650V N-Channel MOSFET
RCF4N65/RCP4N65/RCD4N65

Description

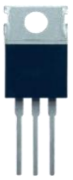
The Power MOSFET is fabricated using the advanced planar VDMOS technology.
The resulting device has low conduction resistance, superior switching performance and high avalance energy.

V_{DSS}	650	V
I_D	4	A
$R_{DS(on),max}$	2.7	Ω
$Q_{g,typ}$	12	nC

Features

- ► Low RDS(on)
- ► Low gate charge (typ. Qg = 12 nC)
- ► 100% UIS tested
- ► RoHS compliant

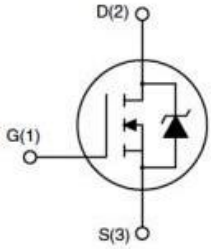

TO-220F


TO-220


TO-252

Applications

►Power faction correction.
►Switched mode power supplies.
►LED driver.



Ordering Information

Part Number	Package	Brand
RCF4N65	TO-220F	RC
RCP4N65	TO-220	RC
RCD4N65	TO-252	RC

Absolute Maximum Ratings(TC=25℃unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	650	V
Continuous drain current (T_C = 25°C)	I_D	4	A
(T_C = 100°C)		2.5	A
Pulsed drain current [1]	I_{DM}	16	A
Gate-Source voltage	V_{GSS}	±30	V
Avalanche energy, single pulse [2]	E_{AS}	198	mJ
Peak diode recovery dv/dt [3]	dv/dt	5	V/ns
Power Dissipation TO-220F (T_C = 25°C)	P_D	32	W
Derate above 25°C		0.26	W/°C

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Power Dissipation TO-220/TO-252(T_c = 25°C) Derate above 25°C	P_D	 77 0.61	 W W/°C
Operating juncition and storage temperature range	T_J, T_{STG}	-55 to +150	°C
Continuous diode forward current	I_S	4	A
Diode pulse current	$I_{S,pulse}$	16	A

Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO-220F	TO-220/TO-252	
Thermal resistance, Junction-to-case	$R_{\theta JC}$	3.8	1.62	°C/W
Thermal resistance, Junction-to-ambient	$R_{\theta JA}$	62.5	110	°C/W

Electrical Characteristics (TJ=25℃ unless otherwise specified)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0 V, I_D=0.25 mA	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=0.25 mA	2	-	4	V
Drain cut-off current	I_{DSS}	V_{DS}=650 V, V_{GS}=0 V, T_j = 25°C T_j = 125°C	 - -	-	 1 100	μA
Gate leakage current, Forward	I_{GSSF}	V_{GS}=30 V, V_{DS}=0 V	-	-	100	nA
Gate leakage current, Reverse	I_{GSSR}	V_{GS}=-30 V, V_{DS}=0 V	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=2 A	-	2.50	2.70	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz	-	600	-	pF
Output capacitance	C_{oss}		-	55	-	
Reverse transfer capacitance	C_{rss}		-	3.2	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 325 V, I_D = 4 A	-	12	-	ns
Rise time	t_r		-	31	-	

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Turn-off delay time	$t_{d(off)}$	R_G = 10 Ω, V_{GS}=15 V	-	42	-	ns
Fall time	t_f		-	15	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DD}=520 V, I_D=4 A, V_{GS}=0 to 10 V	-	3.2	-	nC
Gate to drain charge	Q_{gd}		-	5.1	-	
Gate charge total	Q_g		-	12	-	
Gate plateau voltage	$V_{plateau}$		-	6	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=4 A	-	-	1.5	V
Reverse recovery time	t_{rr}	V_R=400 V, I_F=4 A, dI_F/dt=100 A/μs	-	282	-	ns
Reverse recovery charge	Q_{rr}		-	1.4	-	μC
Peak reverse recovery current	I_{rrm}		-	10	-	A

Notes:

1. Pulse width limited by maximum junction temperature.
2. L=10mH, I_{AS} = 6.3A, Starting T_j= 25°C.
3. I_{SD} = 4A, di/dt≤100A/us, V_{DD}≤BV_{DS}, Starting T_j= 25°C.

