

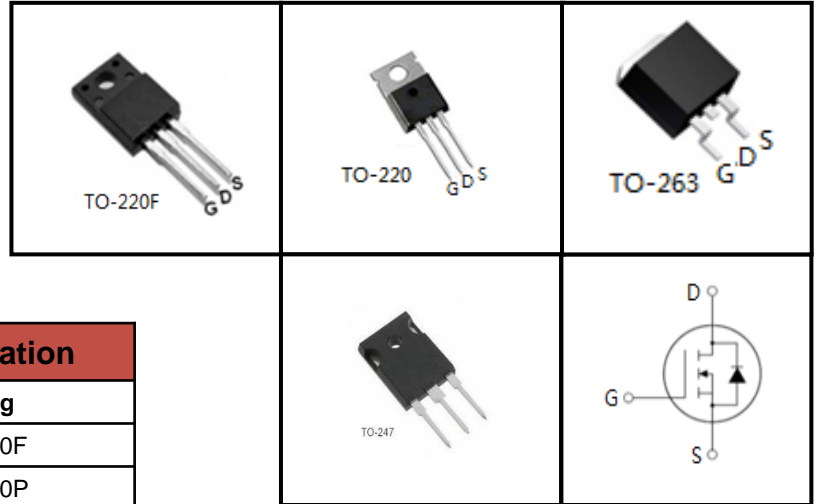
## 900V N-Channel MOSFET

### FEATURES

- Fast switching
- 100% avalanche tested
- Improved dv/dt capability

### APPLICATIONS

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)



### Device Marking and Package Information

Device	Package	Marking
CS6N90F	TO-220F	CS6N90F
CS6N90P	TO-220	CS6N90P
CS6N90B	TO-263	CS6N90B
CS6N90W	TO-247	CS6N90W

### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ , unless otherwise noted

Parameter	Symbol	Value				Unit
		TO-220F	TO-220	TO-263	TO-247	
Drain-Source Voltage ( $V_{GS} = 0V$ )	$V_{DSS}$	900				V
Continuous Drain Current	$I_D$	6				A
Pulsed Drain Current (note1)	$I_{DM}$	24				A
Gate-Source Voltage	$V_{GSS}$	$\pm 30$				V
Single Pulse Avalanche Energy (note2)	$E_{AS}$	180				mJ
Avalanche Current (note1)	$I_{AS}$	6				A
Repetitive Avalanche Energy (note1)	$E_{AR}$	108				mJ
Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_D$	63	97			W
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55~+150				$^\circ\text{C}$

