

N-Channel Super Junction Power MOSFET III

General Description

The series of devices use advanced trench gate super junction technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This super junction MOSFET fits the industry's AC-DC SMPS requirements for PFC, AC/DC power conversion, and industrial power applications.

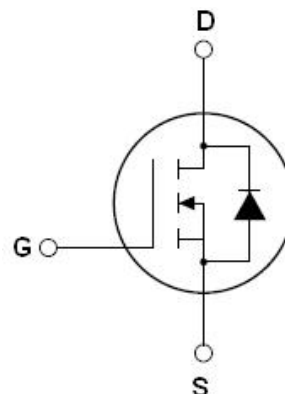
Features

- New technology for high voltage device
- Low on-resistance and low conduction losses
- Small package
- Ultra Low Gate Charge cause lower driving requirements
- 100% Avalanche Tested
- ROHS compliant

Application

- Power factor correction (PFC)
- Switched mode power supplies(SMPS)
- Uninterruptible Power Supply (UPS)

V_{DS}	700	V
$R_{DS(ON)TYP}$	260	mΩ
I_D	15	A



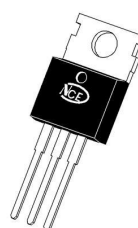
Schematic diagram

Package Marking And Ordering Information

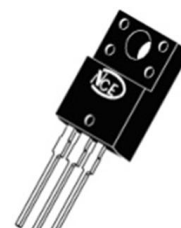
Device	Device Package	Marking
NCE70T260D	TO-263	NCE70T260D
NCE70T260	TO-220	NCE70T260
NCE70T260F	TO-220F	NCE70T260F



TO-263



TO-220



TO-220F

Table 1. Absolute Maximum Ratings ($T_c=25^\circ\text{C}$)

Parameter	Symbol	NCE70T260D NCE70T260	NCE70T260F	Unit
Drain-Source Voltage ($V_{GS}=0V$)	V_{DS}	700		V
Gate-Source Voltage ($V_{DS}=0V$) AC ($f>1\text{ Hz}$)	V_{GS}	± 30		V
Continuous Drain Current at $T_c=25^\circ\text{C}$	$I_D(DC)$	15	15*	A
Continuous Drain Current at $T_c=100^\circ\text{C}$	$I_D(DC)$	10	10*	A
Pulsed drain current (Note 1)	$I_{DM}(\text{pluse})$	60	60*	A
Maximum Power Dissipation($T_c=25^\circ\text{C}$)	P_D	131	33.2	W
Derate above 25°C		1.05	0.265	W/ $^\circ\text{C}$
Single pulse avalanche energy (Note 2)	E_{AS}	304		mJ
Avalanche current(Note 1)	I_{AR}	3		A
Repetitive Avalanche energy , t_{AR} limited by T_{jmax} (Note 1)	E_{AR}	1.6		mJ

Parameter	Symbol	NCE70T260D NCE70T260	NCE70T260F	Unit
Drain Source voltage slope, $V_{DS} \leq 480V$,	dv/dt	50		V/ns
Reverse diode dv/dt , $V_{DS} \leq 480V, I_{SD} < I_D$	dv/dt	15		V/ns
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55...+150		°C

* limited by maximum junction temperature

Table 2. Thermal Characteristic

Parameter	Symbol	NCE70T260D NCE70T260	NCE70T260F	Unit
Thermal Resistance, Junction-to-Case (Maximum)	R_{thJC}	0.95	3.76	°C / W
Thermal Resistance, Junction-to-Ambient (Maximum)	R_{thJA}	62	80	°C / W

Table 3. Electrical Characteristics (TA=25°C unless otherwise noted)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
On/off states						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	700			V
Zero Gate Voltage Drain Current(Tc=25℃)	I _{DSS}	V _{DS} =700V, V _{GS} =0V			1	μA
Zero Gate Voltage Drain Current(Tc=125℃)	I _{DSS}	V _{DS} =700V, V _{GS} =0V			100	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V			±100	nA
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	3	3.5	4	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =8A		260	290	mΩ
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =50V, V _{GS} =0V, F=1.0MHz		1210	1400	pF
Output Capacitance	C _{oss}			74		pF
Reverse Transfer Capacitance	C _{rss}			0.2		pF
Total Gate Charge	Q _g	V _{DS} =480V, I _D =15A, V _{GS} =10V		24.7	42	nC
Gate-Source Charge	Q _{gs}			8.2		nC
Gate-Drain Charge	Q _{gd}			8.5		nC
Switching times						
Turn-on Delay Time	t _{d(on)}	V _{DD} =420V, I _D =8A, R _G =2.3Ω, V _{GS} =10V		15		nS
Turn-on Rise Time	t _r			10		nS
Turn-Off Delay Time	t _{d(off)}			57		nS
Turn-Off Fall Time	t _f			9		nS
Source- Drain Diode Characteristics						
Source-drain current(Body Diode)	I _{SD}	T _C =25℃			15	A
Pulsed Source-drain current(Body Diode)	I _{SDM}				60	A
Forward On Voltage	V _{SD}	T _j =25℃, I _{SD} =15A, V _{GS} =0V		0.9	1.2	V
Reverse Recovery Time	t _{rr}	T _j =25℃, I _f =7.5A, di/dt=100A/μs		240		nS
Reverse Recovery Charge	Q _{rr}			2		uC
Peak Reverse Recovery Current	I _{rrm}			17		A

