



## N-channel 650V, 4A Power MOSFET

<p><b>Description</b> 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.</p> <p><b>Features</b></p> <ul style="list-style-type: none"> <li>◆ Low <math>R_{DS(on)}</math></li> <li>◆ Low gate charge (typ. <math>Q_g = 12</math> nC)</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.</li> <li>◆ Switched mode power supplies.</li> <li>◆ LED driver.</li> </ul>	<p><b>Product Summary</b></p> <table> <tr> <td><math>V_{DSS}</math></td> <td>650V</td> </tr> <tr> <td><math>I_D</math></td> <td>4A</td> </tr> <tr> <td><math>R_{DS(on),max}</math></td> <td>2.70<math>\Omega</math></td> </tr> <tr> <td><math>Q_{g,typ}</math></td> <td>12 nC</td> </tr> </table> <div style="text-align: center;"> <p>TO-252      TO-220F</p> <p>N-Channel MOSFET</p> </div>	$V_{DSS}$	650V	$I_D$	4A	$R_{DS(on),max}$	2.70 $\Omega$	$Q_{g,typ}$	12 nC
$V_{DSS}$	650V								
$I_D$	4A								
$R_{DS(on),max}$	2.70 $\Omega$								
$Q_{g,typ}$	12 nC								

### Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	650	V
Continuous drain current ( $T_C = 25^\circ\text{C}$ ) ( $T_C = 100^\circ\text{C}$ )	$I_D$	4 2.5	A A
Pulsed drain current <sup>1)</sup>	$I_{DM}$	16	A
Gate-Source voltage	$V_{GSS}$	$\pm 30$	V
Avalanche energy, single pulse <sup>2)</sup>	$E_{AS}$	198	mJ
Peak diode recovery $dv/dt$ <sup>3)</sup>	$dv/dt$	5	V/ns
Power Dissipation TO-220F ( $T_C = 25^\circ\text{C}$ ) Derate above $25^\circ\text{C}$	$P_D$	32 0.26	W W/ $^\circ\text{C}$
Power Dissipation TO-252 ( $T_C = 25^\circ\text{C}$ ) Derate above $25^\circ\text{C}$		77 0.61	W W/ $^\circ\text{C}$
Operating junction and storage temperature range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$
Continuous diode forward current	$I_S$	4	A
Diode pulse current	$I_{S,pulse}$	16	A

### Thermal Characteristics

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



Package Marking and Ordering Information

Device	Device Package	Marking	Units/Tube	Units/Real
BCT4N65	TO-220F	BCT4N65	50	
BCD4N65	TO-252	BCD4N65		2500

Electrical Characteristics

T<sub>c</sub> = 25°C unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>Static characteristics</b>						
Drain-source breakdown voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0 V, I <sub>D</sub> =0.25 mA	650	-	-	V
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =0.25 mA	2	-	4	V
Drain cut-off current	I <sub>DSS</sub>	V <sub>DS</sub> =650 V, V <sub>GS</sub> =0 V, T <sub>j</sub> = 25°C T <sub>j</sub> = 125°C	-	-	1	μA
Gate leakage current, Forward	I <sub>GSSF</sub>	V <sub>GS</sub> =30 V, V <sub>DS</sub> =0 V	-	-	100	nA
Gate leakage current, Reverse	I <sub>GSSR</sub>	V <sub>GS</sub> =-30 V, V <sub>DS</sub> =0 V	-	-	-100	nA
Drain-source on-state resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10 V, I <sub>D</sub> =2 A	-	2.50	2.70	Ω
<b>Dynamic characteristics</b>						
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	-	600	-	pF
Output capacitance	C <sub>oss</sub>		-	55	-	
Reverse transfer capacitance	C <sub>rss</sub>		-	3.2	-	
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = 325 V, I <sub>D</sub> = 4 A R <sub>G</sub> = 10 Ω, V <sub>GS</sub> =15 V	-	12	-	ns
Rise time	t <sub>r</sub>		-	31	-	
Turn-off delay time	t <sub>d(off)</sub>		-	42	-	
Fall time	t <sub>f</sub>		-	15	-	
<b>Gate charge characteristics</b>						
Gate to source charge	Q <sub>gs</sub>	V <sub>DD</sub> =520 V, I <sub>D</sub> =4 A, V <sub>GS</sub> =0 to 10 V	-	3.2	-	nC
Gate to drain charge	Q <sub>gd</sub>		-	5.1	-	
Gate charge total	Q <sub>g</sub>		-	12	-	
Gate plateau voltage	V <sub>plateau</sub>		-	6	-	V
<b>Reverse diode characteristics</b>						
Diode forward voltage	V <sub>SD</sub>	V <sub>GS</sub> =0 V, I <sub>F</sub> =4 A	-	-	1.5	V
Reverse recovery time	t <sub>rr</sub>	V <sub>R</sub> =400 V, I <sub>F</sub> =4 A, di <sub>F</sub> /dt=100 A/μs	-	282	-	ns
Reverse recovery charge	Q <sub>rr</sub>		-	1.4	-	μC
Peak reverse recovery current	I <sub>rrm</sub>		-	10	-	A

Notes:

1. Pulse width limited by maximum junction temperature.
2. L=10mH, I<sub>AS</sub> = 6.3A, Starting T<sub>j</sub>= 25°C.
3. I<sub>SD</sub> = 4A, di/dt≤100A/μs, V<sub>DD</sub>≤BV<sub>DS</sub>, Starting T<sub>j</sub>= 25°C.



