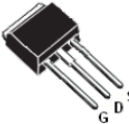
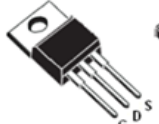
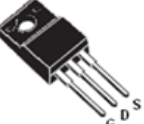
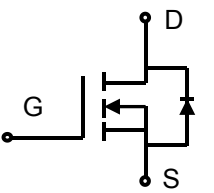


Description The Power MOSFET is fabricated using the advanced planer VDMOS technology. The resulting device has low conduction resistance, superior switching performance and high avalanche energy. Features ◆ Low $R_{DS(on)}$ ◆ Low gate charge (typ. $Q_g = 34.2$ nC) ◆ 100% UIS tested ◆ RoHS compliant 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>10A</td></tr> <tr> <td>$R_{DS(on),max}$</td><td>1.0Ω</td></tr> <tr> <td>$Q_{g,typ}$</td><td>34.2 nC</td></tr> </table>     TO-262 TO-263 TO-220 TO-220F  N-Channel MOSFET	V_{DSS}	650V	I_D	10A	$R_{DS(on),max}$	1.0 Ω	$Q_{g,typ}$	34.2 nC
V_{DSS}	650V								
I_D	10A								
$R_{DS(on),max}$	1.0 Ω								
$Q_{g,typ}$	34.2 nC								

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	10 6.3	A A
Pulsed drain current ¹⁾	I_{DM}	40	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 ($T_C = 25^\circ\text{C}$) Derate above 25°C	P_D	40 0.32	W W/ $^\circ\text{C}$
Power Dissipation TO-220\ TO-262\ TO-263 ($T_C = 25^\circ\text{C}$) Derate above 25°C		130 1.04	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	10	A
Diode pulse current	$I_{S,pulse}$	40	A

Thermal Characteristics

Parameter	Symbol	Value		Unit
		TO-220F\TO-220F Narrow Pin	TO-220\TO-251\TO-252	

Thermal resistance, Junction-to-case	$R_{\theta JC}$	3.13	0.96	°C/W
Thermal resistance, Junction-to-ambient	$R_{\theta JA}$	110	62.5	°C/W

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 =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 =5A	-	0.81	1.0	Ω
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz	-	1622	-	pF
Output capacitance	C _{oss}		-	144.2	-	
Reverse transfer capacitance	C _{rss}		-	6.8	-	
Turn-on delay time	t _{d(on)}	V _{DD} = 325 V, I _D = 10 A R _G = 10 Ω, V _{GS} =15 V	-	14.16	-	ns
Rise time	t _r		-	34.64	-	
Turn-off delay time	t _{d(off)}		-	65.72	-	
Fall time	t _f		-	16.04	-	
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DD} =520 V, I _D =10 A, V _{GS} =0 to 10 V	-	8.8	-	nC
Gate to drain charge	Q _{gd}		-	12.89	-	
Gate charge total	Q _g		-	34.2	-	
Gate plateau voltage	V _{plateau}		-	5	-	V
Reverse diode characteristics						
Diode forward voltage	V _{SD}	V _{GS} =0 V, I _F =10 A	-	-	1.5	V
Reverse recovery time	t _{rr}	V _R =325 V, I _F =10 A, dI _F /dt=100 A/μs	-	418.8	-	ns
Reverse recovery charge	Q _{rr}		-	3.40	-	μC
Peak reverse recovery current	I _{rrm}		-	16.28	-	A

Notes:

1. Pulse width limited by maximum junction temperature.
2. $L=10\text{ mH}, I_{AS} = 10\text{ A},$ Starting $T_j = 25^\circ\text{C}.$
- 3 $I_{SD} = 10\text{ A}$ $di/dt \leq 100\text{ A}/\mu\text{s}$ $V_{DD} \leq BV_{DS}$ Starting $T_j = 25^\circ\text{C}$

