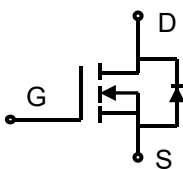


N-channel 650V, 7A Power MOSFET

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

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	650	V
Continuous drain current ($T_C = 25^\circ C$) ($T_C = 100^\circ C$)	I_D	7 4.3	A A
Pulsed drain current ¹⁾	I_{DM}	28	A
Gate-Source voltage	V_{GS}	± 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 ($T_C = 25^\circ C$) Derate above $25^\circ C$	P_D	39 0.31	W W/ $^\circ C$
Power Dissipation TO-220\ TO-252 ($T_C = 25^\circ C$) Derate above $25^\circ C$		100 0.8	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	7	A
Diode pulse current	$I_{S,pulse}$	28	A

Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO-220F	TO-220\TO-252	
Thermal resistance, Junction-to-case	$R_{\theta JC}$	3.2	1.25	$^\circ C/W$
Thermal resistance, Junction-to-ambient	$R_{\theta JA}$	62.5	110	$^\circ C/W$

Package Marking and Ordering Information

Device	Device Package	Marking	Units/Tube	Units/Real
JMA7N65C	TO-220	JMA7N65C	50	
JMF7N65C	TO-220F	JMF7N65C	50	
JMB7N65C	TO-252	JMB7N65C		2500

Electrical Characteristics

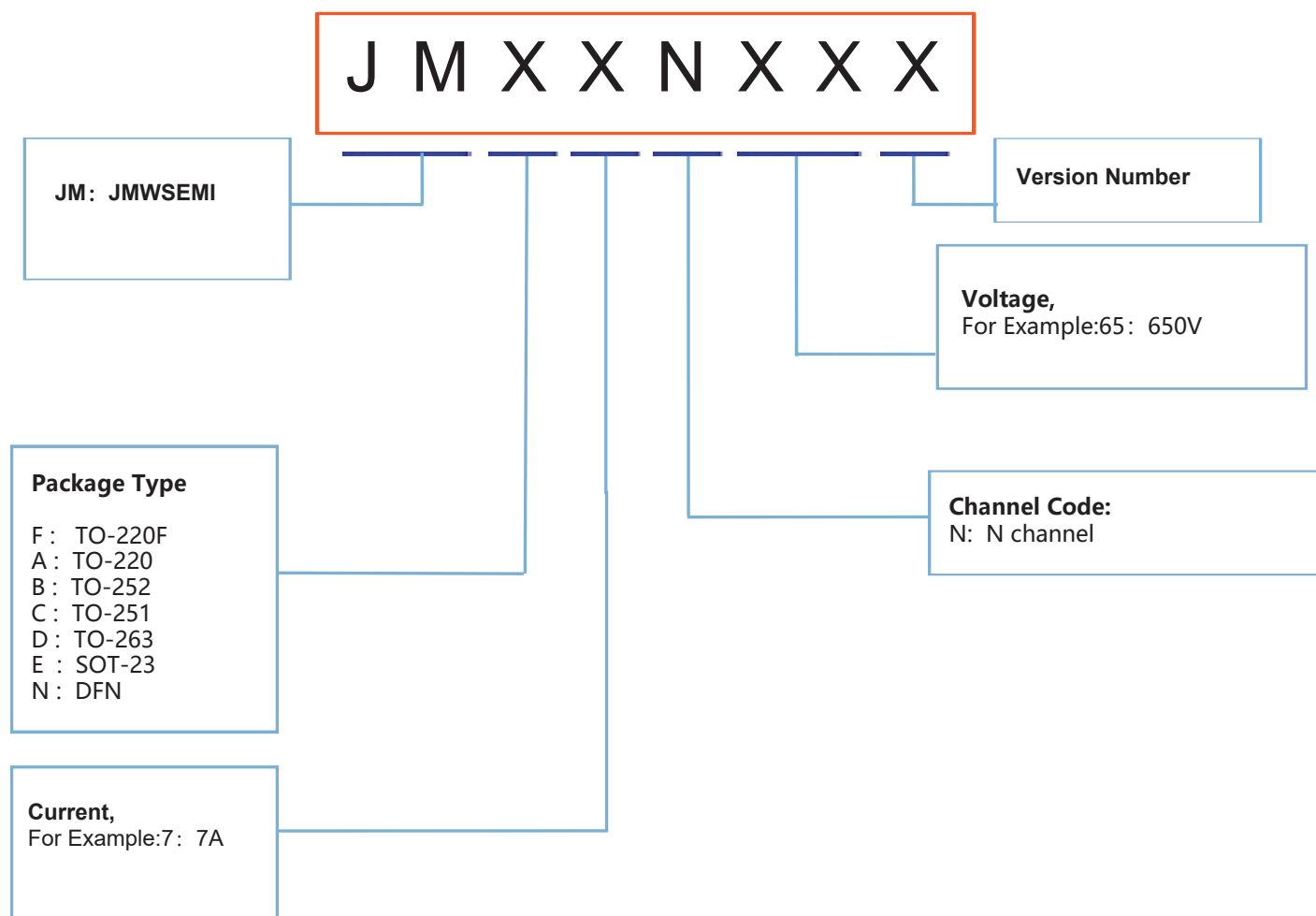
$T_c = 25^\circ\text{C}$ unless otherwise noted

