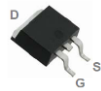

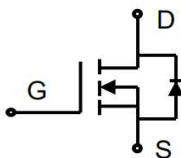




N- channel 650V, 12A Power MOSFET

<p>Description The Power MOSFET is fabricated using the advanced planer VDMOS technology. The resulting device has low conduction resistance, superior switching performance and high avalanche energy.</p> <p>Features</p> <ul style="list-style-type: none"> ◆ Low $R_{DS(on)}$ ◆ Low gate charge (typ. $Q_g = 41.9$ nC) ◆ 100% UIS tested ◆ RoHS compliant <p>Applications</p> <ul style="list-style-type: none"> ◆ Power factor correction. ◆ Switched mode power supplies. ◆ LED driver. 	<p>Product Summary</p> <p>V_{DSS} 650V</p> <p>I_D 12A</p> <p>$R_{DS(on),max}$ 0.8Ω</p> <p>$Q_{g,typ}$ 41.9 nC</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>TO-252</p> </div> <div style="text-align: center;">  <p>TO-220F</p> </div> </div> <div style="text-align: center; margin-top: 20px;">  <p>N-Channel MOSFET</p> </div>
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Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	650	V
Continuous drain current ($T_c=25^\circ C$) ($T_c = 100^\circ C$)	I_D	12 7.5	A A
Pulsed drain current ¹⁾	I_{DM}	48	A
Gate-Source voltage	V_{GSS}	± 30	V
Avalanche energy, single pulse ²⁾	E_{AS}	500	mJ
Peak diode recovery dv/dt ³⁾	dv/dt	5	V/ns
Power Dissipation TO-220F/TO-220F Narrow Pin ($T_c=25^\circ C$) Derate above $25^\circ C$	P_D	42 0.34	W W/ $^\circ C$
Power Dissipation TO-252 ($T_c = 25^\circ C$) Derate above $25^\circ C$		150 1.2	W W/ $^\circ C$
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150	$^\circ C$
Continuous diode forward current	I_S	12	A
Diode pulse current	$I_{S,pulse}$	48	A

Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO-220F\TO-220F Narrow Pin	TO-252	
Thermal resistance, Junction-to-case	$R_{\theta JC}$	2.98	0.83	$^\circ C/W$



Thermal resistance, Junction-to-ambient	R _{θJA}	110	62.5	°C/W
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Package Marking and Ordering Information

Device	Device Package	Marking	Units/Tube	Units/Real
BCT12N65	TO-220F	BCT12N65	50	
BCD12N65	TO-252	BCD12N65		2500

Electrical Characteristics T_c = 25°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 =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 =6A	-	0.64	0.8	Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V,	-	2000	-	pF
Output capacitance	C _{oss}	f = 1 MHz	-	164	-	
Reverse transfer capacitance	C _{rss}		-	7.4	-	
Turn-on delay time	t _{d(on)}	V _{DD} =325V, I _D =12A	-	14.6	-	ns
Rise time	t _r	R _G = 10 Ω, V _{GS} =15 V	-	37.8	-	
Turn-off delay time	t _{d(off)}		-	69.3	-	
Fall time	t _f		-	15.8	-	
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =520 V, I _D =12 A,	-	10.8	-	nC
Gate to drain charge	Q _{gd}	V _{GS} =0 to 10 V	-	15	-	
Gate charge total	Q _g		-	41.9	-	
Gate plateau voltage	V _{plateau}		-	5	-	V
Reverse diode characteristics						
Diode forward voltage	V _{SD}	V _{GS} =0 V, I _F =12 A	-	-	1.5	V
Reverse recovery time	t _{rr}	V _R =325 V, I _F =12 A,	-	450.4	-	ns
Reverse recovery charge	Q _{rr}	di/dt=100 A/μs	-	4.75	-	μC
Peak reverse recovery current	I _{rrm}		-	21.1	-	A

Notes:

- Pulse width limited by maximum junction temperature.
- L=10mH, I_{AS} = 10A, Starting T_J= 25°C.
- I_{SD} = 12A, di/dt ≤ 100A/μs, V_{DD} ≤ BV_{DSS}, Starting T_J= 25°C.