Electrical Characteristics Diagrams

Figure 1. Typical Output Characteristics

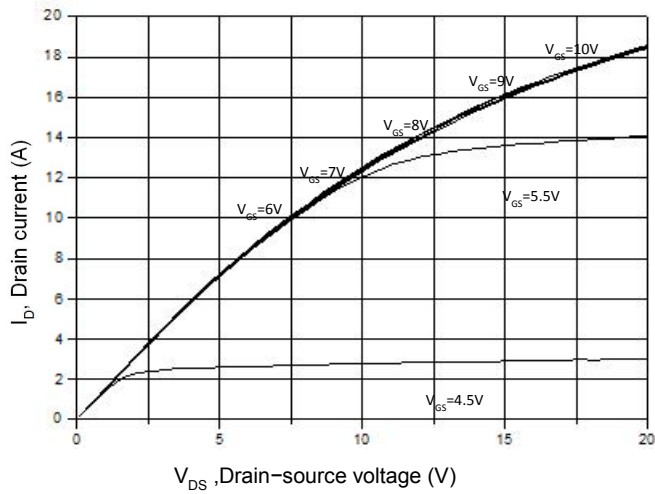


Figure 2. Transfer Characteristics

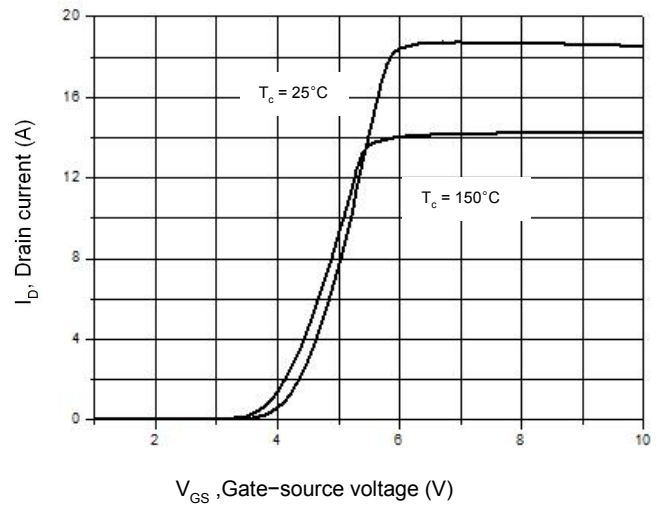


Figure 3. On-Resistance Variation vs. Drain Current

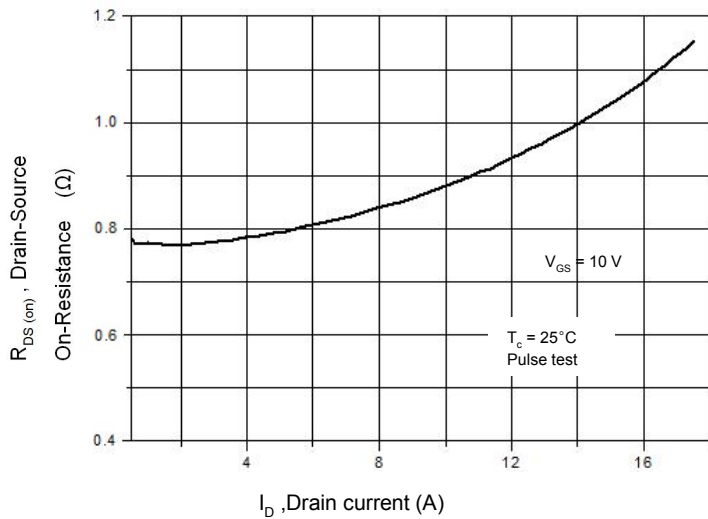


Figure 4. Threshold Voltage vs. Temperature

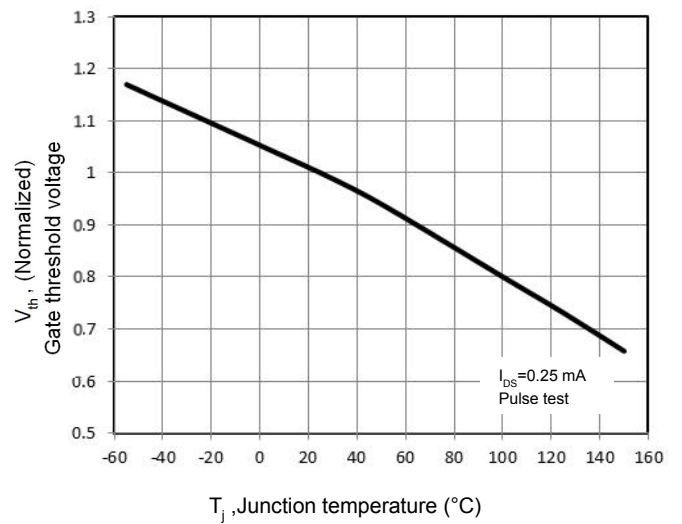


Figure 5. Breakdown Voltage vs. Temperature