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

2. $T_J=25^\circ C, V_{DD}=50V, V_G=10V, R_G=25\Omega$

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure1. Safe operating area

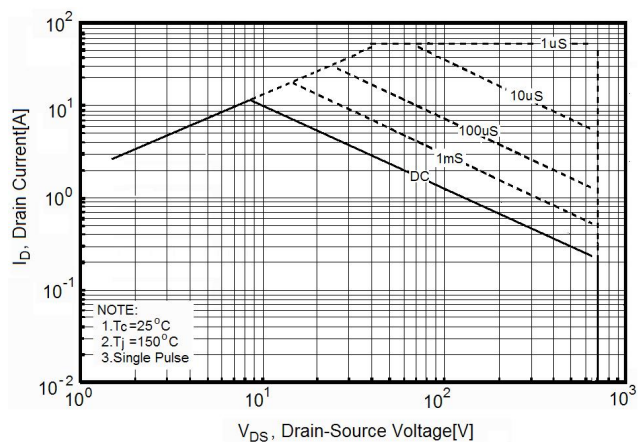


Figure2. Safe operating area for TO-220F

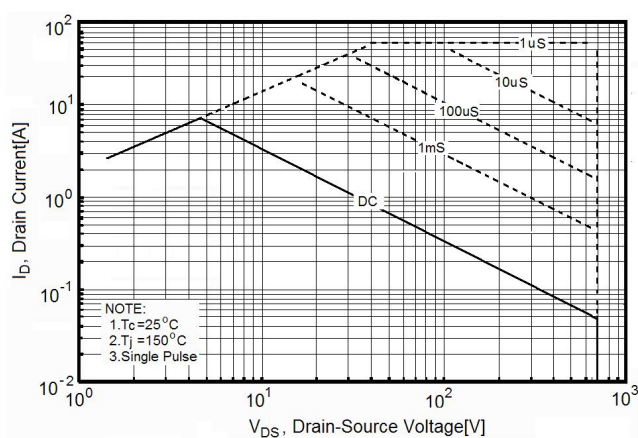


Figure3. Source-Drain Diode Forward Voltage

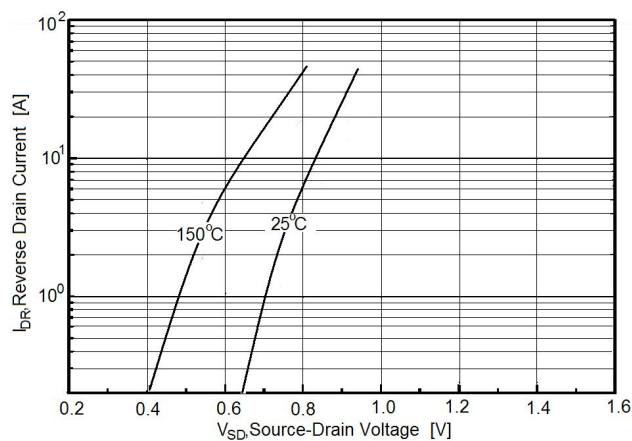