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:

- Pulse width limited by maximum junction temperature.
- $L=10\text{mH}$, $I_{AS} = 8.4\text{A}$, Starting $T_j = 25^\circ\text{C}$.
- $I_{SD} = 7\text{A}$, $di/dt \leq 100\text{A}/\mu\text{s}$, $V_{DD} \leq BV_{DS}$, Starting $T_j = 25^\circ\text{C}$.

VD MOS Product Names Rules



Electrical Characteristics Diagrams

Figure 1. Typical Output Characteristics

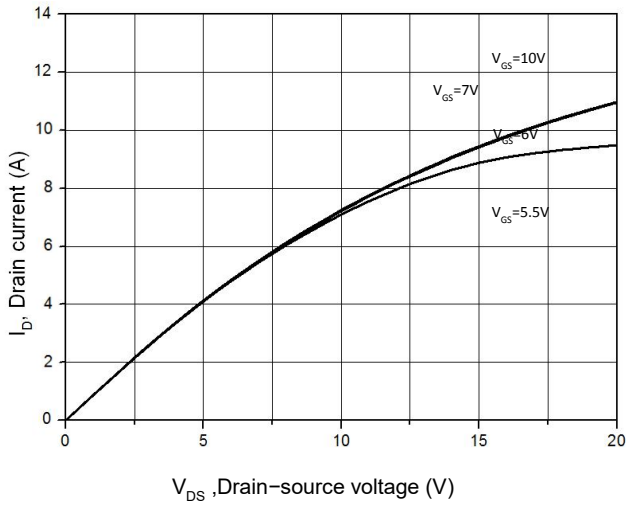


Figure 2. Transfer Characteristics

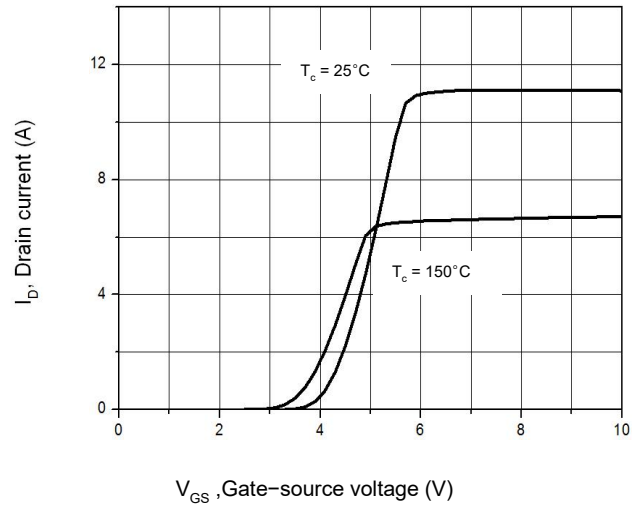


Figure 3. On-Resistance Variation vs. Drain Current

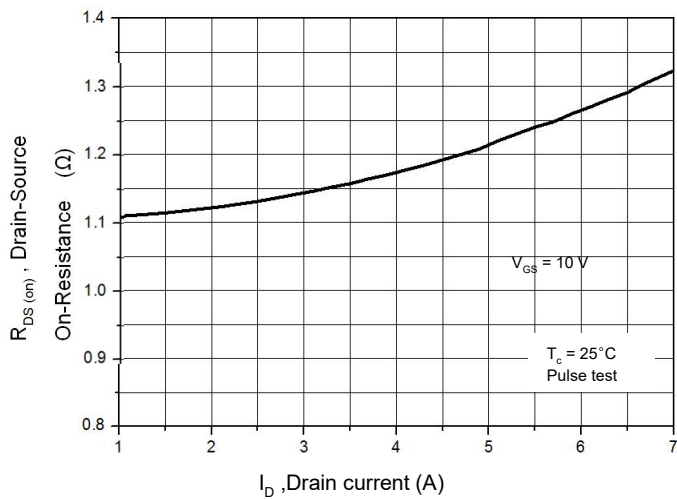


Figure 4. Threshold Voltage vs. Temperature

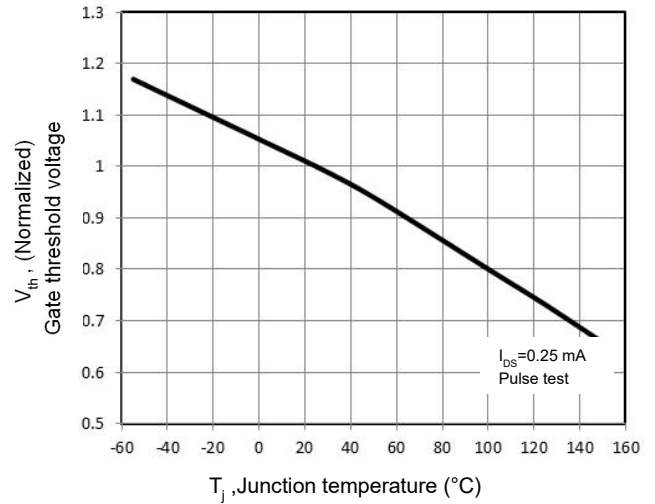


Figure 5. Breakdown Voltage vs. Temperature

