

650V N-Channel MOSFET

RCF7N65/RCP7N65/RCD7N65

Description

The Power MOSFET is fabricated using the advanced planar VDMOS technology.

The resulting device has low conduction resistance, superior switching performance and high avalanche energy.

V_{DS}	650	V
I_D	7	A
$R_{DS(on),max}$	1.4	Ω
$Q_{g,typ}$	20.7	nC

Features

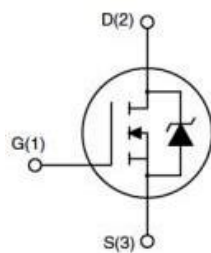
- Low $R_{DS(on)}$
- Low gate charge (typ. $Q_g = 20.7$ nC)
- 100% UIS tested
- RoHS compliant

Applications

- Power factor correction.
- Switched mode power supplies.
- LED driver.

Ordering Information

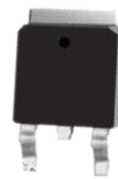
Part Number	Package	Brand
RCF7N65	TO-220F	RC
RCP7N65	TO-220	RC
RCD7N65	TO-252	RC



TO-220F



TO-220



TO-252

Absolute Maximum Ratings (TC=25°C unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	650	V
Continuous drain current ($T_c = 25^\circ\text{C}$) ($T_c = 100^\circ\text{C}$)	I_D	7 4.3	A A
Pulsed drain current ¹⁾	I_{DM}	28	A
Gate-Source voltage	V_{GS}	± 30	V
Avalanche energy, single pulse ²⁾	E_{AS}	352	mJ
Peak diode recovery dv/dt ³⁾	dv/dt	5	V/ns
Power Dissipation TO-220F ($T_c = 25^\circ\text{C}$) Derate above 25°C	P_D	39 0.31	W W/°C

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Power Dissipation TO-220\ TO-252($T_c = 25^{\circ}\text{C}$) Derate above 25°C	P_D	100 0.8	W $\text{W}/^{\circ}\text{C}$
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150	$^{\circ}\text{C}$
Continuous diode forward current	I_S	7	A
Diode pulse current	$I_{S,pulse}$	28	A

Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO-220F	TO-220/TO-252	
Thermal resistance, Junction-to-case	$R_{\theta JC}$	3.2	1.25	$^{\circ}\text{C}/\text{W}$
Thermal resistance, Junction-to-ambient	$R_{\theta JA}$	62.5	110	$^{\circ}\text{C}/\text{W}$

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	$V_{GS}=0\text{ V}, I_D=250\text{ uA}$	650	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\text{ uA}$	2	-	4	V
Drain cut-off current	I_{DSS}	$V_{DS}=650\text{ V}, V_{GS}=0\text{ V},$ $T_J = 25^{\circ}\text{C}$ $T_J = 125^{\circ}\text{C}$	- -	-	1 100	μA
Gate leakage current, Forward	I_{GSSF}	$V_{GS}=30\text{ V}, V_{DS}=0\text{ V}$	-	-	100	nA
Gate leakage current, Reverse	I_{GSSR}	$V_{GS}=-30\text{ V}, V_{DS}=0\text{ V}$	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=10\text{ V}, I_D=3.5\text{ A}$	-	1.2	1.4	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	$V_{DS} = 25\text{ V},$ $V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	-	1090	-	pF
Output capacitance	C_{oss}		-	111	-	
Reverse transfer capacitance	C_{rss}		-	6.1	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 325\text{ V}, I_D = 7\text{ A}$	-	12.2	-	ns
Rise time	t_r		-	33.4	-	

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Turn-off delay time	$t_{d(off)}$	$R_G = 10 \Omega, V_{GS}=15 \text{ V}$	-	53.6	-	ns
Fall time	t_f		-	15	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	$V_{DD}=520 \text{ V}, I_D=7 \text{ A},$ $V_{GS}=0 \text{ to } 10 \text{ V}$	-	5.7	-	nC
Gate to drain charge	Q_{gd}		-	7.2	-	
Gate charge total	Q_g		-	20.7	-	
Gate plateau voltage	$V_{plateau}$		-	5	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	$V_{GS}=0 \text{ V}, I_F=7 \text{ A}$	-	0.85	1.5	V
Reverse recovery time	t_{rr}	$V_R=325 \text{ V}, I_F=7 \text{ A},$ $di_F/dt=100 \text{ A}/\mu\text{s}$	-	373.2	-	ns
Reverse recovery charge	Q_{rr}		-	2.1	-	μC
Peak reverse recovery current	I_{rm}		-	15.7	-	A

Notes:

1. Pulse width limited by maximum junction temperature.
2. $L=10\text{mH}$, $I_{AS}=8.4\text{A}$, Starting $T_J=25^\circ\text{C}$.
3. $I_{SD}=7\text{A}$, $dI/dt \leq 100\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DS}$, Starting $T_J=25^\circ\text{C}$.