Electrical Characteristics Diagrams

Figure 1. Typical Output Characteristics

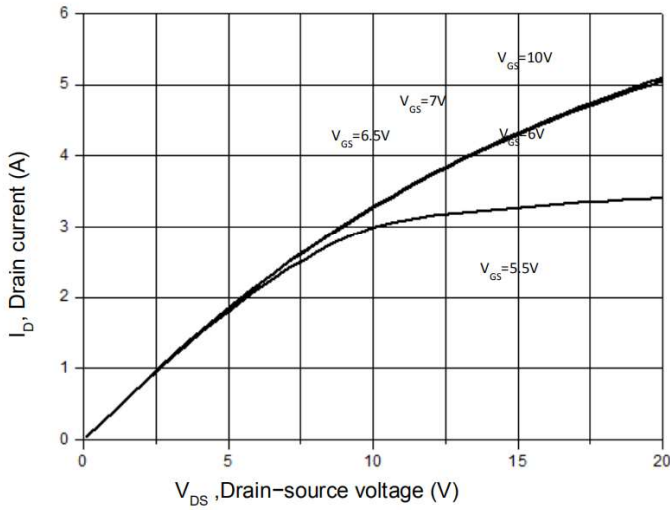


Figure 3. On-Resistance Variation vs. Drain Current

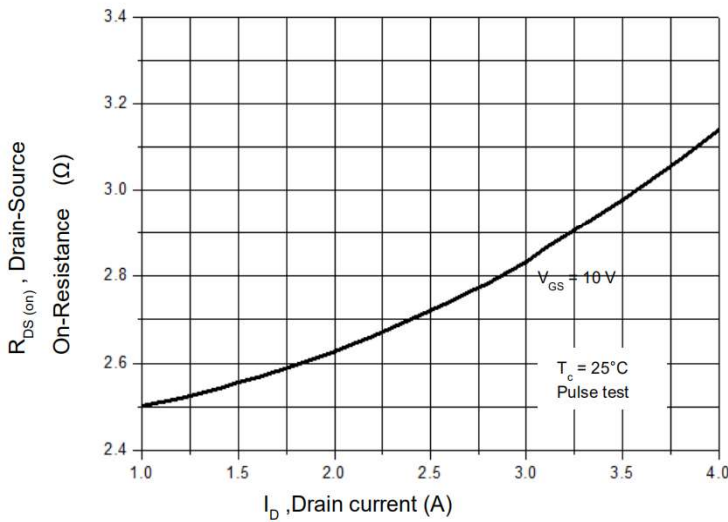


Figure 5. Breakdown Voltage vs. Temperature

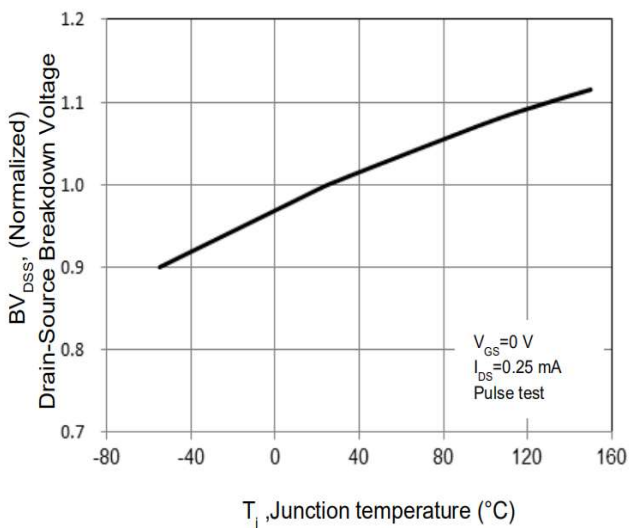