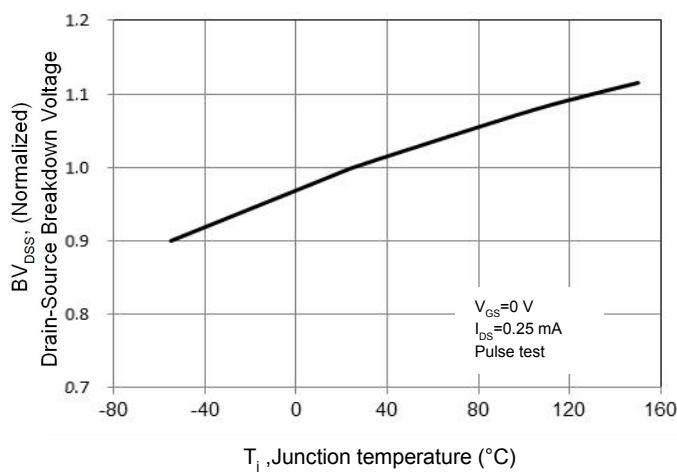


Figure 6. On-Resistance vs. Temperature

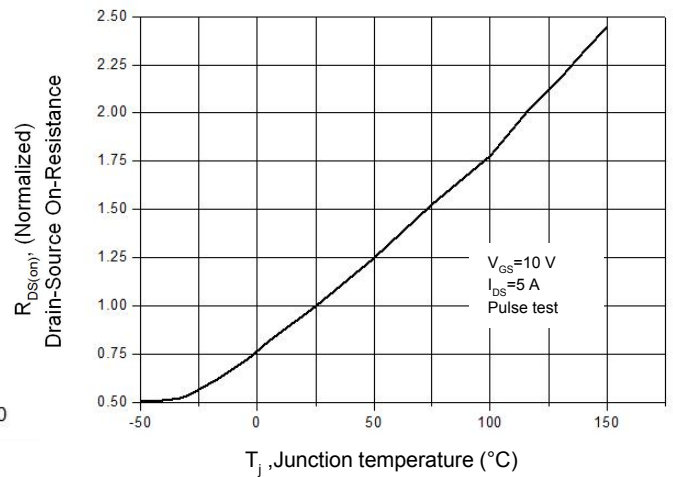


Figure 7. Capacitance Characteristics

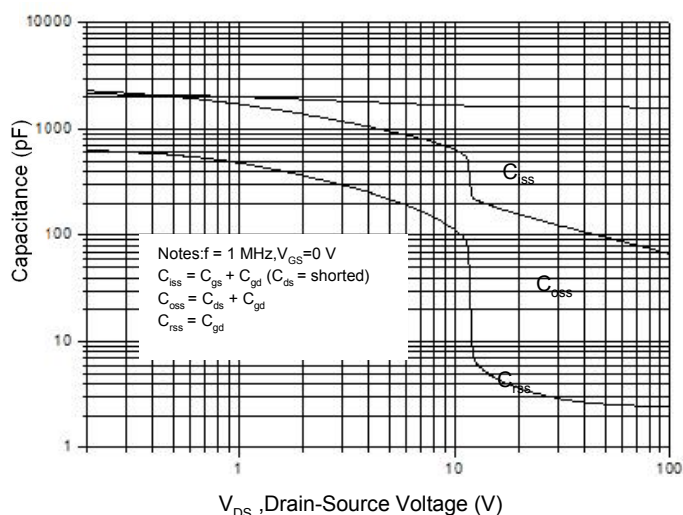


Figure 8. Gate Charge Characteristics

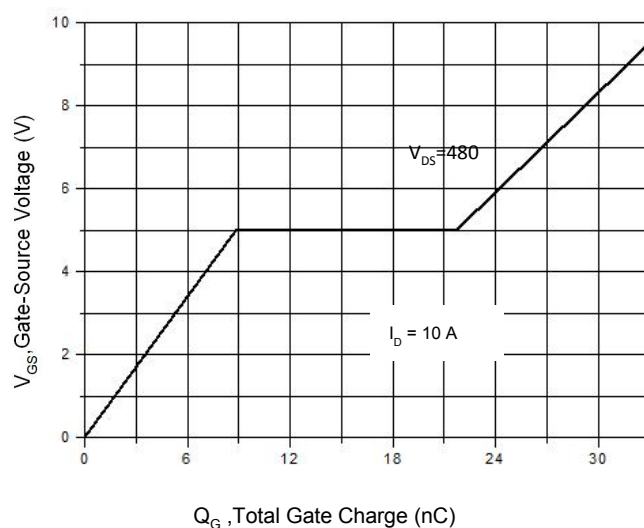


Figure 9. Maximum Safe Operating Area
TO-220F/TO-220F Narrow Pin

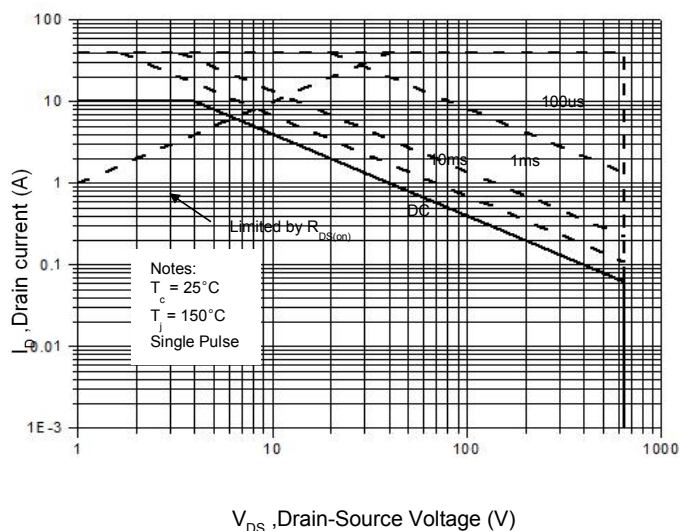


