


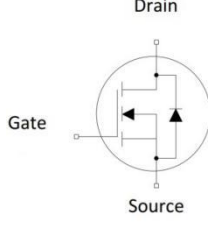



## N-channel 700V, 11A, 0.38Ω Super-Junction Power MOSFET

<p><b>Description</b>                  Super-junction power MOSFET is a revolutionary technology for high voltage power MOSFET , designed according to the SJ principle. The resulting device has extremely low on resistance,making it especially suitable for applications which require superior power density and outstanding efficiency.</p> <p><b>Features</b></p> <ul style="list-style-type: none"> <li>◆ Very low FOM <math>R_{DS(on)} \times Q_g</math></li> <li>◆ 100% UIS tested</li> <li>◆ RoHS compliant</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>◆ Power factor correction (PFC).</li> <li>◆ Switched mode power supplies (SMPS).</li> <li>◆ Uninterrupted power supply (UPS).</li> </ul>	<p><b>Product Summary</b></p> <table> <tr> <td><math>V_{DS} @ T_{j,25^{\circ}C}</math></td> <td>700V</td> </tr> <tr> <td><math>R_{DS(on),max}</math></td> <td>0.38Ω</td> </tr> <tr> <td><math>I_D</math></td> <td>11A</td> </tr> <tr> <td><math>Q_{g,typ}</math></td> <td>19.2 nC</td> </tr> </table> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">   <b>TO-252</b> </div> <div style="text-align: center;">   <b>TO-251</b> </div> <div style="text-align: center;">   <b>TO-220F</b> </div> </div> <div style="text-align: center; margin-top: 20px;">    <b>N-Channel MOSFET</b> </div> <div style="text-align: right; margin-top: 20px;">  </div>	$V_{DS} @ T_{j,25^{\circ}C}$	700V	$R_{DS(on),max}$	0.38Ω	$I_D$	11A	$Q_{g,typ}$	19.2 nC
$V_{DS} @ T_{j,25^{\circ}C}$	700V								
$R_{DS(on),max}$	0.38Ω								
$I_D$	11A								
$Q_{g,typ}$	19.2 nC								

### Marking information

Product	Package	Marking	Packing method
RMA70R380SN	TO-252	RMA70R380SN	Reel
RMG70R380SN	TO-251	RMG70R380SN	Tube
RMC70R380SN	TO-220F	RMC70R380SN	Tube

### Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	700	V
Continuous drain current ( $T_C = 25^{\circ}C$ ) ( $T_C = 100^{\circ}C$ )	$I_D$	11 7	A A
Pulsed drain current <sup>1)</sup>	$I_{DM}$	33	A
Gate-Source voltage	$V_{GSS}$	±30	V
Avalanche energy, single pulse <sup>2)</sup>	$E_{AS}$	210	mJ
Avalanche current, repetitive <sup>3)</sup>	$I_{AR}$	1.6	A
Power Dissipation TO-252 /TO-251 ( $T_C = 25^{\circ}C$ ) - Derate above 25°C	$P_D$	118 0.94	W W/°C
Power Dissipation TO-220F ( $T_C = 25^{\circ}C$ ) - Derate above 25°C	$P_D$	33 0.26	W W/°C
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	°C
Continuous diode forward current	$I_S$	11	A
Diode pulse current	$I_{S,pulse}$	33	A

**Thermal Characteristics**

Parameter	Symbol	Value		Unit
		TO252/TO-251	TO-220F	
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.32	3.6	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	87	62	$^{\circ}\text{C}/\text{W}$
Soldering temperature, wave soldering only allowed at leads. (1.6mm from case for 10s)	$T_{\text{sold}}$	260	260	$^{\circ}\text{C}$

