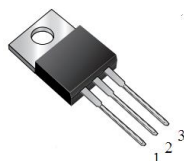
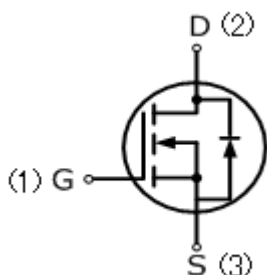


2N65(F,B,H,G,D)S

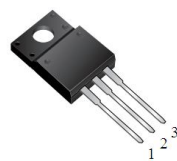
2 Amps,650 Volts N-Channel Super Junction Power MOSFET

FEATURE

- 2A,650V, $R_{DS(ON)MAX}=2.5\ \Omega$ @ $V_{GS}=10V/1A$
- Low gate charge
- Low C_{iss}
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



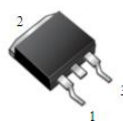
TO-220AB
2N65S



ITO-220AB
2N65FS



TO-262
2N65HS



TO-263
2N65BS



TO-252
2N65GS



TO-251
2N65DS

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

Parameter	Symbol	2N65(F,B,H,G,D)S	UNIT
Drain-Source Voltage	V_{DSS}	650	V
Gate-Source Voltage	V_{GSS}	± 30	
Continuous Drain Current	I_D	2	A
Pulsed Drain Current(Note1)	I_{DM}	6	
Single Pulse Avalanche Energy (Note 2)	E_{AS}	45	mJ
Avalanche Current(Note1)	I_{AR}	1	A
Repetitive Avalanche Energy (Note1)	E_{AR}	0.06	mJ
Reverse Diode dV/dt (Note 3)	dV/dt	15	V/ns
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	T_L	260	$^\circ\text{C}$
Mounting Torque	6-32 or M3 screw	10	lbf • in
		1.1	N • m

Thermal Characteristics

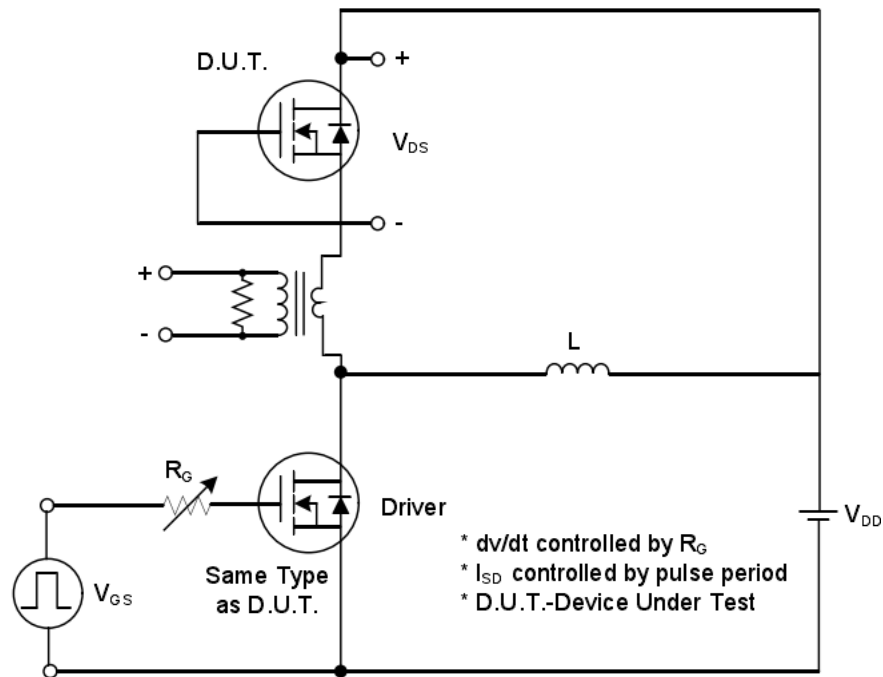
Parameter		Symbol	ITO-220	TO-220/TO-262/ TO-263	TO-251/252	Units
Thermal resistance , Junction to Case		R _{th(J-c)}	7.8	5.4	5.4	°C/W
Thermal resistance , Channel to Case		R _{th(ch-c)}	7.8	5.4	5.4	°C/W
Thermal resistance , Channel to Ambient		R _{th(ch-a)}	80	62	62	°C/W
Maximum Power Dissipation	T _C =25 °C	P _D	16	23	23	W