Figure 10. Maximum Safe Operating Area
TO-220/ TO-262/TO-263

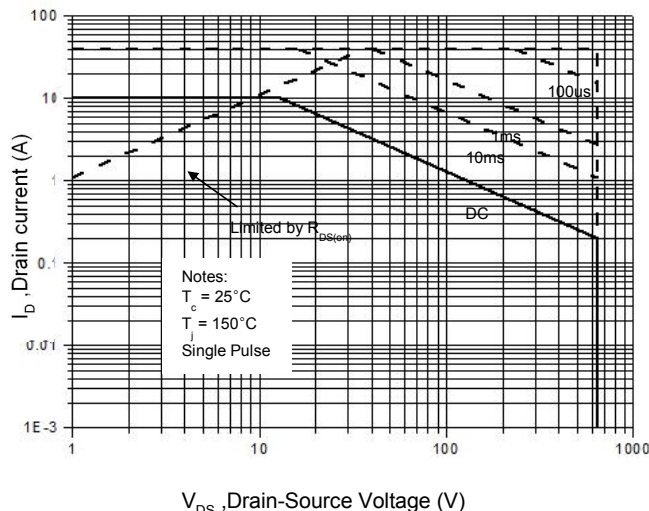


Figure 11. Power Dissipation vs. Temperature
TO-220F/TO-220F Narrow Pin

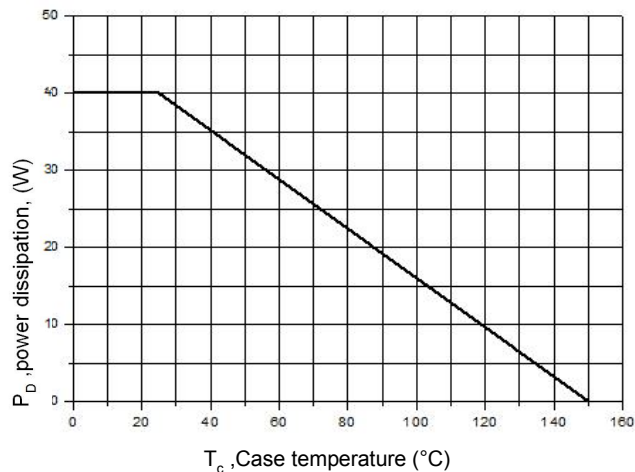


Figure 12. Power Dissipation vs. Temperature
TO-220/ TO-262/TO-263

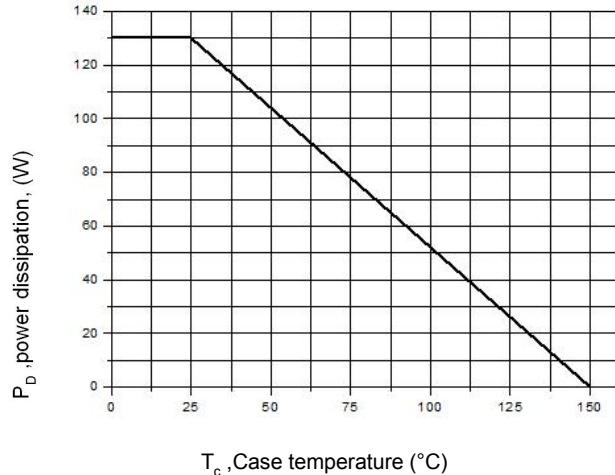


Figure 13. Continuous Drain Current vs. Temperature

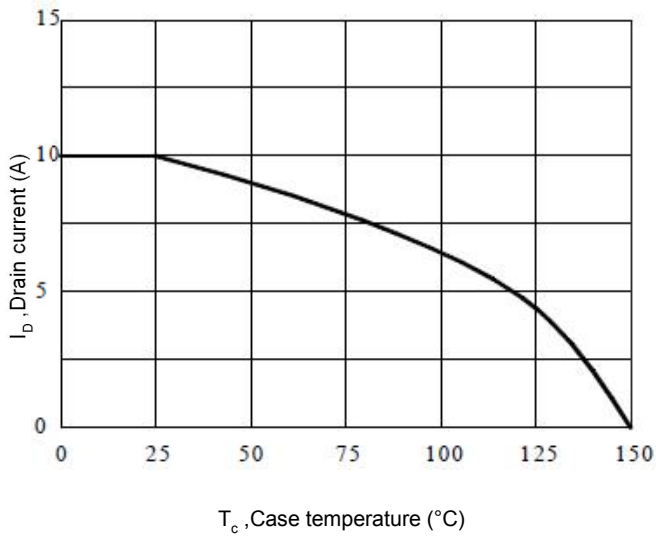


