BCT5N50\BCD5N50

N-channel 500V, 5A 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.

Product Summary

V_{DSS}	500V
I_D	5A
$R_{DS(on),max}$	1.6Ω
$Q_{g,typ}$	12.8 nC

Features

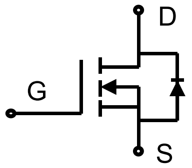
- Low $R_{DS(on)}$
- Low gate charge (typ. Q_g = 12.8 nC)
- 100% UIS tested
- RoHS compliant

TO-252

TO-220F

Applications

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



N-Channel MOSFET

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	500	V
Continuous drain current (T_C = 25°C)	I_D	5	A
(T_C = 100°C)		3.1	A
Pulsed drain current [1]	I_{DM}	20	A
Gate-Source voltage	V_{GSS}	±30	V
Avalanche energy, single pulse [2]	E_{AS}	210	mJ
Peak diode recovery dv/dt [3]	dv/dt	5	V/ns
Power Dissipation TO-220F (T_C = 25°C)	P_D	30	W
Derate above 25°C		0.24	W/°C
Power Dissipation TO-252 (T_C = 25°C)		75	W
Derate above 25°C		0.6	W/°C
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +150	°C
Continuous diode forward current	I_S	5	A
Diode pulse current	$I_{S,pulse}$	20	A

Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO-220F	TO-252	
Thermal resistance, Junction-to-case	$R_{\theta JC}$	4.17	1.67	°C/W
Thermal resistance, Junction-to-ambient	$R_{\theta JA}$	62.5	110	°C/W

Package Marking and Ordering Information

Device	Device Package	Marking	Units/Tube	Units/Reel
BCT5N50	TO-220F	BCT5N50	50	
BCD5N50	TO-252	BCD5N50		3000

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	500	-	-	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}=500 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=2.5 A	-	1.35	1.60	Ω
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz	-	537.5	-	pF
Output capacitance	C_{oss}		-	80.3	-	
Reverse transfer capacitance	C_{rss}		-	4	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 250 V, I_D = 5 A R_G = 10 Ω, V_{GS}=15 V	-	10.3	-	ns
Rise time	t_r		-	33.1	-	
Turn-off delay time	$t_{d(off)}$		-	29.4	-	
Fall time	t_f		-	13.2	-	
Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DD}=400 V, I_D=5 A, V_{GS}=0 to 10 V	-	3.9	-	nC
Gate to drain charge	Q_{gd}		-	4.6	-	
Gate charge total	Q_g		-	12.8	-	
Gate plateau voltage	$V_{plateau}$		-	5	-	V
Reverse diode characteristics						
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=5 A	-	-	1.5	V
Reverse recovery time	t_{rr}	V_R=250 V, I_F=5 A, dI_F/dt=100 A/μs	-	319.2	-	ns
Reverse recovery charge	Q_{rr}		-	1.6	-	μC
Peak reverse recovery current	I_{rrm}		-	10.2	-	A

Notes:

1. Pulse width limited by maximum junction temperature.
2. L=10mH, I_{AS} = 6.5A, Starting T_j= 25°C.
3. I_{SD} = 5A, di/dt$\leqslant$100A/us, $V_{DD}$$\leqslant$$BV_{DS}$, Starting T_j= 25°C.