**Electrical Characteristics**
 $T_c = 25^{\circ}\text{C}$  unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>Static characteristics</b>						
Drain-source breakdown voltage	$BV_{\text{DSS}}$	$V_{\text{GS}}=0\text{ V}, I_{\text{D}}=250\mu\text{A}$	700	-	-	V
Gate threshold voltage	$V_{\text{GS(th)}}$	$V_{\text{DS}}=V_{\text{GS}}, I_{\text{D}}=250\mu\text{A}$	2.5	-	4.0	V
Drain cut-off current	$I_{\text{DSS}}$	$V_{\text{DS}}=700\text{ V}, V_{\text{GS}}=0\text{ V},$ $T_j = 25^{\circ}\text{C}$ $T_j = 125^{\circ}\text{C}$	-	-	1	$\mu\text{A}$
Gate leakage current, Forward	$I_{\text{GSSF}}$	$V_{\text{GS}}=30\text{ V}, V_{\text{DS}}=0\text{ V}$	-	-	100	nA
Gate leakage current, Reverse	$I_{\text{GSSR}}$	$V_{\text{GS}}=-30\text{ V}, V_{\text{DS}}=0\text{ V}$	-	-	-100	nA
Drain-source on-state resistance	$R_{\text{DS(on)}}$	$V_{\text{GS}}=10\text{ V}, I_{\text{D}}=5.5\text{ A}$ $T_j = 25^{\circ}\text{C}$	-	0.34	0.38	$\Omega$
<b>Dynamic characteristics</b>						
Input capacitance	$C_{\text{iss}}$	$V_{\text{DS}} = 100\text{ V}, V_{\text{GS}} = 0\text{ V},$ $f = 1\text{ MHz}$	-	852	-	pF
Output capacitance	$C_{\text{oss}}$		-	37	-	
Reverse transfer capacitance	$C_{\text{rss}}$		-	2.0	-	
Turn-on delay time	$t_{\text{d(on)}}$	$V_{\text{DD}} = 400\text{ V}, I_{\text{D}} = 5.5\text{ A}$ $R_{\text{G}} = 25\Omega, V_{\text{GS}}=10\text{ V}$	-	16.3	-	ns
Rise time	$t_{\text{r}}$		-	35	-	
Turn-off delay time	$t_{\text{d(off)}}$		-	78	-	
Fall time	$t_{\text{f}}$		-	39.5	-	
<b>Gate charge characteristics</b>						
Gate to source charge	$Q_{\text{gs}}$	$V_{\text{DD}}=560\text{ V}, I_{\text{D}}=5.5\text{ A},$ $V_{\text{GS}}=0\text{ to }10\text{ V}$	-	3.1	-	nC
Gate to drain charge	$Q_{\text{gd}}$		-	8.2	-	
Gate charge total	$Q_{\text{g}}$		-	19.2	-	
Gate plateau voltage	$V_{\text{plateau}}$		-	5.5	-	V
<b>Reverse diode characteristics</b>						
Diode forward voltage	$V_{\text{SD}}$	$V_{\text{GS}}=0\text{ V}, I_{\text{F}}=5.5\text{ A}$	-	0.85	-	V
Reverse recovery time	$t_{\text{rr}}$	$V_{\text{R}}=400\text{ V}, I_{\text{F}}=5.5\text{ A},$ $dI_{\text{F}}/dt=100\text{ A}/\mu\text{s}$	-	310	-	ns
Reverse recovery charge	$Q_{\text{rr}}$		-	2.8	-	$\mu\text{C}$
Peak reverse recovery current	$I_{\text{rrm}}$		-	16.8	-	A

**Notes:**

- Limited by maximum junction temperature, maximum duty cycle is 0.75.
- $I_{\text{AS}} = 3\text{ A}, V_{\text{DD}} = 50\text{ V},$  Starting  $T_j = 25^{\circ}\text{C}.$