Figure4. Output characteristics

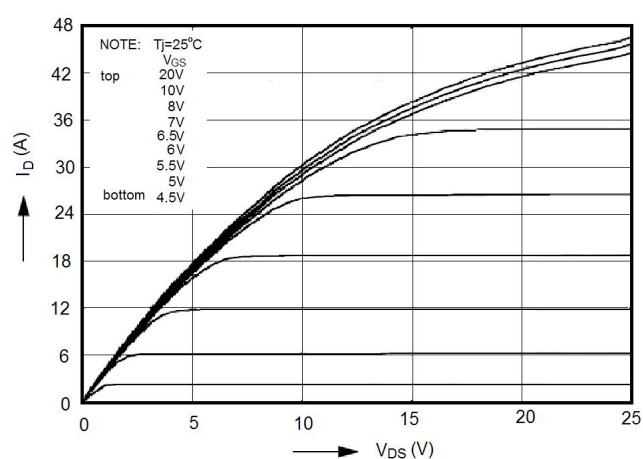


Figure5. Transfer characteristics

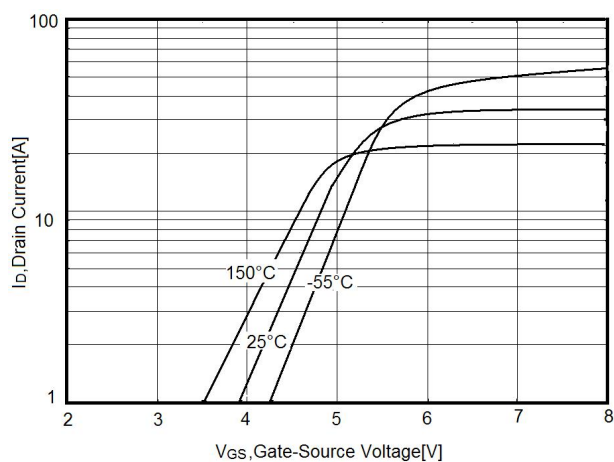


Figure6. Static drain-source on resistance

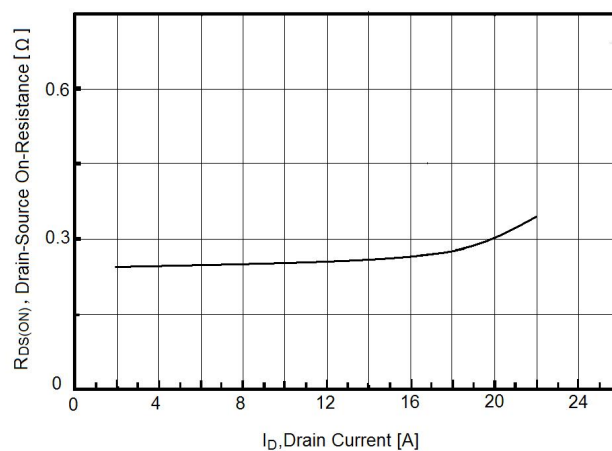


Figure7. $R_{DS(ON)}$ vs Junction Temperature

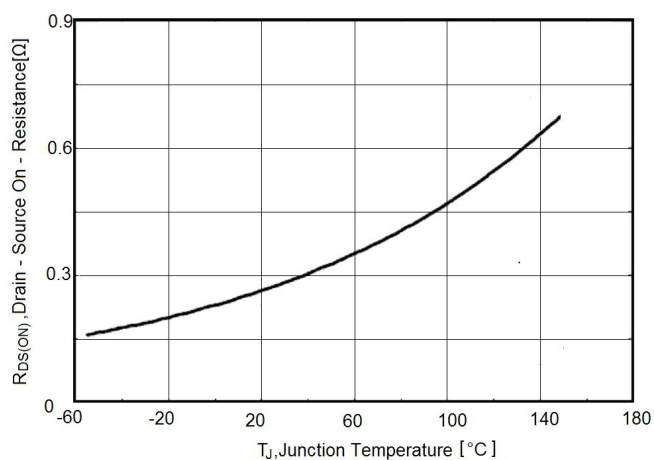


Figure8. BV_{DSS} vs Junction Temperature

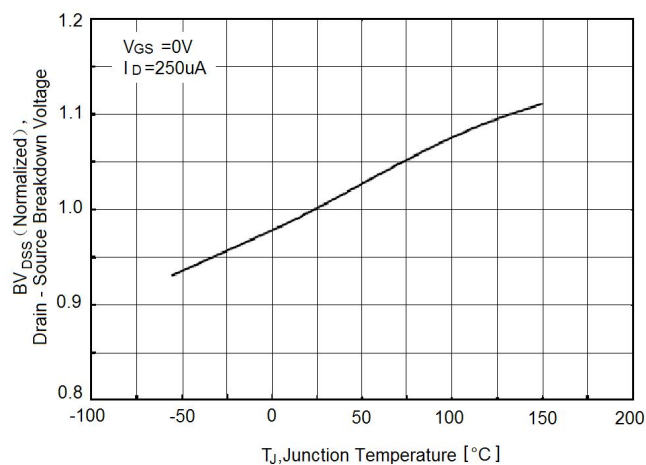


