

650V 20A 0.37Ω N-ch Power MOSFET

Description

DT2 MOS is DIN-TEK 2nd generation VDMOS family that is dramatic reduction in on-resistance and ultra-low gate charge for applications requiring high power density and high efficiency. And it is very robust and RoHS compliant.

Features

- Typ. $R_{DS(on)}=0.37\Omega@V_{GS}=10V$
- 100% avalanche tested
- RoHS Compliant

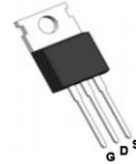
Applications

- SMPS
- Charger
- DC-DC

TO-220F



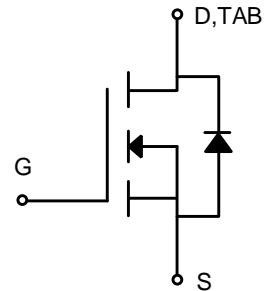
TO-220



TO-247



TO-263



Absolute Maximum Ratings (T_c=25°C)

Parameter	Symbol	DTP20N65F	DTP20N65/DTK20N65	DTN20N65	Unit
Drain-source voltage	V _{DSS}	650			V
Gate-source voltage	V _{GS}	±30			V
Continuous drain current	I _D	20			A
Pulsed drain current ¹	I _{DM}	80			A
Avalanche energy, single pulse ²	E _{AS}	980			mJ
Power dissipation	P _D	74	250	313	W
Derate above 25°C		0.6	2	2.5	W/°C
Operating junction temperature	T _j	-55~150			°C
Storage temperature	T _{stg}	-55~150			°C
Continuous diode forward current	I _S	20			A
Diode pulse current ¹	I _{Spulse}	80			A

Thermal Characteristic

Thermal resistance, junction-to-case	R _{θJC}	1.7	0.5	0.4	°C/W
Thermal resistance, junction-to-ambient	R _{θJA}	62.5	62.5	40	°C/W

Electrical Characteristics of MOSFET

				Min.	Typ.	Max.	
Drain-source break down voltage	BV_{DSS}	$I_D=250\mu A, V_{GS}=0V$	$T_C=25^\circ C$	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$I_D=250\mu A, V_{DS}=V_{GS}$	$T_J=25^\circ C$	2.0	-	4.0	V
Drain-source leakage current	I_{DSS}	$V_{DS}=650V, V_{GS}=0V$	$T_J=25^\circ C$	-	-	1	μA
		$V_{DS}=520V, V_{GS}=0V$	$T_J=125^\circ C$	-	-	100	μA
Gate-source leakage current,forward	I_{GSSF}	$V_{DS}=0V, V_{GS}=30V$	$T_J=25^\circ C$	-	-	100	nA
Gate-source leakage current,reverse	I_{GSSR}	$V_{DS}=0V, V_{GS}=-30V$	$T_J=25^\circ C$	-	-	-100	nA
Drain-source on-state resistance ³	$R_{DS(on)}$	$V_{GS}=10V, I_D=10A$	$T_J=25^\circ C$	-	0.37	0.44	Ω
Transconductance ³	G_{fs}	$V_{DS}=20V$	$T_J=25^\circ C$	-	22	-	S

Dynamic Characteristics of MOSFET ($T_C=25^\circ C$)

				Min.	Typ.	Max.	
Input capacitance	C_{iss}	$f=1MHz,$ $V_{DS}=25V, V_{GS}=0V$		-	3280	-	pF
Output capacitance	C_{oss}			-	244	-	pF
Reverse transfer capacitance	C_{rss}			-	26	-	pF
Gate to source charge	Q_{gs}	$V_{DD}=320V$		-	17	-	nC
Gate to drain charge	Q_{gd}	$I_D=20A$		-	26	-	nC
Total gate charge	Q_g	$V_{GS}=0$ to 10V		-	73	-	nC

Switching Characteristics of MOSFET ($T_C=25^\circ C$)

				Min.	Typ.	Max.	
Turn-on delay time	$t_{d on}$	$V_{DS}=320V,$ $I_D=20A, R_G=25\Omega,$ $V_{GS}=0$ to 10V		-	18	-	ns
Rise time	t_r			-	33	-	ns
Turn-off delay time	$t_{d off}$			-	104	-	ns
Fall time	t_f			-	50	-	ns