Electrical Characteristics (T _c =25℃,unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V,I _D =250uA	650	—	—	V
Breakdown Temperature Coefficient	ΔBV _{DSS} /ΔT _J	Reference to 25℃ , I _D =250uA	—	0.6	—	V/℃
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =650V,V _{GS} =0V	—	—	1	μ A
Gate-Body Leakage Current,Forward	I _{GSSF}	V _{GS} =30V,V _{DS} =0V	—	—	1	μ A
Gate-Body Leakage Current,Reverse	I _{GSSR}	V _{GS} =-30V,V _{DS} =0V	—	—	-1	μ A
On Characteristics						
Gate-Source Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} ,I _D =250uA	2	—	4	V
Drain-Source On-State Resistance	R _{DS(on)}	V _{GS} =10V,I _D =2A	—	2.2	2.5	Ω
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =50V,V _{GS} =0V, f=1.0MHZ	—	190	—	pF
Output Capacitance	C _{oss}		—	13	—	pF
Reverse Transfer Capacitance	C _{rss}		—	1.1	—	pF
Switching Characteristics						
Turn-On Delay Time	t _{d(on)}	V _{DD} =380V,I _D =1A, R _G =50Ω (Note4,5)	—	6	—	ns
Turn-On Rise Time	t _r		—	3	—	ns
Turn-Off Delay Time	t _{d(off)}		—	65	—	ns
Turn-Off Fall Time	t _f		—	11	—	ns
Total Gate Charge	Q _g	V _{DS} =480V,I _D =2 A, V _{GS} =10V, (Note4,5)	—	3.2	—	nC
Gate-Source Charge	Q _{gs}		—	0.6	—	nC
Gate-Drain Charge	Q _{gd}		—	1.2	—	nC
Drain-Source Body Diode Charcteristics and Maximum Ratings						
Continuous Diode Forward Current	I _S		—	—	2	A
Pulsed Diode Forward Current	I _{SM}		—	—	6	A
Diode Forward Voltage	V _{SD}	I _S =2A,V _{GS} =0V	—	—	1.3	V
Reverse Recovery Time	t _{rr}	V _{GS} =0V,I _S =2A,	—	140	—	ns
Reverse Recovery Charge	Q _{rr}	dI _F /dt=100A/us, (Note4)	—	0.65	—	μ C