Figure 2. Transfer Characteristics

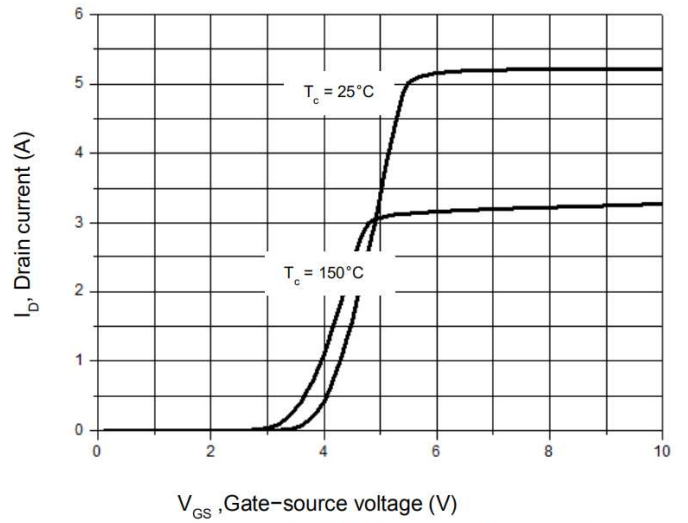


Figure 4. Threshold Voltage vs. Temperature

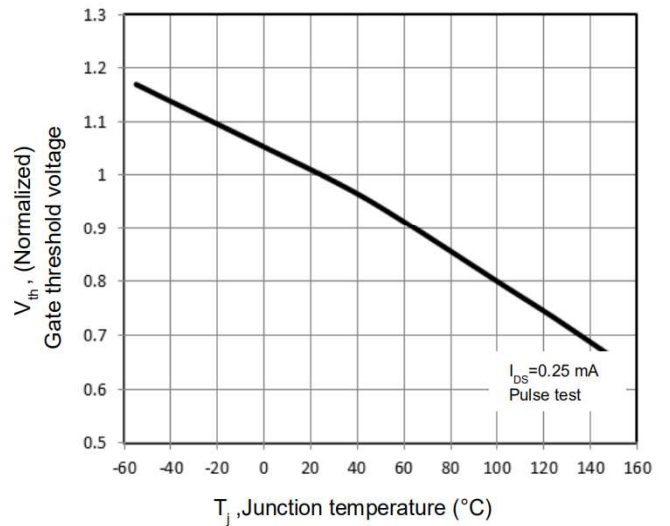


Figure 6. On-Resistance vs. Temperature

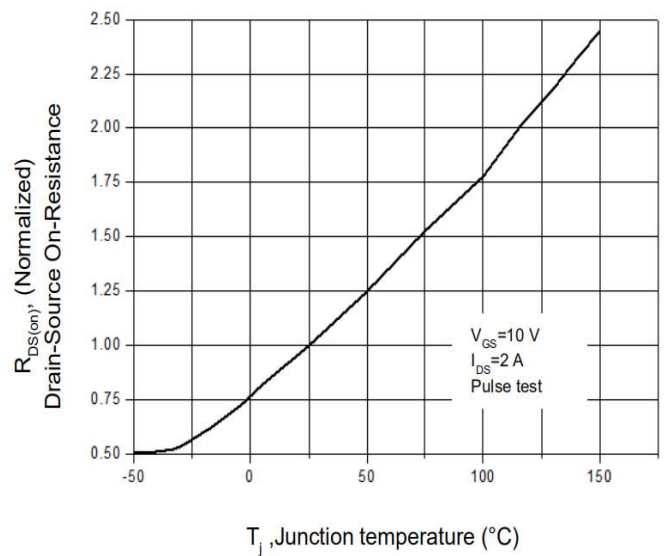




Figure 7. Capacitance Characteristics