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Electrical Characteristics Diagrams

Figure 1. Typical Output Characteristics

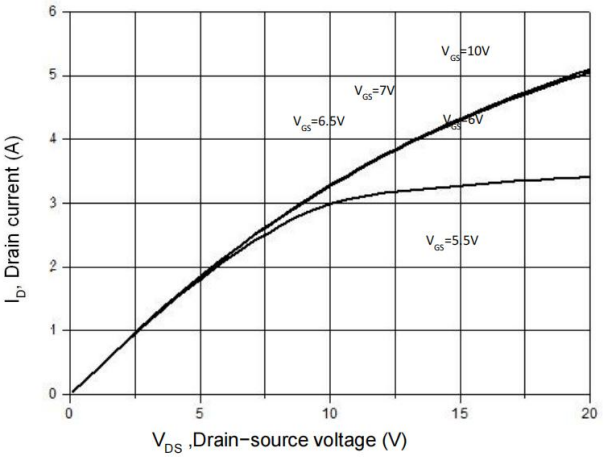

Figure 2. Transfer Characteristics

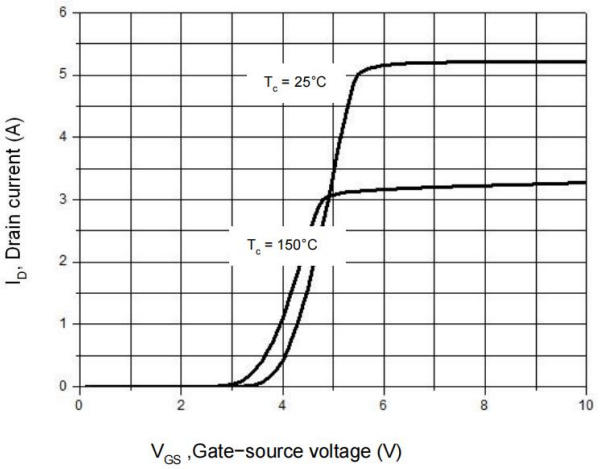

Figure 3. On-Resistance Variation vs. Drain Current

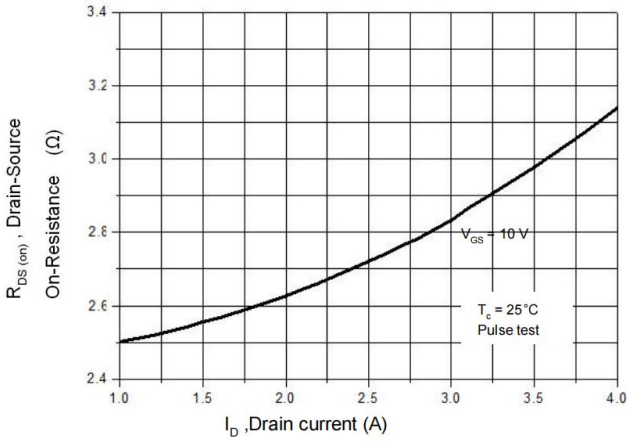

Figure 4. Threshold Voltage vs. Temperature

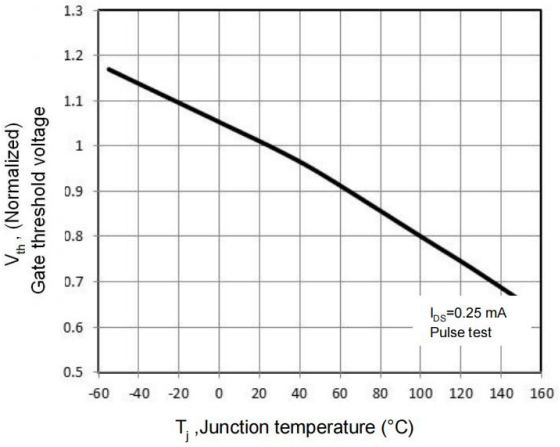

Figure 5. Breakdown Voltage vs. Temperature

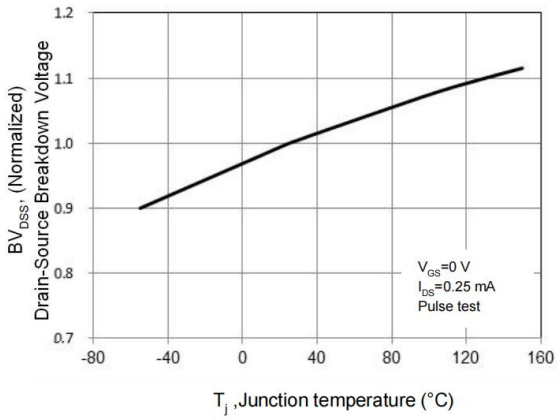

Figure 6. On-Resistance vs. Temperature

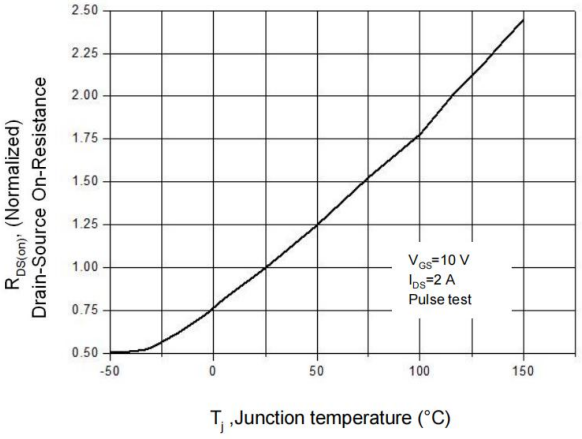

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Figure 7. Capacitance Characteristics