Figure9. Maximum I_D vs Junction Temperature

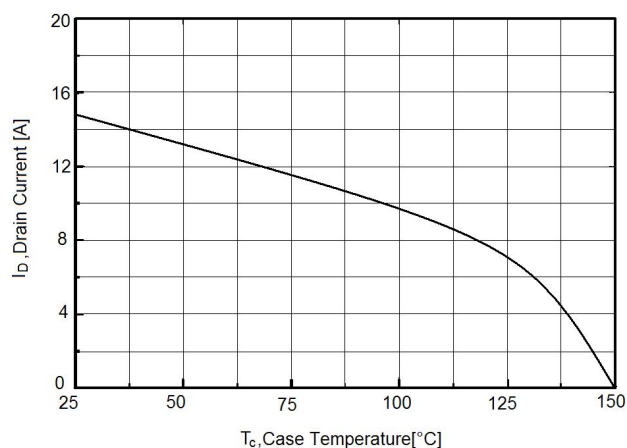


Figure10. Gate charge waveforms

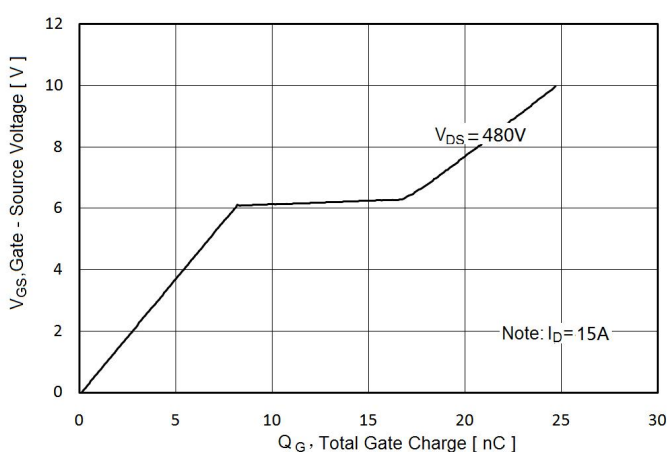


Figure11. Capacitance

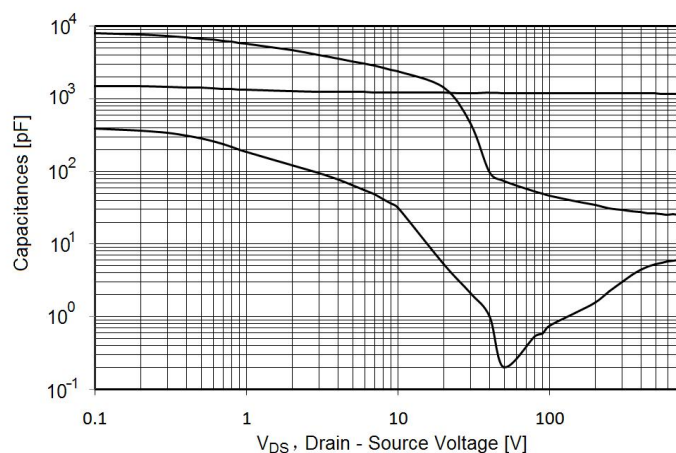


Figure12. Transient Thermal Impedance

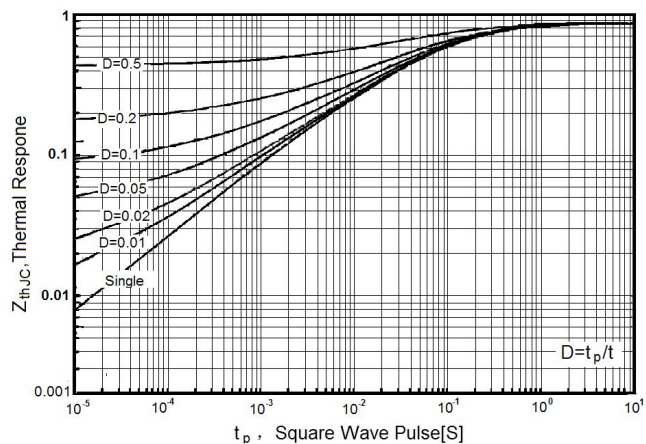
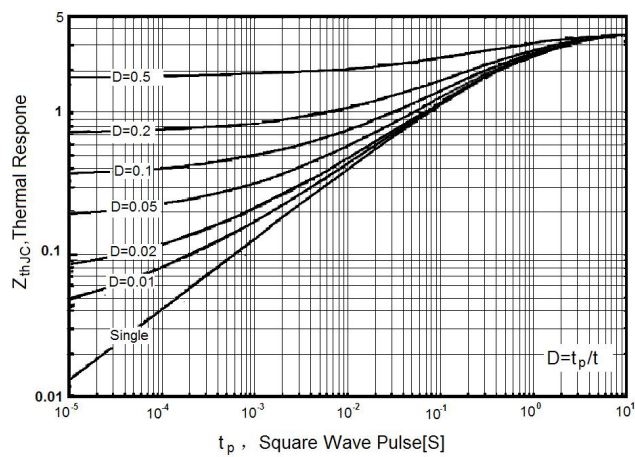
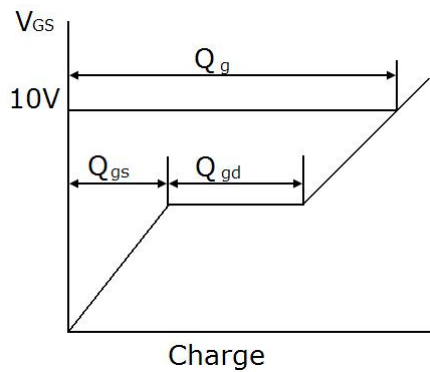
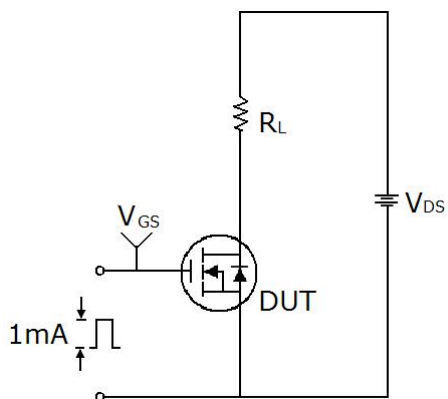