Electrical Characteristics Diagrams

Figure 1. Typical Output Characteristics

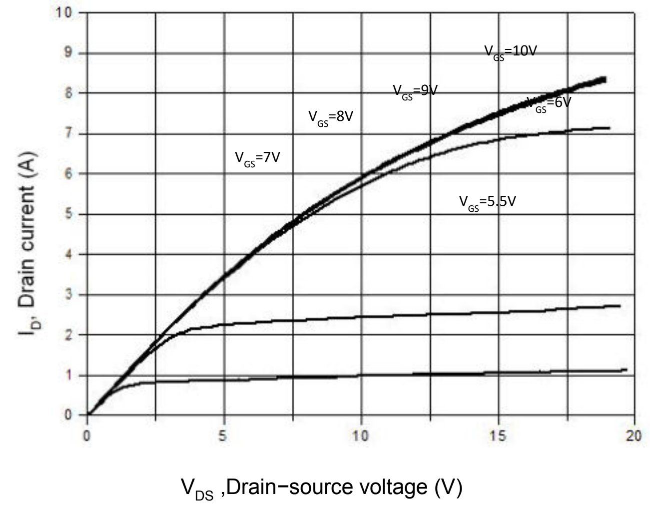


Figure 2. Transfer Characteristics

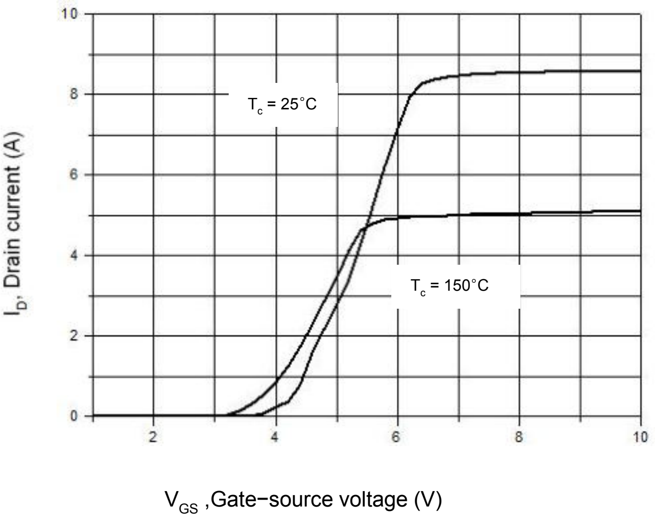


Figure 3. On-Resistance Variation vs. Drain Current