**Electrical Characteristics Diagrams**

Figure 1. Output Characteristics

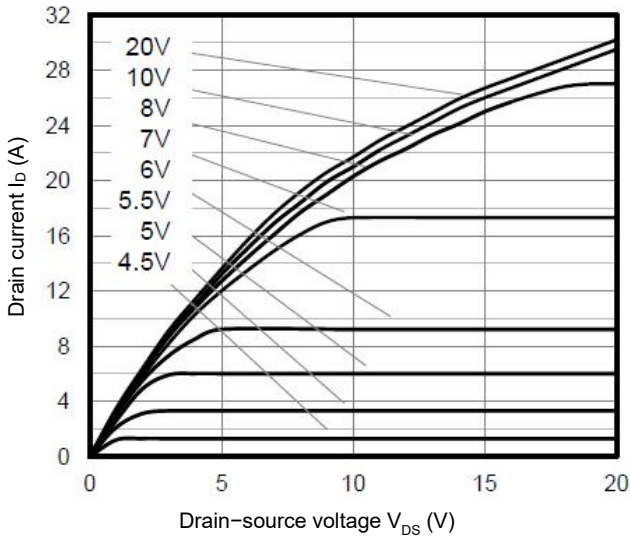


Figure 2. Transfer Characteristics

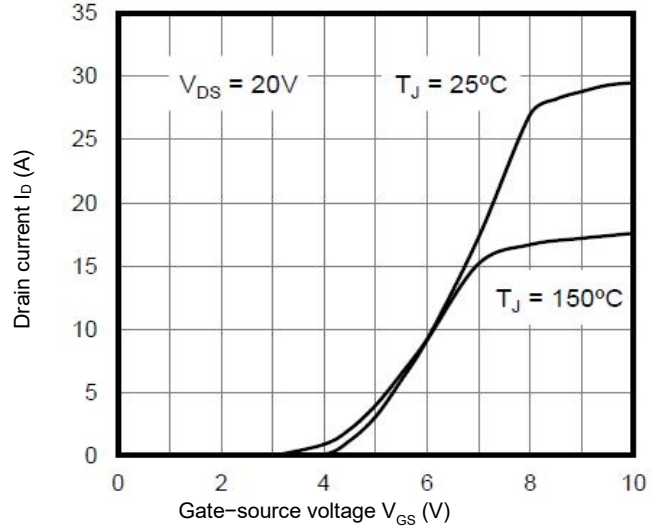


Figure 3. On-Resistance vs. Drain Current

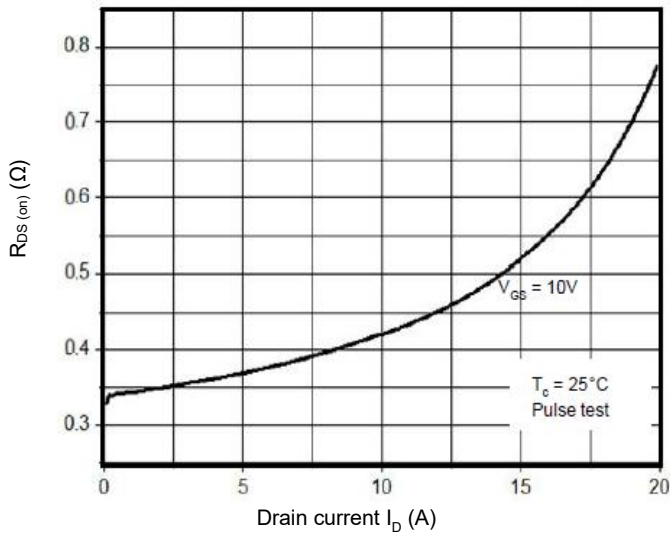


Figure 4. Capacitance Characteristics