Figure13. Transient Thermal Impedance for TO-220F

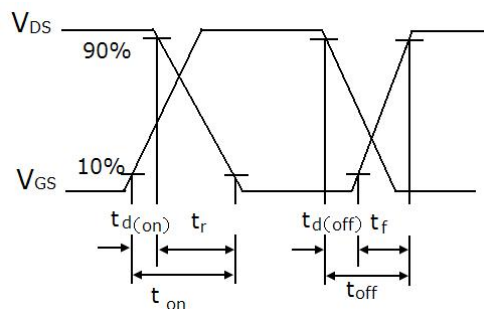
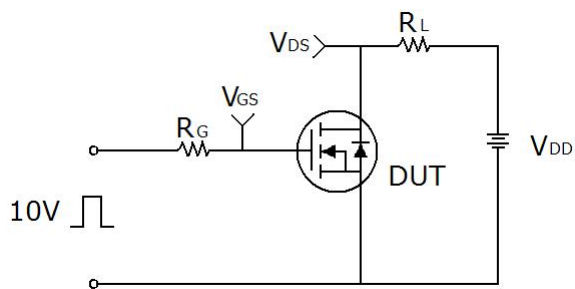


Test circuit

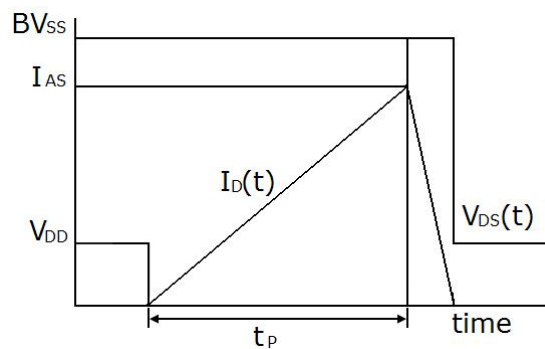
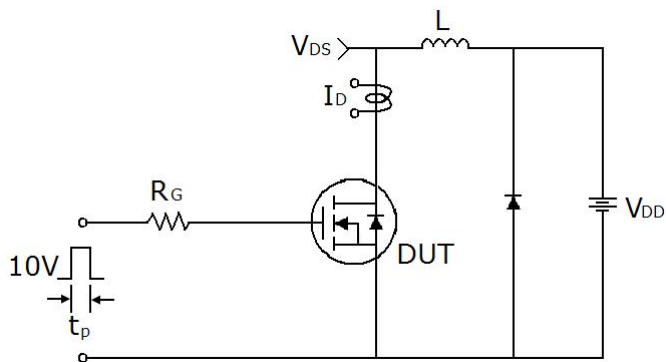
1) Gate charge test circuit & Waveform