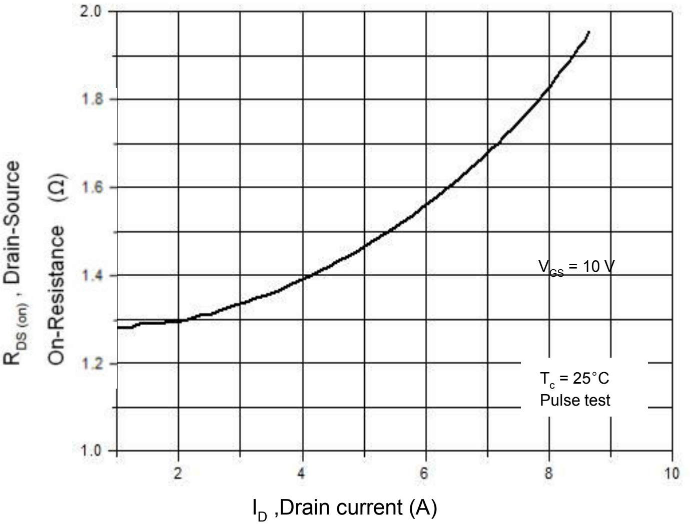


Figure 4. Threshold Voltage vs. Temperature

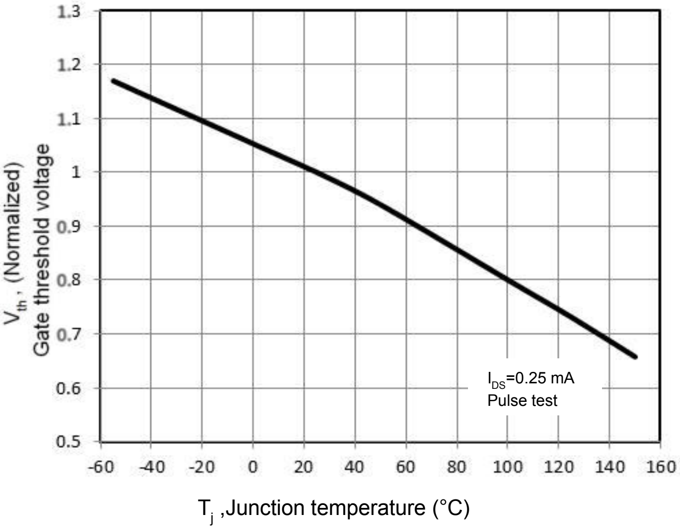


Figure 5. Breakdown Voltage vs. Temperature

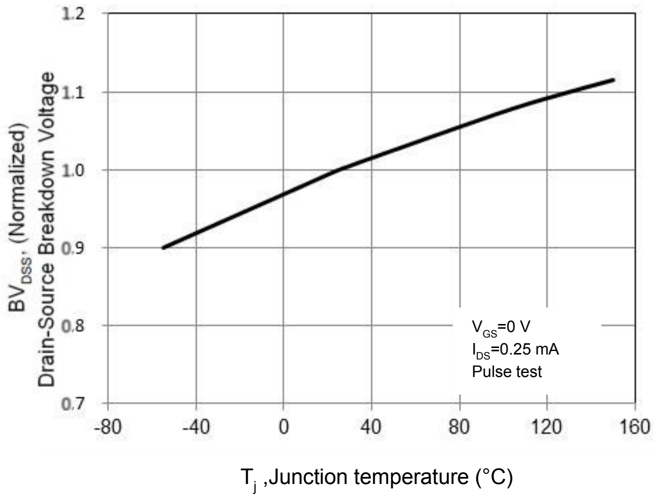


Figure 6. On-Resistance vs. Temperature