Electrical Characteristics Diagrams

Figure 1. Typical Output Characteristics

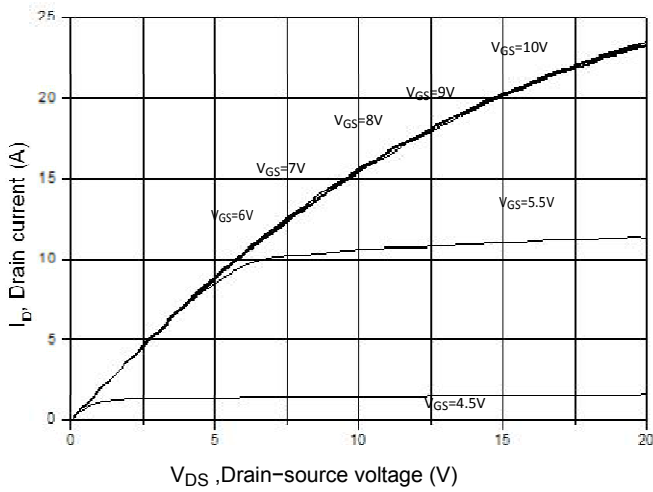


Figure 2. Transfer Characteristics

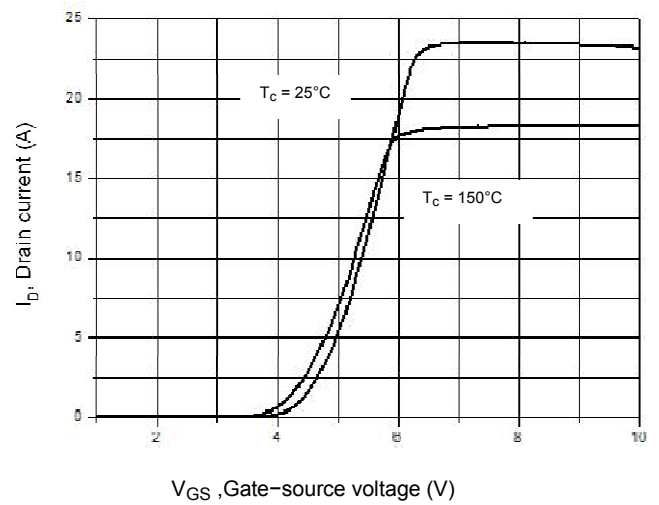


Figure 3. On-Resistance Variation vs. Drain Current

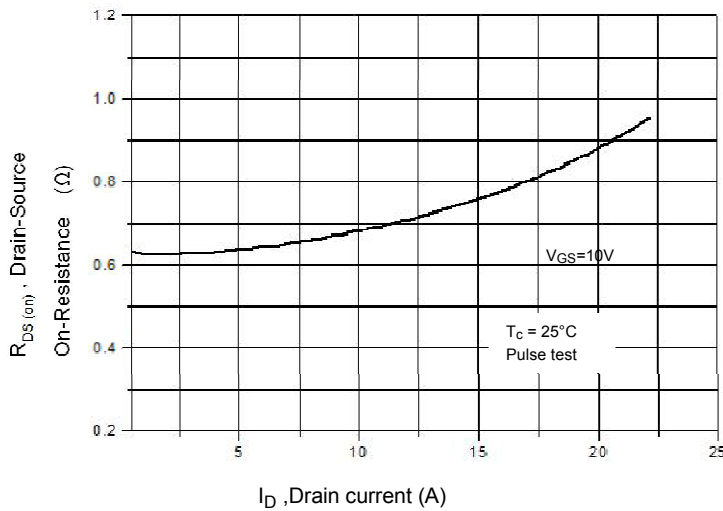


Figure 4. Threshold Voltage vs. Temperature

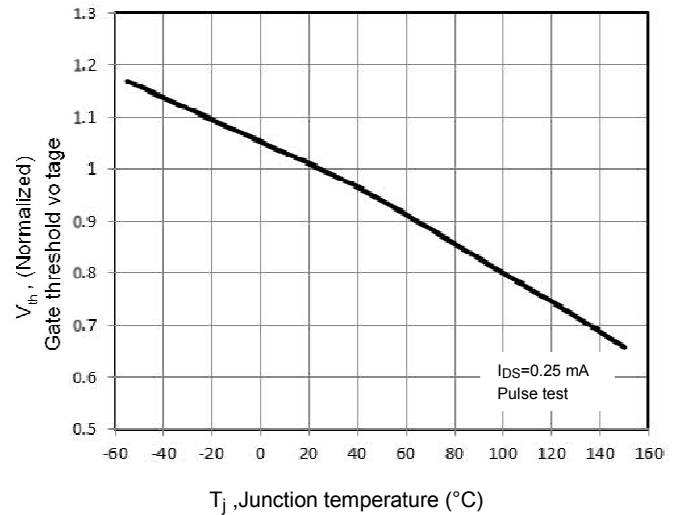