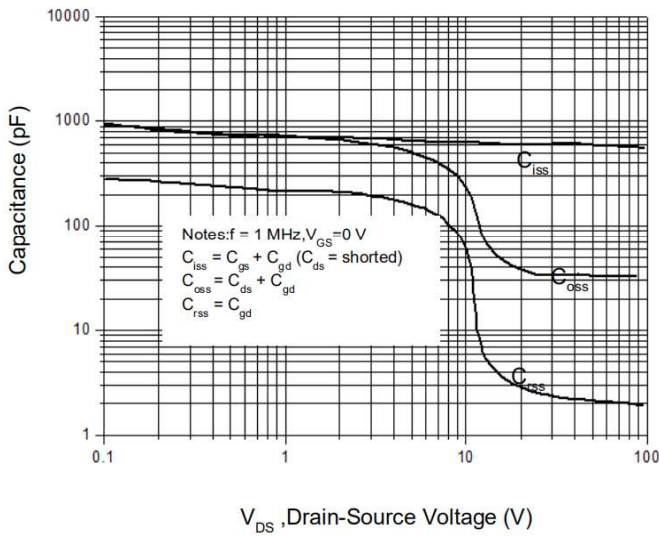


Figure 8. Gate Charge Characterist

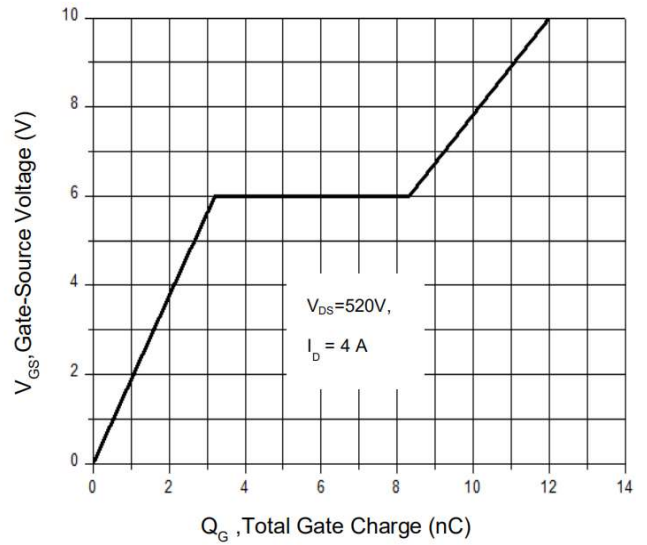


Figure 9. Maximum Safe Operating Area  
TO-220F

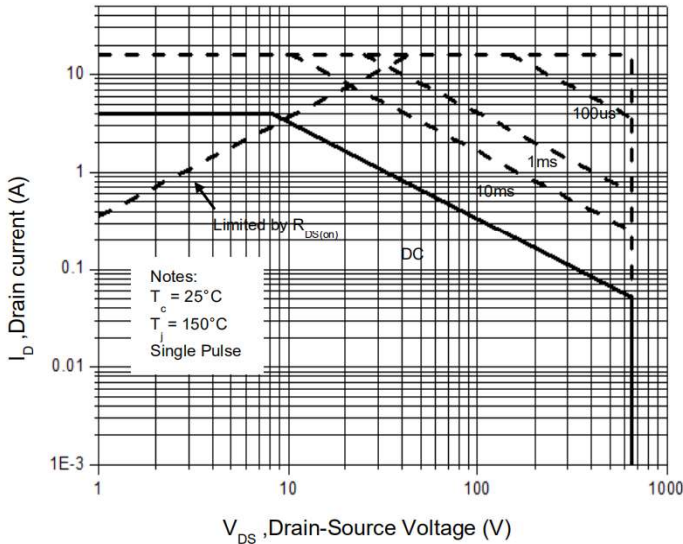


Figure 10. Maximum Safe Operating Area  
TO-252

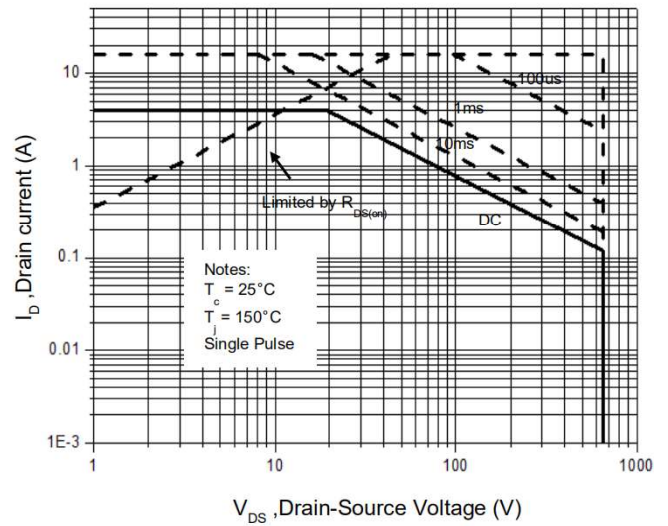