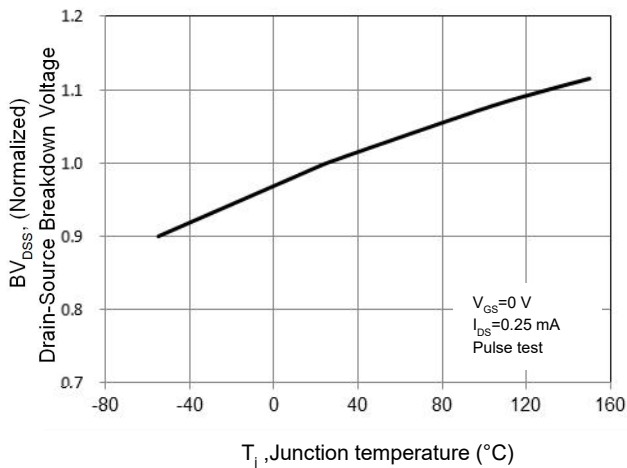


Figure 6. On-Resistance vs. Temperature

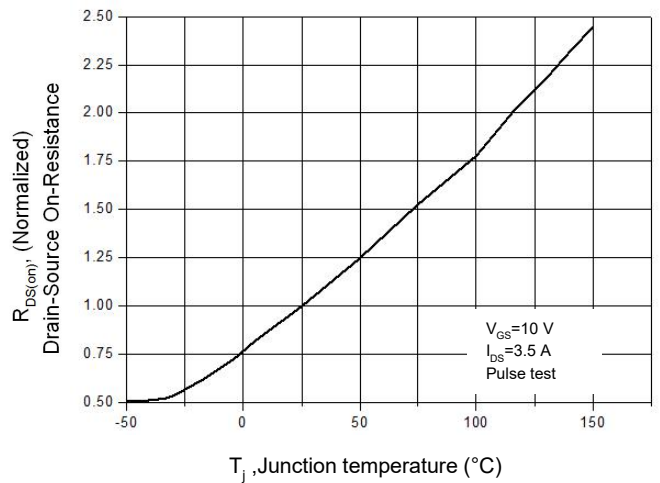


Figure 7. Capacitance Characteristics

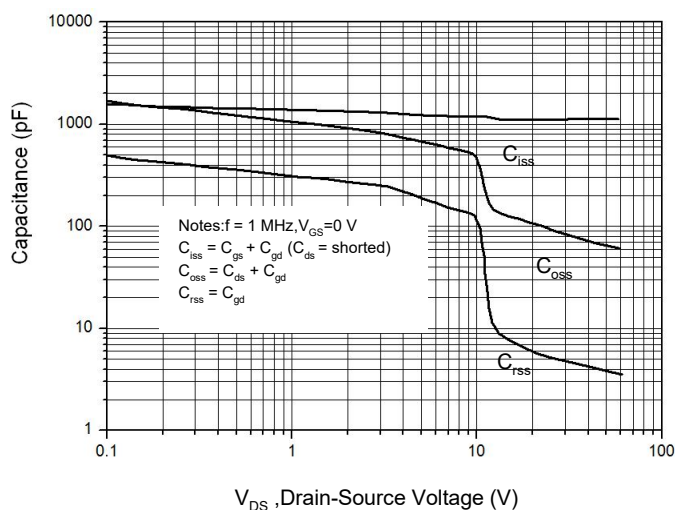


Figure 8. Gate Charge Characterist

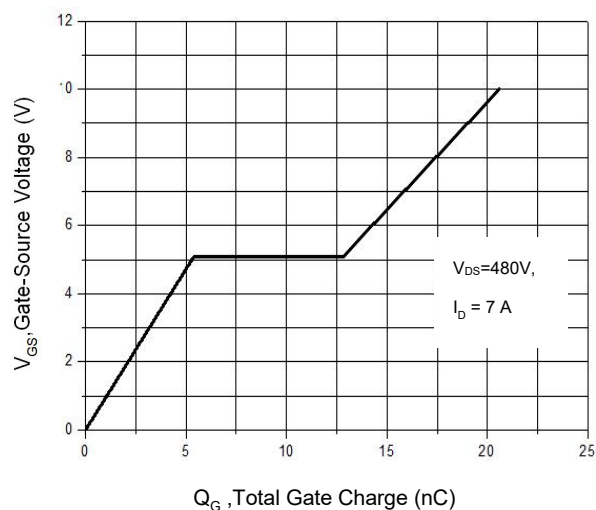


Figure 9. Maximum Safe Operating Area
TO-220F

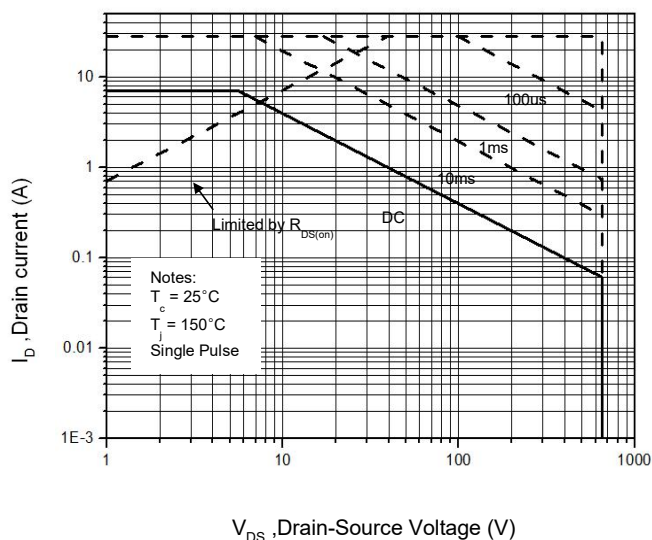


Figure 10. Maximum Safe Operating Area