Figure 5. Breakdown Voltage vs. Temperature

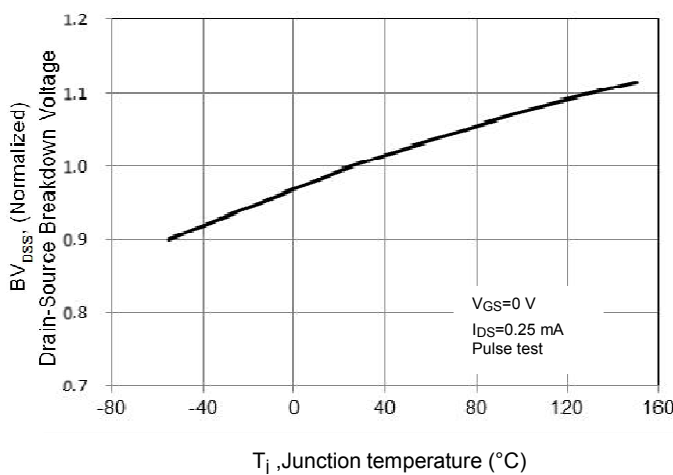


Figure 6. On-Resistance vs. Temperature

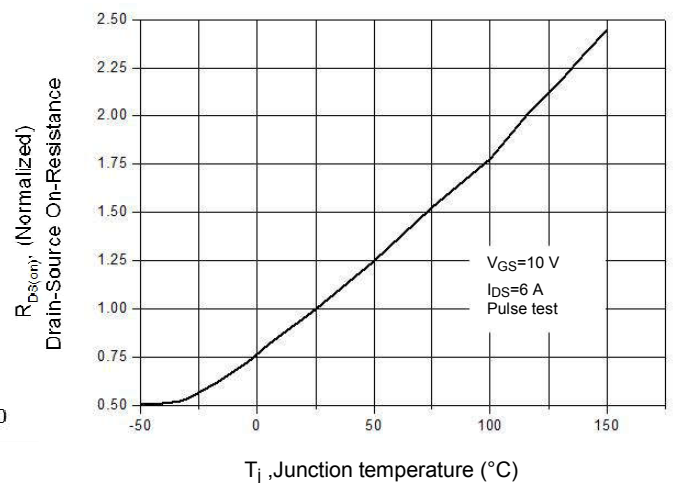




Figure 7. Capacitance Characteristics

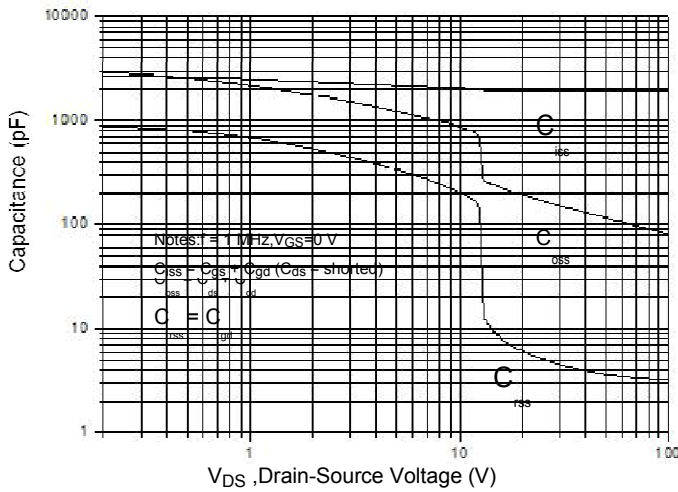


Figure 9. Maximum Safe Operating Area TO-220F/TO-220F Narrow Pin

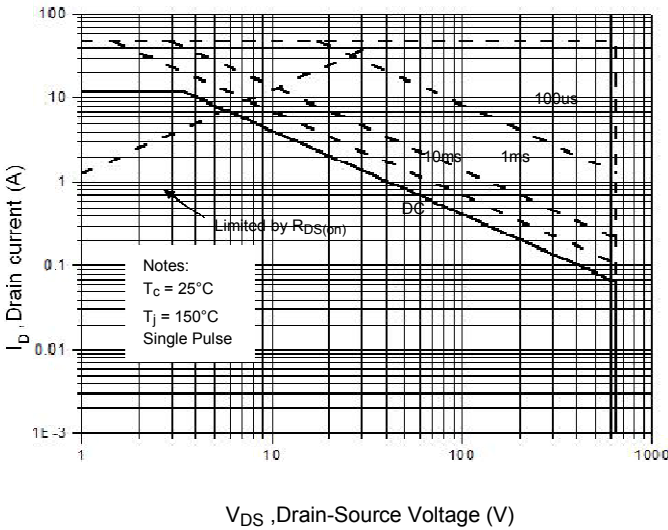


Figure 11. Power Dissipation vs. Temperature TO-220F/TO-220F Narrow Pin