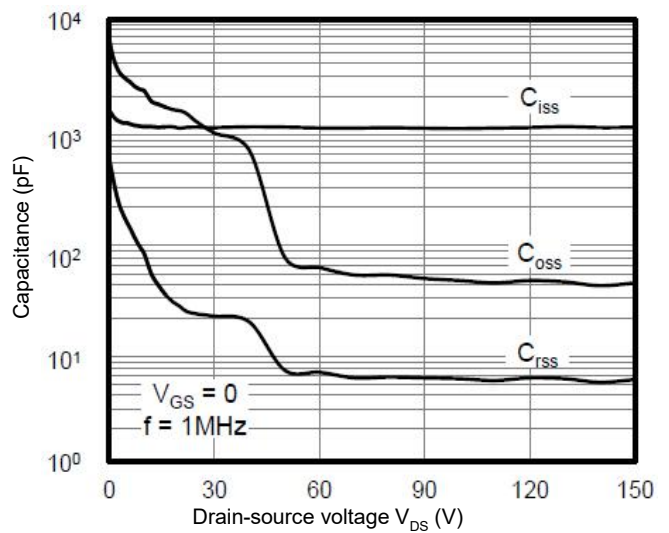


Figure 5. Gate Charge Characteristics

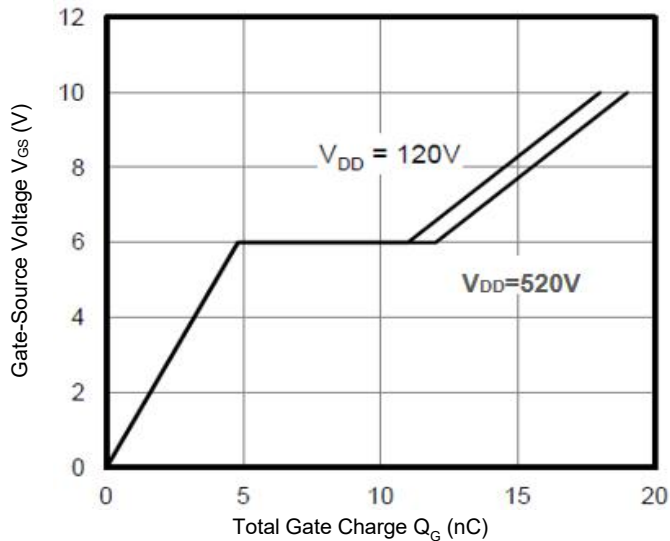


Figure 6. Body Diode Forward Voltage

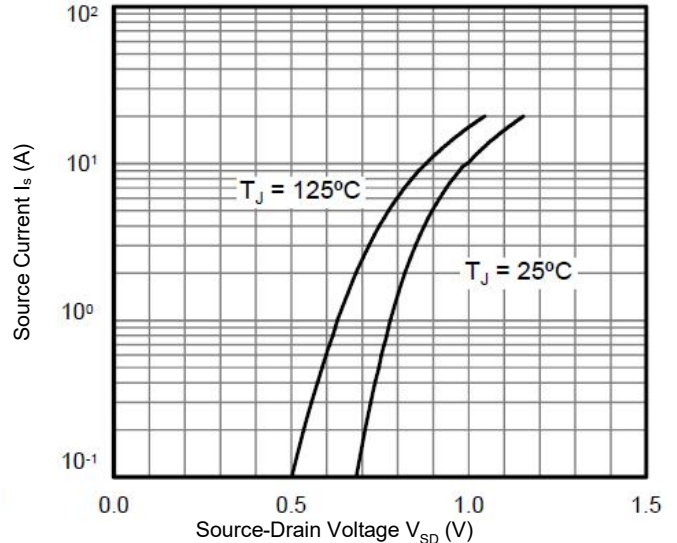


Figure 7. Breakdown Voltage vs. Temperature

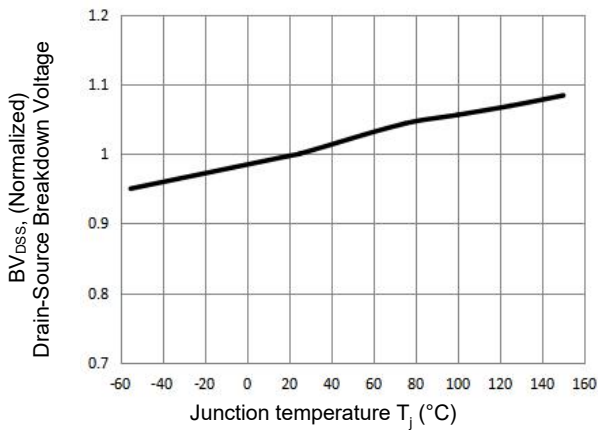