Characteristics of Body Diode ($T_C=25^\circ C$)

				Min.	Typ.	Max.	
Forward voltage	V_{SD}	$I_{SD}=20A, V_{GS}=0V$		-	-	1.5	V
Reverse recovery time	t_{rr}	$V_{DS}=320V,$		-	420	-	ns
Reverse recovery current	I_{rr}	$I_S=20A, V_{GS}=10V$		-	20	-	A
Recovery charge	Q_{rr}	$-di/dt=100A/\mu s$		-	4.2	-	μC

Notes:

1. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}=150^\circ C$.
2. The E_{AS} data shows Max. rating . The test condition is $V_{DD}=80V, V_{GS}=10V, L=10mH, I_{AS}=14A, T_C=25^\circ C$.
3. The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

TYPICAL CHARACTERISTICS

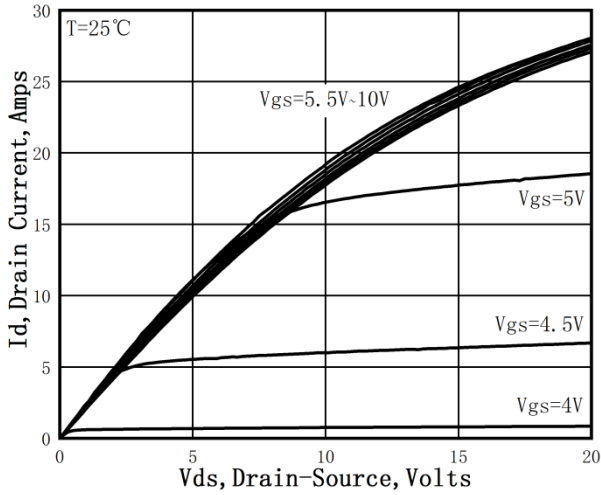


Figure 1. On-Region Characteristics

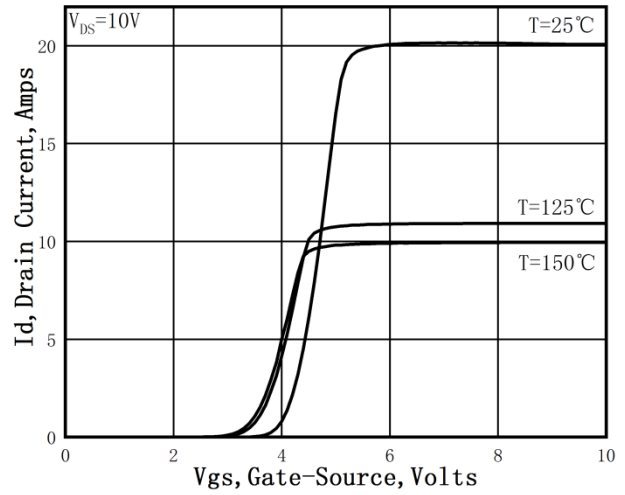


Figure 2. Transfer Characteristics

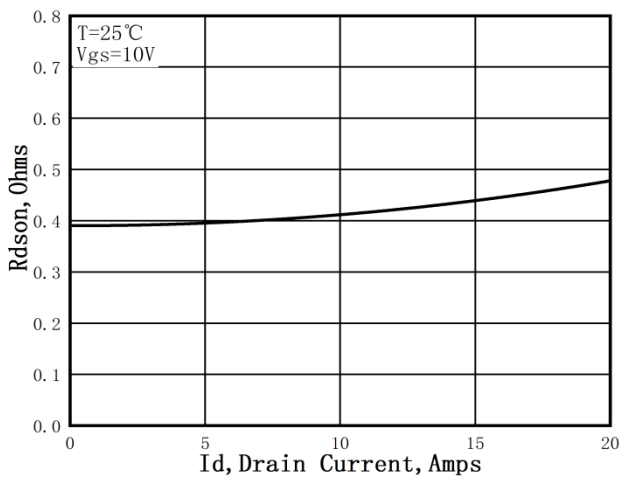


Figure 3. Static Drain-Source On Resistance

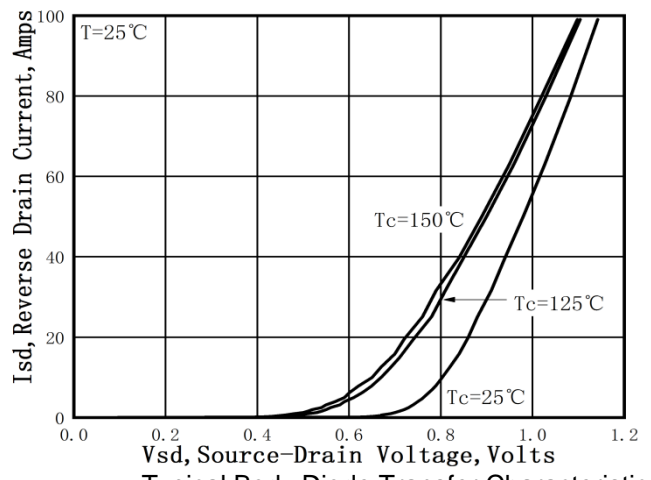


Figure 4.