### Thermal Resistance

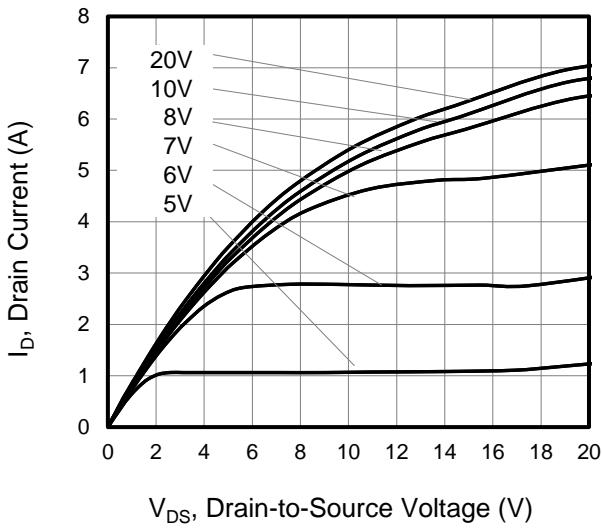
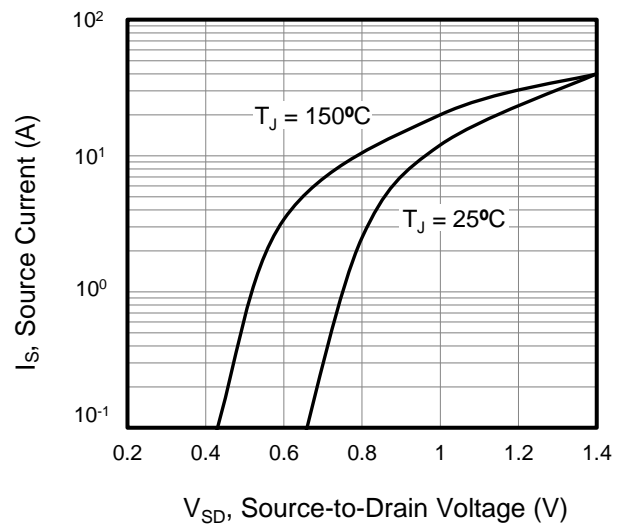
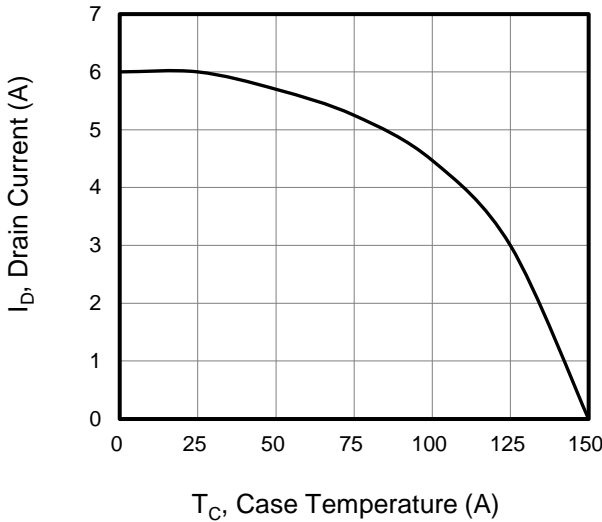
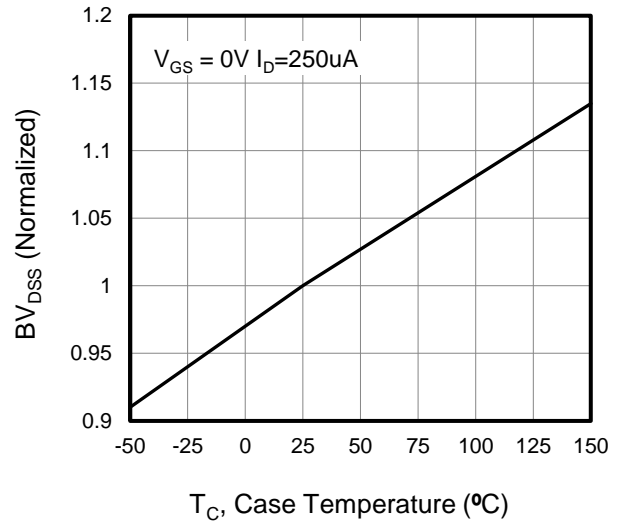
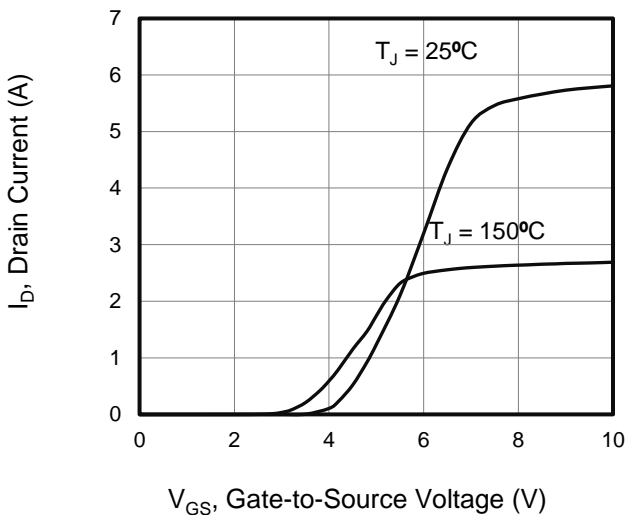
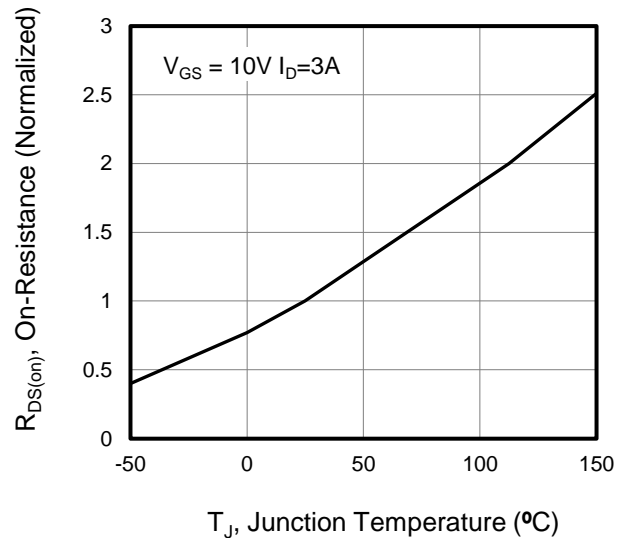
Parameter	Symbol	Value				Unit
		TO-220F	TO-220	TO-263	TO-247	
Thermal Resistance, Junction-to-Case	$R_{thJC}$	1.98	1.29			$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient	$R_{thJA}$	62.5	60			