Figure 11. Power Dissipation vs. Temperature  
TO-220F

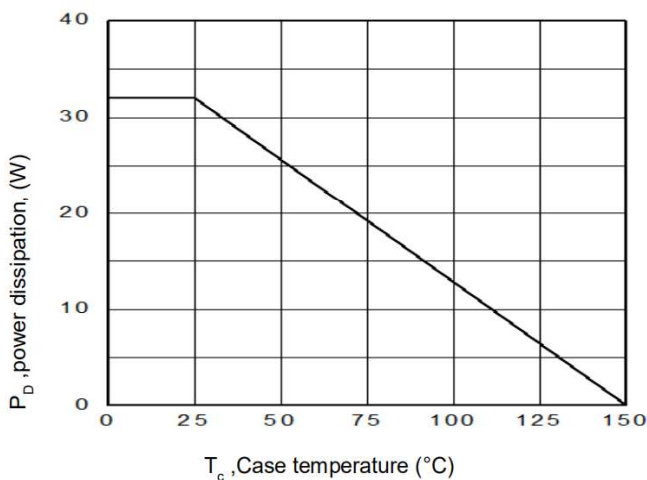


Figure 12. Power Dissipation vs. Temperature  
TO-252

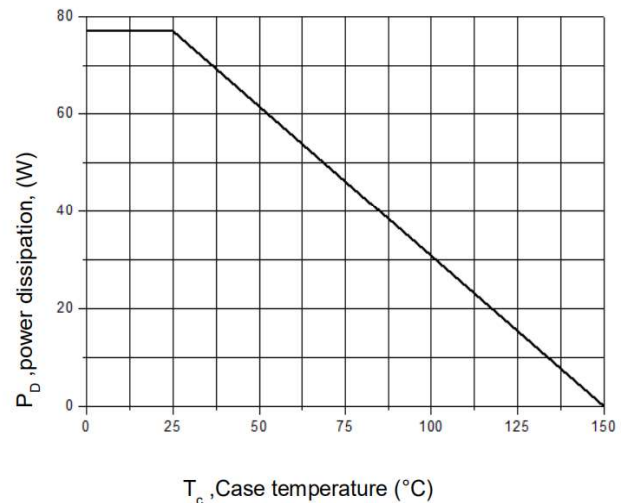




Figure 13. Continuous Drain Current vs. Temperature

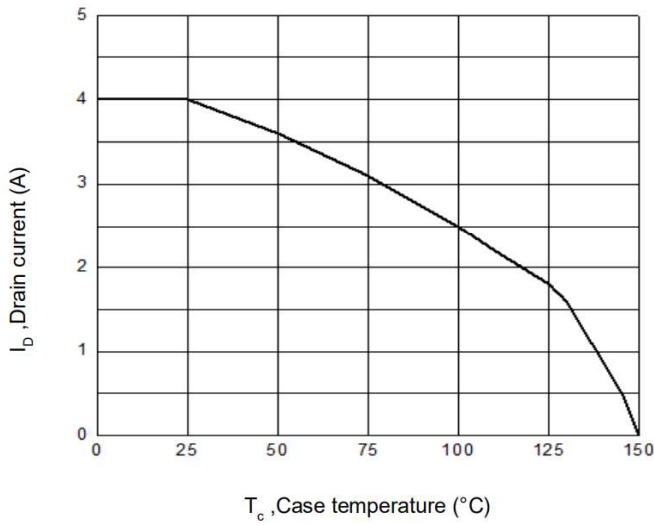