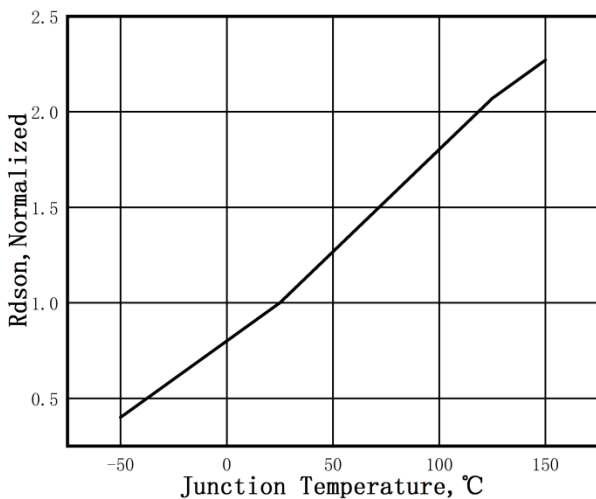


Figure 5. Normalized $R_{DS(on)}$ vs. Temperature

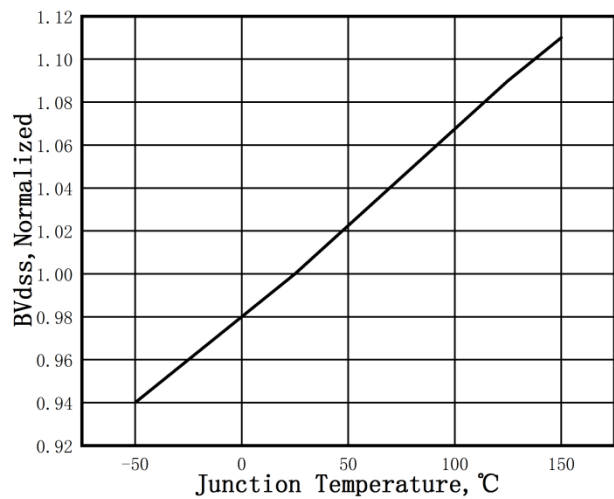


Figure 6. Normalized BV_{DSS} vs. Temperature

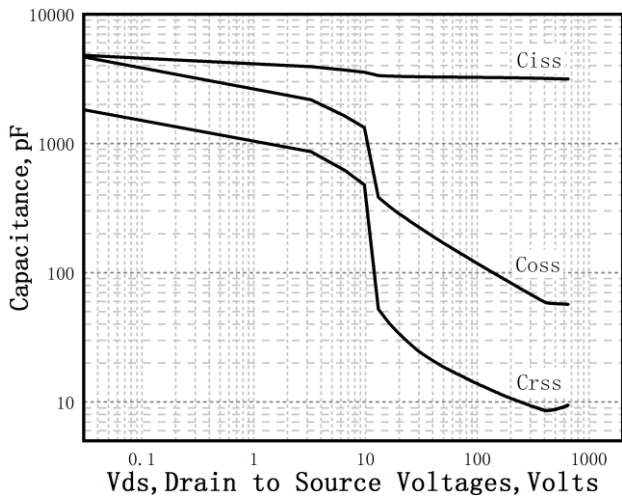


Figure 7. Capacitance Characteristics

