

**N-channel 650V, 7A Power MOSFET**

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. Features ◆ Low $R_{DS(on)}$ ◆ Low gate charge (typ. $Q_g = 20.7\text{nC}$) ◆ 100% UIS tested ◆ RoHS compliant Applications ◆ Power factor correction. ◆ Switched mode power supplies. ◆ LED driver.	Product Summary <table><tr><td>V_{DSS}</td><td>650V</td></tr><tr><td>I_D</td><td>7A</td></tr><tr><td>$R_{DS(on),max}$</td><td>1.4Ω</td></tr><tr><td>$Q_{g,typ}$</td><td>20.7nC</td></tr></table> TO-252 TO-220F N-Channel MOSFET	V_{DSS}	650V	I_D	7A	$R_{DS(on),max}$	1.4 Ω	$Q_{g,typ}$	20.7nC
V_{DSS}	650V								
I_D	7A								
$R_{DS(on),max}$	1.4 Ω								
$Q_{g,typ}$	20.7nC								

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	7 4.3	A A
Pulsed drain current ¹⁾	I_{DM}	28	A
Gate-Source voltage	V_{GSS}	± 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/ $^\circ\text{C}$
Power Dissipation TO-252 ($T_C = 25^\circ\text{C}$) Derate above 25°C		100 0.8	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	7	A
Diode pulse current	$I_{S,pulse}$	28	A

Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO-220F	TO-252	
Thermal resistance, Junction-to-case	$R_{\theta JC}$	3.2	1.25	$^\circ\text{C/W}$
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
BCT7N65	TO-220F	BCT7N65	50	
BCD7N65	TO-252	BCD7N65		2500

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

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV _{DSS}	V _{GS} =0 V, I _D =250 uA	650	-	-	V
Gate threshold voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250 uA	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 =3.5 A	-	1.2	1.4	Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 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 V, I _D = 7 A R _G = 10 Ω, V _{GS} =15 V	-	12.2	-	ns
Rise time	t _r		-	33.4	-	
Turn-off delay time	t _{d(off)}		-	53.6	-	
Fall time	t _f		-	15	-	
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =520 V, I _D =7 A, V _{GS} =0 to 10 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 V, I _F =7 A	-	0.85	1.5	V
Reverse recovery time	t _{rr}	V _R =325 V, I _F =7 A, dI _F /dt=100 A/μs	-	373.2	-	ns
Reverse recovery charge	Q _{rr}		-	2.1	-	μC
Peak reverse recovery current	I _{rrm}		-	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 $T_j = 25^{\circ}\text{C}$.