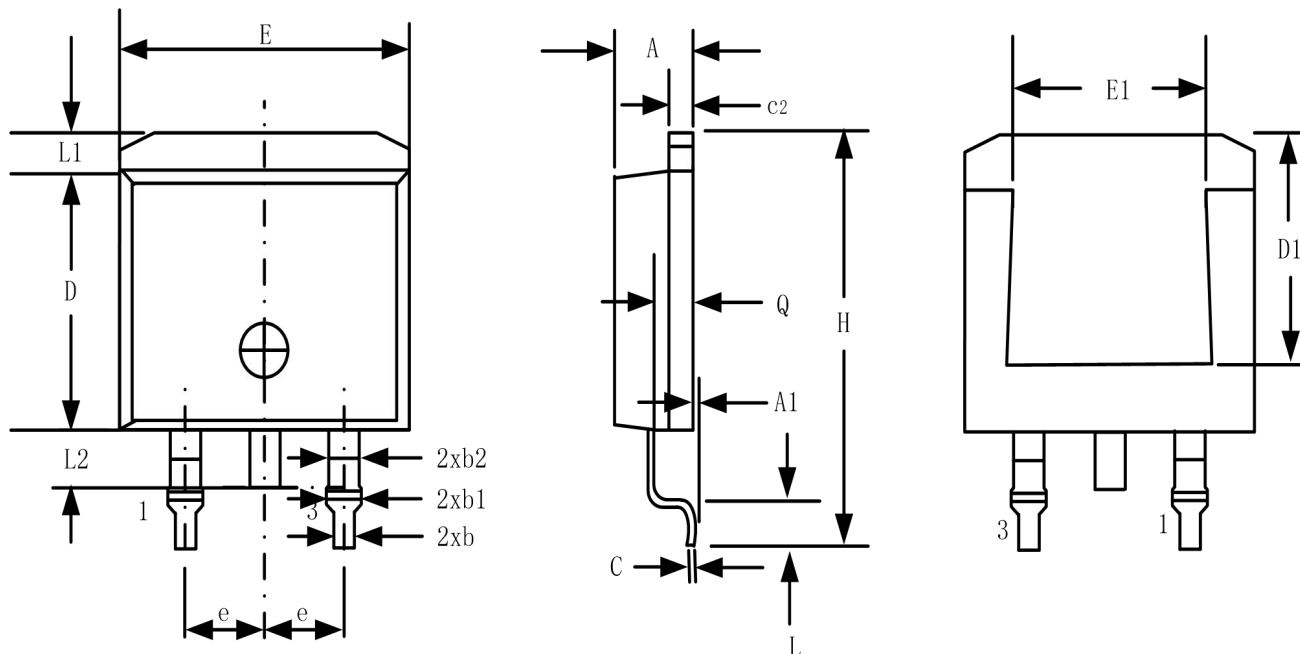
2) Switch Time Test Circuit:



3) Unclamped Inductive Switching Test Circuit & Waveforms

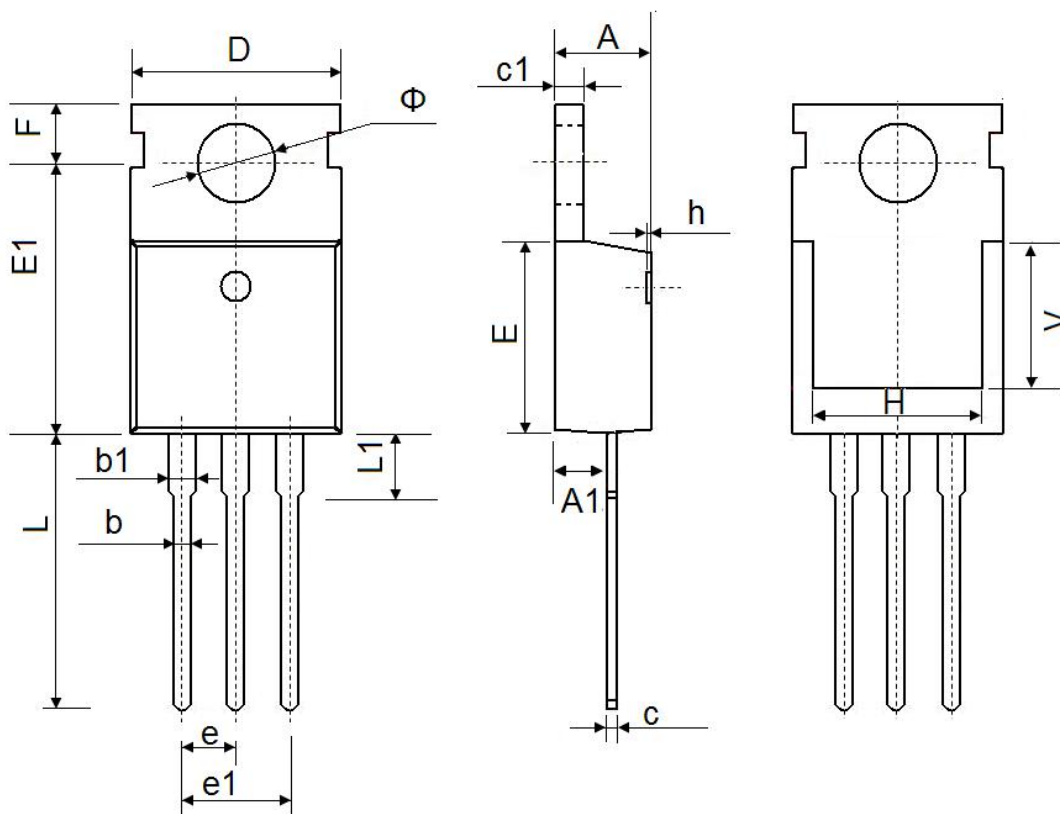


TO-263-3L Package Information



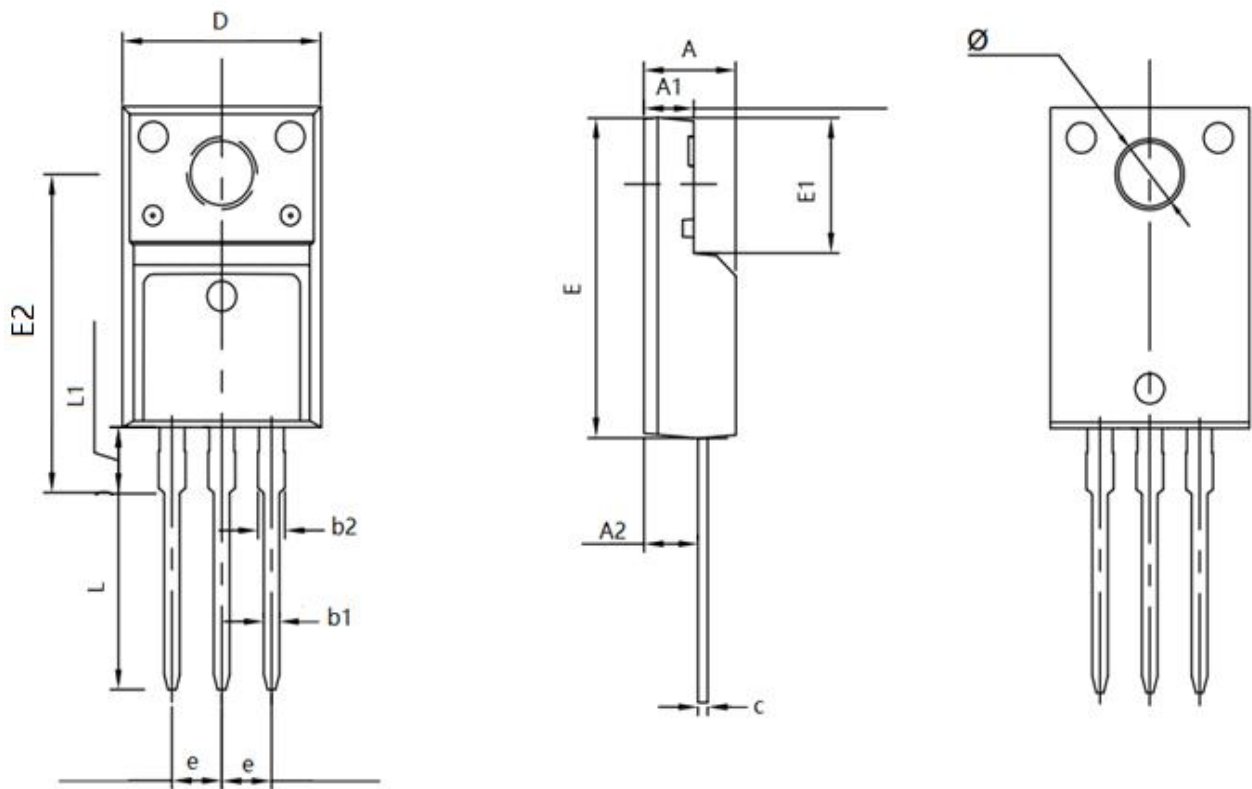
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.24	4.64	0.167	0.183
A1	0.00	0.15	0.000	0.006
b	0.70	0.90	0.028	0.035
b1	1.20	1.75	0.047	0.069
b2	1.20	1.70	0.047	0.067
C	0.40	0.60	0.016	0.024
c2	1.15	1.40	0.045	0.055
D	8.82	9.02	0.347	0.355
D1	6.86	--	0.270	--
E	9.96	10.36	0.392	0.408
E1	6.89	7.89	0.271	0.311
e	2.54 BSC		0.10 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	1.36 REF		0.054 REF	
L2	1.50 REF		0.059 REF	
L3	0.25 REF		0.010 REF	
Q	2.30	2.70	0.091	0.106