<b>Specifications</b> $T_J = 25^\circ\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	900	--	--	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 900V, V_{GS} = 0V, T_J = 25^\circ\text{C}$	--	--	1	$\mu A$
Gate-Source Leakage	$I_{GSS}$	$V_{GS} = \pm 30V$	--	--	$\pm 100$	nA
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	3.0	--	4.0	V
Drain-Source On-Resistance (Note3)	$R_{DS(on)}$	$V_{GS} = 10V, I_D = 3.0A$	--	1.7	2.05	$\Omega$
<b>Dynamic</b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0V,$ $V_{DS} = 25V,$ $f = 1.0\text{MHz}$	--	1215	--	pF
Output Capacitance	$C_{oss}$		--	115	--	
Reverse Transfer Capacitance	$C_{rss}$		--	21	--	
Total Gate Charge	$Q_g$	$V_{DD} = 720V, I_D = 6.0A,$ $V_{GS} = 15V$	--	48	--	nC
Gate-Source Charge	$Q_{gs}$		--	4.8	--	
Gate-Drain Charge	$Q_{gd}$		--	27	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 450V, I_D = 6.0A,$ $R_G = 25\Omega$	--	43	--	ns
Turn-on Rise Time	$t_r$		--	26	--	
Turn-off Delay Time	$t_{d(off)}$		--	208	--	
Turn-off Fall Time	$t_f$		--	47	--	
<b>Drain-Source Body Diode Characteristics</b>						
Continuous Body Diode Current	$I_S$	$T_C = 25^\circ\text{C}$	--	--	6	A
Pulsed Diode Forward Current	$I_{SM}$		--	--	24	
Body Diode Voltage	$V_{SD}$	$T_J = 25^\circ\text{C}, I_{SD} = 3.0A, V_{GS} = 0V$	--	--	1.4	V
Reverse Recovery Time	$t_{rr}$	$V_{GS} = 0V, I_S = 6.0A,$ $di_F/dt = 100A/\mu s$	--	567	--	ns
Reverse Recovery Charge	$Q_{rr}$		--	1.6	--	$\mu C$

**Notes**

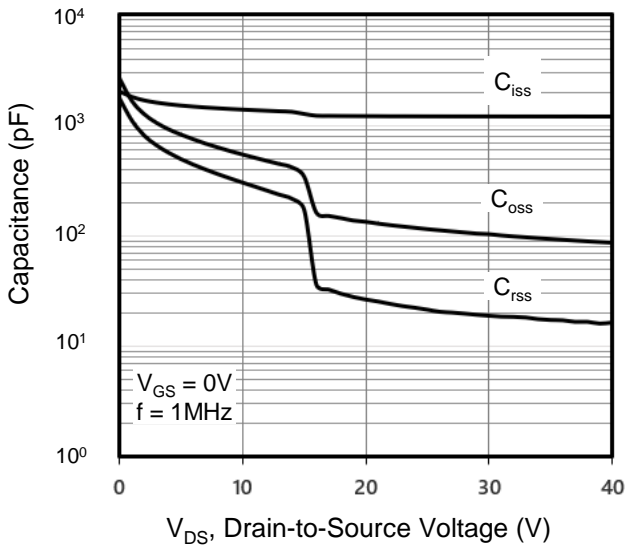
1. Repetitive Rating: Pulse width limited by maximum junction temperature
2.  $L=10\text{mH}, V_{DD} = 50V, R_G = 25\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3. Pulse Test: Pulse width  $\leq 300\mu s$ , Duty Cycle  $\leq 1\%$