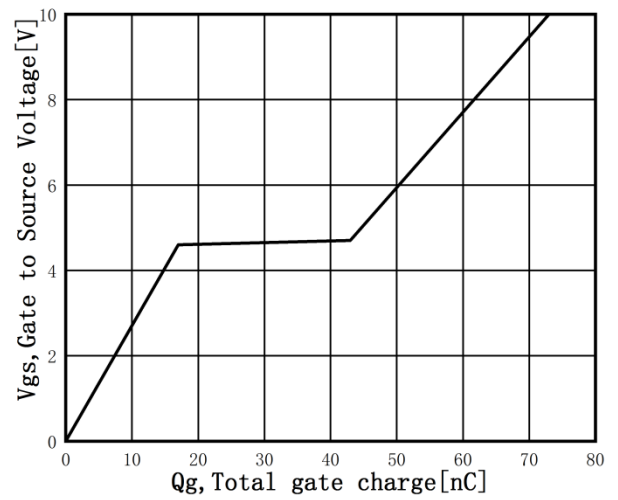


Figure 8. Gate Charge Characteristics

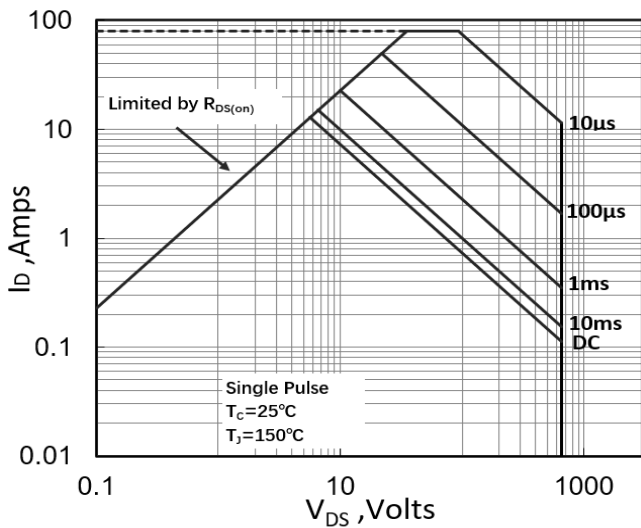


Figure 9. Maximum Safe Operating Area (TO-220F)

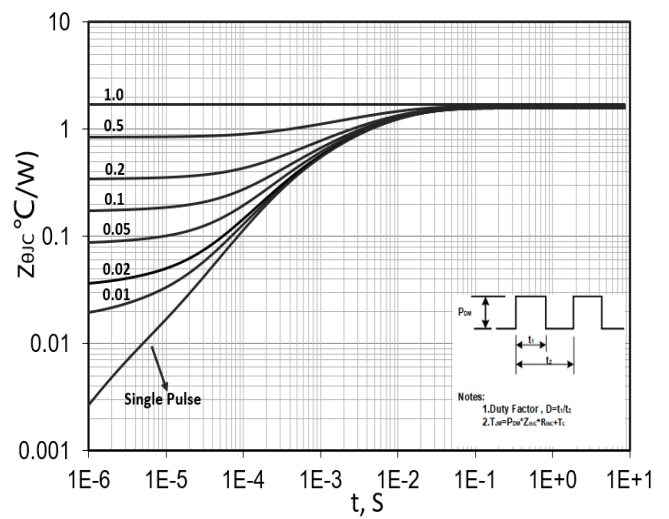


Figure 10. Transient Thermal Response Curve (TO-220F)