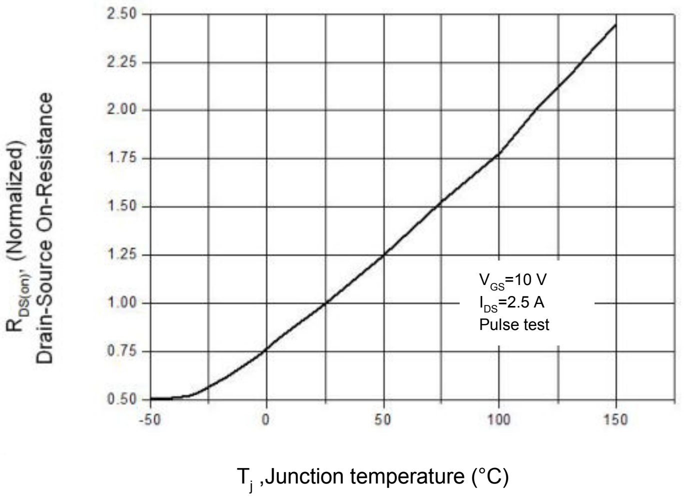


Figure 7. Capacitance Characteristics

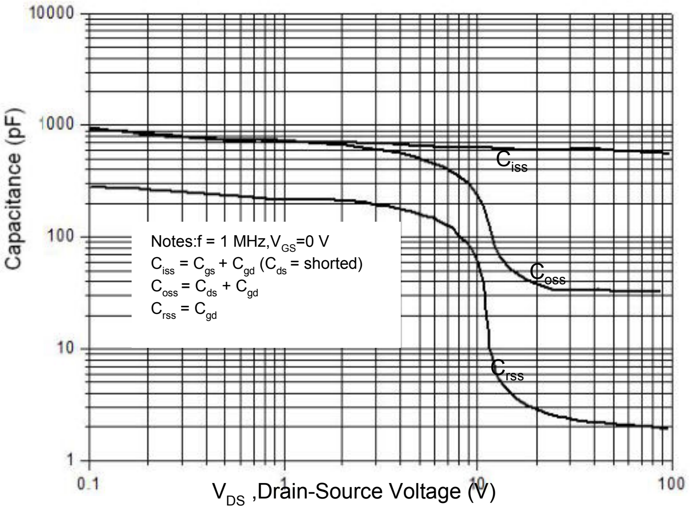


Figure 8. Gate Charge Characteristics

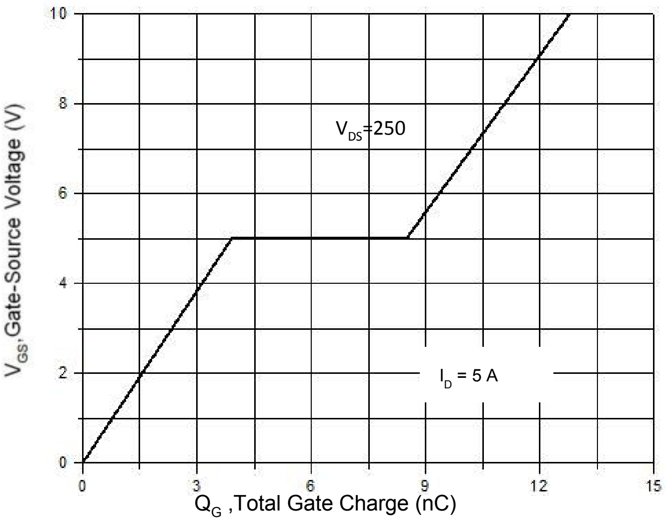


Figure 9. Maximum Safe Operating Area