TO-220/ TO-252

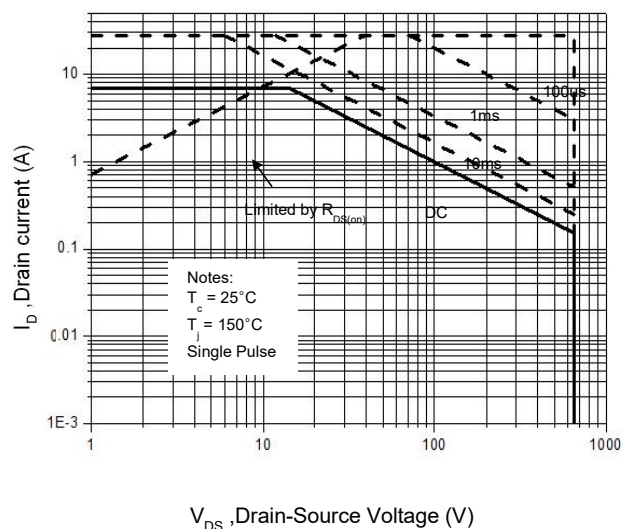


Figure 11. Power Dissipation vs. Temperature
TO-220F

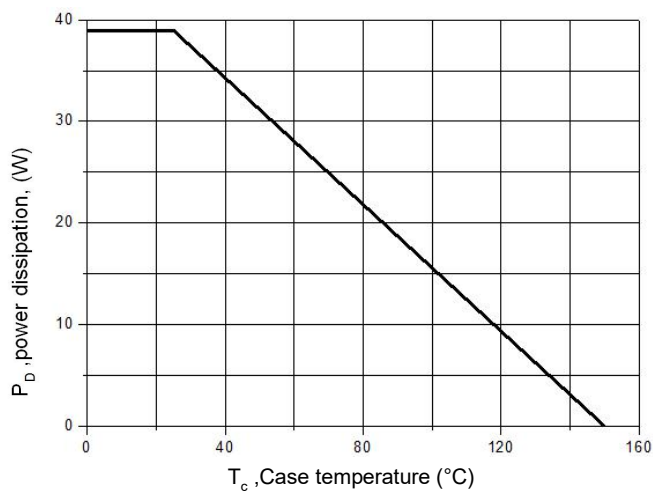


Figure 12. Power Dissipation vs. Temperature
TO-220 / TO-252

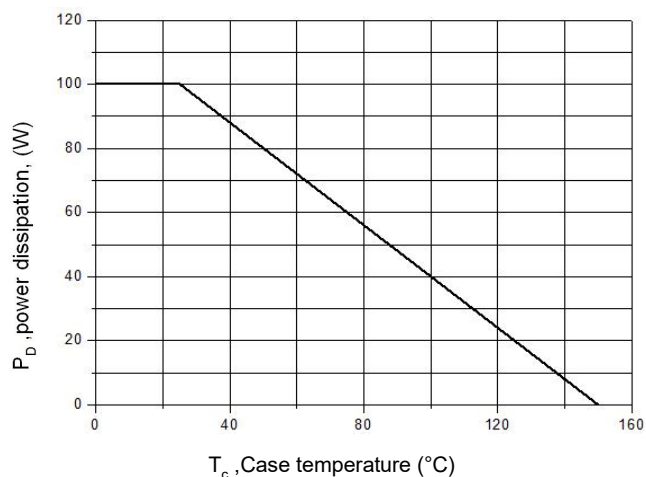


Figure 13. Continuous Drain Current vs. Temperature

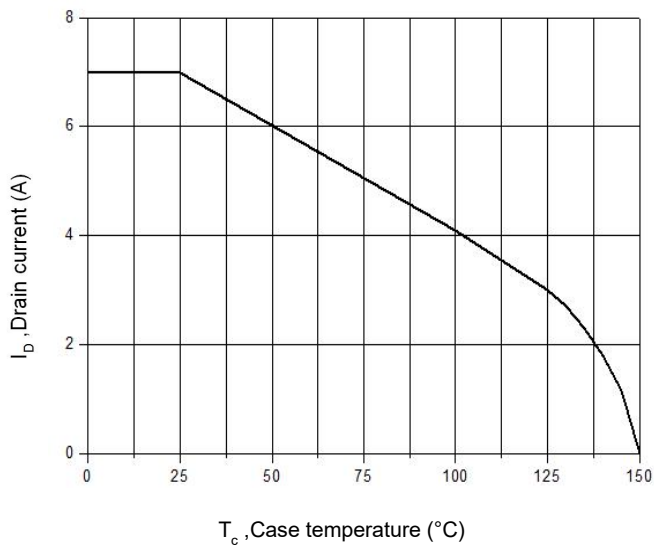