Figure 14. Body Diode Transfer Characteristics

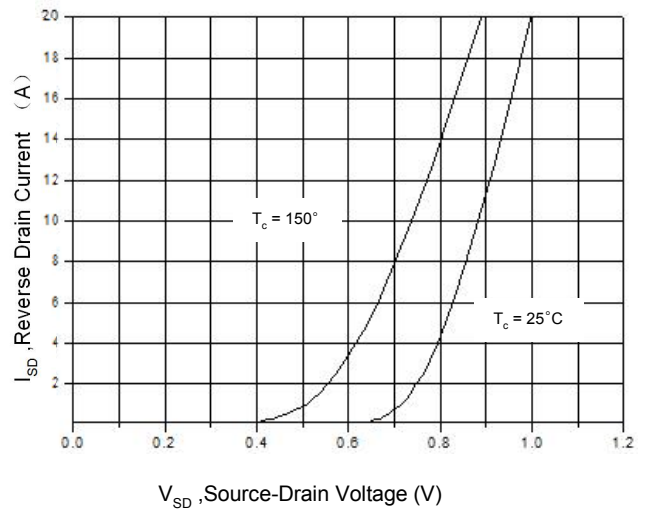


Figure 15 Transient Thermal Impedance, Junction to Case, TO-220F/TO-220F Narrow Pin

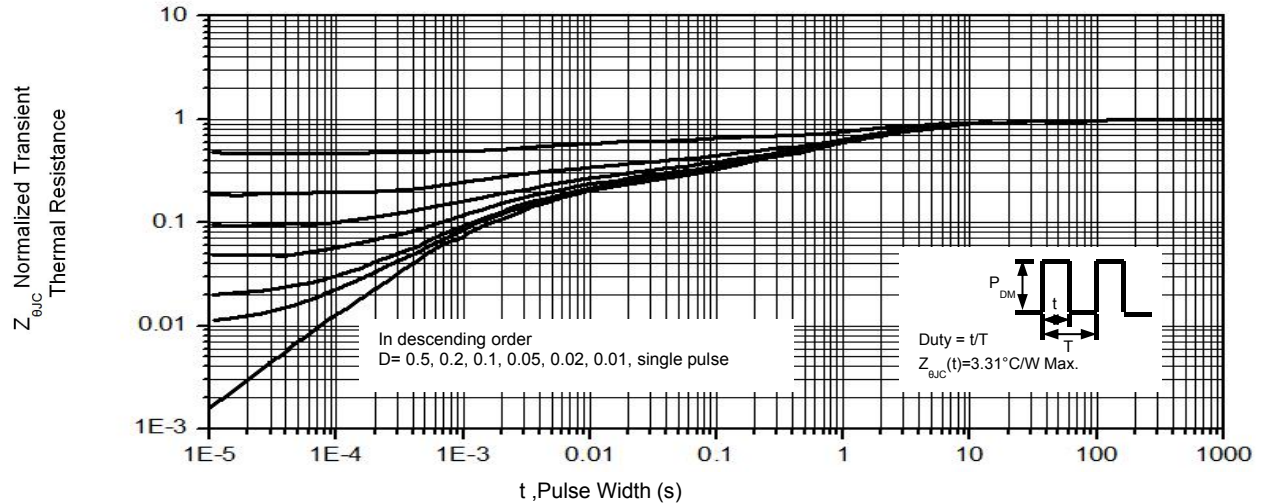
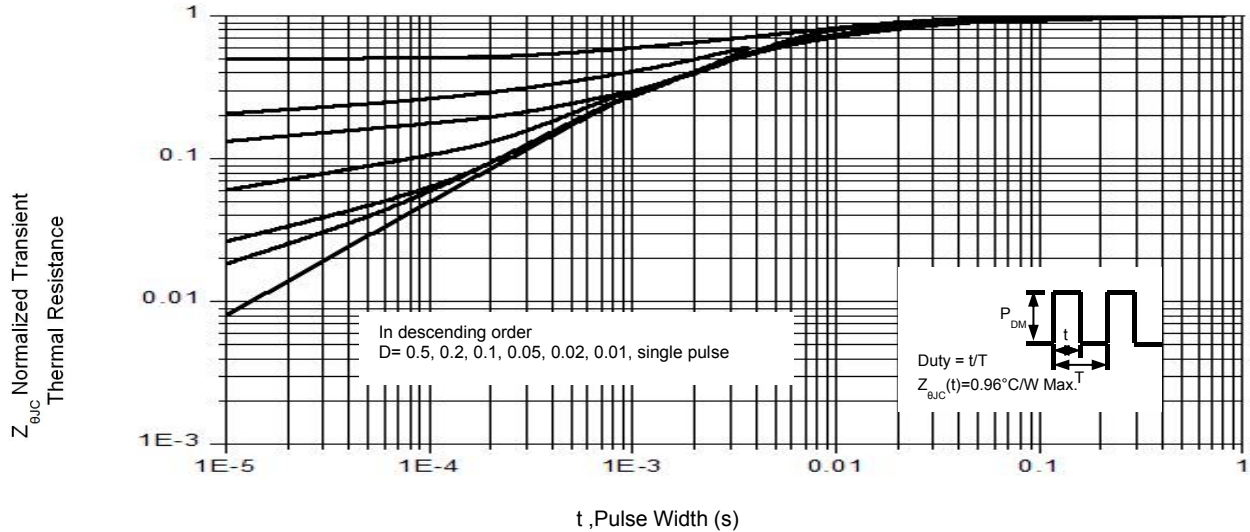
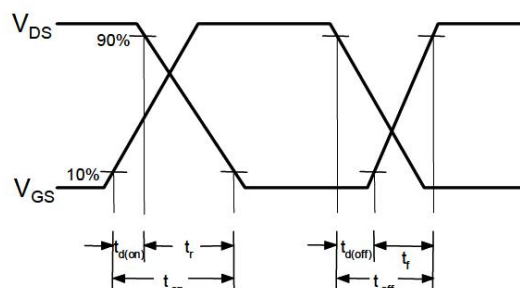
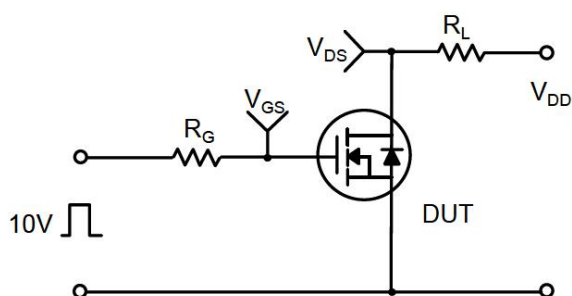
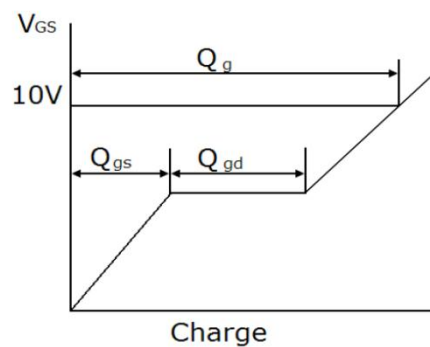
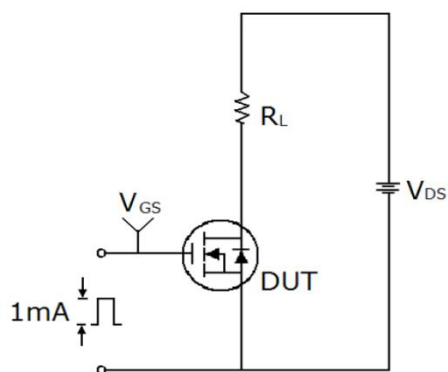