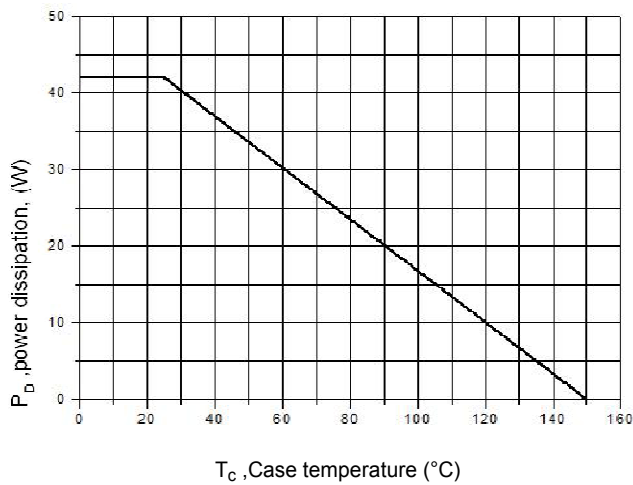


Figure 8. Gate Charge Characteristics

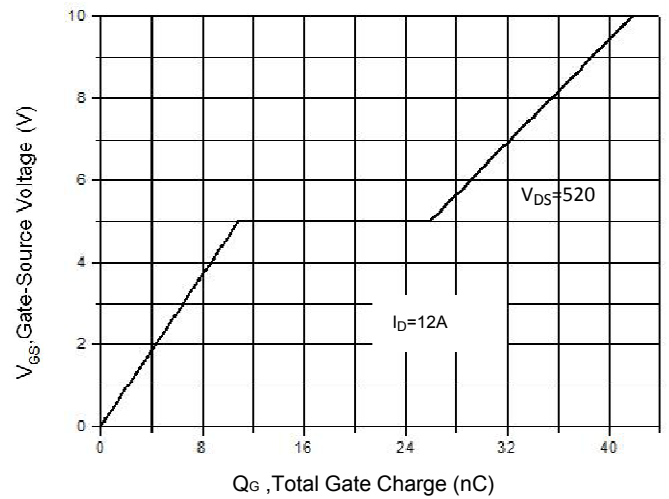


Figure 10. Maximum Safe Operating Area TO-252

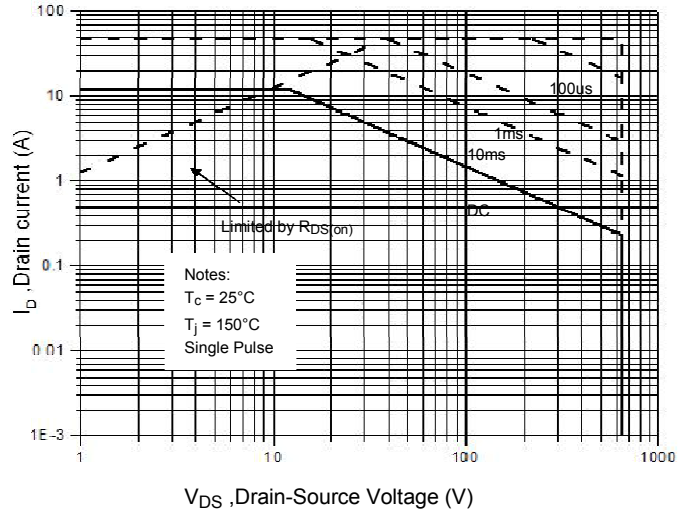


Figure 12. Power Dissipation vs. Temperature TO-252

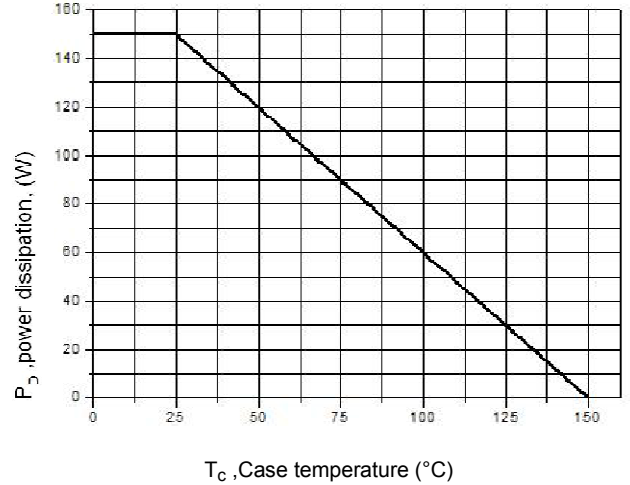




Figure 13. Continuous Drain Current vs. Temperature