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Electrical Characteristics Diagrams

Figure 1. Typical Output Characteristics

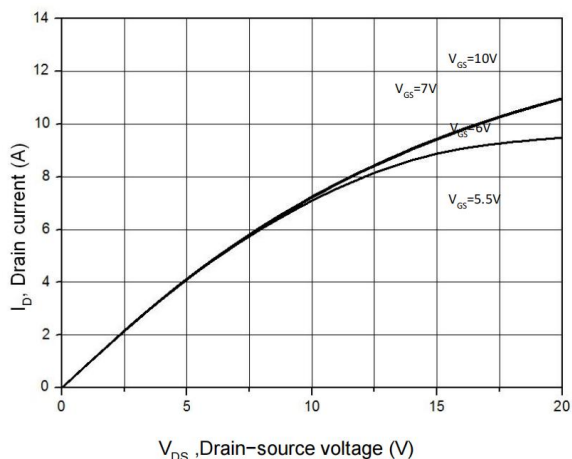


Figure 2. Transfer Characteristics

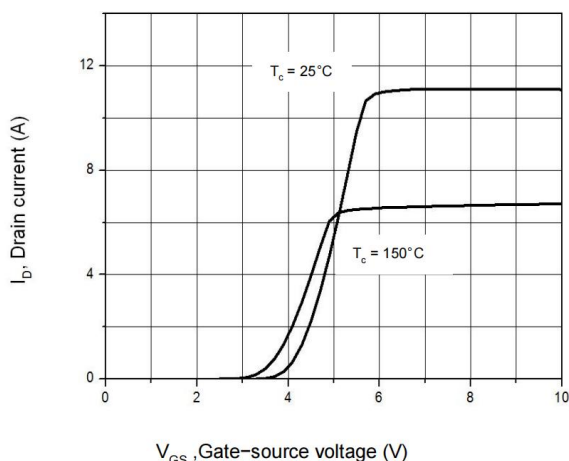


Figure 3. On-Resistance Variation vs. Drain Current

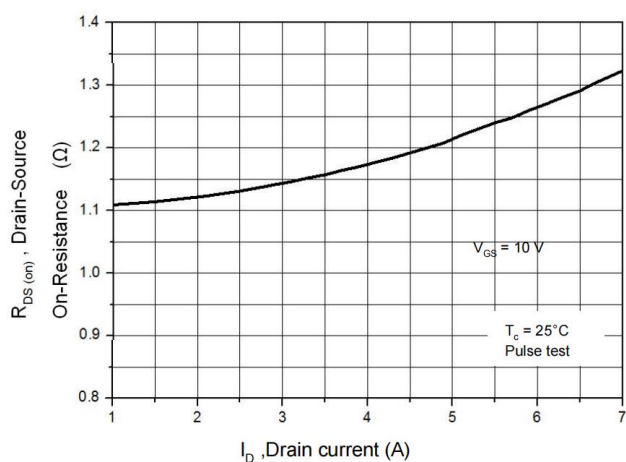


Figure 4. Threshold Voltage vs. Temperature

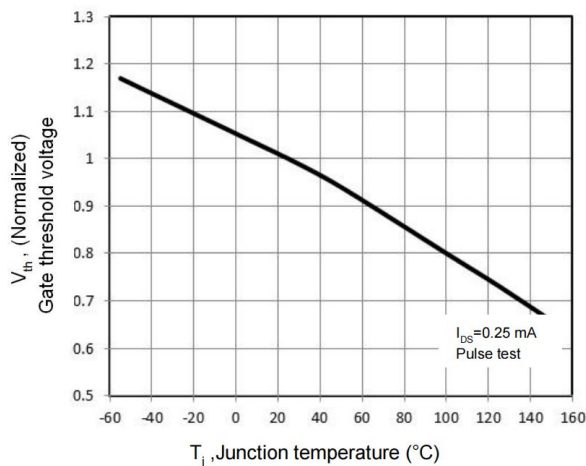


Figure 5. Breakdown Voltage vs. Temperature

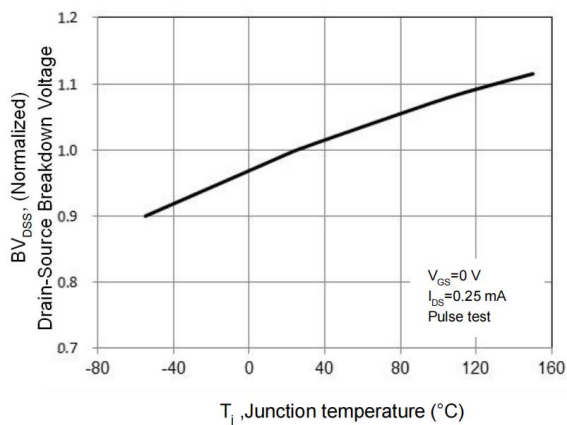
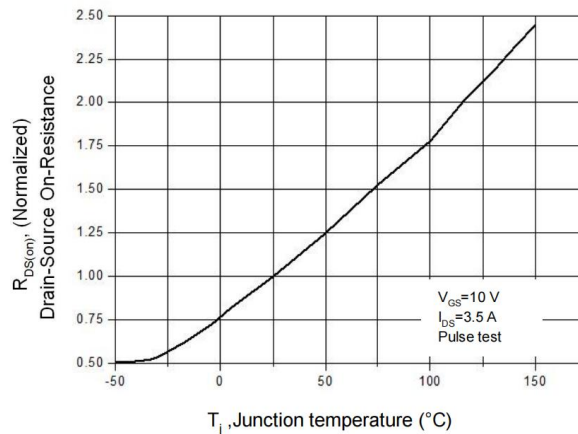


Figure 6. On-Resistance vs. Temperature



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Figure 7. Capacitance Characteristics