TO-220-3L-C Package Information



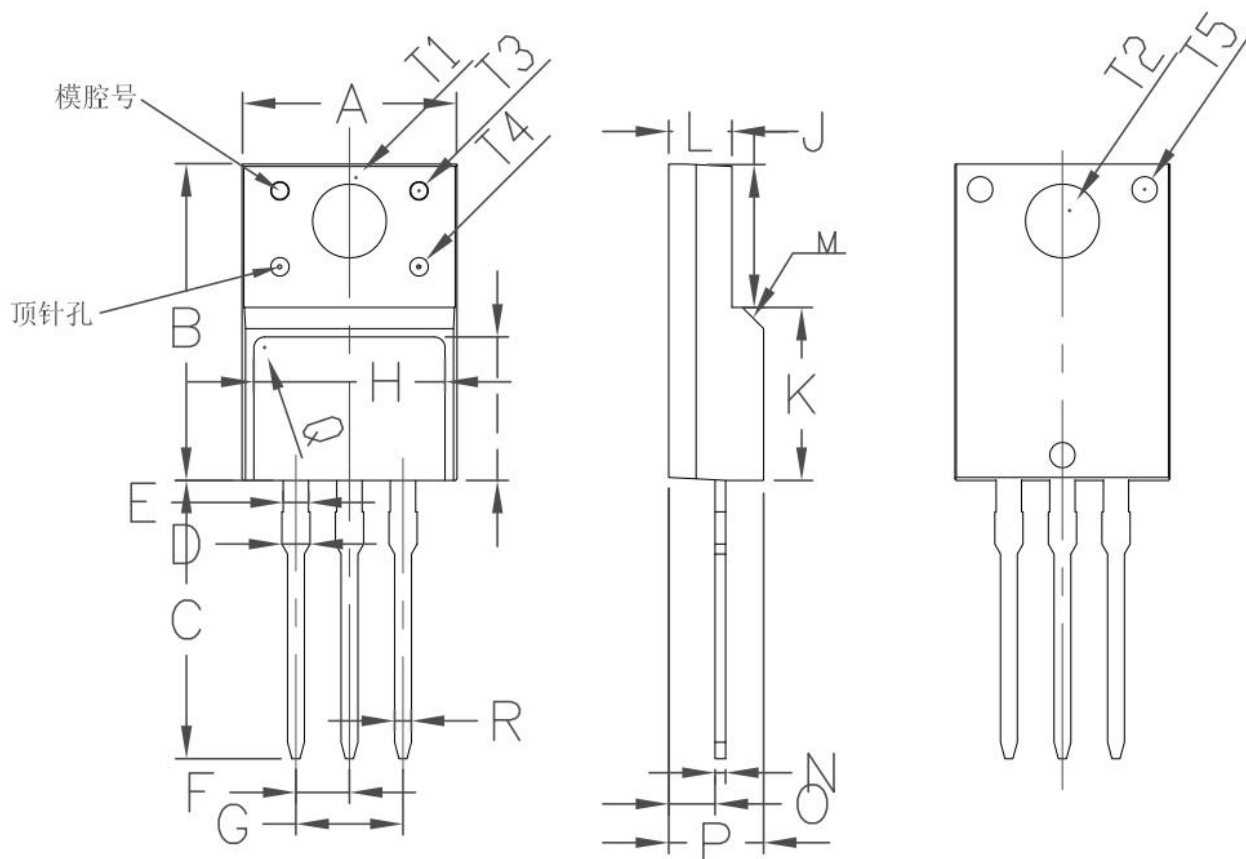
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 TYP.		0.100 TYP.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 REF.		0.295 REF.	
Φ	3.400	3.800	0.134	0.150

TO-220F 集佳 Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.500	4.900	0.177	0.193
A1	2.340	2.740	0.092	0.108
A2	2.560	2.960	0.101	0.117
b1	0.700	0.900	0.028	0.035
b2	1.180	1.580	0.046	0.062
c	0.400	0.600	0.016	0.024
D	9.960	10.360	0.392	0.408
E	15.670	15.970	0.617	0.629
E1	6.500	6.900	0.256	0.272
E2	15.500	16.100	0.610	0.634
e	2.540 TYP		0.100 TYP	
Φ	3.080	3.280	0.121	0.129
L	12.640	13.240	0.498	0.521
L1	3.030	3.430	0.119	0.135

TO-220F 尊阳 Package Information



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Non	Max.	Min.	Non	Max.
A	9.960	10.160	10.360	0.392	0.400	0.408
B	15.670	15.870	16.070	0.617	0.625	0.633
C	13.140	13.340	13.540	0.517	0.525	0.533
D	1.200	1.300	1.400	0.047	0.051	0.055
F	2.540 TYP			0.10 TYP		
J	6.480	6.680	6.880	0.255	0.263	0.271
L	2.340	2.540	2.740	0.092	0.100	0.108
N	0.490	0.500	0.520	0.019	0.020	0.020
O	2.150	2.350	2.550	0.085	0.093	0.100
P	4.500	4.700	4.900	0.177	0.185	0.193
T2		3.180	3.500		0.125	0.138
R	0.770	0.800	0.830	0.030	0.031	0.033

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