Electrical Characteristics Diagrams

Figure 1. Typical Output Characteristics

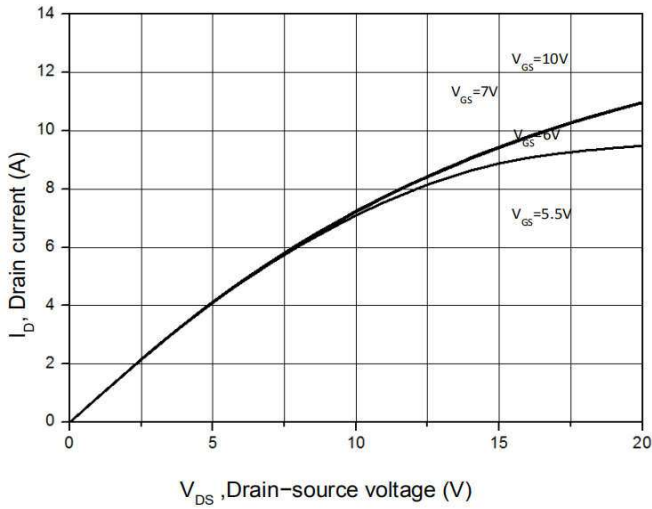


Figure 2. Transfer Characteristics

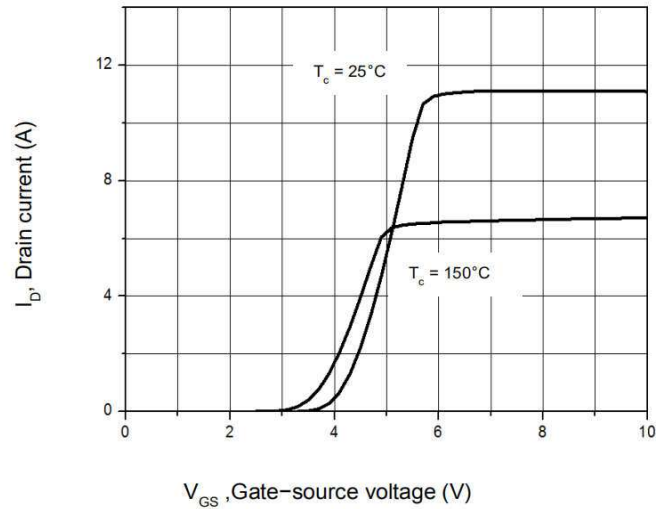


Figure 3. On-Resistance Variation vs. Drain Current

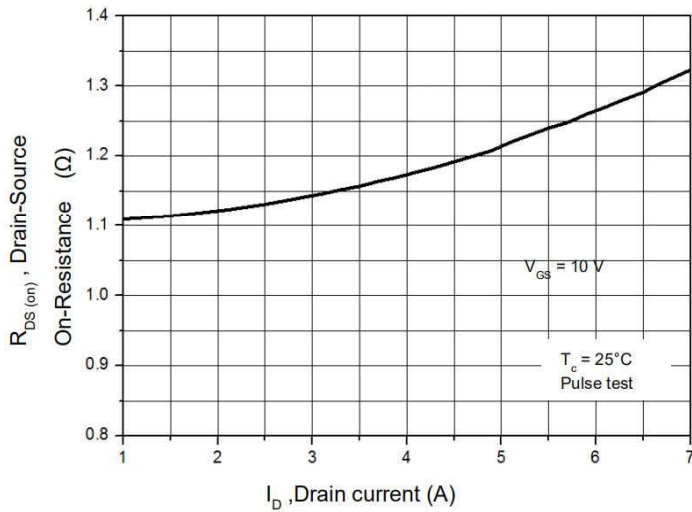