**Typical Characteristics**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

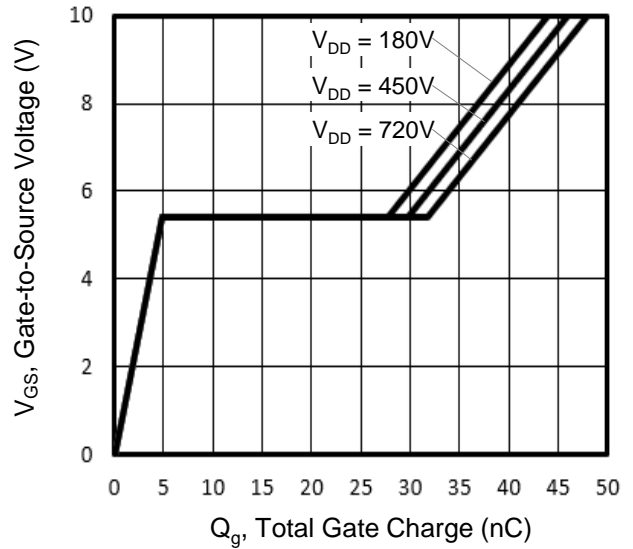
**Figure 1. Output Characteristics ( $T_J = 25^\circ\text{C}$ )**