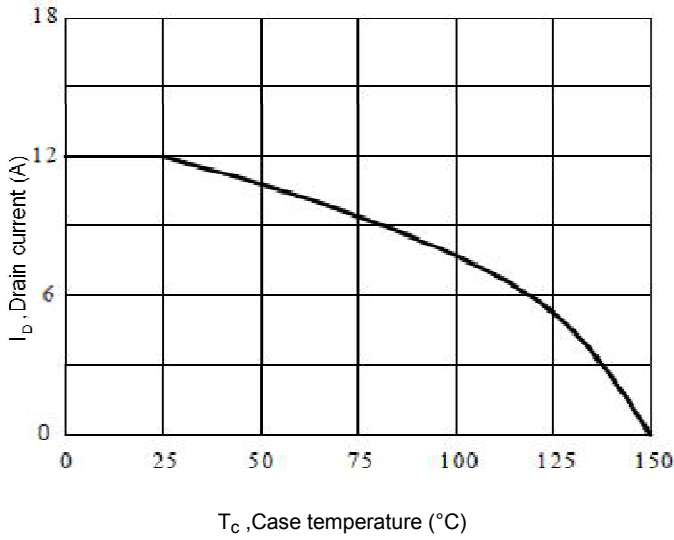


Figure 14. Body Diode Transfer Characteristics

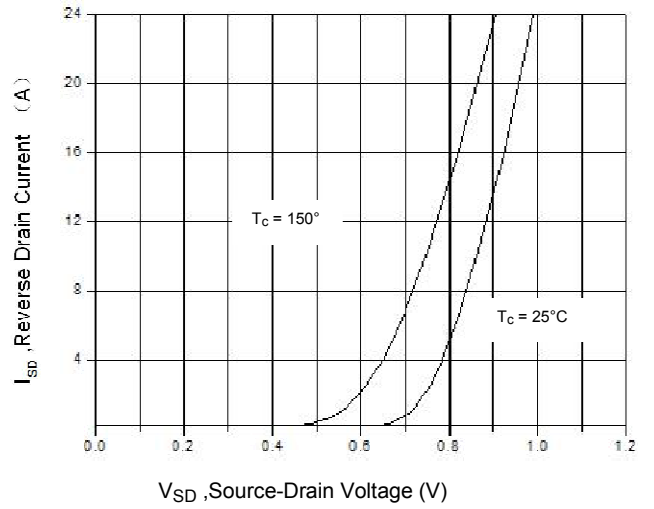


Figure 15 Transient Thermal Impedance, Junction to Case, TO-220F/TO-220F Narrow Pin

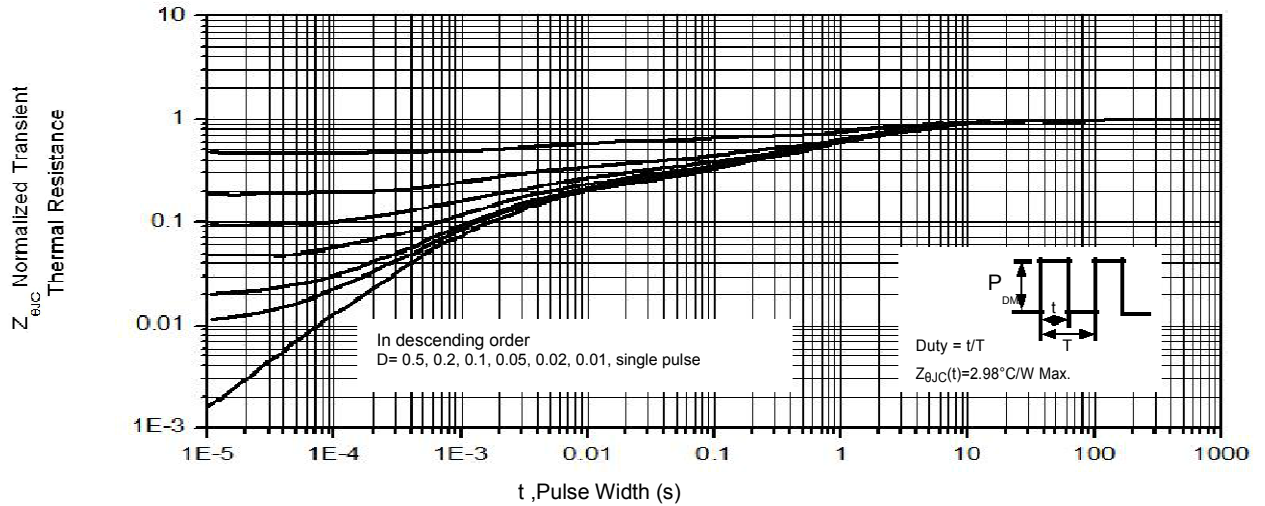
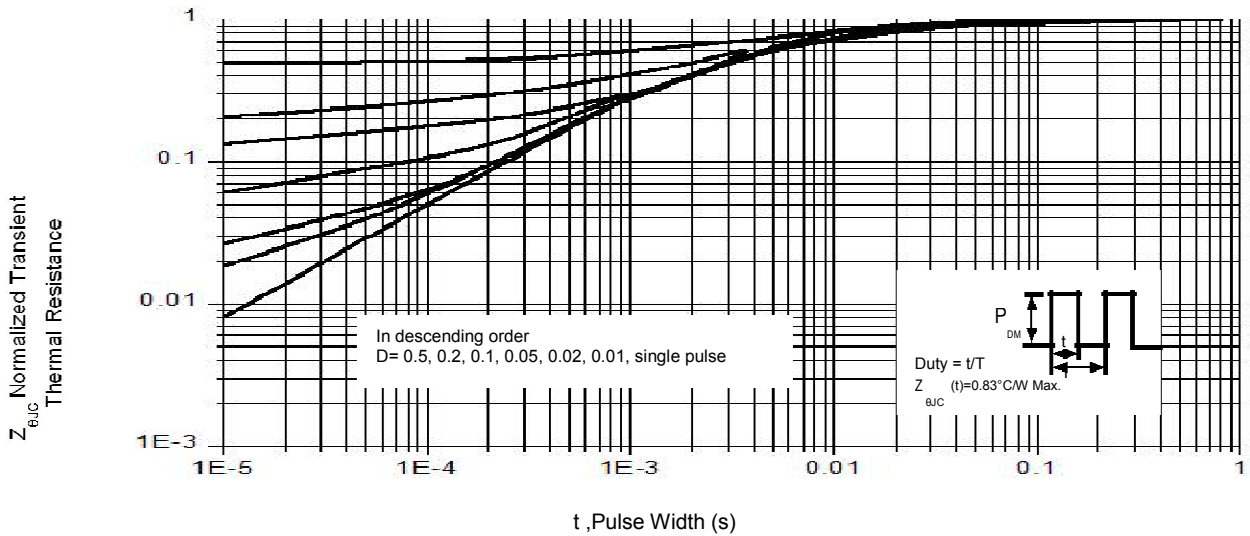
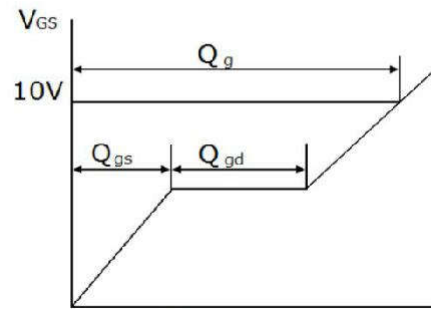
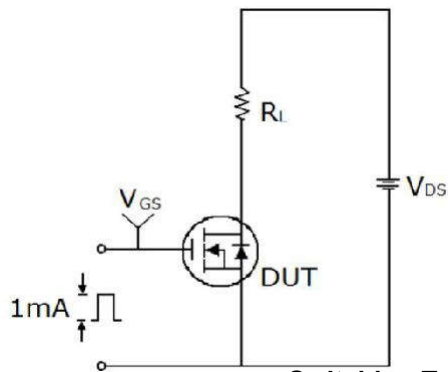