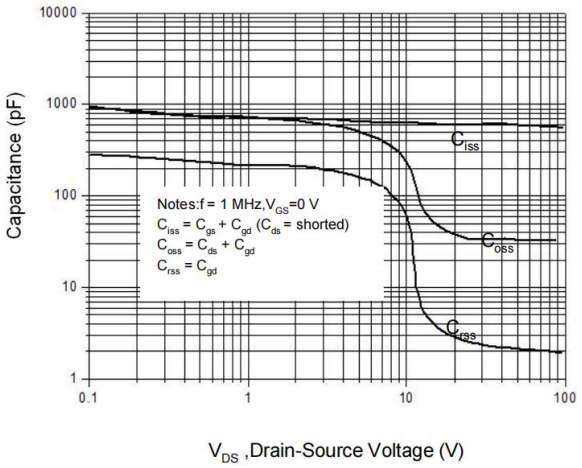

Figure 8. Gate Charge Characterist

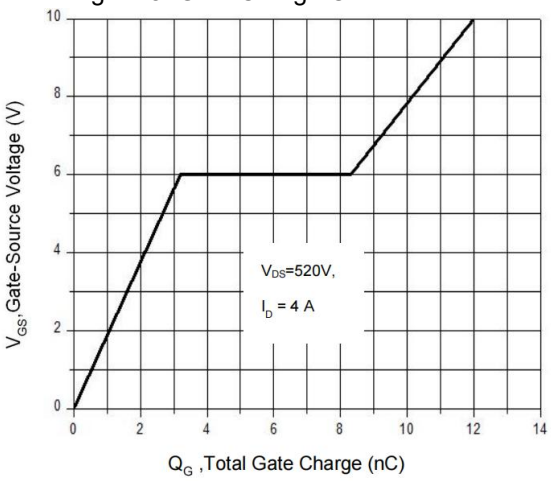

Figure 9. Maximum Safe Operating Area
TO-220F

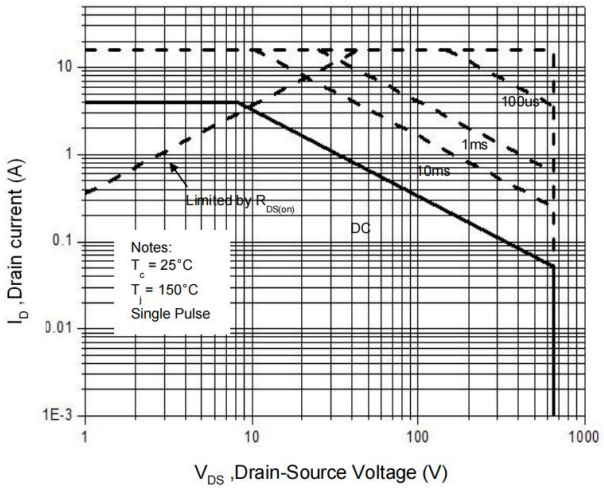

Figure 10. Maximum Safe Operating Area
TO-220 /TO-252

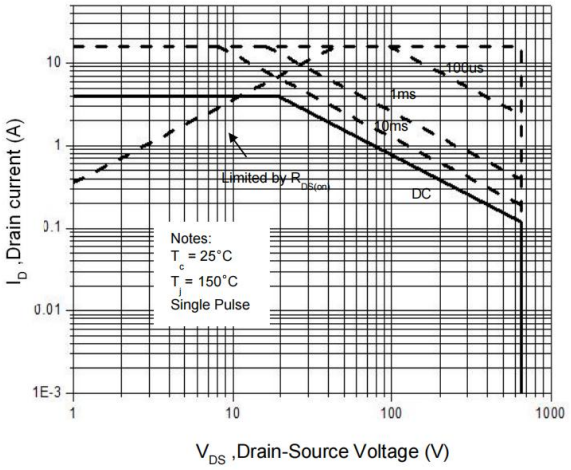