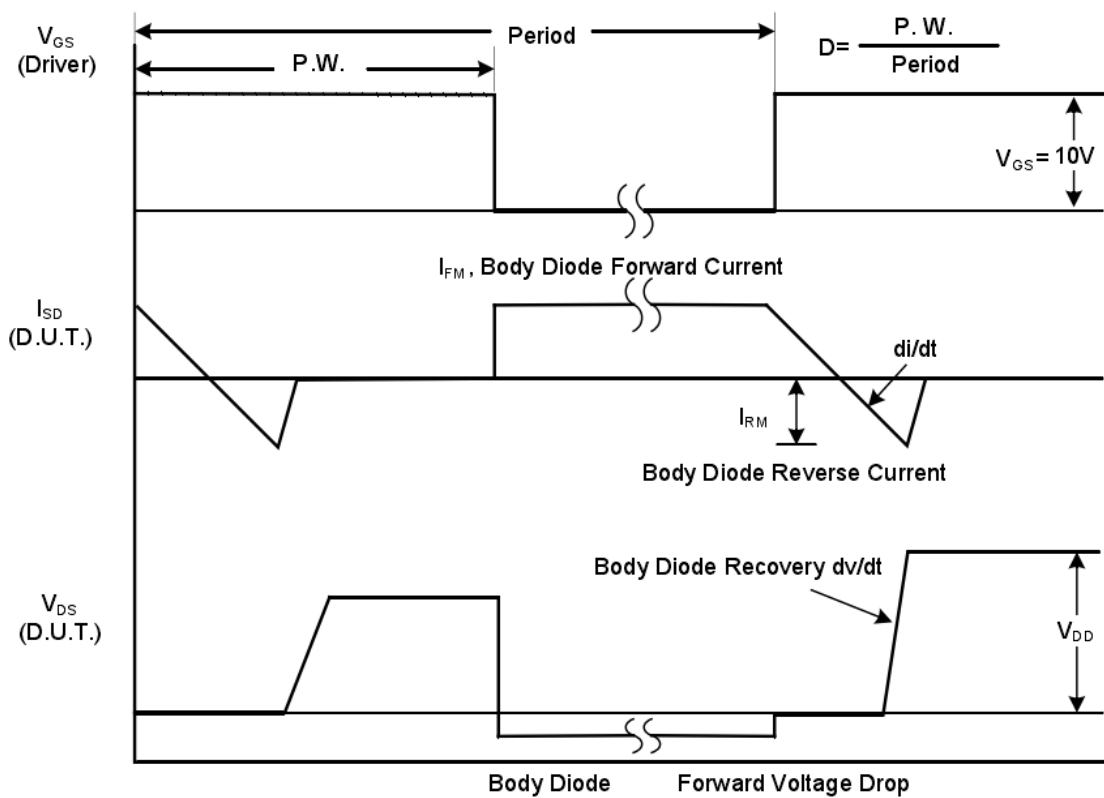
Notes

1. Repetitive Rating; pulse width limited by maximum junction temperature.
2. V_{DD}=50V, L=22.5mH, R_g=25 Ω, I_{AS}=2A, starting T_J=25℃.
3. I_{SD} ≤ I_D, dI/dt=200A/us, V_{DD} ≤ BV_{DSS}, starting T_J=25℃.
4. Pulse width ≤ 300us; duty cycle ≤ 2%.
5. Repetitive rating; pulse width limited by maximum junction temperature.