Figure 4. Threshold Voltage vs. Temperature

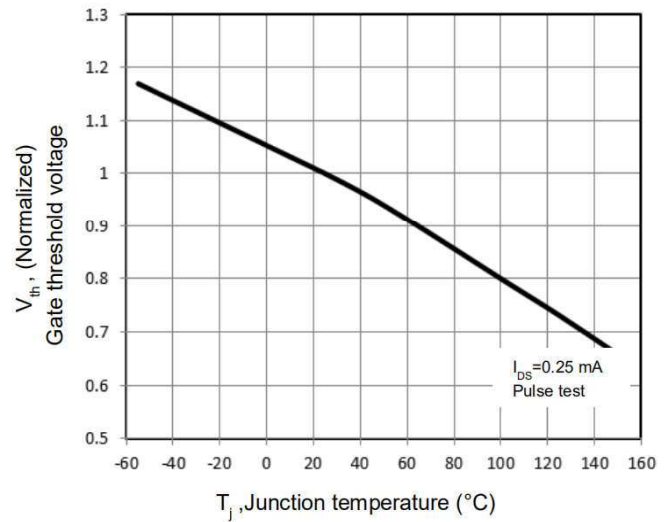


Figure 5. Breakdown Voltage vs. Temperature

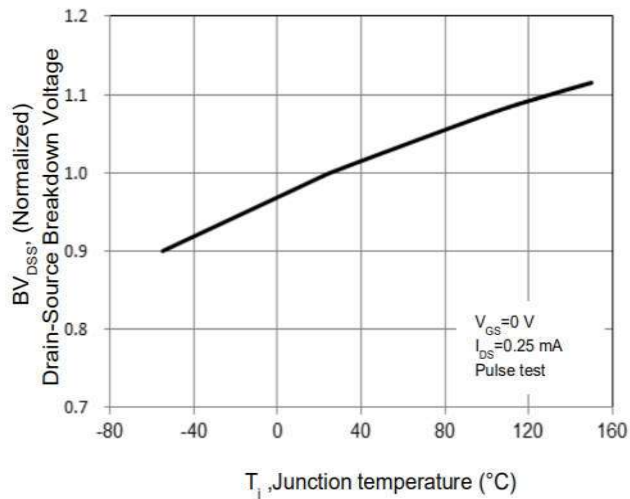


Figure 6. On-Resistance vs. Temperature

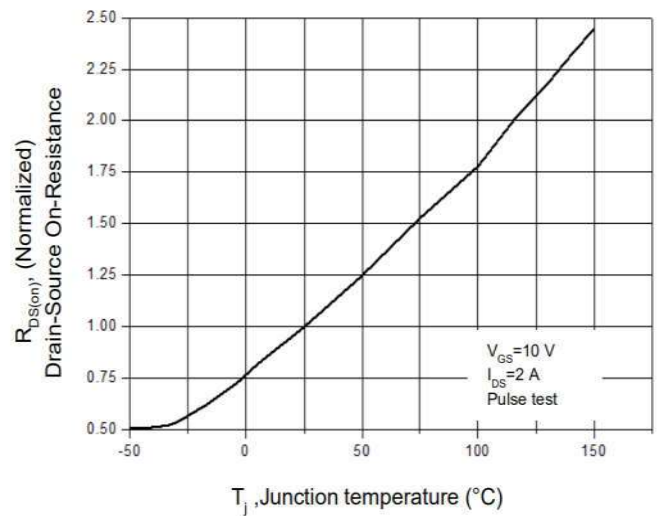




Figure 7. Capacitance Characteristics