TO-220F

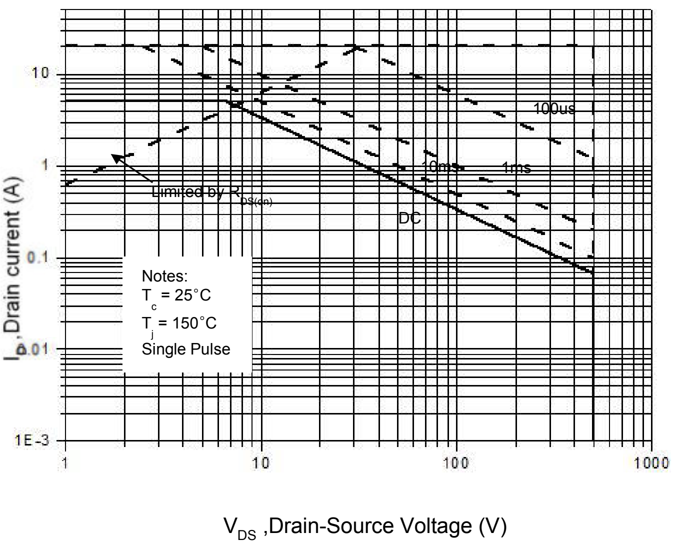


Figure 10. Maximum Safe Operating Area

TO-252

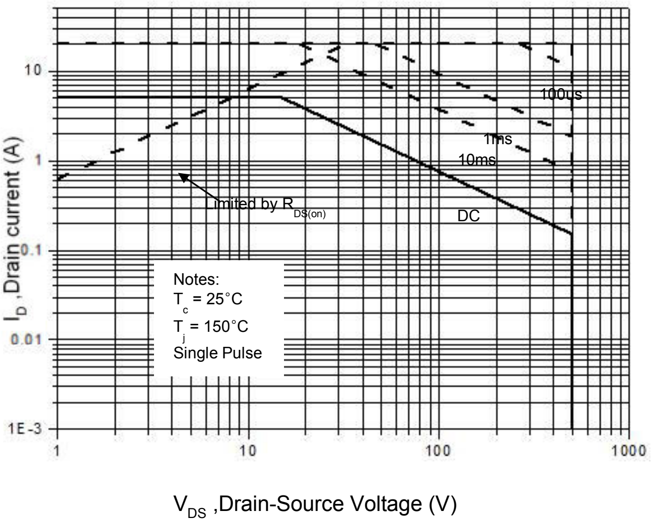


Figure 11. Power Dissipation vs. Temperature

TO-220F

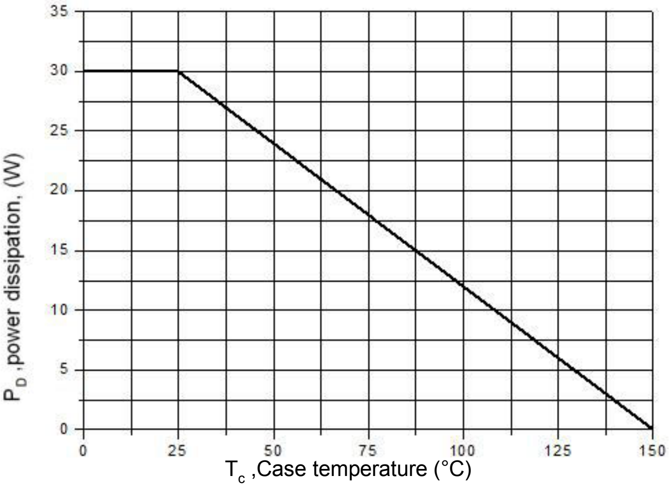