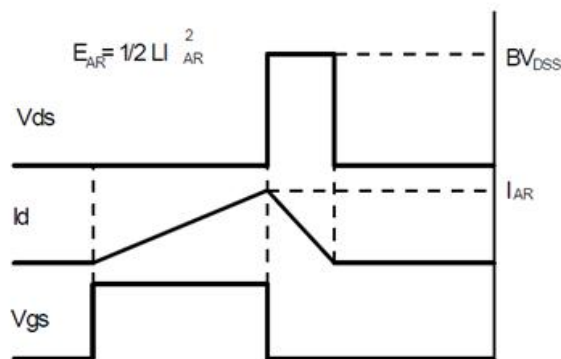
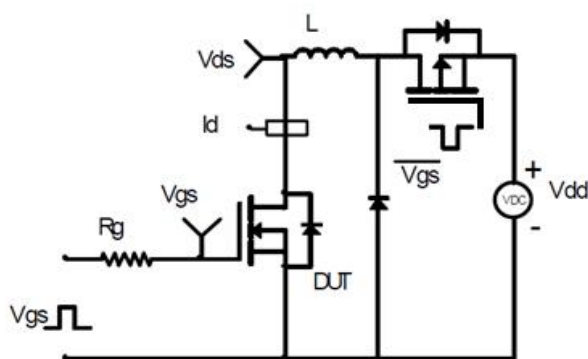
Figure 16. Transient Thermal Impedance, Junction to Case, TO-220/ TO-262/TO-263