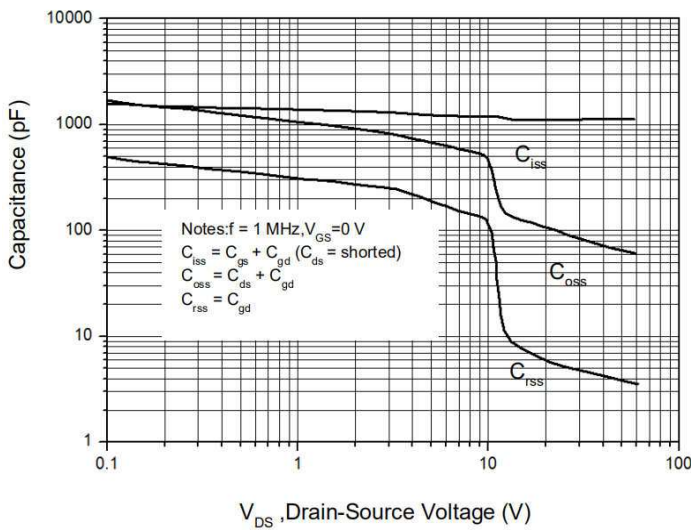


Figure 8. Gate Charge Characterist

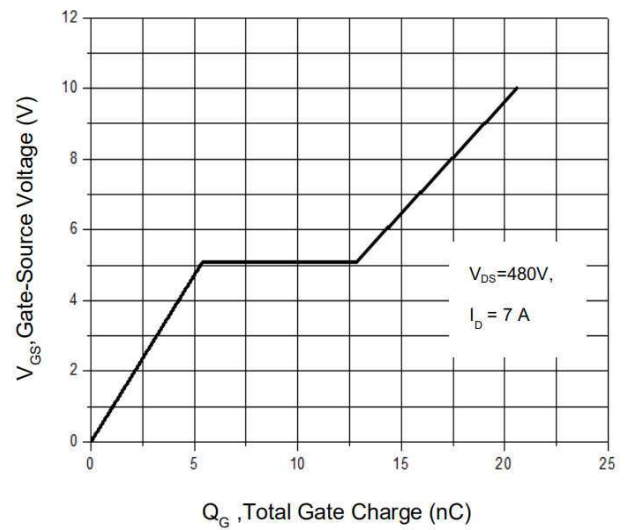


Figure 9. Maximum Safe Operating Area
TO-220F

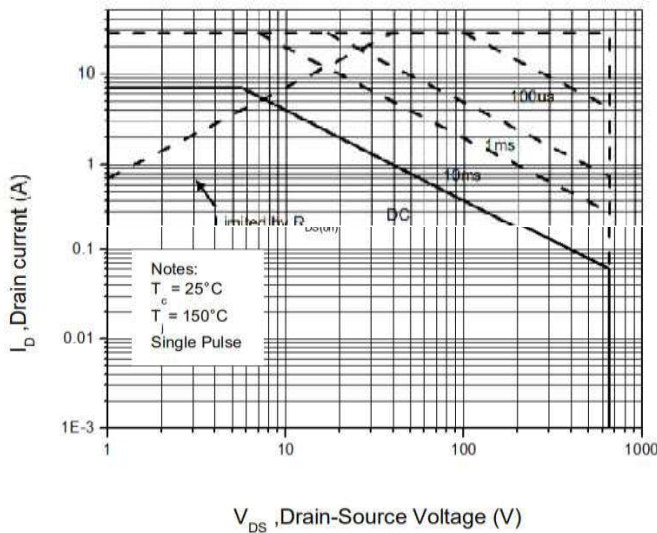


Figure 10. Maximum Safe Operating Area
TO-252

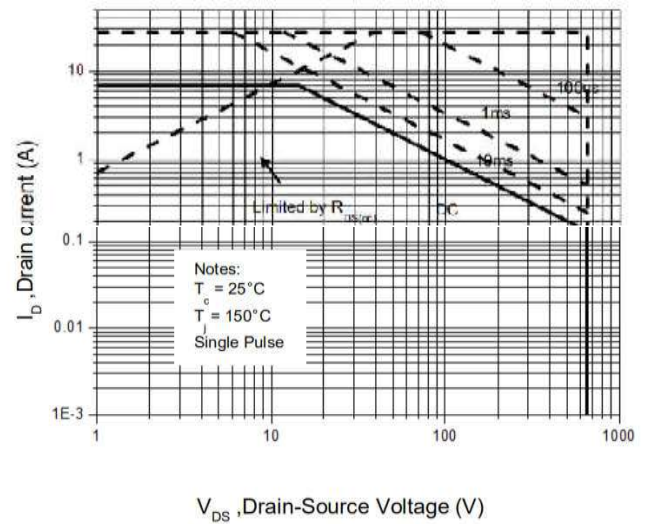