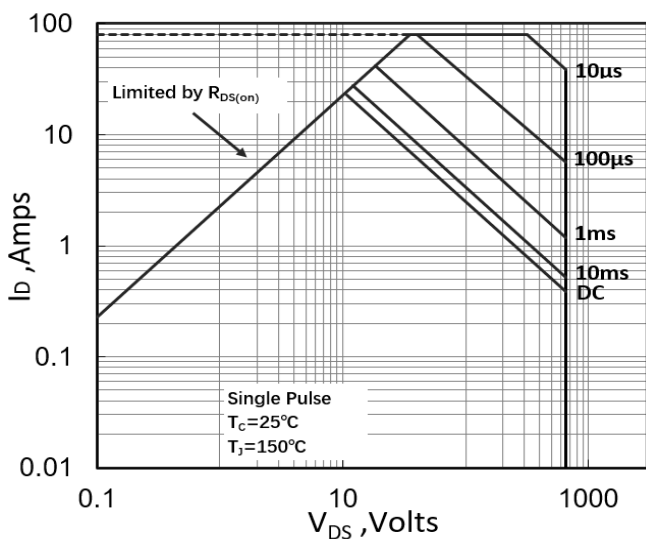


Figure 11. Maximum Safe Operating Area (TO-220/TO-263)

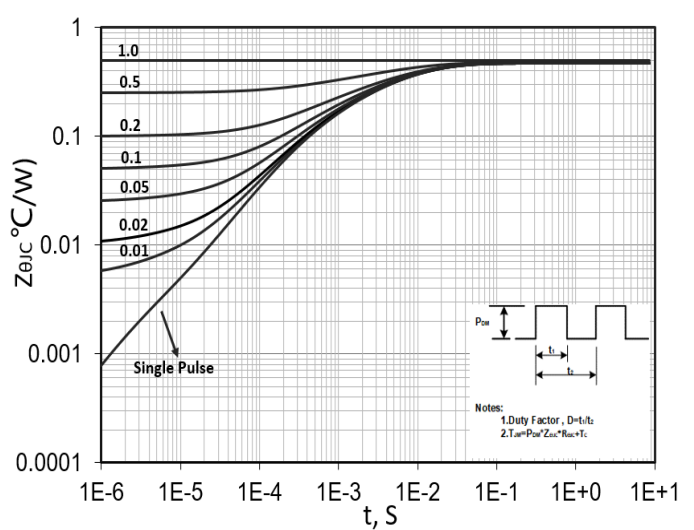


Figure 12. Transient Thermal Response Curve (TO-220/TO-263)

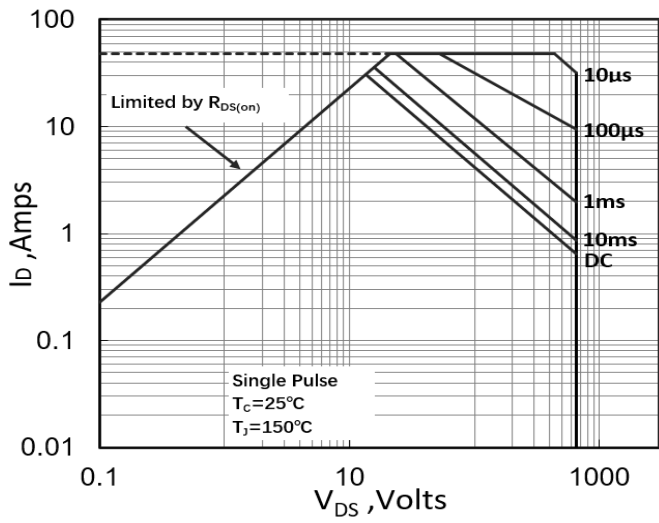


Figure 13. Maximum Safe Operating Area (TO-247)