Figure 12. Power Dissipation vs. Temperature

TO-252

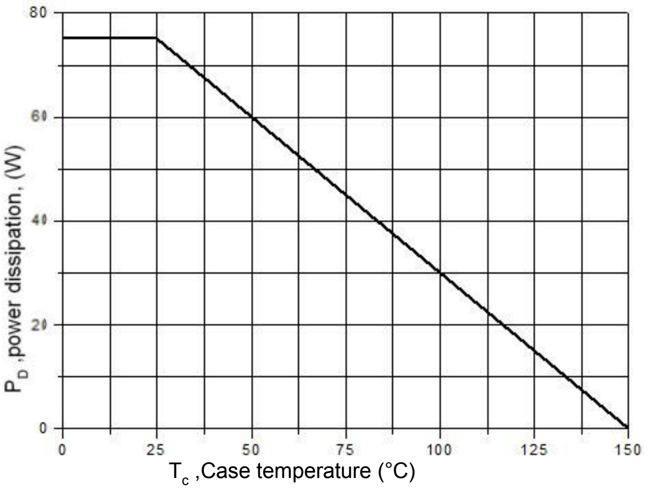


Figure 13. Continuous Drain Current vs. Temperature

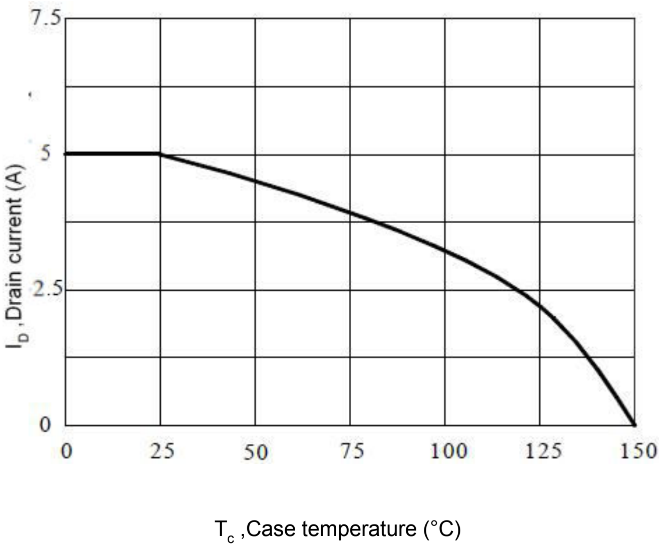


Figure 14. Body Diode Transfer Characteristics

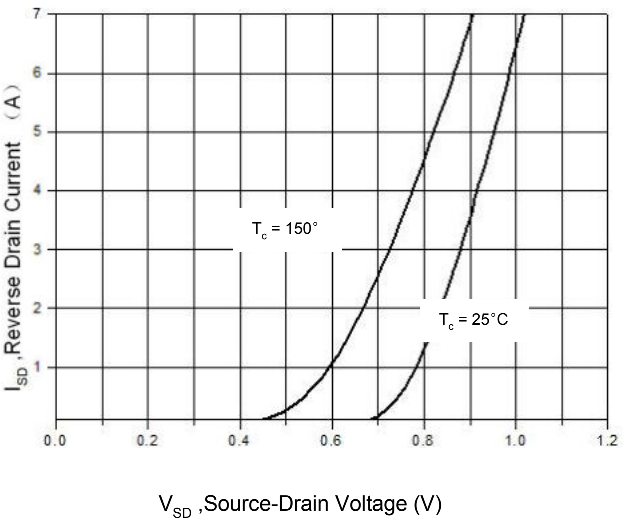