Figure 14. Body Diode Transfer Characteristics

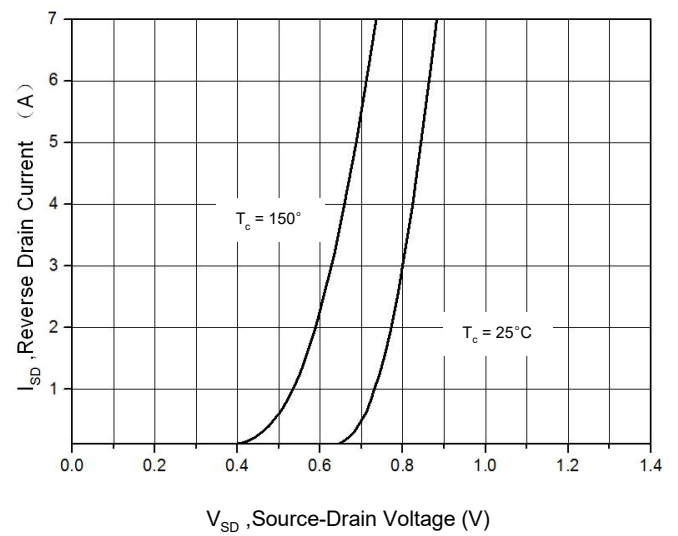


Figure 15 Transient Thermal Impedance, Junction to Case, TO-220F

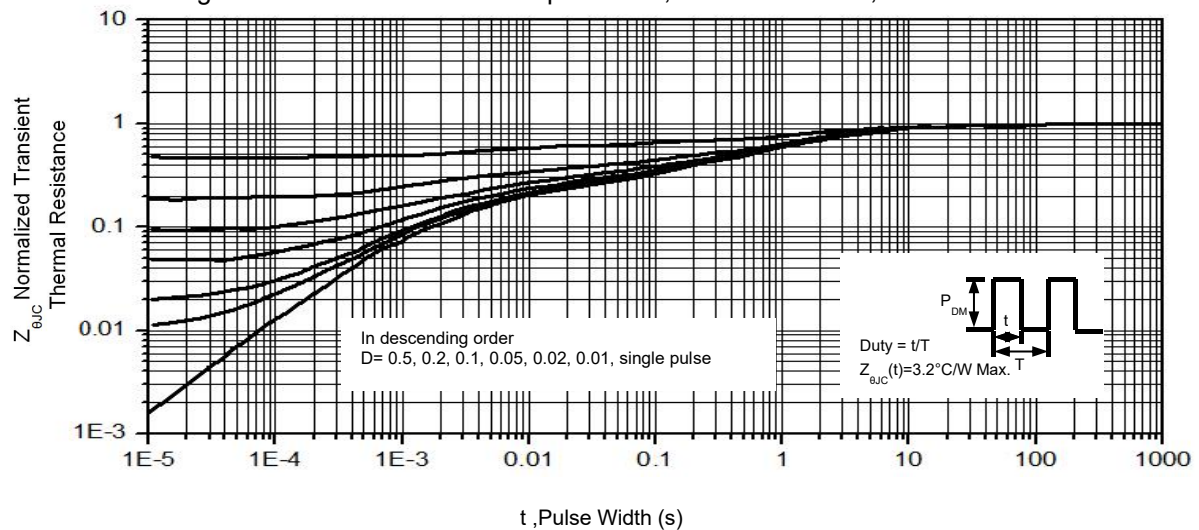
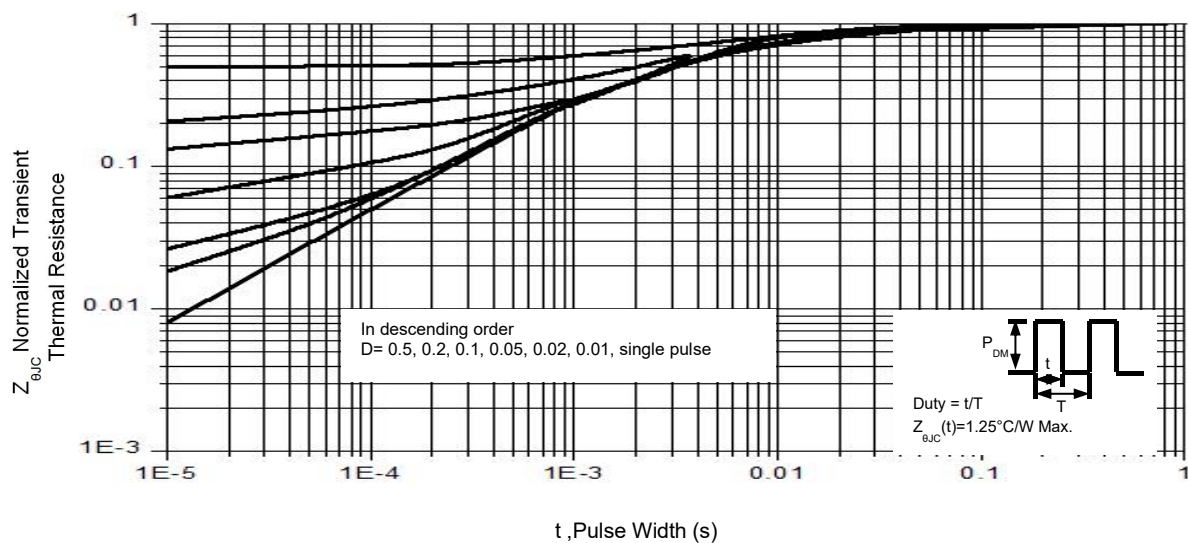
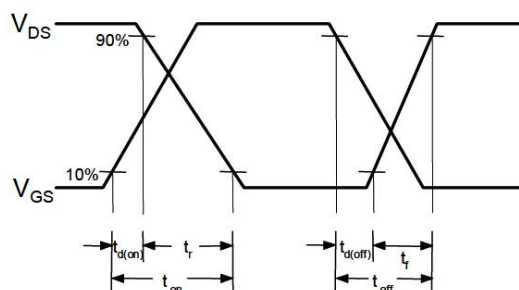
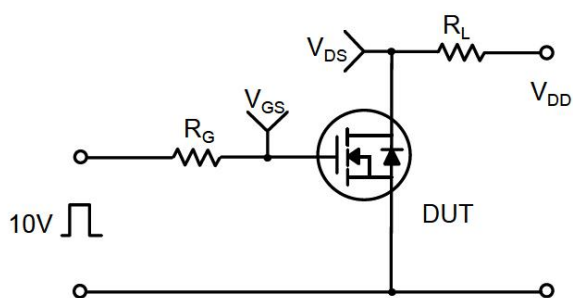
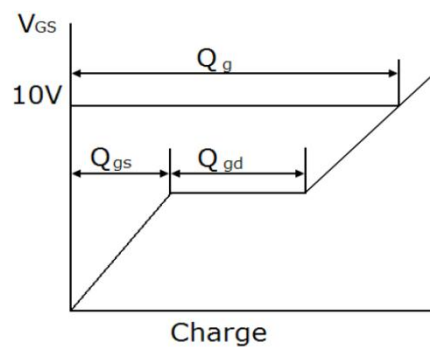
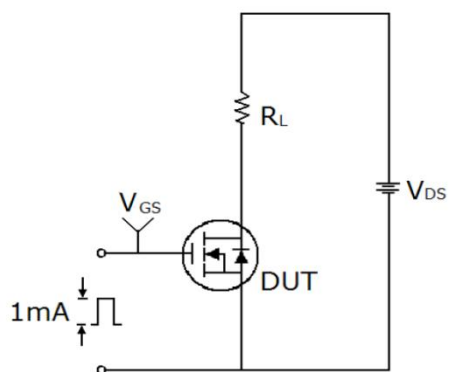