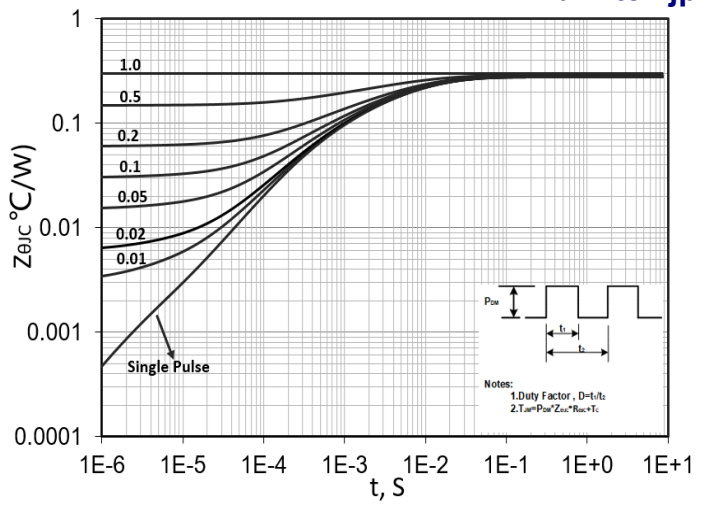
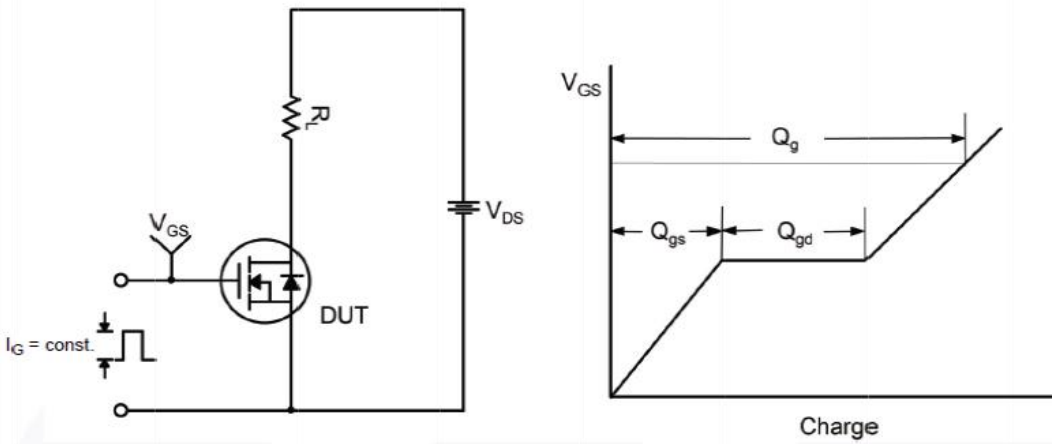


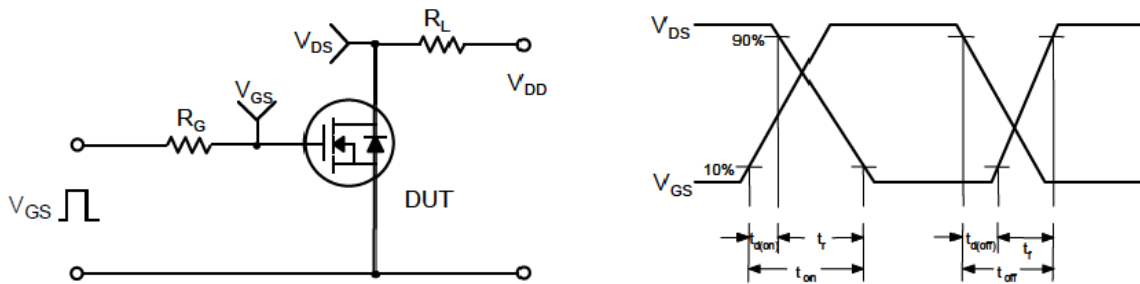
Figure 14. Transient Thermal Response Curve (TO-247)