Figure 14. Body Diode Transfer Characteristics

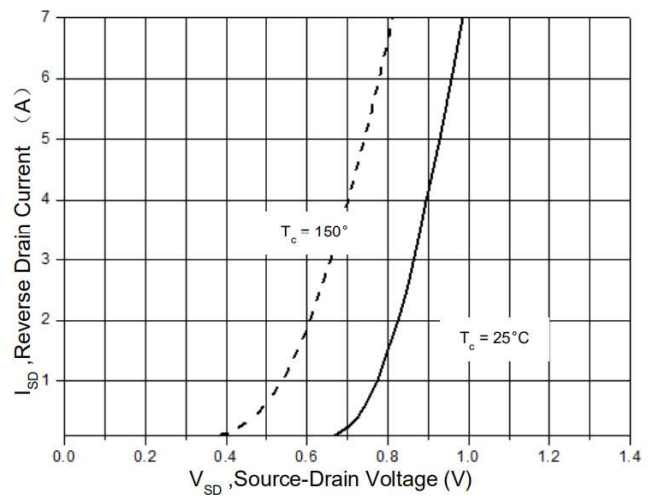


Figure 15 Transient Thermal Impedance, Junction to Case, TO-220F

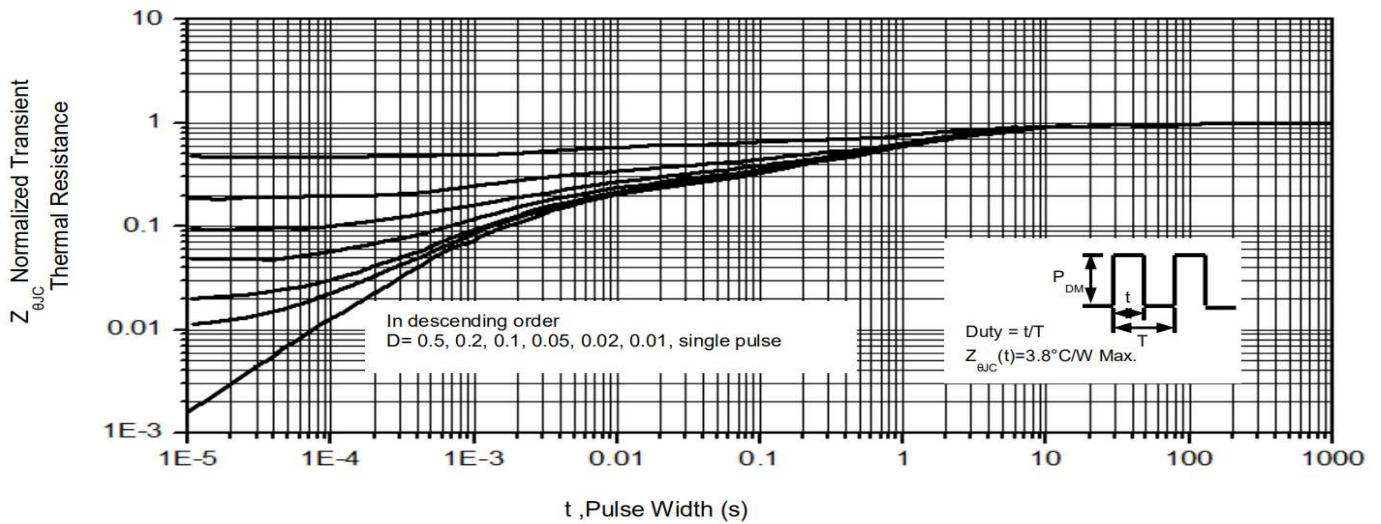
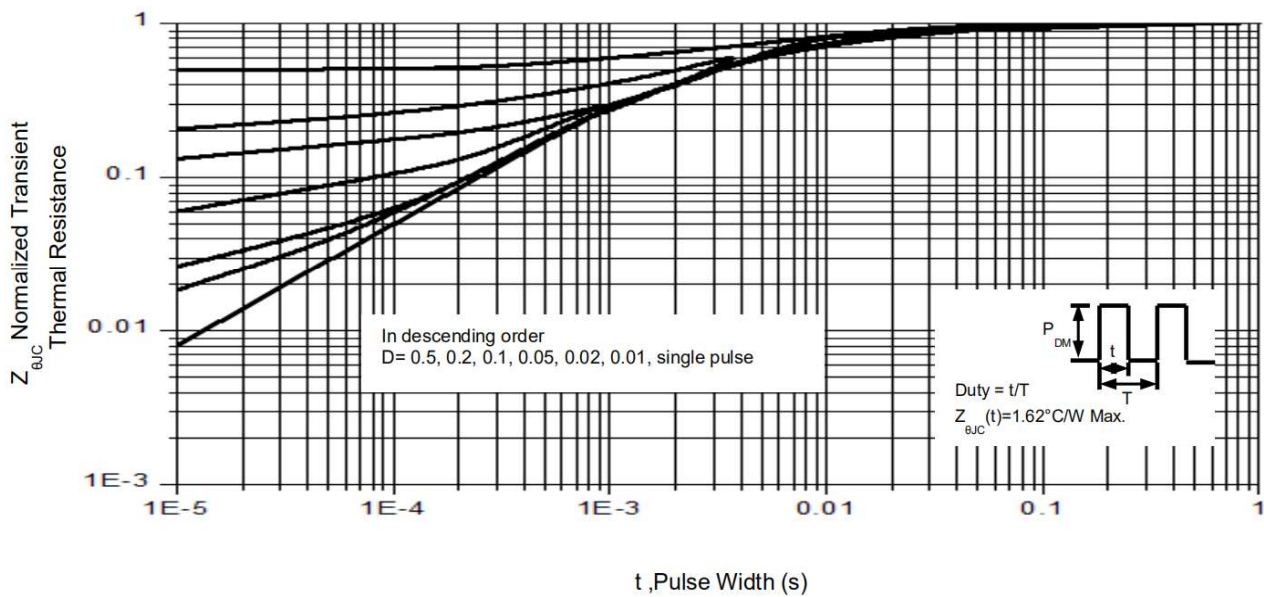
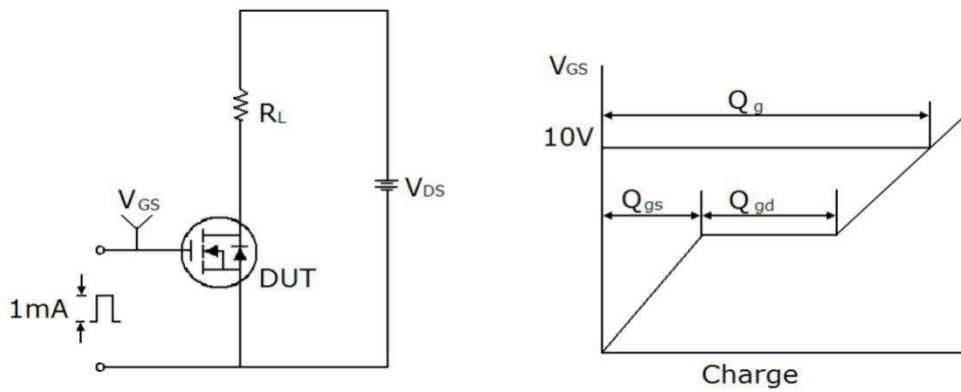