Figure 8. On-Resistance vs. Temperature

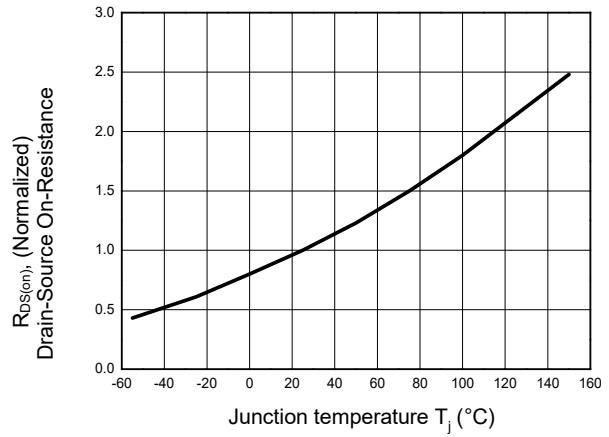


Figure 9. Maximum Safe Operating Area  
TO-252/TO-251

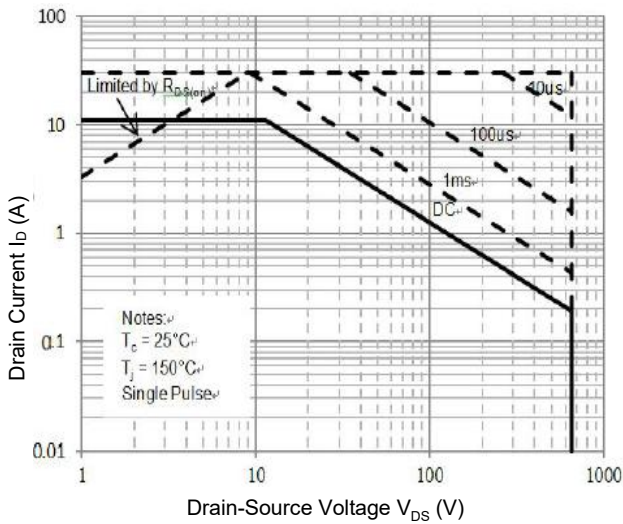
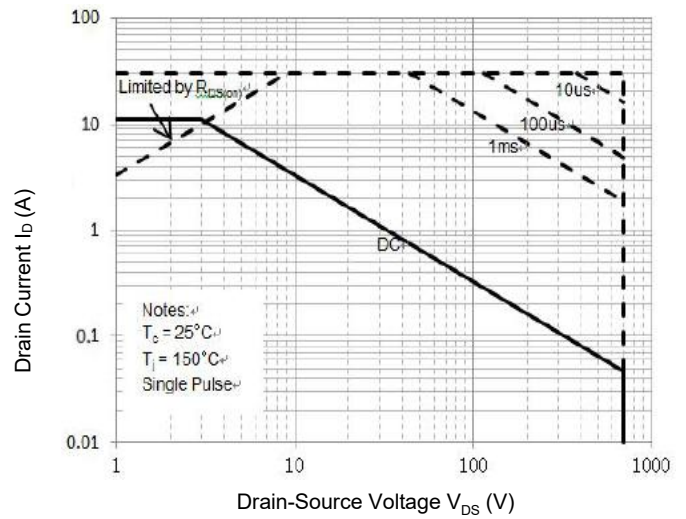
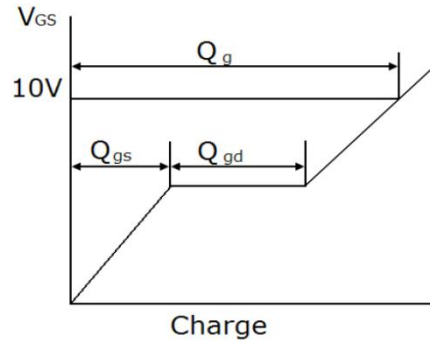
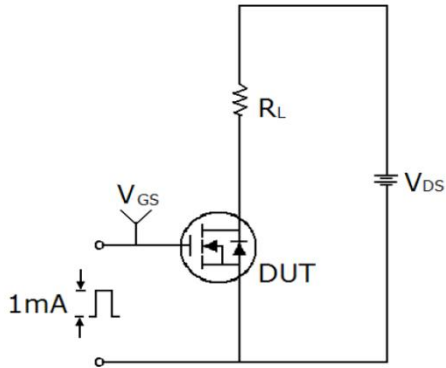