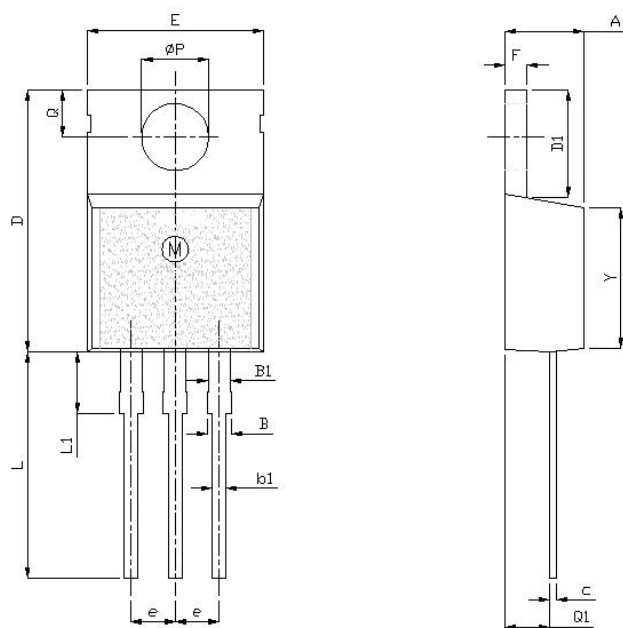
Gate Charge Test Circuit & Waveform



Unclamped Inductive Switching Test Circuit & Waveforms



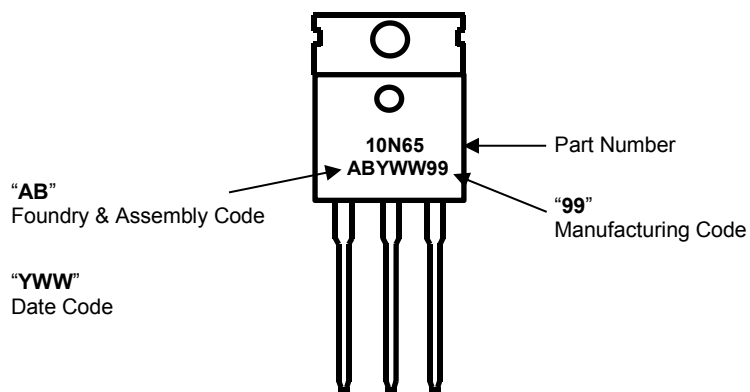
Mechanical Dimensions for TO-220



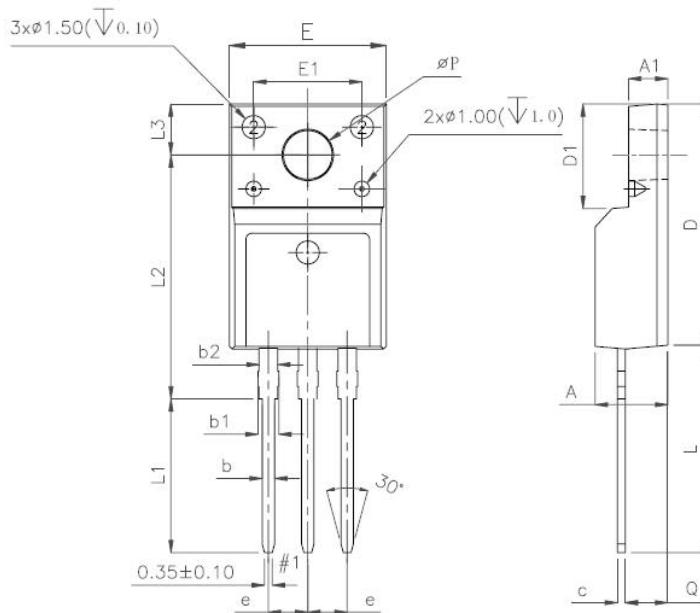
UNIT: mm

SYMBOL	MIN	NOM	MAX
A	4		4.8
B	1.2		1.4
B1	1		1.4
b1	0.75		0.95
c	0.4		0.55
D	15		16.5
D1	5.9		6.9
E	9.9		10.7
e	2.44	2.54	2.64
F	1.1		1.4
L	12.5		14.5
L1	3	3.5	4
ΦP	3.7	3.8	3.9
Q	2.5		3
Q1	2		2.9
Y	8.02	8.12	8.22