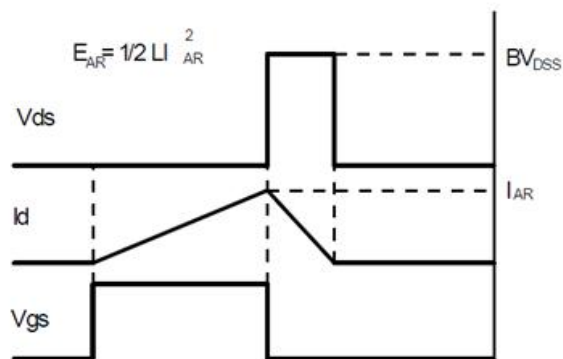
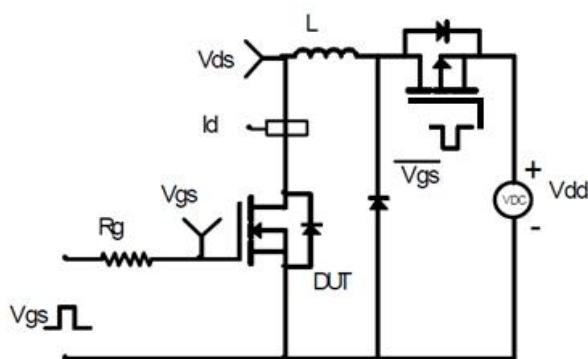
Figure 16. Transient Thermal Impedance, Junction to Case, TO-220/ TO-252



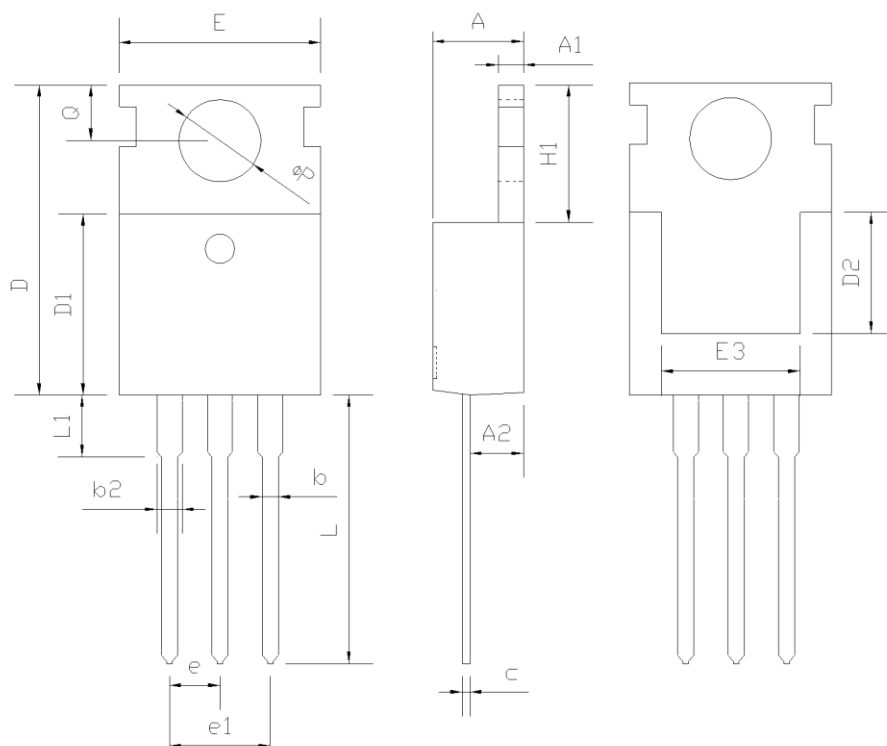
Gate Charge Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveforms

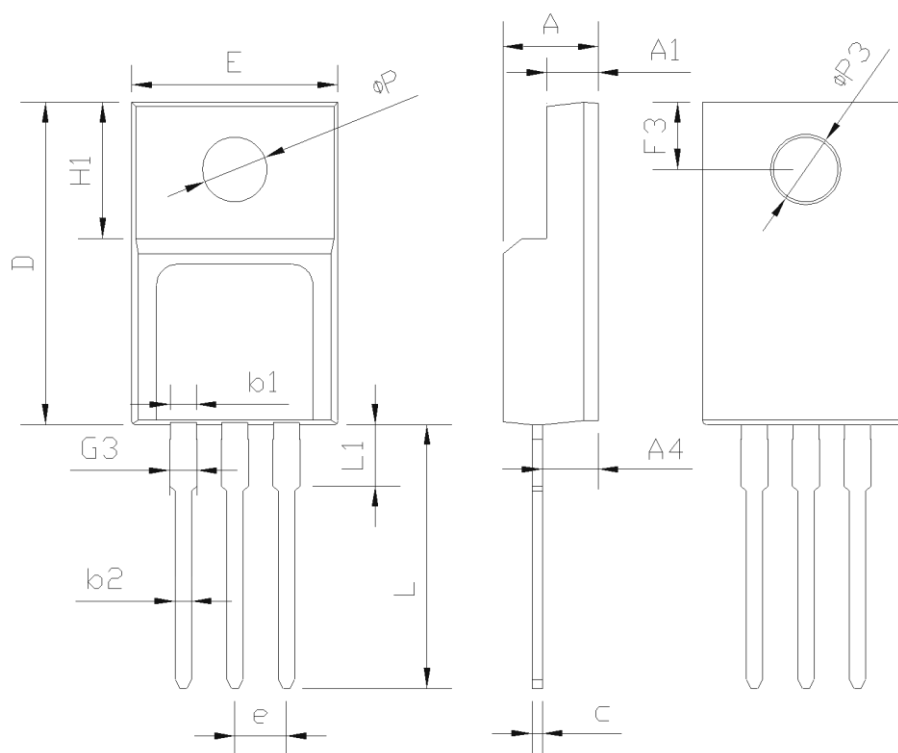


Mechanical Dimensions for TO-220



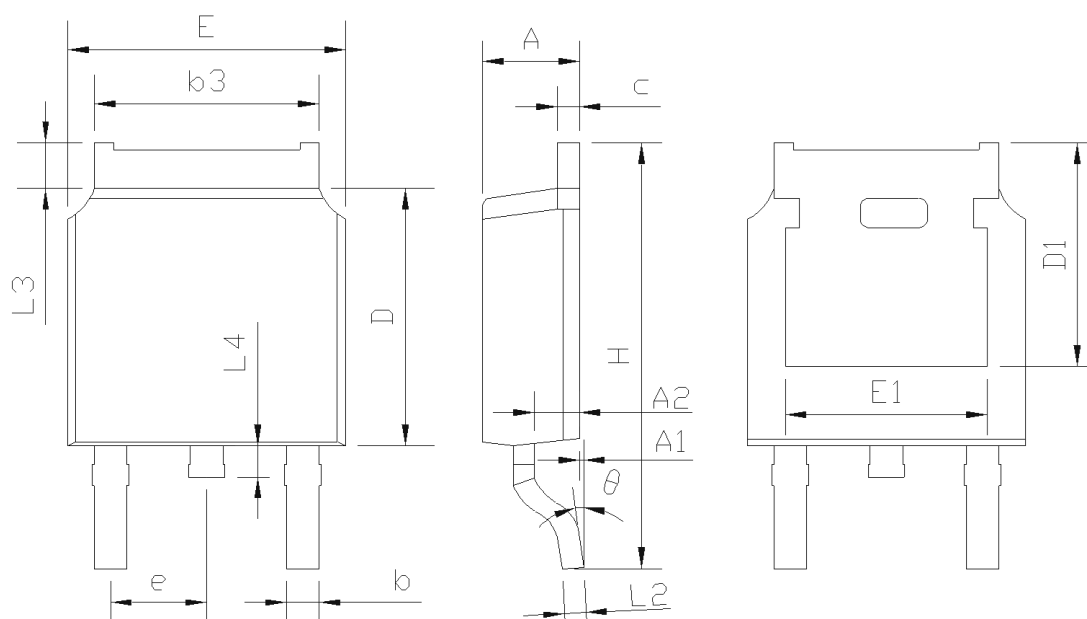
SYMBOL	mm		
	MIN	NOM	MAX
A	4.37	4.57	4.70
A1	1.25	1.30	1.40
A2	2.20	2.40	2.60
b	0.70	0.80	0.95
b2	1.17	1.27	1.47
c	0.45	0.50	0.60
D	15.10	15.60	16.10
D1	8.80	9.10	9.40
D2	5.50	-	-
E	9.70	10.00	10.30
E3	7.00	-	-
e	2.54 BSC		
e1	5.08 BSC		
H1	6.25	6.50	6.85
L	12.75	13.50	13.80
L1	-	3.10	3.40
ΦP	3.40	3.60	3.80
Q	2.60	2.80	3.00

Mechanical Dimensions for TO-220F



SYMBOL	mm		
	MIN	NOM	MAX
E	9.96	10.16	10.36
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A4	2.56	2.76	2.96
c	0.40	0.50	0.65
D	15.57	15.87	16.17
H1	6.70REF		
e	2.54BSC		
L	12.68	12.98	13.28
L1	2.88	3.03	3.18
ΦP	3.03	3.18	3.38
ΦP3	3.15	3.45	3.65
F3	3.15	3.30	3.45
G3	1.25	1.35	1.55
b1	1.18	1.28	1.43
b2	0.70	0.80	0.95

Mechanical Dimensions for TO-252



SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.38
A1	0.00	-	0.20
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.46
c	0.43	0.53	0.61
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.73
E1	4.63	-	-
e	2.286BSC		
H	9.40	10.10	10.50
L2	0.51BSC		
L3	0.88	-	1.28
L4	0.50	-	1.00
θ	0°	-	8°

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