Figure 16. Transient Thermal Impedance, Junction to Case, TO-252

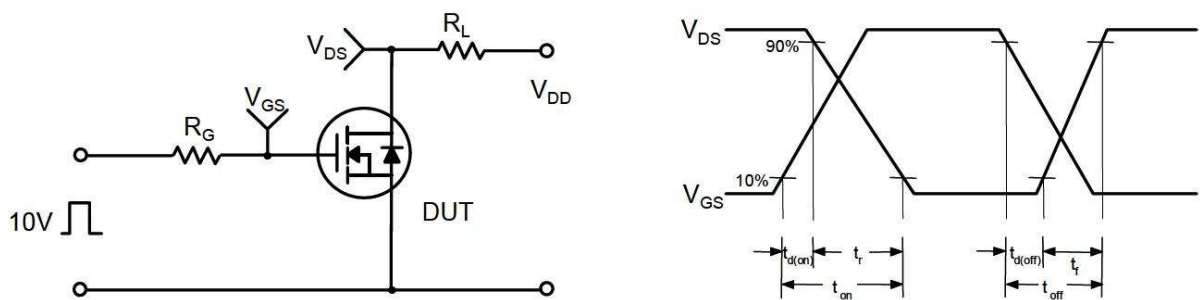




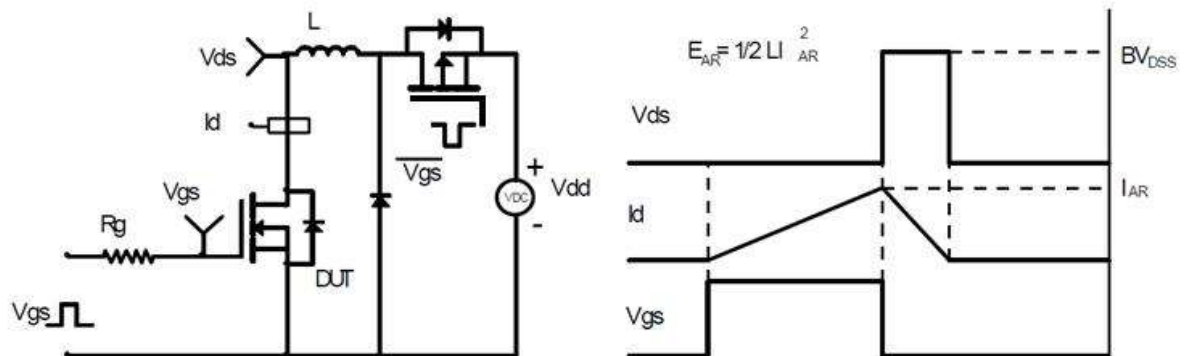
**Gate Charge Test Circuit & Waveform**



**Switching Test Circuit & Waveforms**

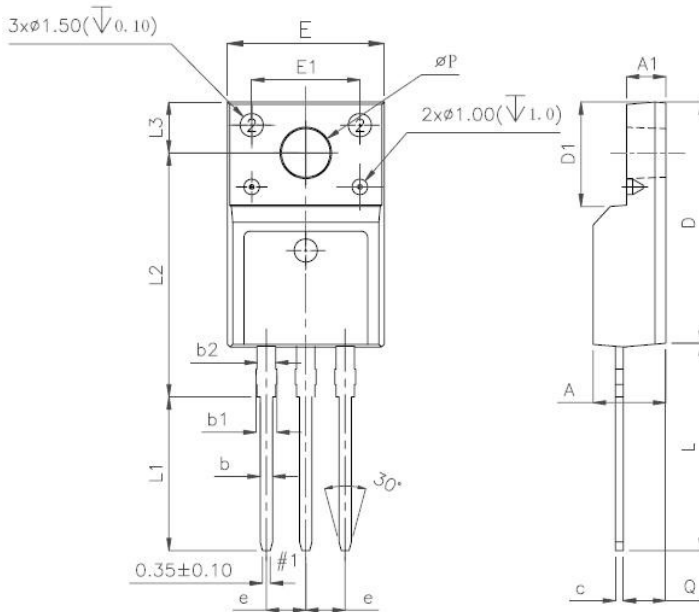


**Unclamped Inductive Switching Test Circuit & Waveforms**





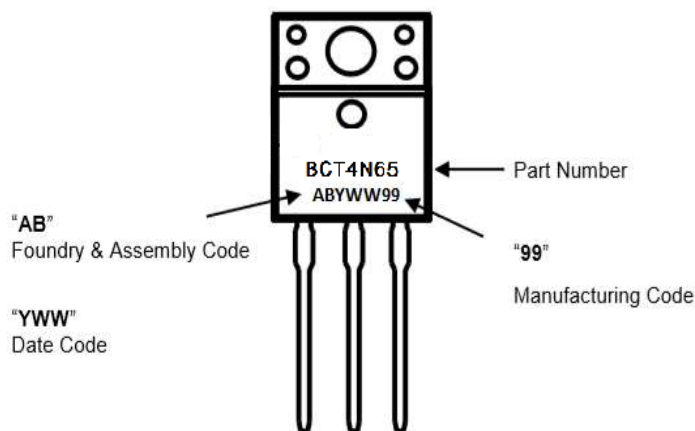
**Mechanical Dimensions for TO-220F**



UNIT:mm

SYMBOL	MIN	NOM	MAX
A	4.5		4.9
A1	2.3		2.9
b	0.65		0.9
b1	1.1		1.7
b2	1.2		1.4
c	0.35		0.65
D	14.5		16.5
D1	6.1		6.9
E	9.6		10.3
E1	6.5	7	7.5
e	2.44	2.54	2.64
L	12.5		14.3
L1	9.45		10.05
L2	15		16
L3	3.2		4.4
ΦP	3		3.3
Q	2.5		2.9