Figure 15 Transient Thermal Impedance, Junction to Case, TO-220F

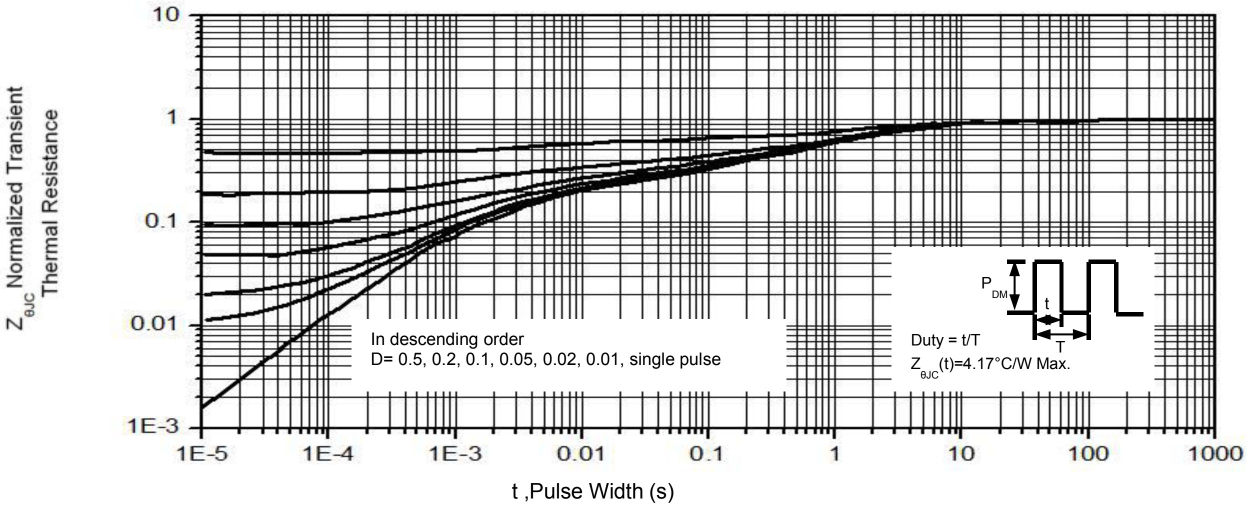
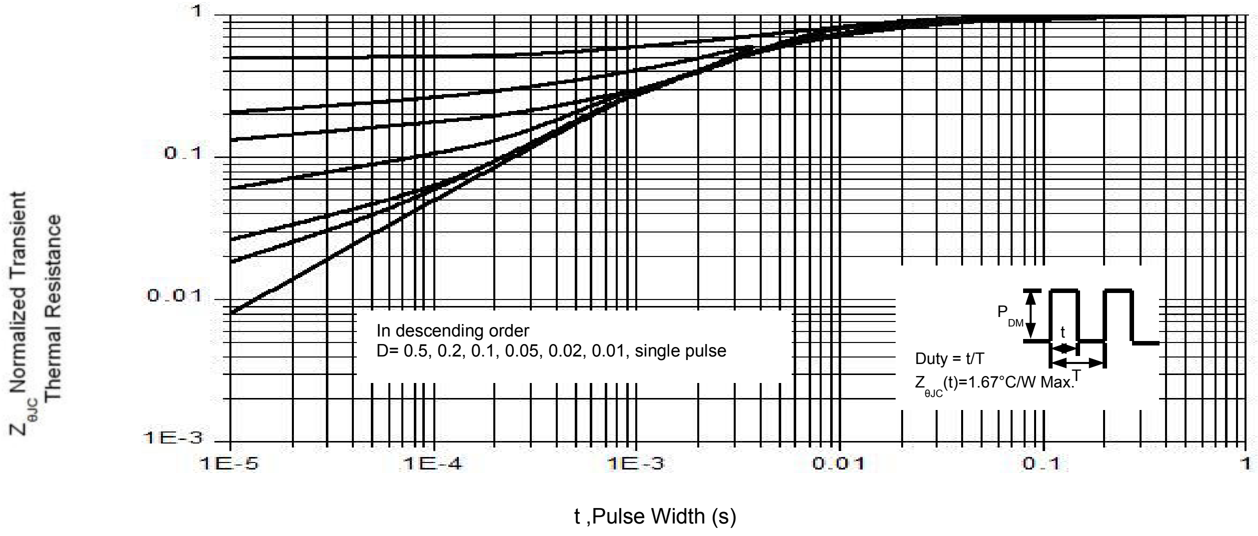
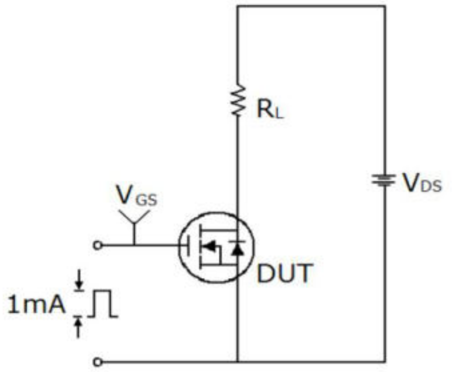
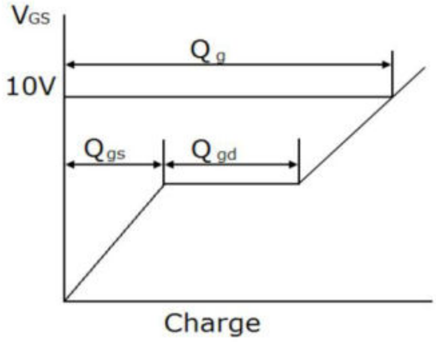