Figure 11. Power Dissipation vs. Temperature
TO-220F

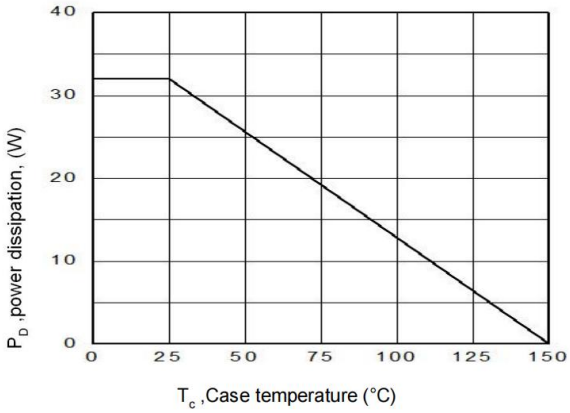

Figure 12. Power Dissipation vs. Temperature
TO-220/ TO-252

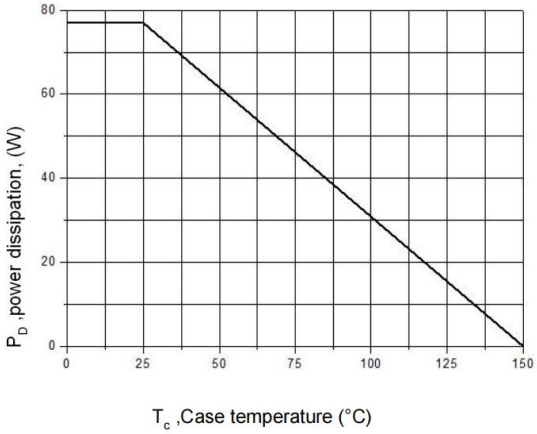

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Figure 13. Continuous Drain Current vs. Temperature