Figure 10. Maximum Safe Operating Area  
TO-220F

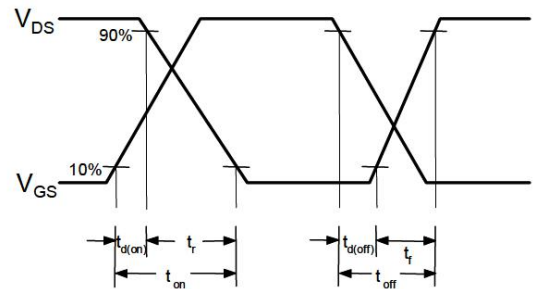
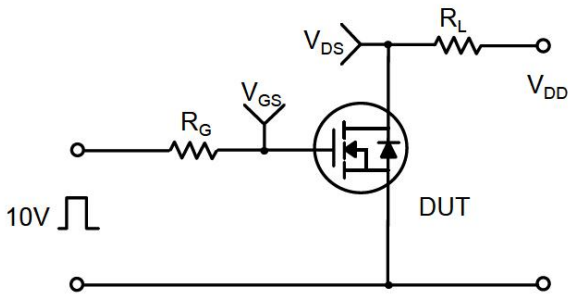


**Test Circuits**

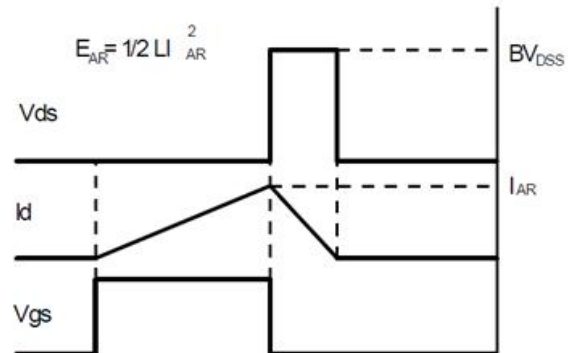
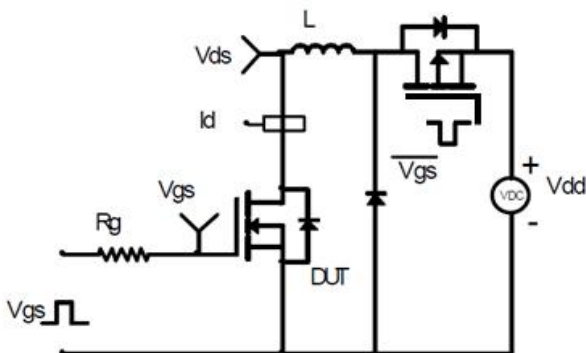
**Gate Charge Test Circuit & Waveform**