Figure 16. Transient Thermal Impedance, Junction to Case, TO-252

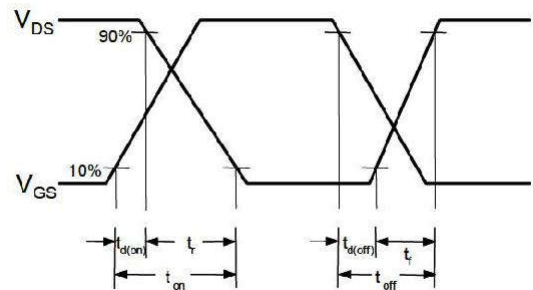
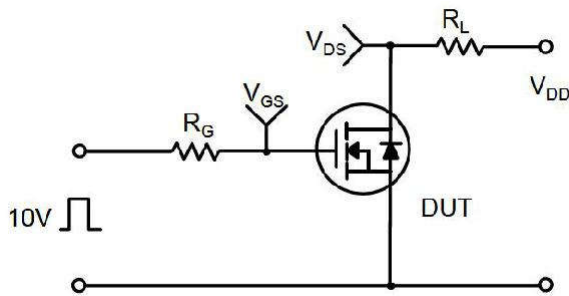




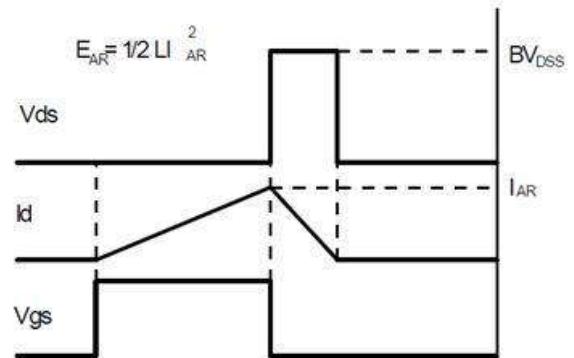
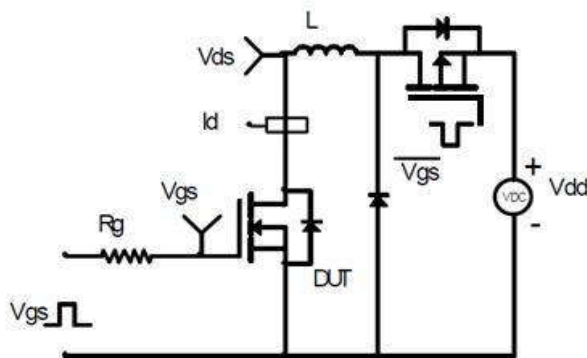
Gate Charge Test Circuit & Waveform