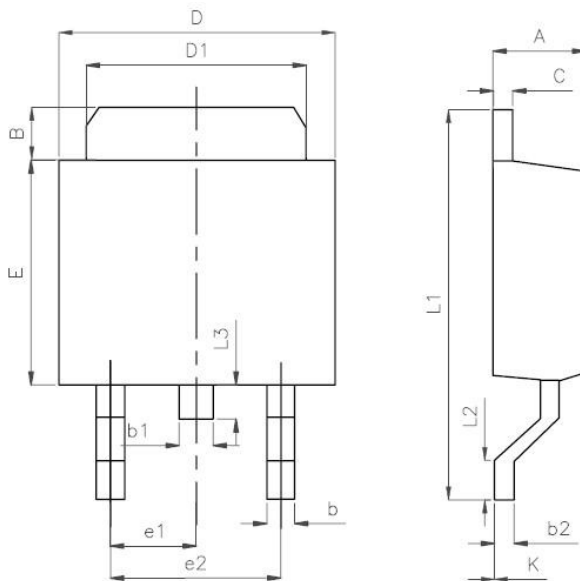
**TO-220F Part Marking Information**





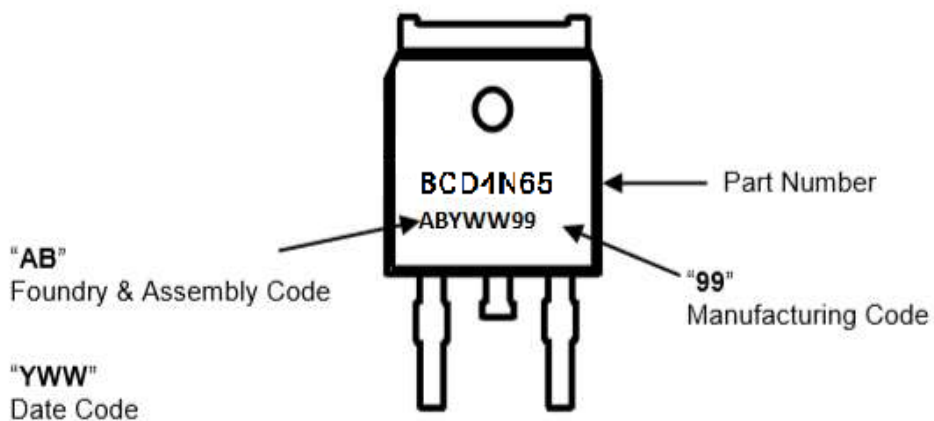
**Mechanical Dimensions for TO-252**

UNIT:mm



SYMBOL	MIN	NOM	MAX
A	2.10		2.50
B	0.80		1.25
b	0.50		0.85
b1	0.50		0.90
b2	0.45		0.60
C	0.45		0.60
D	6.35		6.75
D1	5.10		5.50
E	5.80		6.30
e1	2.25	2.30	2.35
e2	4.45		4.75
L1	9.50		10.20
L2	0.90		1.45
L3	0.60		1.10
K	-0.1		0.10

**TO-252 Part Marking Information**





## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [MOSFET](#) category:*

*Click to view products by [Shandong Baocheng](#) manufacturer:*

Other Similar products are found below :

[IRFD120](#) [JANTX2N5237](#) [2SK2267\(Q\)](#) [BUK455-60A/B](#) [TK100A10N1,S4X\(S](#) [MIC4420CM-TR](#) [VN1206L](#) [NDP4060](#) [SI4482DY](#)  
[IRS2092STRPBF-EL](#) [IPS70R2K0CEAKMA1](#) [SQM120N06-3M5L-GE3](#) [TK31J60W5,S1VQ\(O](#) [TK31J60W,S1VQ\(O](#) [TK16J60W,S1VQ\(O](#)  
[2SK2614\(TE16L1,Q\)](#) [DMN1017UCP3-7](#) [EFC2J004NUZTDG](#) [P85W28HP2F-7071](#) [NTE2384](#) [DMC2700UDMQ-7](#) [DMN2080UCB4-7](#)  
[DMN61D9UWQ-13](#) [US6M2GTR](#) [DMN31D5UDJ-7](#) [DMP22D4UFO-7B](#) [IPS60R3K4CEAKMA1](#) [DMN1006UCA6-7](#) [DMN16M9UCA6-7](#)  
[STF5N65M6](#) [IRF40H233XTMA1](#) [STU5N65M6](#) [DMN6022SSD-13](#) [DMN13M9UCA6-7](#) [DMTH10H4M6SPS-13](#) [IPS60R360PFD7SAKMA1](#)  
[DMN2990UFB-7B](#) [SSM3K35CT,L3F](#) [IPLK60R1K0PFD7ATMA1](#) [2N7002W-G](#) [MCAC30N06Y-TP](#) [IPWS65R035CFD7AXKSA1](#)  
[MCQ7328-TP](#) [SSM3J143TU,LXHF](#) [PJMF280N65E1\\_T0\\_00201](#) [PJMF380N65E1\\_T0\\_00201](#) [PJMF280N60E1\\_T0\\_00201](#)  
[PJMF600N65E1\\_T0\\_00201](#) [PJMF900N65E1\\_T0\\_00201](#) [PJMF900N60E1\\_T0\\_00201](#)