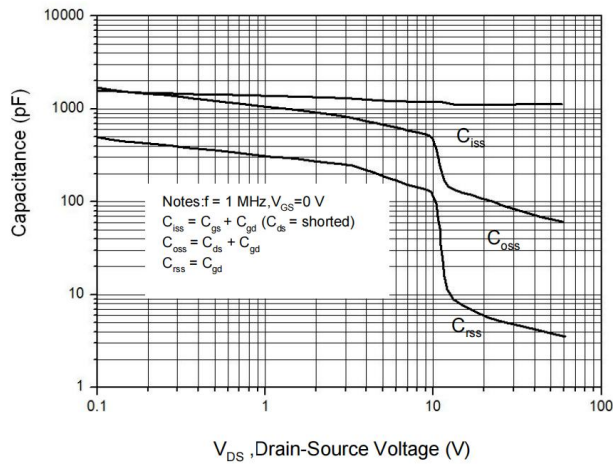


Figure 8. Gate Charge Characterist

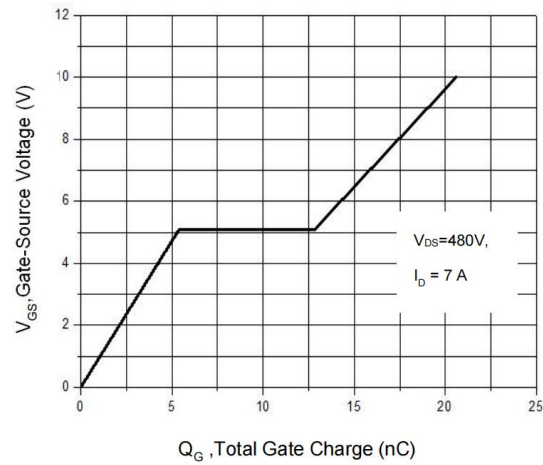


Figure 9. Maximum Safe Operating Area
TO-220F

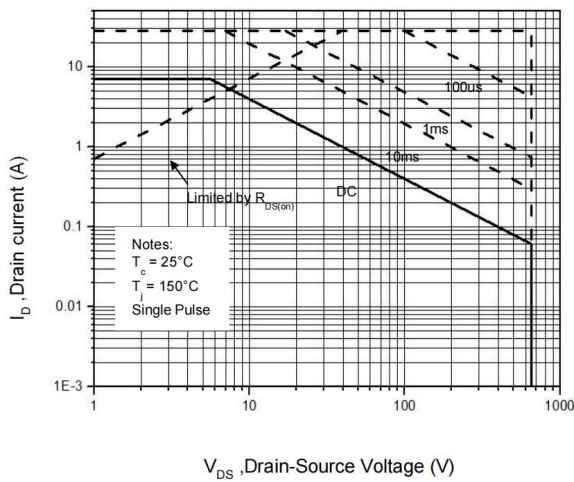


Figure 10. Maximum Safe Operating Area
TO-220/ TO-252

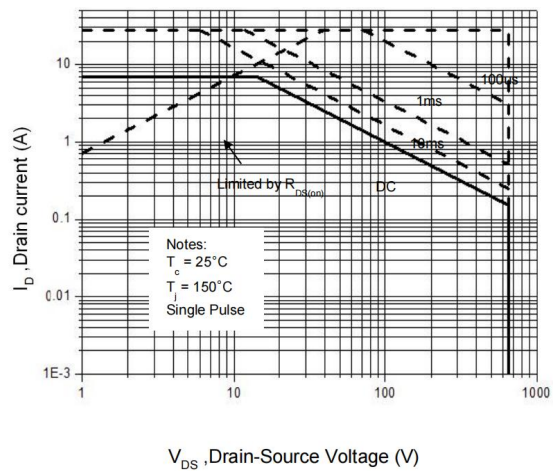


Figure 11. Power Dissipation vs. Temperature
TO-220F

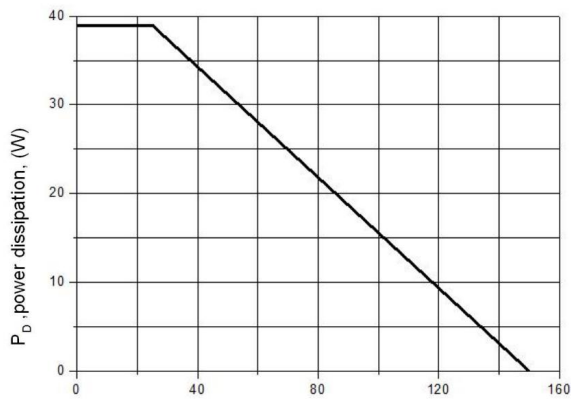
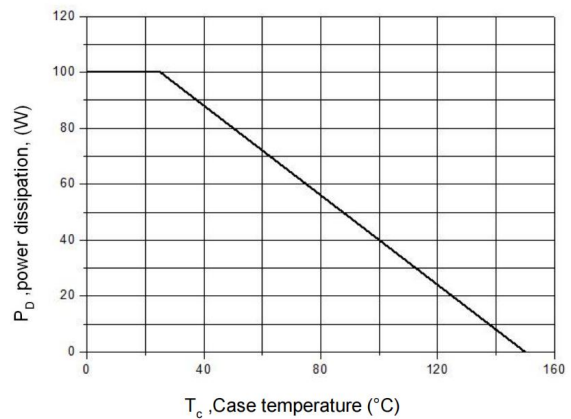


Figure 12. Power Dissipation vs. Temperature
TO-220/ TO-252



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Figure 13. Continuous Drain Current vs. Temperature

