2.45	2.65	0.097	0.104
D	0.80	0.90	0.032	0.035
d	6.30	6.70	0.248	0.264
D1	5.00	5.50	0.197	0.217
D2	TYP 4.83		TYP 0.190	
A	5.80	6.20	0.228	0.244
e	2.19	2.39	0.086	0.094
L	10.40	11.00	0.4098	0.4334
B	3.50	3.70	0.1379	0.1458
L2	1.5	1.8	0.059	0.071
ϕ	1.10	1.30	0.0433	0.0512
h	0.00	0.30	0.000	0.012
V	5.25	5.85	0.207	0.230
E	0.60	0.80	0.0236	0.0315

TO-252 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	min.	max.	min.	max.
a	2.20	2.40	0.087	0.095
b	0.46	0.58	0.018	0.023
c	0.70	0.90	0.028	0.035
D	0.80	1.00	0.032	0.039
d	6.30	6.70	0.248	0.264
D1	5.00	5.50	0.197	0.217
D2	TYP 4.83		TYP 0.190	
A	5.80	6.20	0.228	0.244
e	2.19	2.39	0.086	0.094
L	9.40	10.40	0.370	0.409
B	2.6	3.2	0.102	0.126
L2	1.5	1.8	0.059	0.071
θ	0	8	0	8
h	0	0.3	0	0.012
V	5.25	5.85	0.207	0.230

Friendship Reminder

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