Test Circuit

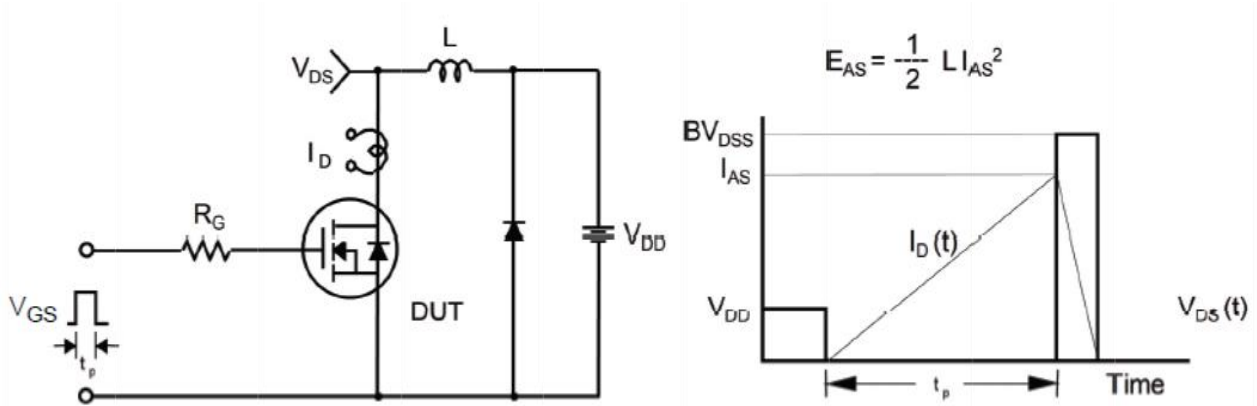
Gate Charge Test Circuit & Waveform



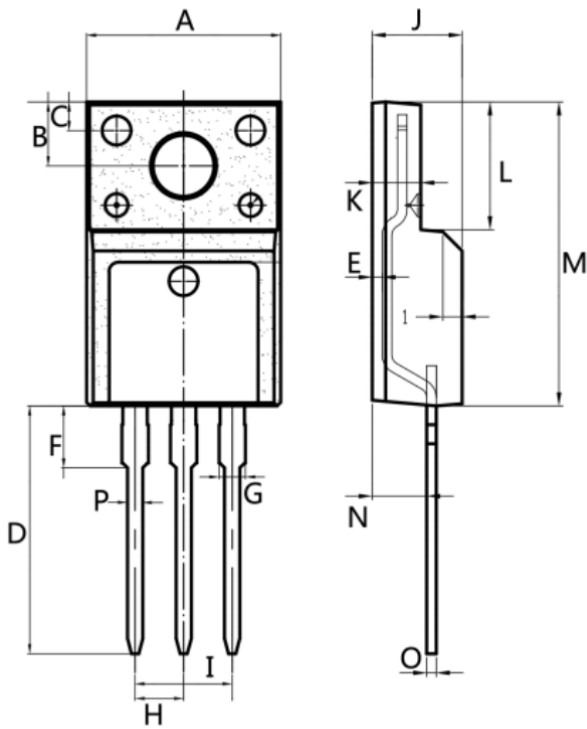
Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



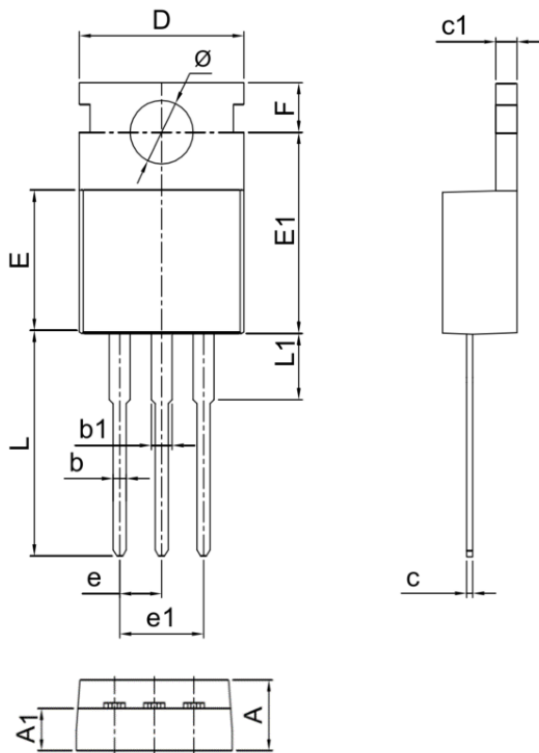
Mechanical Dimensions for TO-220F



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	9.95	10.36
B	2.95	3.55
C	1.25	1.6
D	12.64	13.5
E	0.40	0.60
F	2.80	3.80
G	1.14	1.58
H	2.44	2.64
I	4.88	5.26
J	4.50	4.90
K	2.34	2.80
L	6.48	6.90
M	15.40	16.07
N	2.66	3.50
O	0.40	0.64
P	0.70	0.94