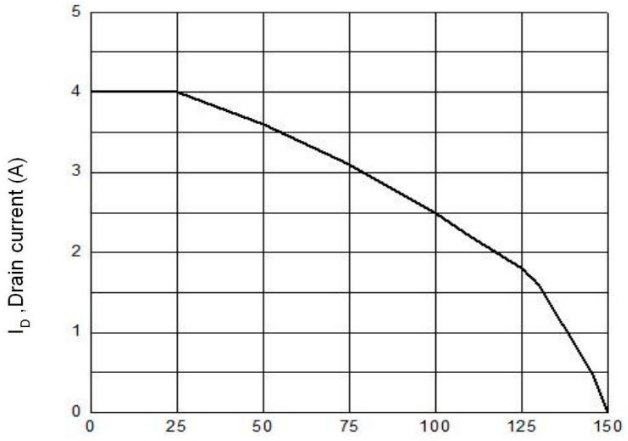


Figure 14. Body Diode Transfer Characteristics

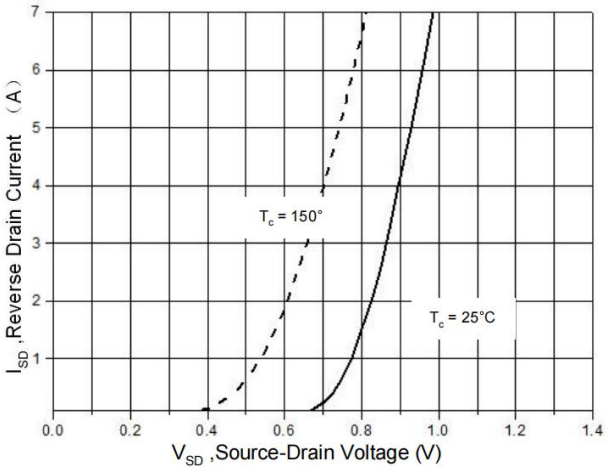


Figure 15 Transient Thermal Impendance,Junction to Case, TO-220F

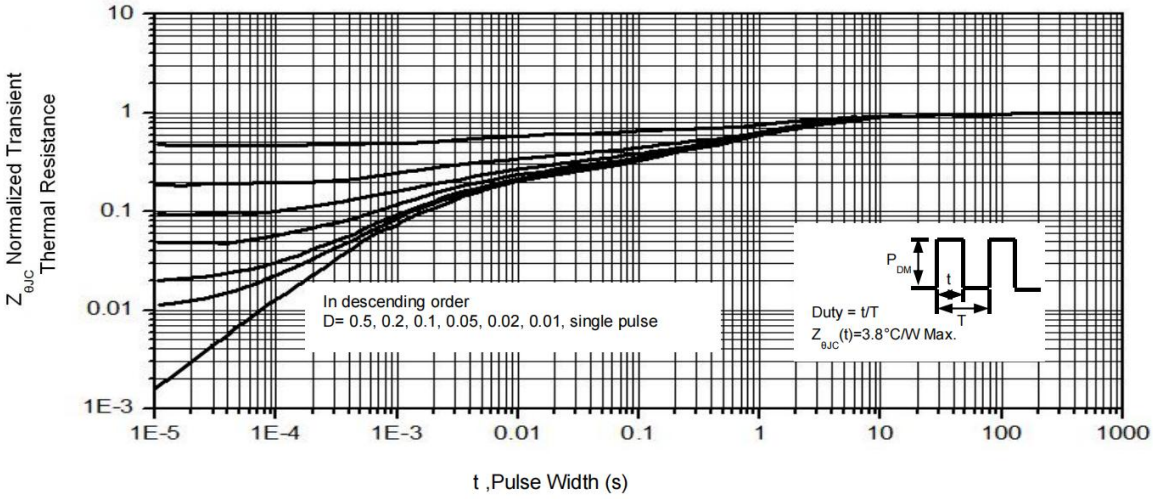
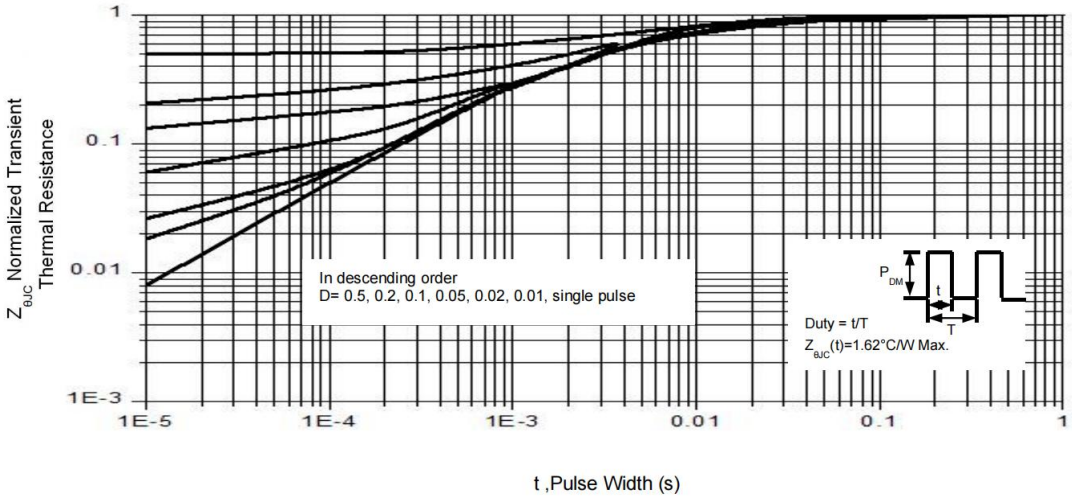