Switching Test Circuit & Waveforms



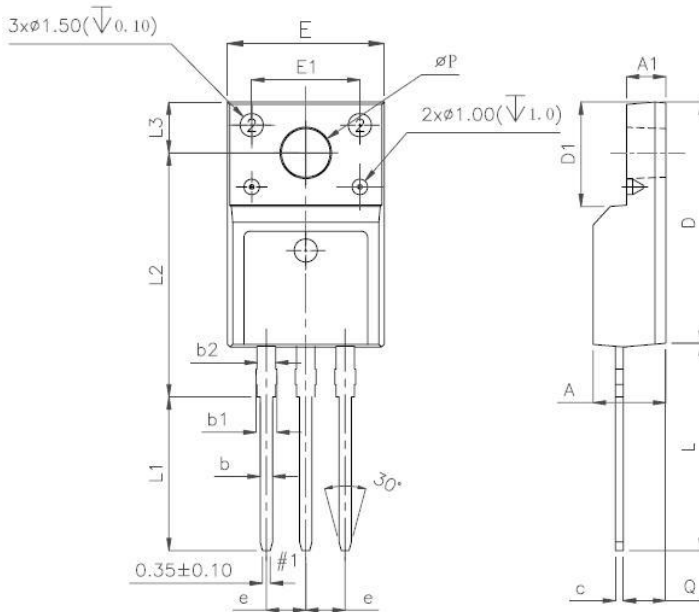
Unclamped Inductive Switching Test Circuit & Waveforms





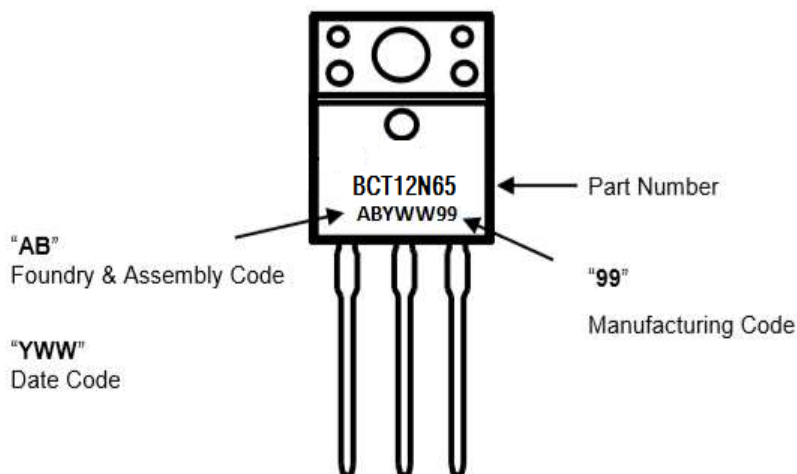
Mechanical Dimensions for TO-220F

UNIT: mm



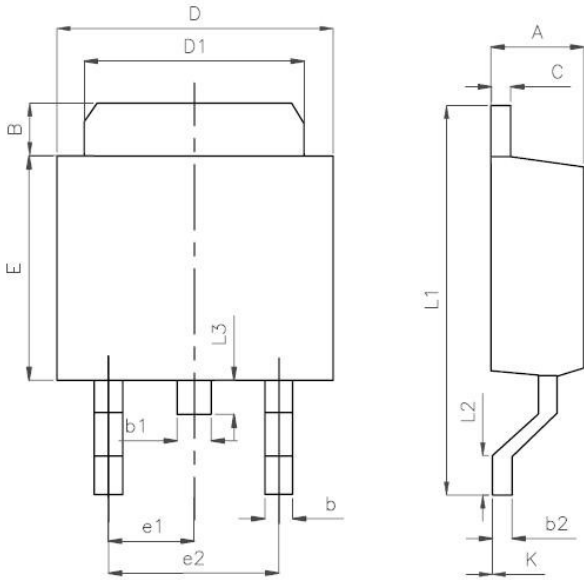
SYMBOL	MIN	NOM	MAX
A	4.5		4.9
A1	2.3		2.9
b	0.65		0.9
b1	1.1		1.7
b2	1.2		1.4
c	0.35		0.65
D	14.5		16.5
D1	6.1		6.9
E	9.6		10.3
E1	6.5	7	7.5
e	2.44	2.54	2.64
L	12.5		14.3
L1	9.45		10.05
L2	15		16
L3	3.2		4.4
ϕP	3		3.3
Q	2.5		2.9