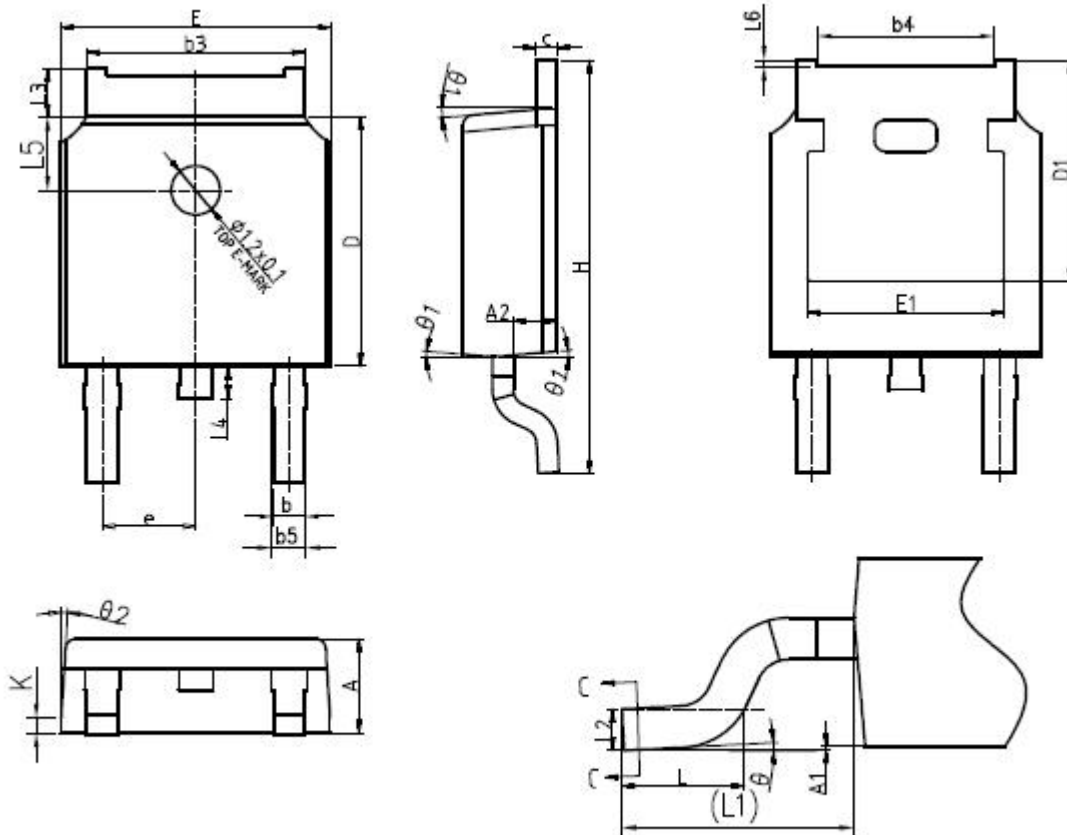
**Switching Test Circuit & Waveform**



**Unclamped Inductive Switching Test Circuit & Waveform**



Mechanical Dimensions for TO-252



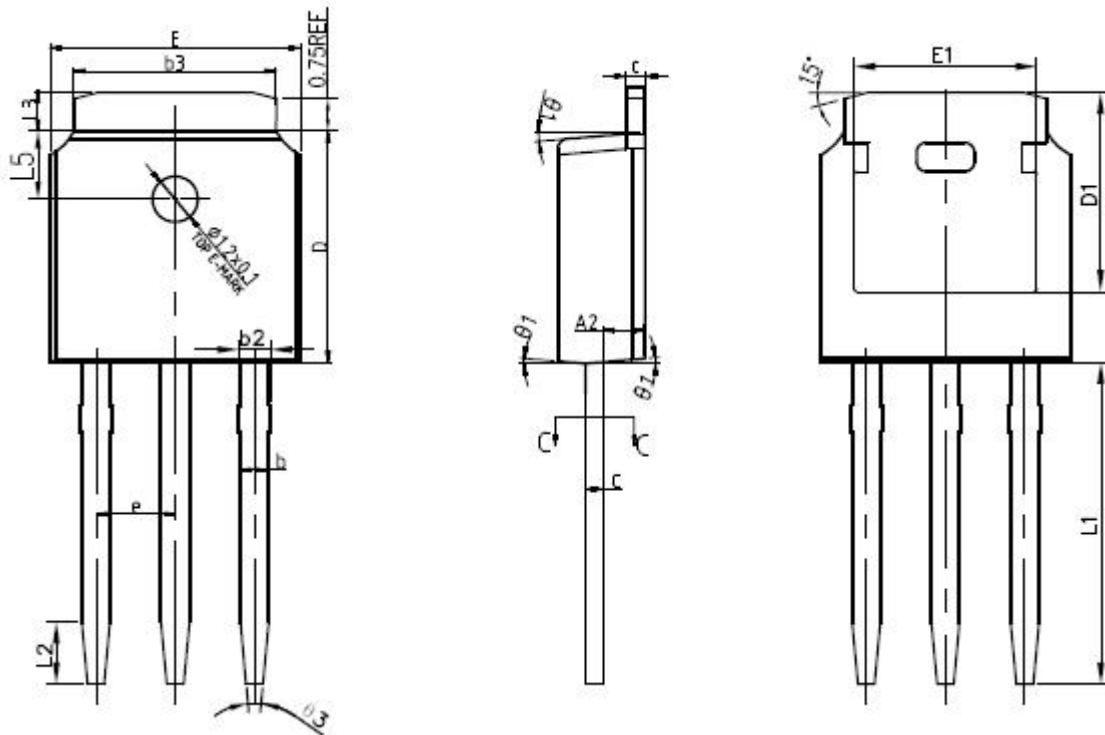
单位: mm

SYMBOL	mm		
	MIN	NOM	MAX
*A	2.20	2.30	2.38
*A1	0.00	-	0.10
A2	0.97	1.07	1.17
*b	0.72	0.78	0.85
b1	0.71	0.76	0.81
*b3	5.23	5.33	5.46
b4	4.27	4.32	4.37
b5	0.72	0.88	0.93
*c	0.47	0.53	0.58
c1	0.46	0.51	0.56
*D	6.00	6.10	6.20
D1	5.30REF		