Figure 16. Transient Thermal Impendance,Junction to Case, TO-220/ TO-252



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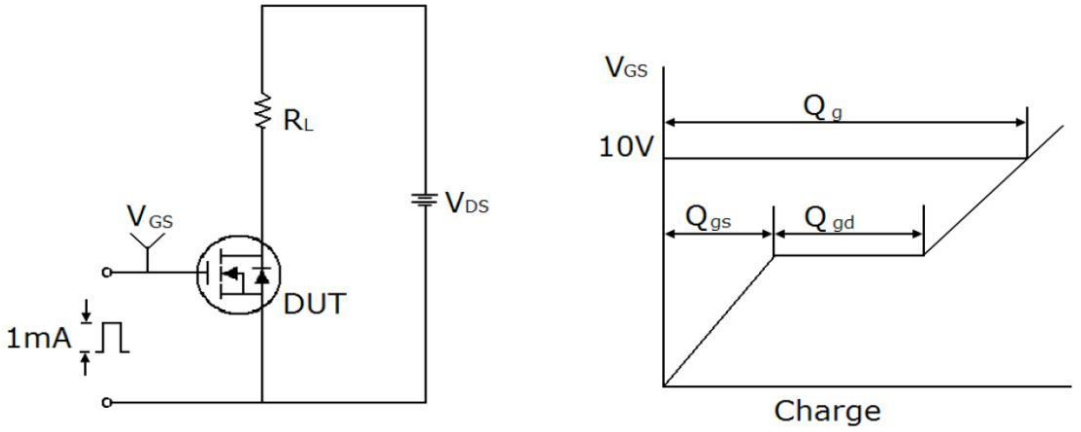
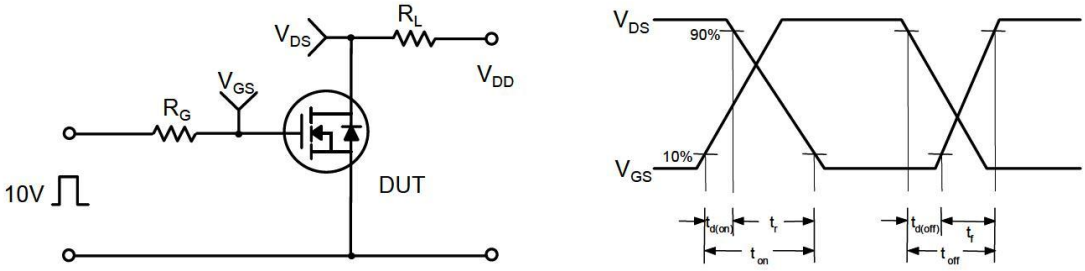
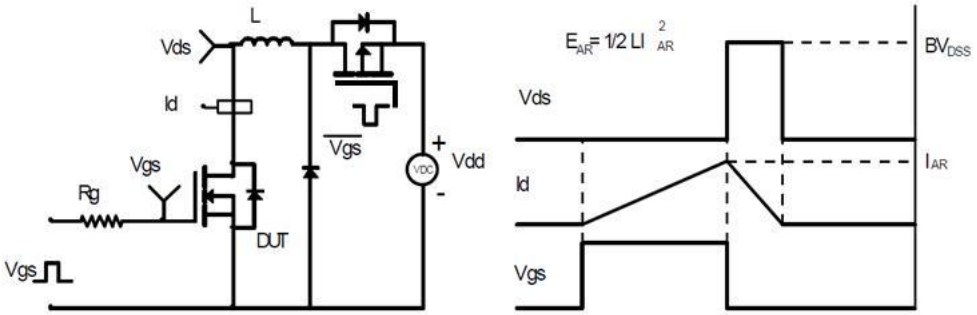
Gate Charge Test Circuit & Waveform



Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



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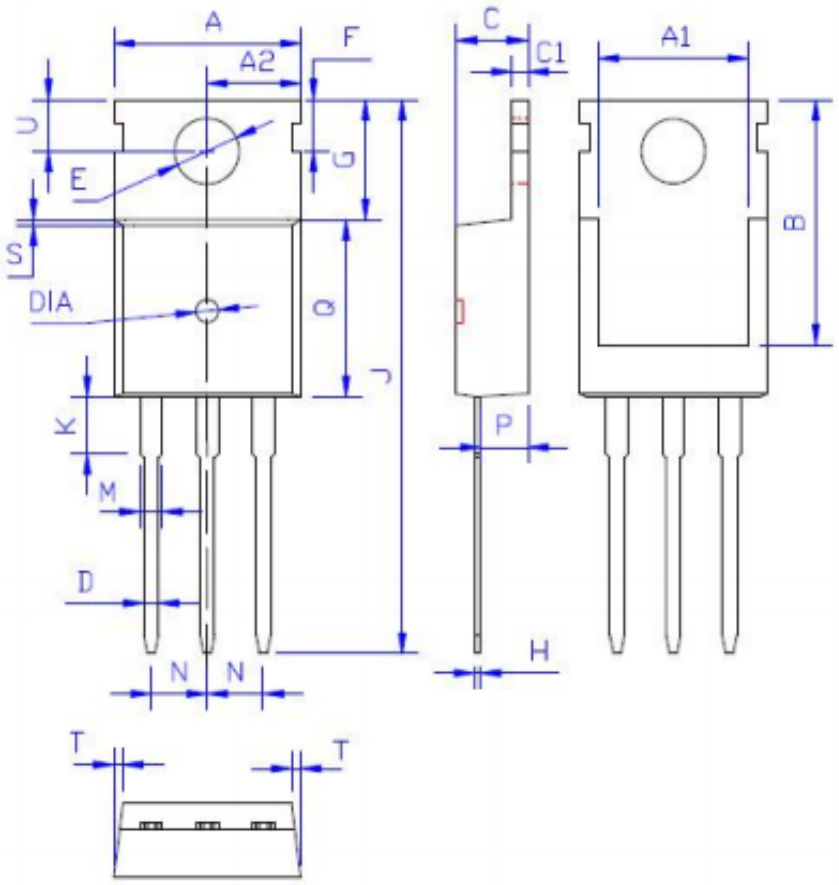
Package Dimension:

TO-220



DIM	MILLIMETERS
A	10.00±0.30
A1	8.00±0.30
A2	5.00±0.30
B	13.20±0.40
C	4.50±0.20
C1	1.30±0.20
D	0.80±0.20
E	3.60±0.20
F	3.00±0.30
G	6.60±0.40
H	0.50±0.20
J	28.88±0.50
K	3.00±0.30
M	1.30±0.30
N	Typical 2.54
P	2.40±0.40
Q	9.20±0.40
S	0.25±0.15
T	0.25±0.15
U	2.80±0.30
DIA	宽 1.50±0.10 深 0.50 MAX