Figure 11. Power Dissipation vs.
Temperature TO-220F

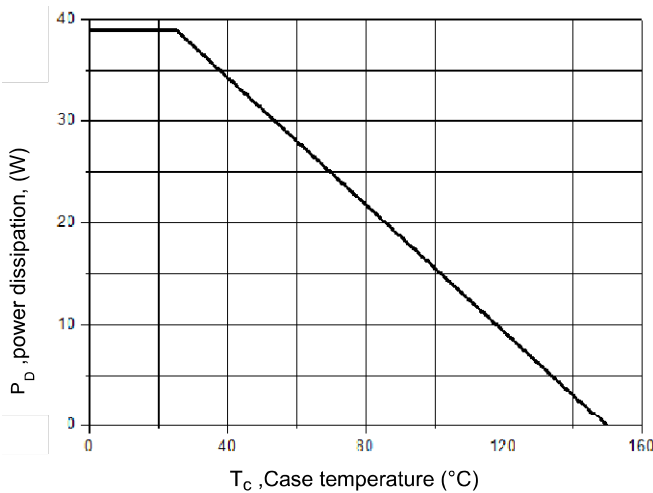


Figure 12. Power Dissipation vs. Temperature
TO-252

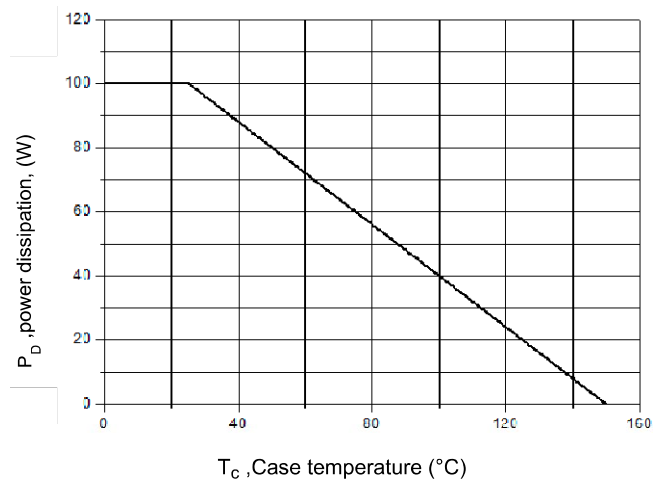




Figure 13. Continuous Drain Current vs. Temperature

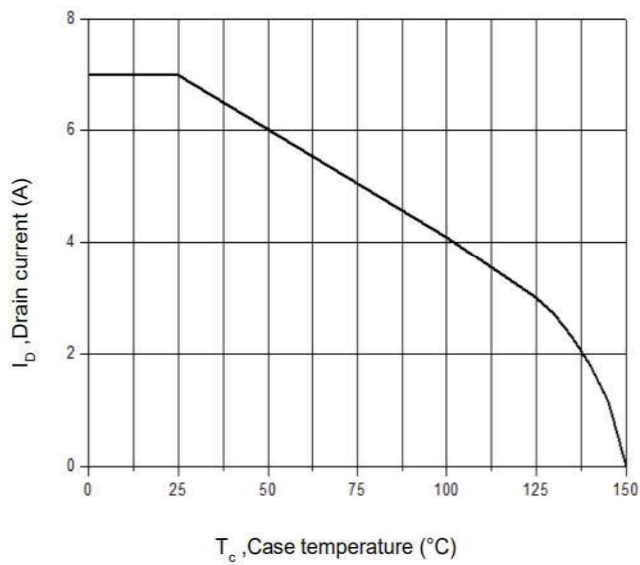