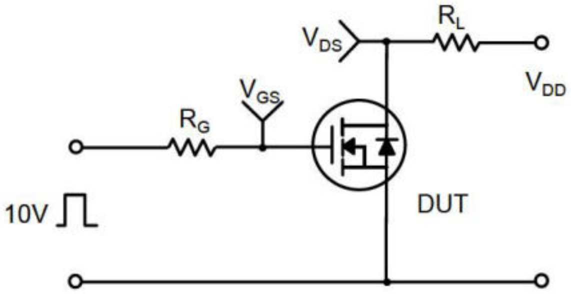
Figure 16. Transient Thermal Impedance, Junction to Case, TO-252

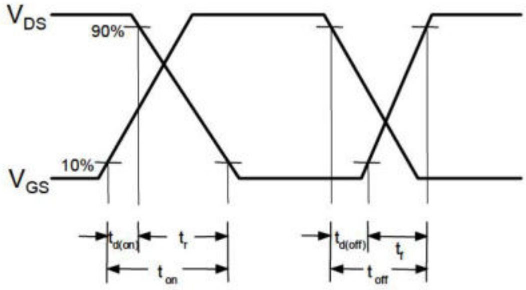


Gate Charge Test Circuit & Waveform

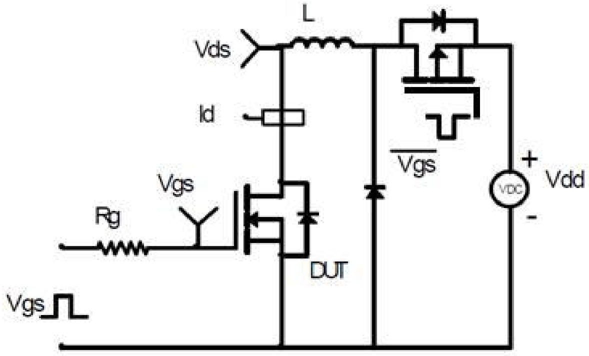


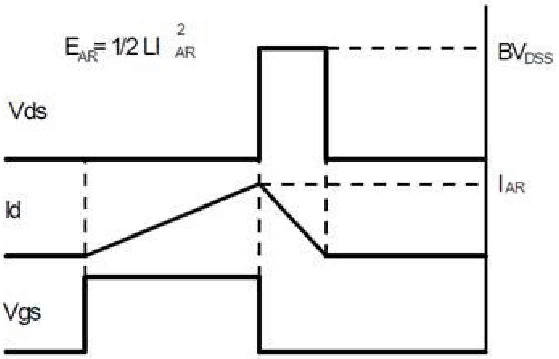




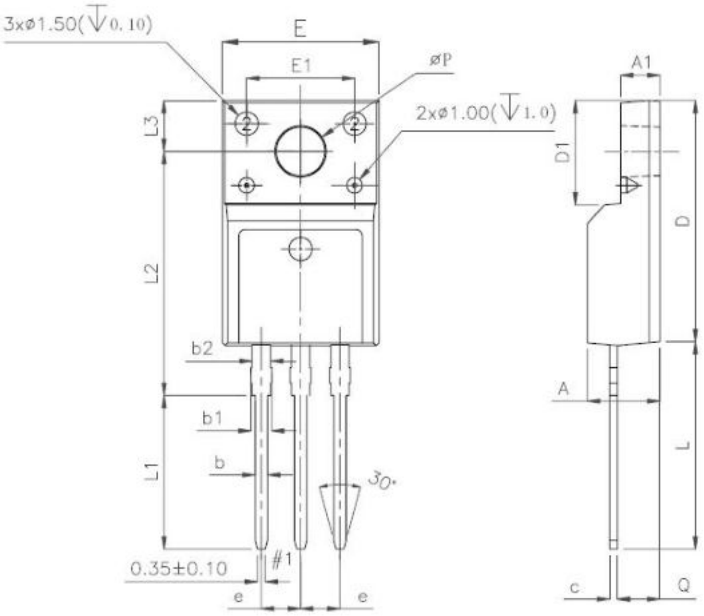


Unclamped Inductive Switching Test Circuit & Waveforms





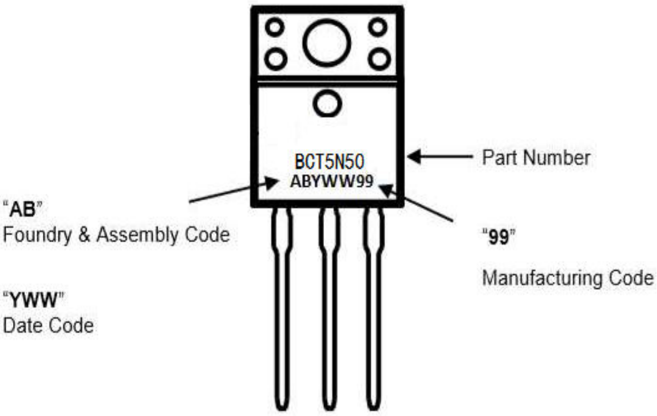
Mechanical Dimensions for TO-220F



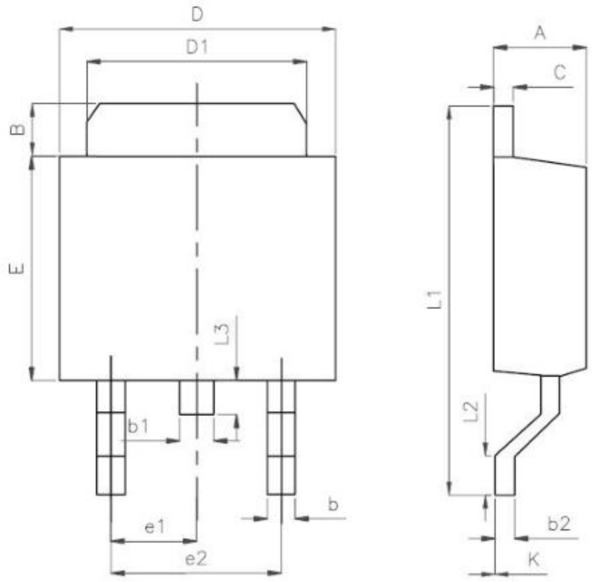
UNIT：mm

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