（Unit：mm）

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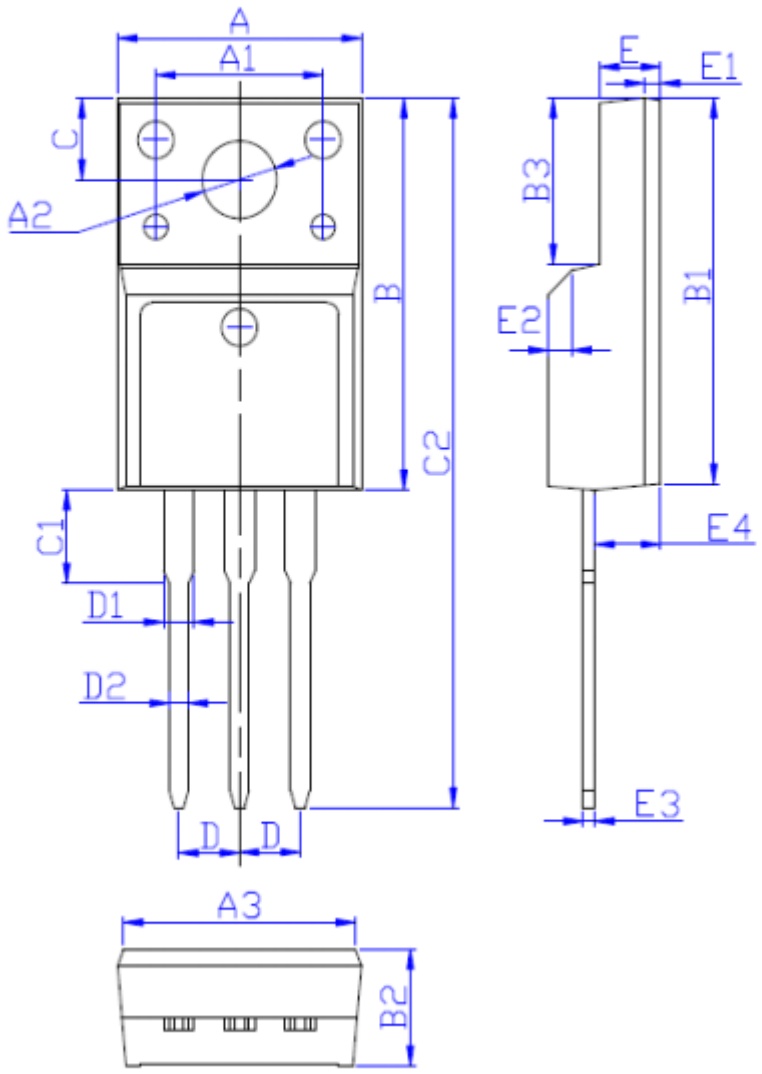

DIM	MILLIMETERS
A	10.16±0.30
A1	7.00±0.20
A2	3.12±0.20
A3	9.70±0.30
B	15.90±0.50
B1	15.60±0.50
B2	4.70±0.30
B3	6.70±0.30
C	3.30±0.25
C1	3.25±0.30
C2	28.70±0.50
D	Typical 2.54
D1	1.47 (MAX)
D2	0.80±0.20
E	2.55±0.25
E1	0.70±0.25
E2	1.0×45°
E3	0.50±0.20
E4	2.75±0.30

(Unit:mm)

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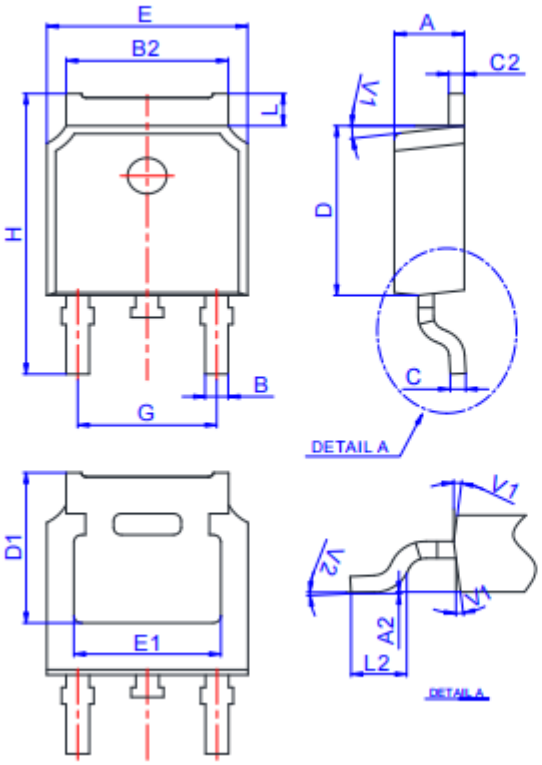
TO-252 Package outline



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.10		2.50	0.083		0.098
A2	0		0.10	0		0.004
B	0.66		0.86	0.026		0.034
B2	5.18		5.48	0.202		0.216
C	0.40		0.60	0.016		0.024
C2	0.44		0.58	0.017		0.023
D	5.90		6.30	0.232		0.248
D1	5.30REF			0.209REF		
E	6.40		6.80	0.252		0.268
E1	4.63			0.182		
G	4.47		4.67	0.176		0.184
H	9.50		10.70	0.374		0.421
L	1.09		1.21	0.043		0.048
L2	1.35		1.65	0.053		0.065
V1		7°			7°	
V2	0°		6°	0°		6°