Figure 14. Body Diode Transfer Characteristics

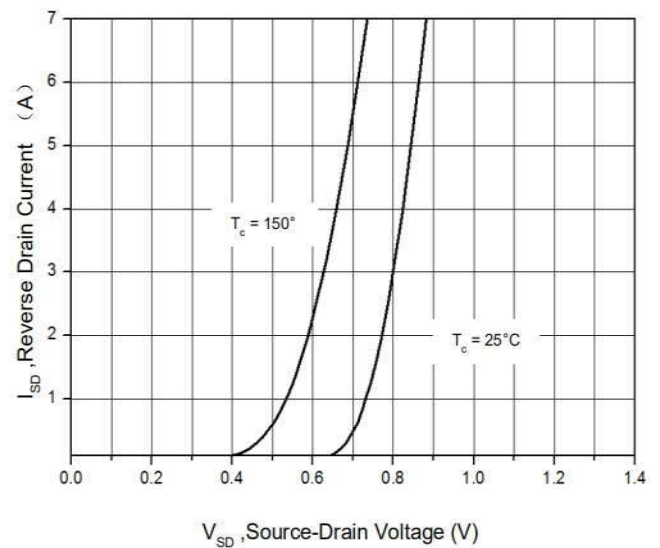


Figure 15 Transient Thermal Impedance, Junction to Case, TO-220F

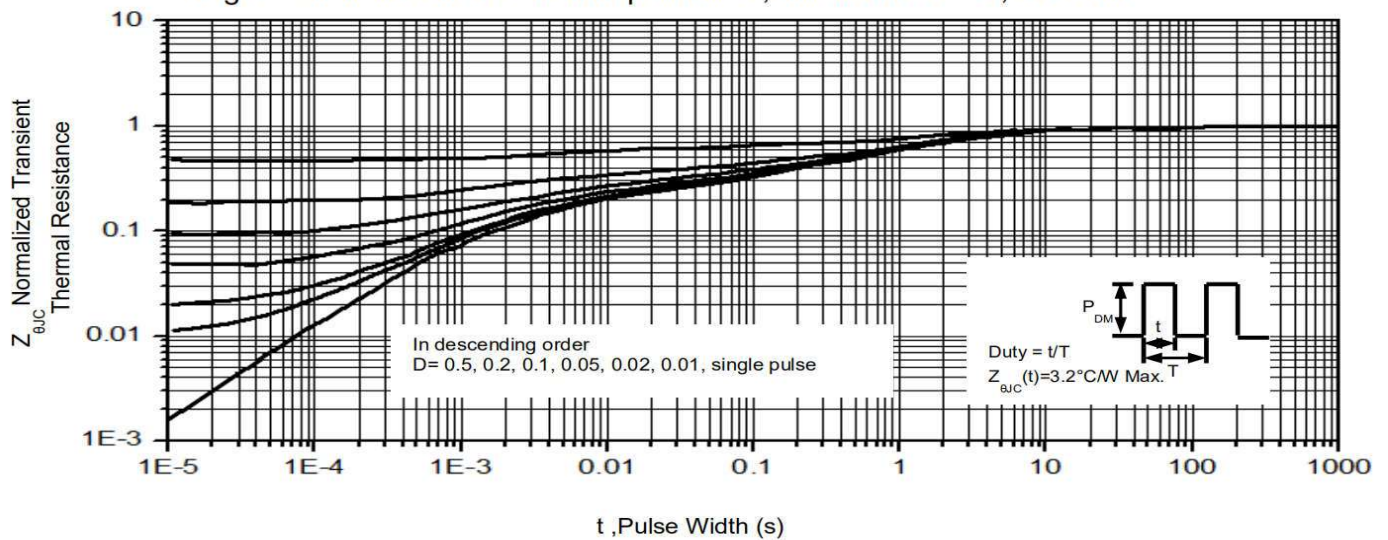
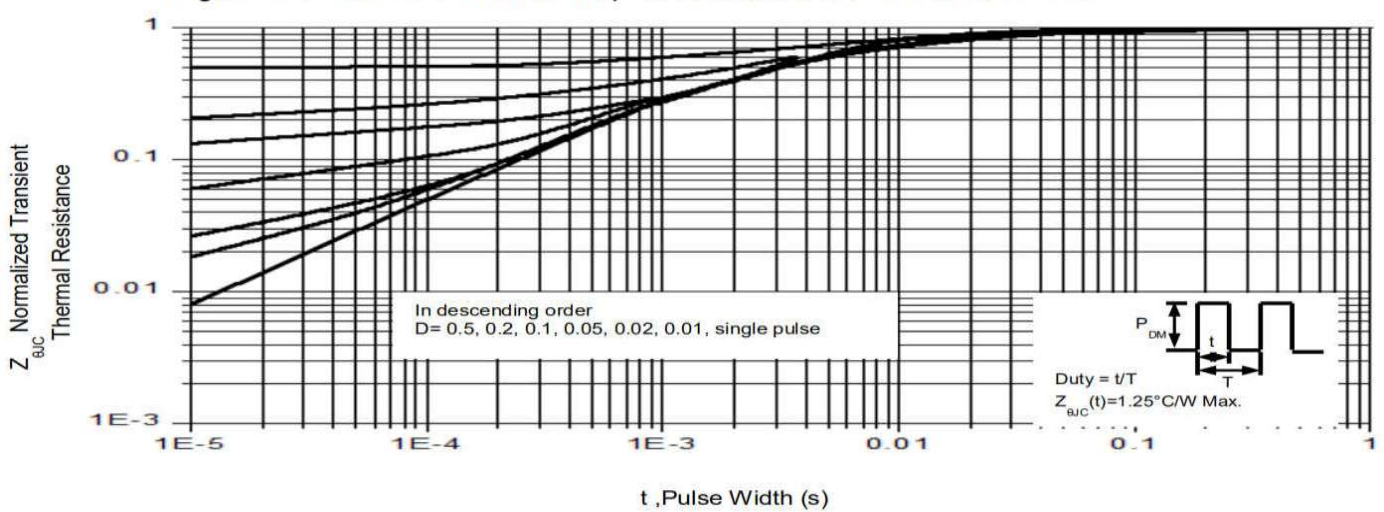
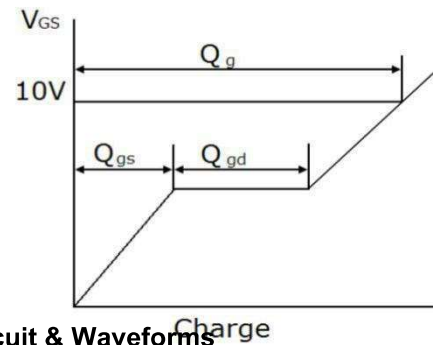
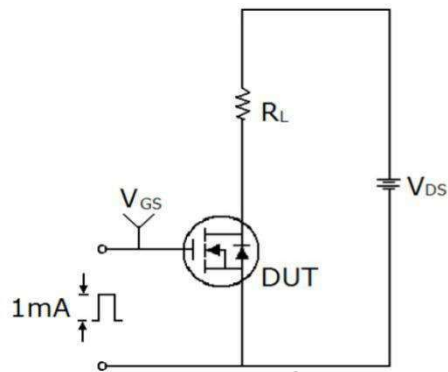