**Figure 2. Body Diode Forward Voltage**

**Figure 3. Drain Current vs. Temperature**

**Figure 4.  $BV_{DSS}$  Variation vs. Temperature**

**Figure 5. Transfer Characteristics**

**Figure 6. On-Resistance vs. Temperature**


Typical Characteristics  $T_J = 25^\circ\text{C}$ , unless otherwise noted

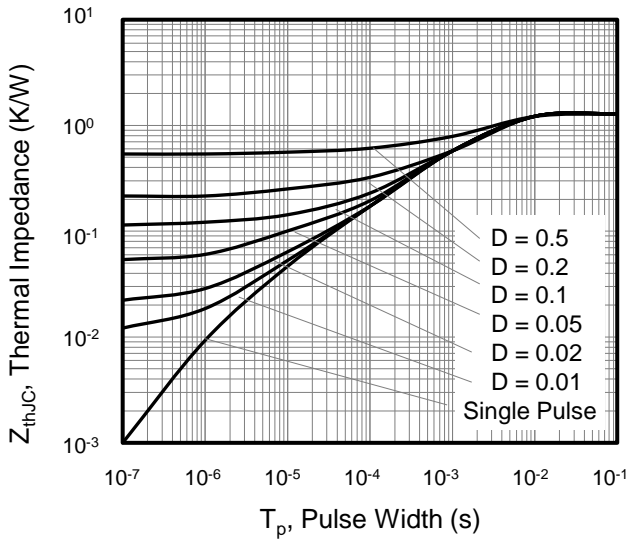
**Figure 7. Capacitance**



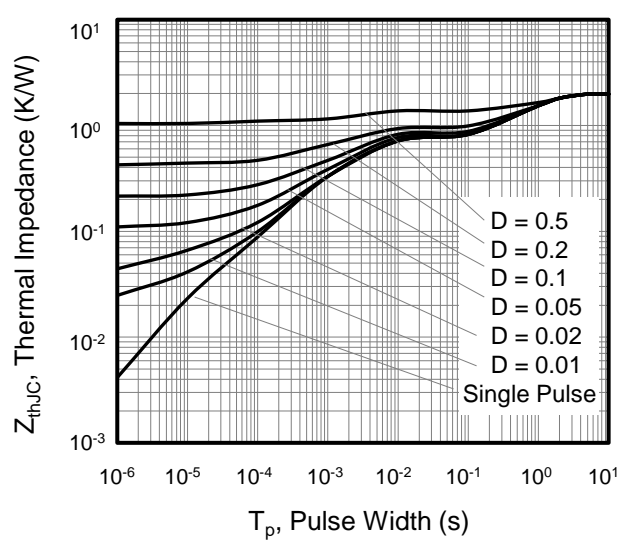
**Figure 8. Gate Charge**

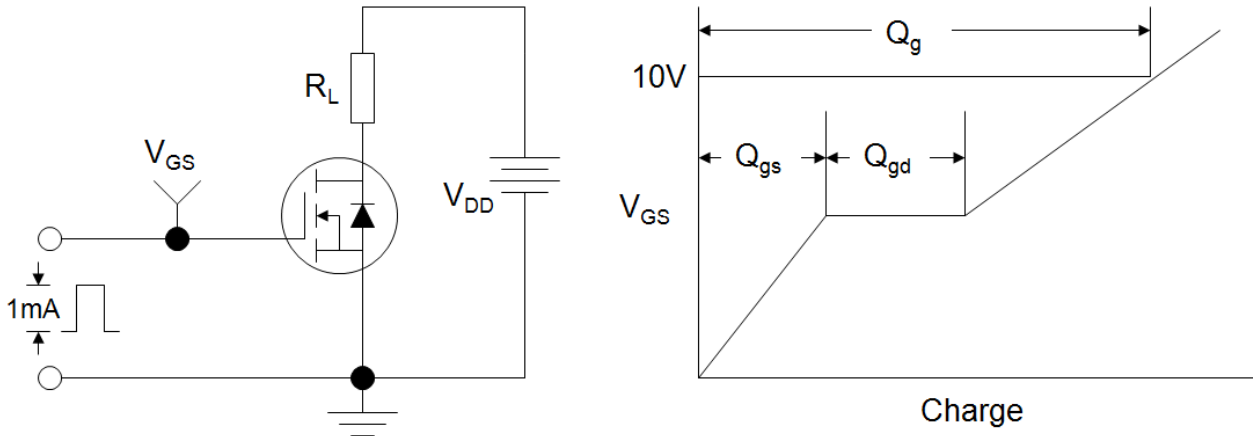