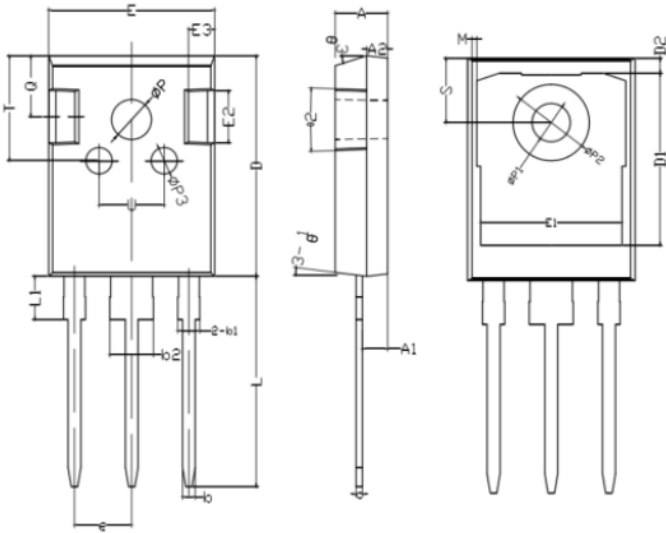
Mechanical Dimensions for TO-220



COMMON DIMENSIONS

SYMBOL	MM	
	MIN	MAX
A	4.30	4.70
A1	2.30	2.82
b	0.70	0.94
b1	1.17	1.41
c	0.30	0.64
c1	1.17	1.44
D	9.70	10.20
E	8.50	9.30
E1	12.00	12.50
e	2.44	2.64
e1	4.88	5.26
F	2.60	2.94
L	13.00	14.00
L1	3.385	4.20
Ø	3.74	3.95

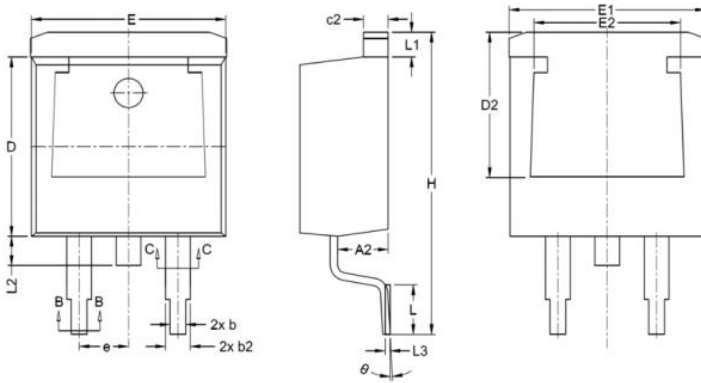
COMMON DIMENSIONS



SYMBOL	MM	
	MIN	MAX
A	4.80	5.20
A1	2.21	2.59
A2	1.85	2.15
b	1.11	1.36
b1	1.91	2.25
b2	2.91	3.25
c	0.51	0.75
D	20.70	21.30
D1	16.25	16.85
E	15.50	16.10
E1	13.00	13.60
E2	4.80	5.20
E3	2.30	2.70
e	5.40	5.48
L	19.62	20.22
L1	-	4.30
ØP	3.40	3.80
ØP2	6.90	7.30
S	6.05	6.25

Mechanical Dimensions for TO-263

COMMON DIMENSIONS



SYMBOL	MM	
	MIN	MAX
A	4.45	4.65
A1	0	0.15
A2	2.50	2.70
b	0.75	0.96
b1	0.71	0.92
b2	1.21	1.41
b3	1.17	1.37
c	0.33	0.52
c1	0.28	0.48
c2	1.21	1.41
D	9.10	9.30
D2	7.21	7.62
E	9.90	10.10
E1	9.90	10.30
E2	7.34	7.74
e	2.50	2.60
H	15.30	15.70
L	2.34	2.74
L1	1.06	1.47
L2	1.40	1.60
L3	0.25	0.26

Part	Package	Packing method
DTP20N65F	TO-220F	Tube
DTP20N65	TO-220	Tube
DTN20N65	TO-247	Tube
DTK20N65	TO-263	Tape and reel

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