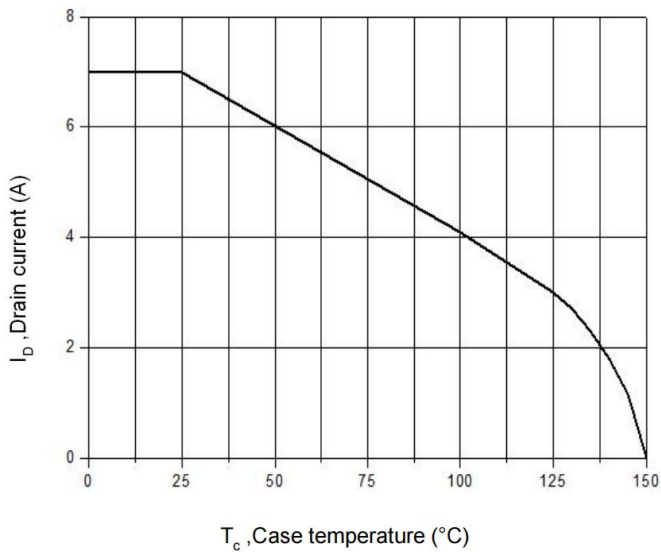


Figure 14. Body Diode Transfer Characteristics

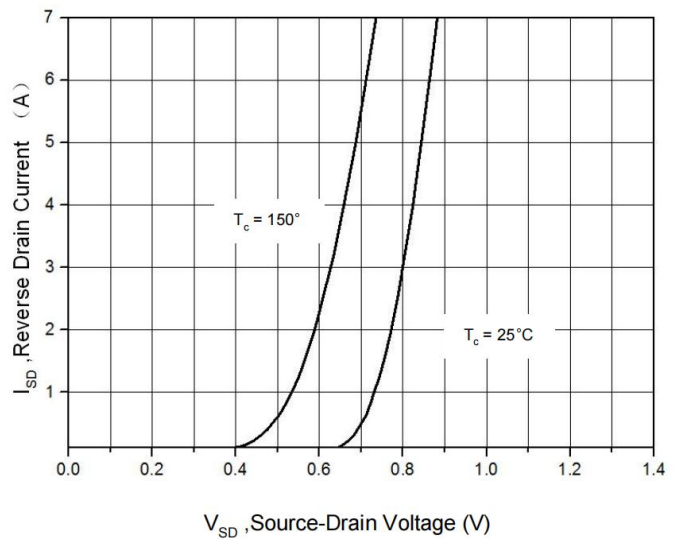