Figure 16. Transient Thermal Impedance, Junction to Case, TO-252

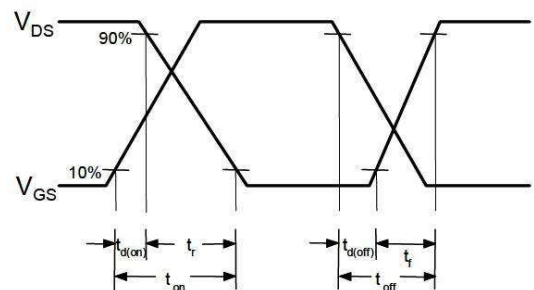
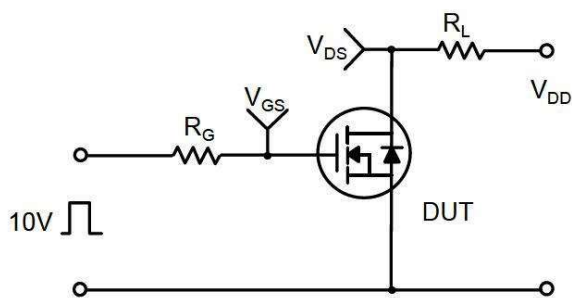




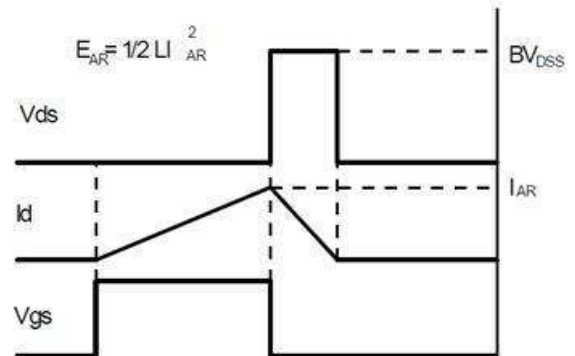
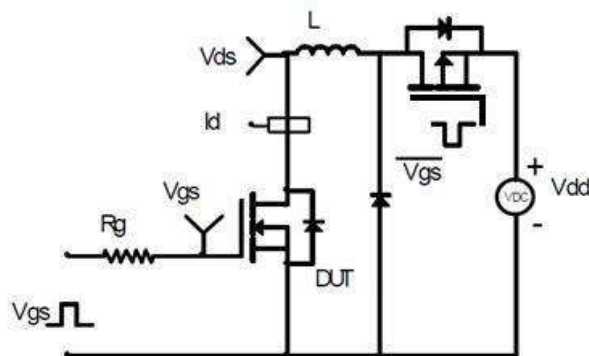
Gate Charge Test Circuit & Waveform