TO-220F Part Marking Information





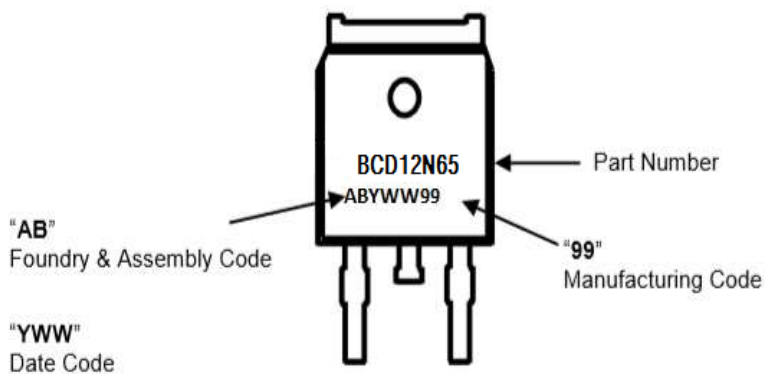
Mechanical Dimensions for TO-252



UNIT: mm

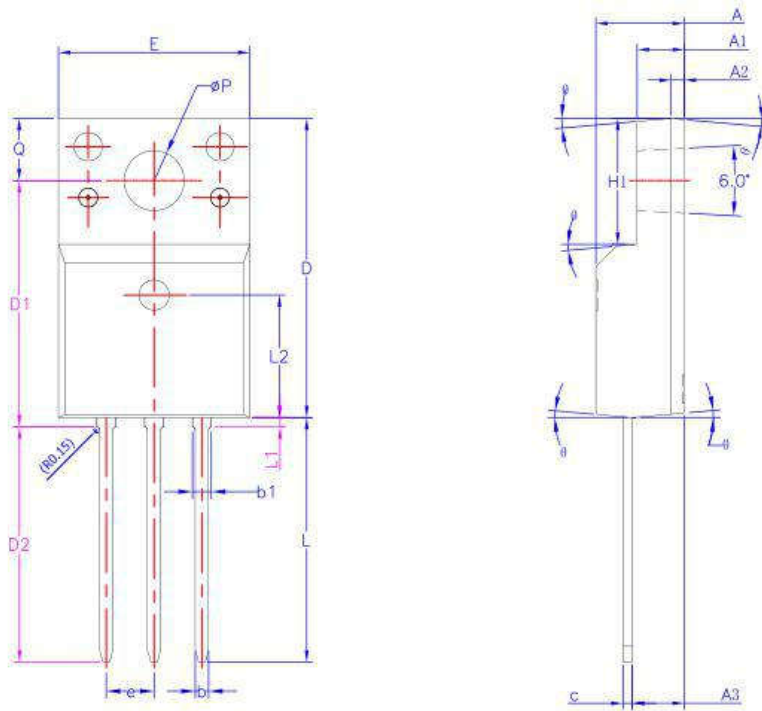
SYMBOL	MIN	NOM	MAX
A	2.10		2.50
B	0.80		1.25
b	0.50		0.85
b1	0.50		0.90
b2	0.45		0.60
C	0.45		0.60
D	6.35		6.75
D1	5.10		5.50
E	5.80		6.30
e1	2.25	2.30	2.35
e2	4.45		4.75
L1	9.50		10.20
L2	0.90		1.45
L3	0.60		1.10
K	-0.1		0.10

TO-252 Part Marking Information





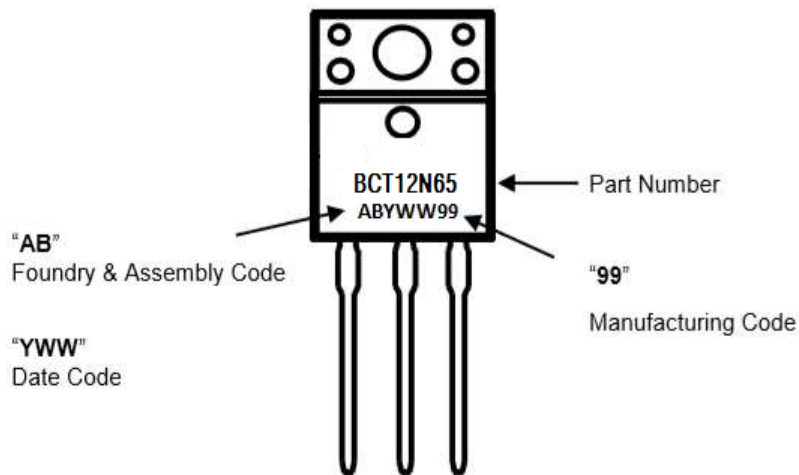
Mechanical Dimensions for TO-220F Narrow Pin



(UNITS:mm)

SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.83
A1	2.34	2.54	2.74
A2	0.70 REF		
A3	2.56	2.76	2.93
b	0.60	—	0.80
b1	0.90	—	1.10
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	12.87	13.07	13.27
D2	12.28	12.48	12.68
E	9.96	10.16	10.36
e	2.54BSC		
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	—	—	0.85
L2	6.50REF		
ϕP	3.08	3.18	3.28
Q	3.20	—	3.40
θ	1°	3°	5°

TO-220F Narrow Pin Part Marking Information



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[DMN61D9UWQ-13](#) [US6M2GTR](#) [DMN31D5UDJ-7](#) [DMP22D4UFO-7B](#) [IPS60R3K4CEAKMA1](#) [DMN1006UCA6-7](#) [DMN16M9UCA6-7](#)
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[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](#)