Figure 15 Transient Thermal Impedance, Junction to Case, TO-220F

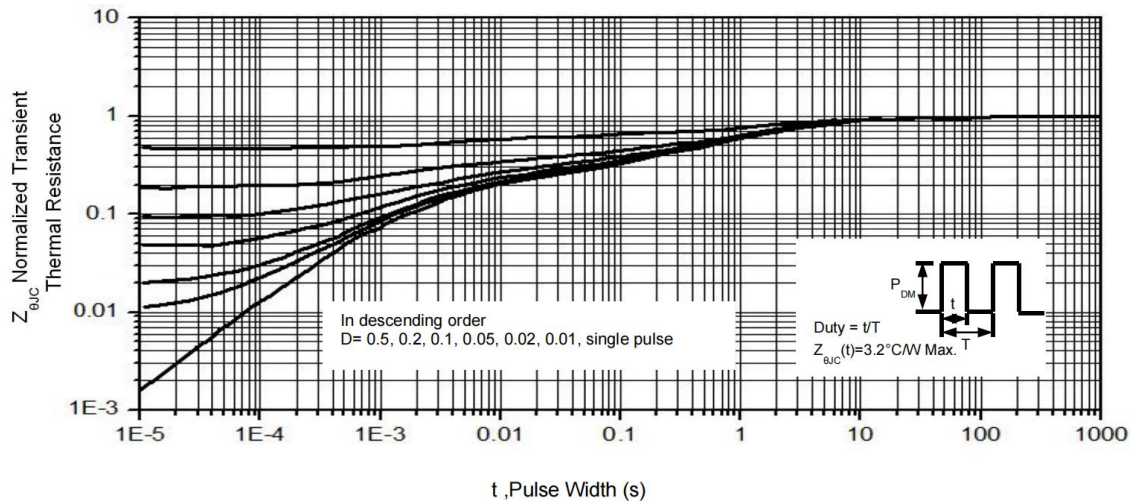
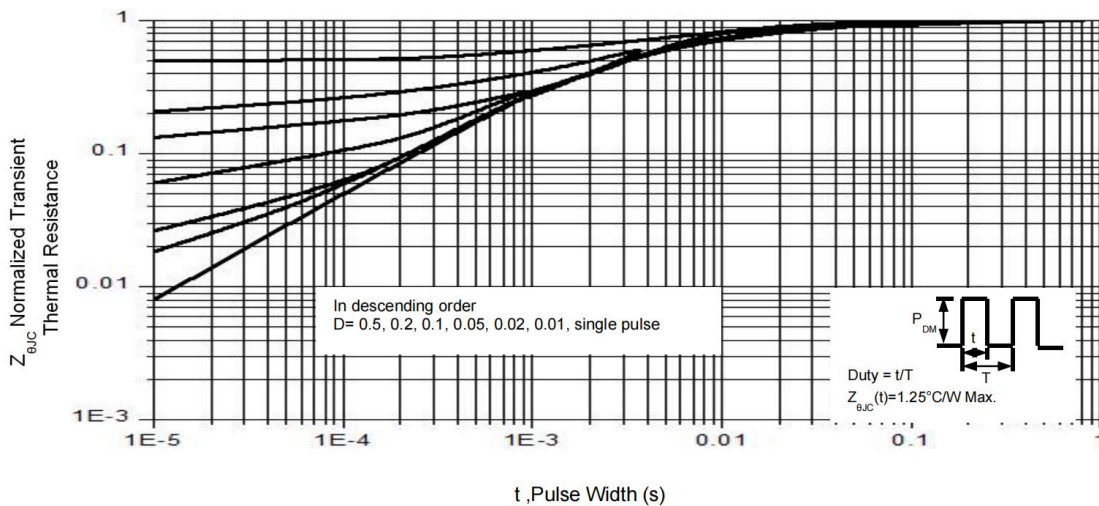