Switching Test Circuit & Waveforms

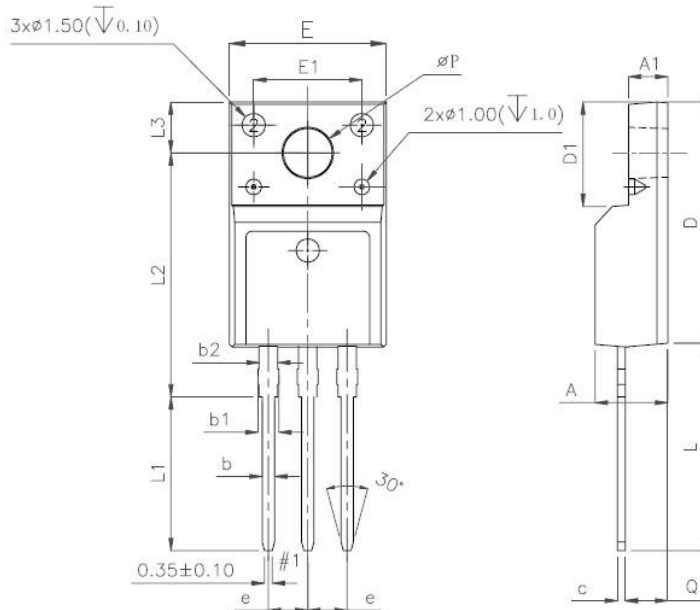


Unclamped Inductive Switching Test Circuit & Waveforms





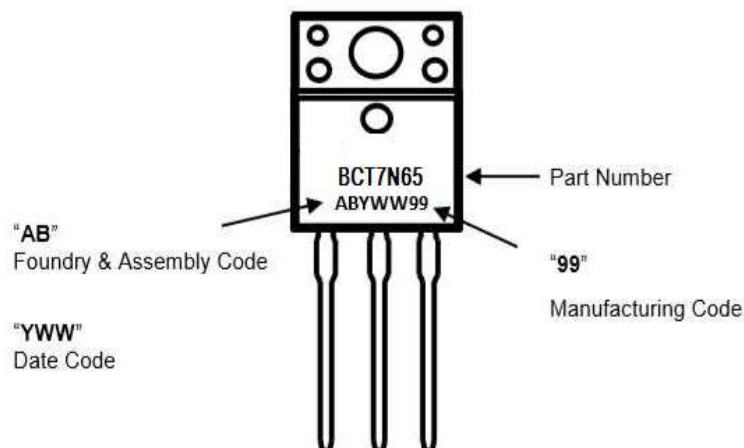
Mechanical Dimensions for TO-220F



UNIT : mm

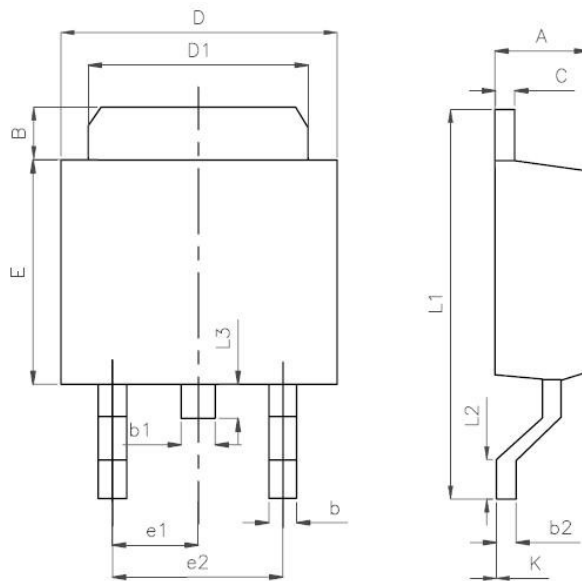
SYMBOL	MIN	NOM	MAX
A	4.5		4.9
A1	2.3		2.9
b	0.65		0.9
b1	1.1		1.7
b2	1.2		1.4
c	0.35		0.65
D	14.5		16.5
D1	6.1		6.9
E	9.6		10.3
E1	6.5	7	7.5
e	2.44	2.54	2.64
L	12.5		14.3
L1	9.45		10.05
L2	15		16
L3	3.2		4.4
ΦP	3		3.3
Q	2.5		2.9

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