*E	6.50	6.60	6.70
E1	4.70	4.83	4.92
*e	2.286BSC		
L	1.40	1.50	1.70
L1	2.90REF		
L2	0.51BSC		
*L3	0.90	-	1.25
*L4	0.60	0.80	1.00
L5	1.70	1.80	1.90
L6	0	0.047	0.123
theta	0°	-	8°
*theta 1	5°	7°	9°
theta 2	5°	7°	9°
K	0.40REF		

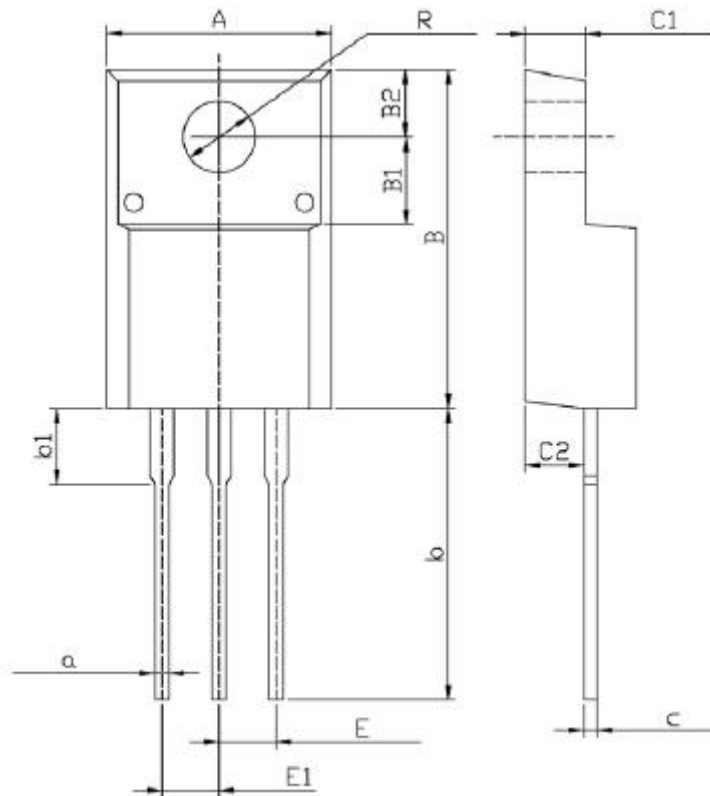


Mechanical Dimensions for TO-251



SYMBOL	MM		
	MIN	NOM	MAX
*A	2.20	2.30	2.38
*A2	0.97	1.07	1.17
*b	0.72	0.78	0.85
b1	0.71	0.76	0.81
*b2	0.72	0.88	0.95
*b3	5.23	5.33	5.46
*c	0.47	0.53	0.58
c1	0.46	0.51	0.56
*D	6.00	6.10	6.20
D1	5.30REF		
*E	6.50	6.60	6.70
E1	4.70	4.83	4.92
*e	2.286BSC		
*L1	9.20	9.40	9.60
L2	1.25	1.35	1.45
*L3	0.90	1.02	1.25
L5	1.70	1.80	1.90
* $\theta 1$	5°	7°	9°
$\theta 2$	5°	7°	9°
$\theta 3$	11°	13°	15°
K	0.40REF		

Mechanical Dimensions for TO-220F



Symbol	Dimensions In Millimeters		Symbol	Dimensions In Millimeters	
	Min	Max		Min	Max
C	4.3	4.7	b1	2.9	3.9
A	9.7	10.3	a	0.55	0.75
B	14.7	15.3	E	2.29	2.79
B1	3.8	4.0	E1	2.29	2.79
B2	2.9	3.1	C1	2.5	2.9
R	3.0	3.4	C2	2.5	2.7
b	12.5	13.5	c	0.5	0.7



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