TO-220 Part Marking Information



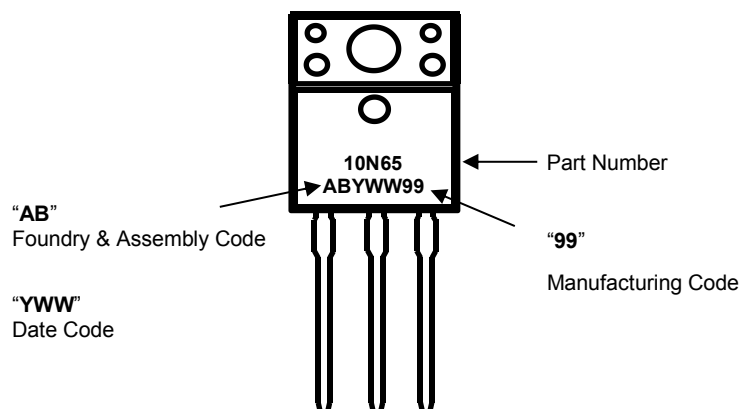
Mechanical Dimensions for TO-220F



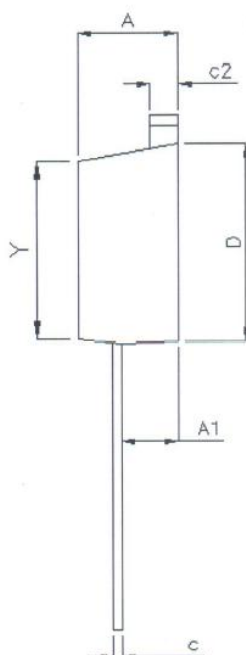
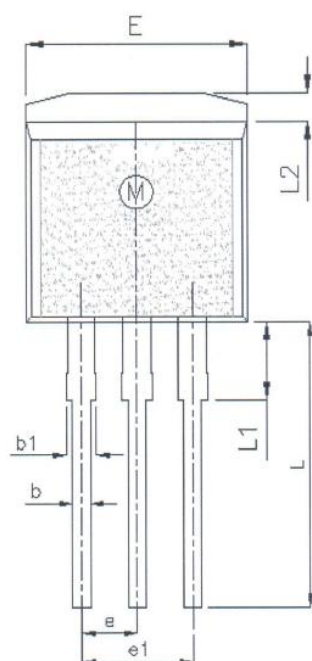
UNIT: mm

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



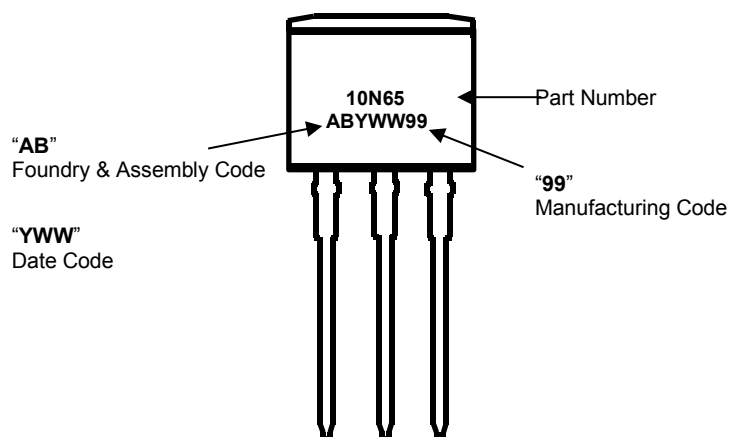
Mechanical Dimensions for TO-262



UNIT: mm

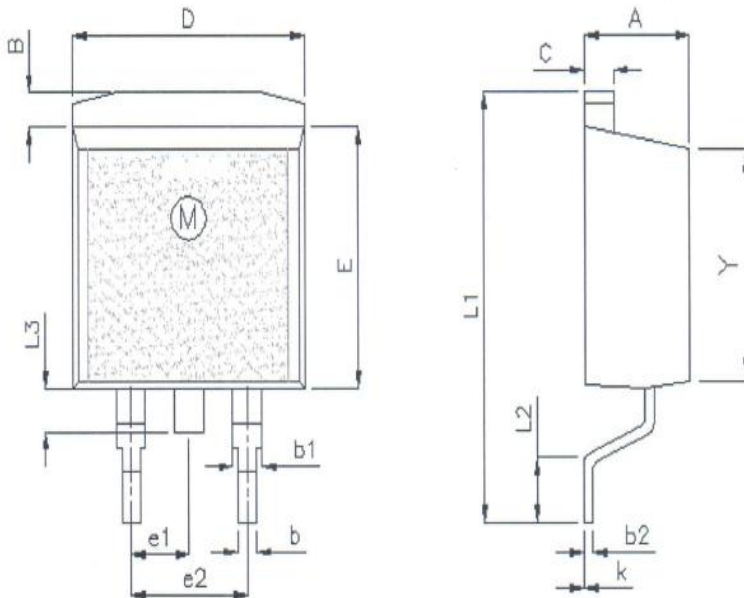
SYMBOL	MIN	NOM	MAX
A	4.42		4.72
A1	2.40		2.80
b	0.76		0.86
b1	1.22		1.40
c	0.33		0.43
c2	1.22		1.35
D	8.99		9.29
e	2.44	2.54	2.64
e1	4.98		5.18
E	9.95		10.25
L	12.50		13.60
L1	3.30	3.50	3.80
L2	1.22		1.40
Y	8.02	8.12	8.22

TO-262 Part Marking Information



Mechanical Dimensions for TO 263

UNIT: mm



SYMBOL	MIN	NOM	MAX
A	4.42		4.72
B	1.22		1.4
b	0.76		0.86
b1	1.22		1.4
b2	0.33		0.43
C	1.22		1.35
D	9.95		10.25
E	8.99		9.29
e1	2.44	2.54	2.64
e2	4.98		5.18
L1	14.7	15.1	15.5
L2	2	2.3	2.6
L3	1.5		2
K	-0.1		0.1
Y	8.02	8.12	8.22

TO-263 Part Marking Information