**Figure 9. Transient Thermal Impedance**  
**TO-220,TO-263,TO-247**

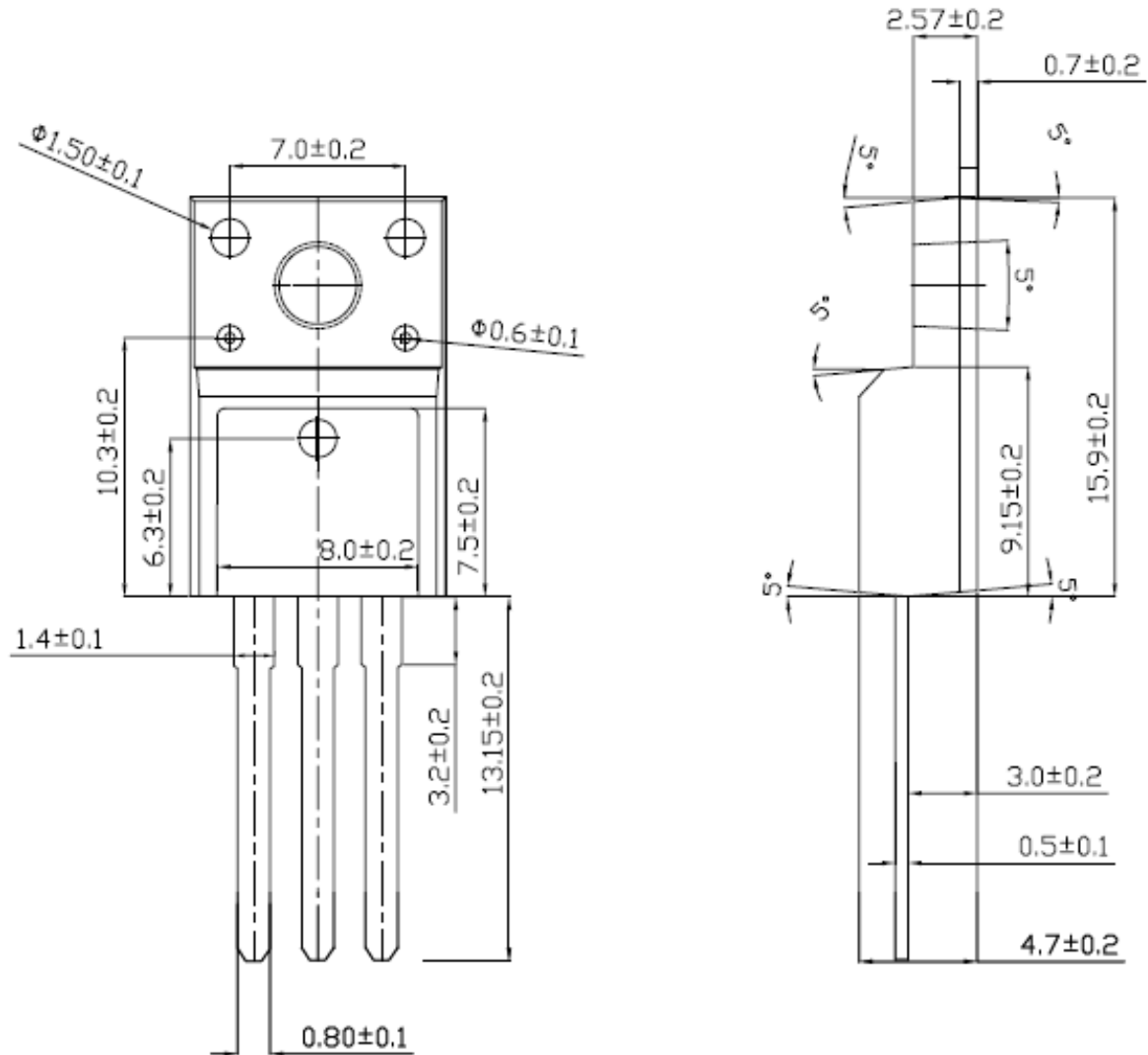


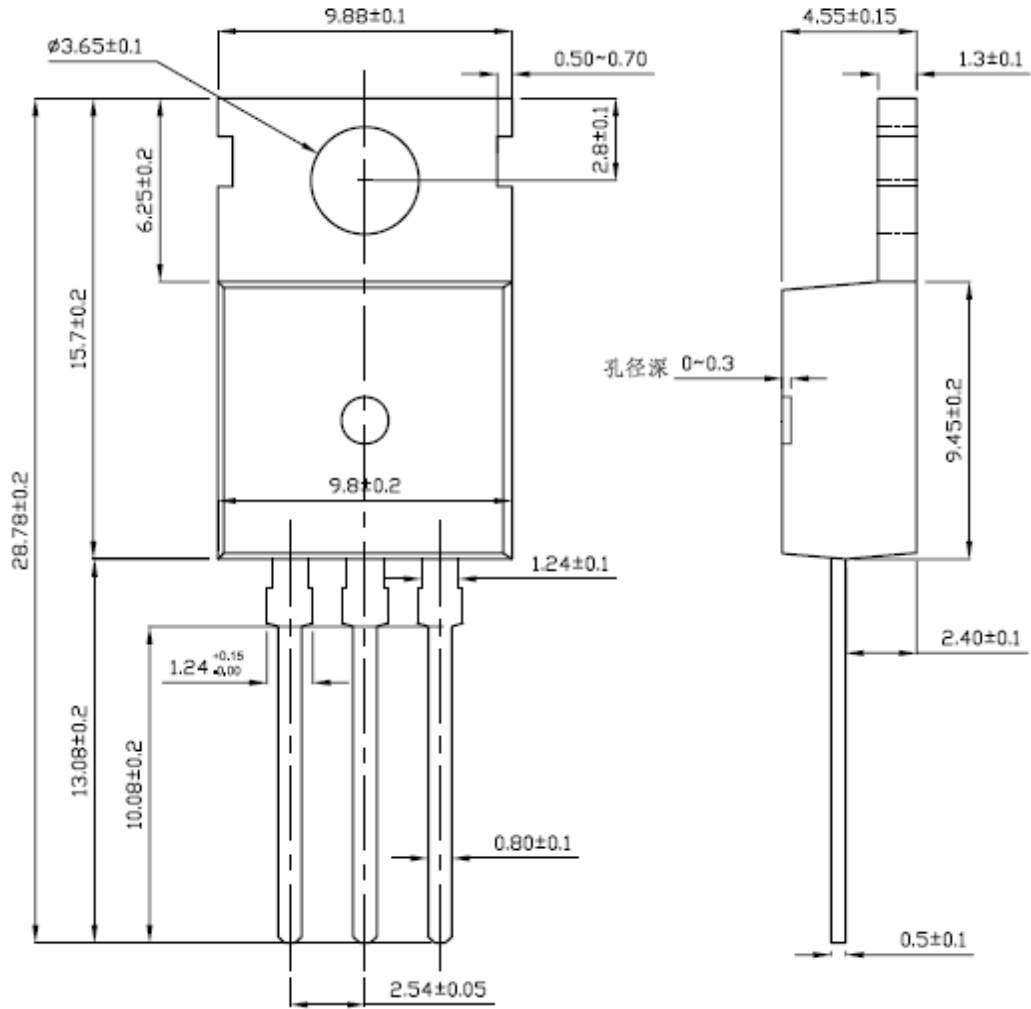
**Figure 10. Transient Thermal Impedance**  
**TO-220F**