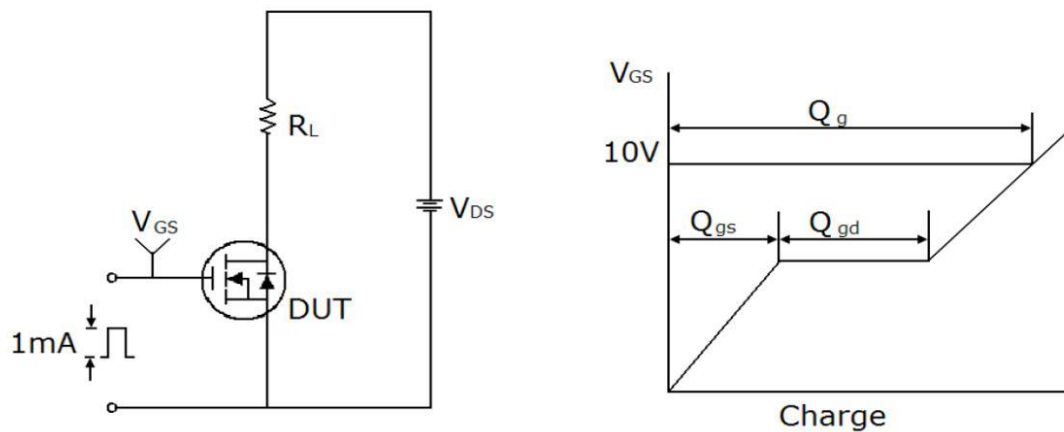
Figure 16. Transient Thermal Impedance, Junction to Case, TO-220/ TO-252



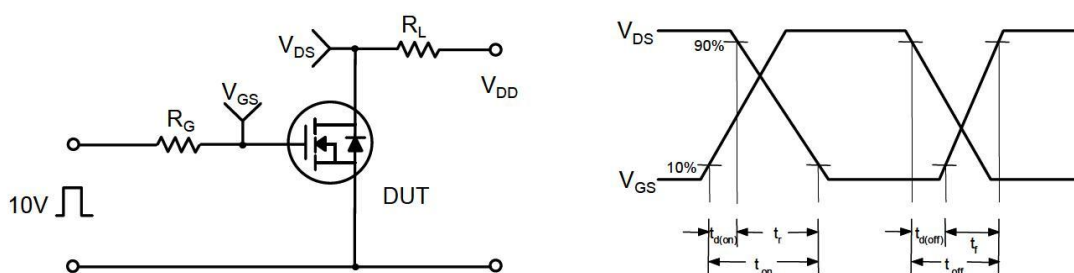
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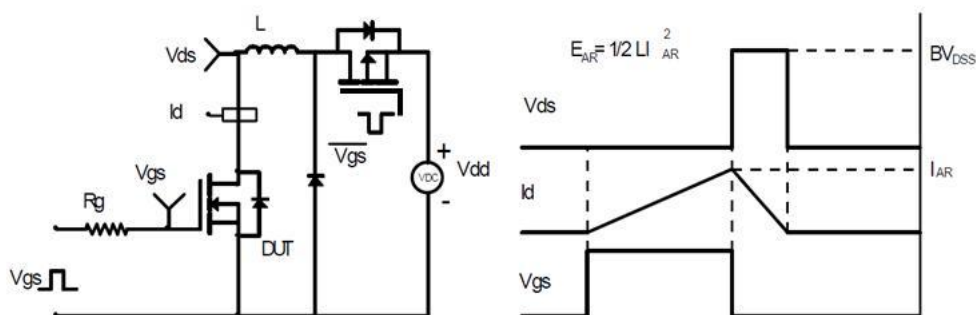
Gate Charge Test Circuit & Waveform



Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

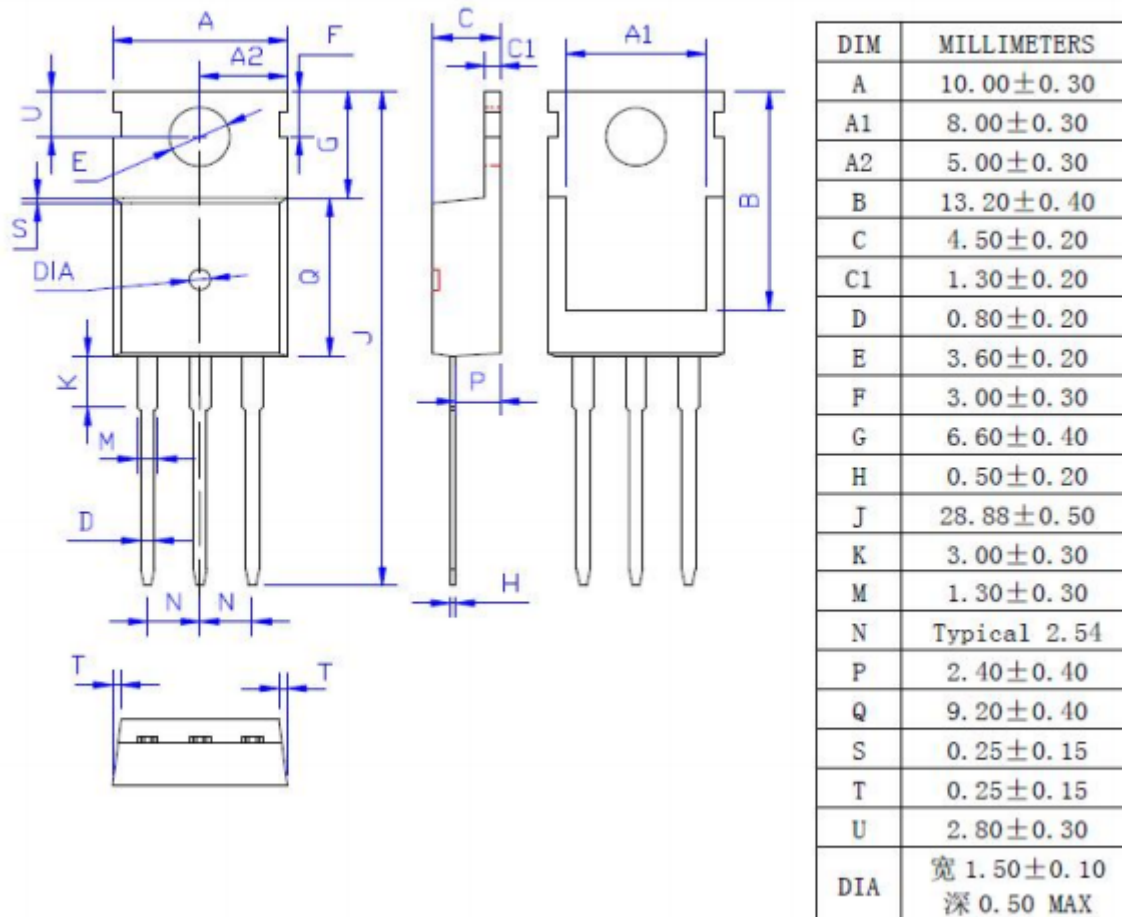


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Package Dimension:

TO-220



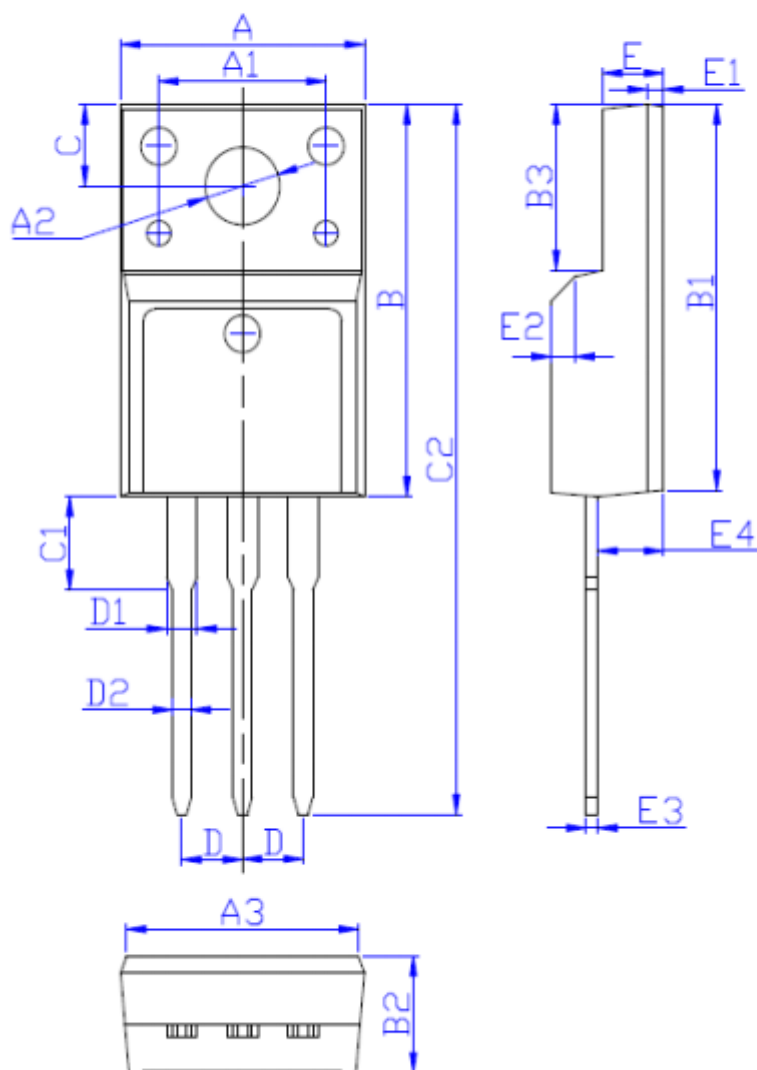
(Unit: mm)

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Package Dimension:

TO-220F



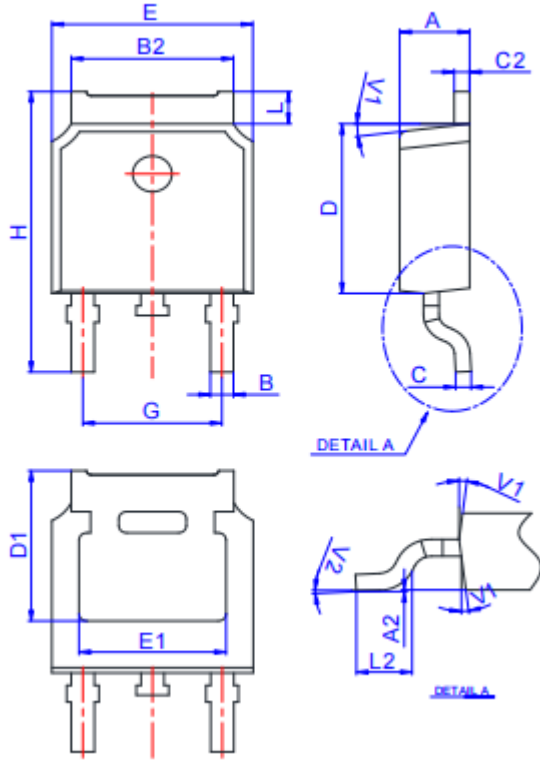
DIM	MILLIMETERS
A	10.16 ± 0.30
A1	7.00 ± 0.20
A2	3.12 ± 0.20
A3	9.70 ± 0.30
B	15.90 ± 0.50
B1	15.60 ± 0.50
B2	4.70 ± 0.30
B3	6.70 ± 0.30
C	3.30 ± 0.25
C1	3.25 ± 0.30
C2	28.70 ± 0.50
D	Typical 2.54
D1	1.47 (MAX)
D2	0.80 ± 0.20
E	2.55 ± 0.25
E1	0.70 ± 0.25
E2	$1.0 \times 45^\circ$
E3	0.50 ± 0.20
E4	2.75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