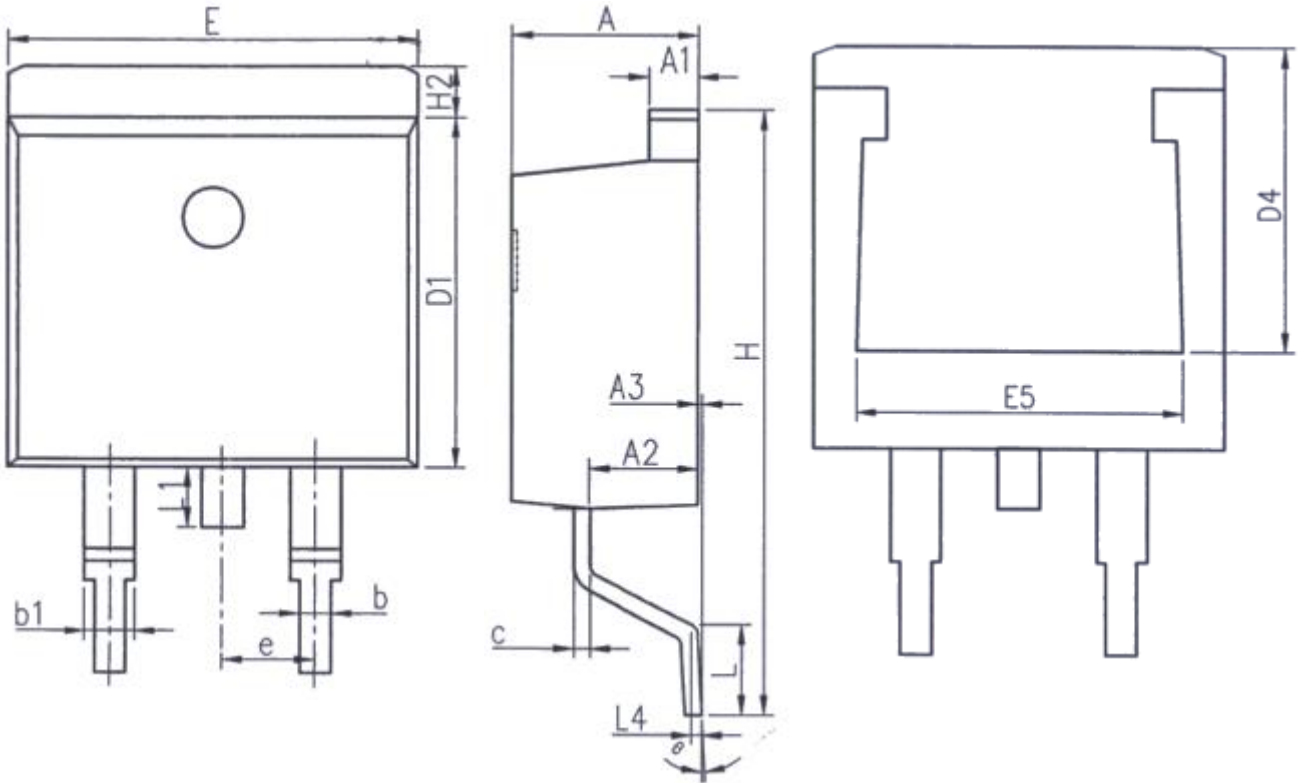


**Figure A: Gate Charge Test Circuit and Waveform**

**Figure B: Resistive Switching Test Circuit and Waveform**

**Figure C: Unclamped Inductive Switching Test Circuit and Waveform**


**TO-220F**


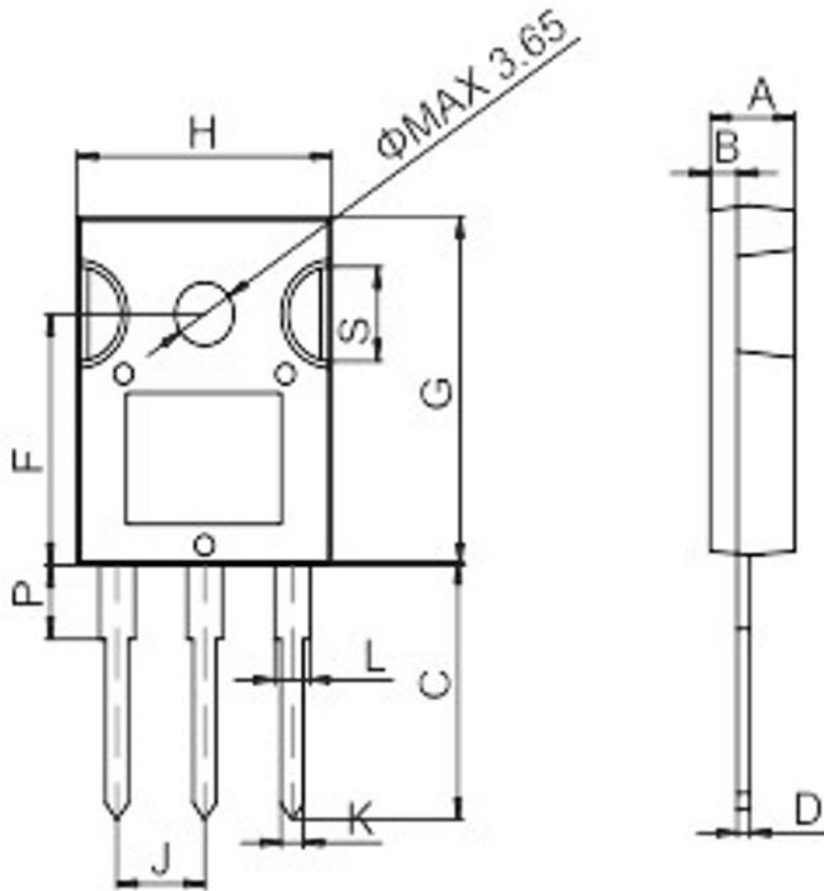
**TO-220**


**TO-263**


Unit: mm		
Symbol	Min.	Max.
A	4.37	4.77
A1	1.22	1.42
A2	2.49	2.89
A3	0.00	0.25
b	0.70	0.96
b1	1.17	1.47
c	0.30	0.53
D1	8.50	8.90
D4	6.60	-

Unit: mm		
Symbol	Min.	Max.
E	9.86	10.36
E5	7.06	-
e	2.54BSC	
H	14.70	15.50
H2	1.07	1.47
L	2.00	2.60
L1	1.40	1.70
L4	0.25BSC	
θ	0°	9°



**TO-247**


Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.9		5.4	0.193		0.213
B	1.6		2.0	0.063		0.079
C	14.35		15.4	0.565		0.606
D	0.5		0.8	0.020		0.031
F	14.4		15.1	0.567		0.594
G	19.7		20.6	0.775		0.811
H	15.4		16.2	0.606		0.638
J	5.3		5.6	0.209		0.220
K	1.3		1.5	0.051		0.059
L	2.8		3.3	0.110		0.130
P	3.7		4.2	0.146		0.165
S	5.35		5.65	0.211		0.222

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