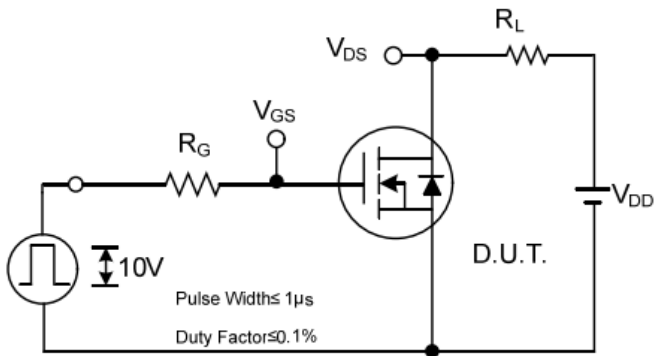
TEST CIRCUIT AND WAVEFORM



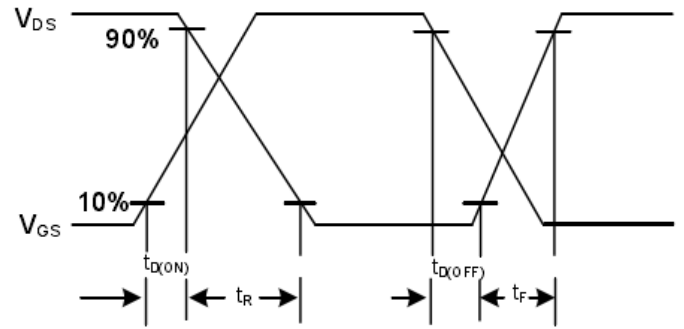
Peak Diode Recovery dv/dt Test Circuit



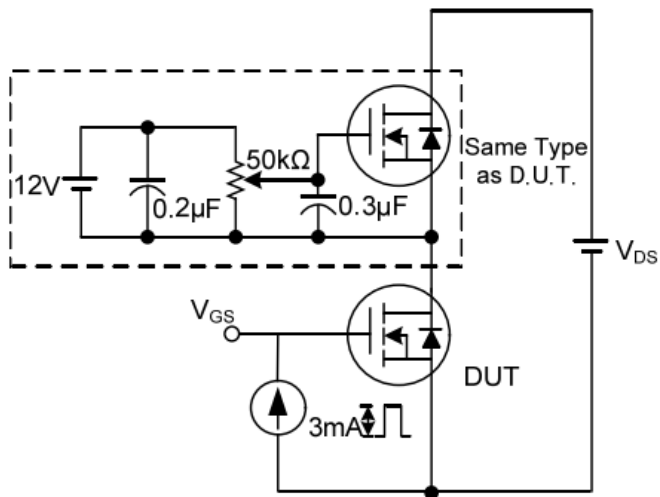
Peak Diode Recovery dv/dt Waveforms



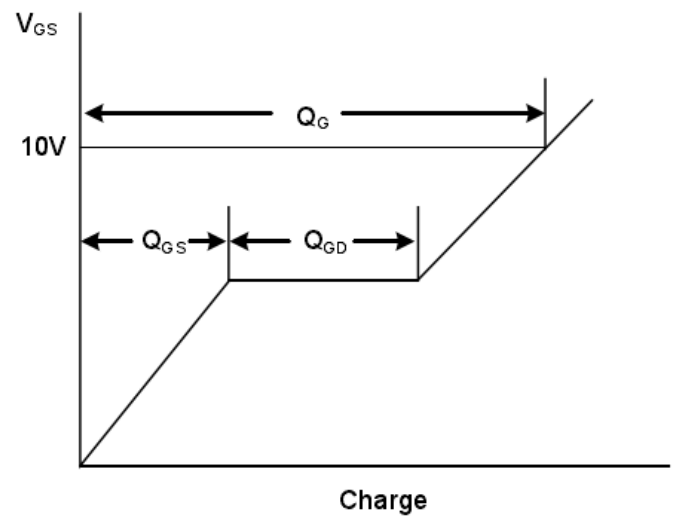
Switching Test Circuit



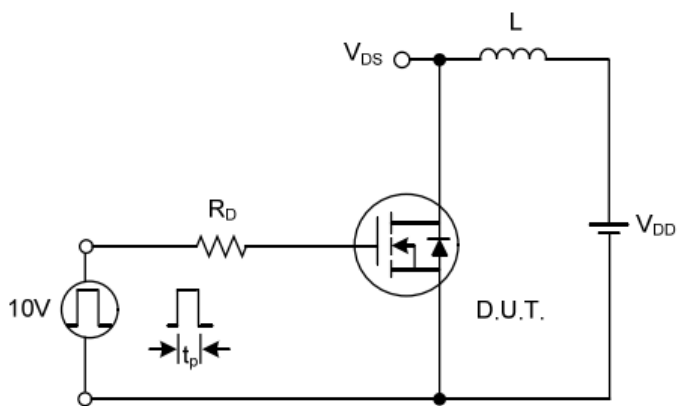
Switching Waveforms



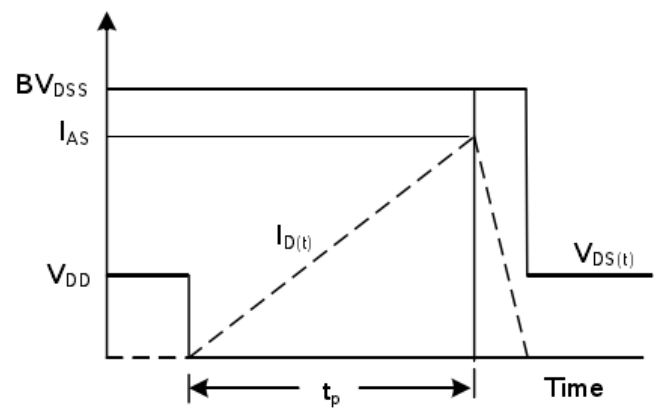
Gate Charge Test Circuit



Gate Charge Waveform

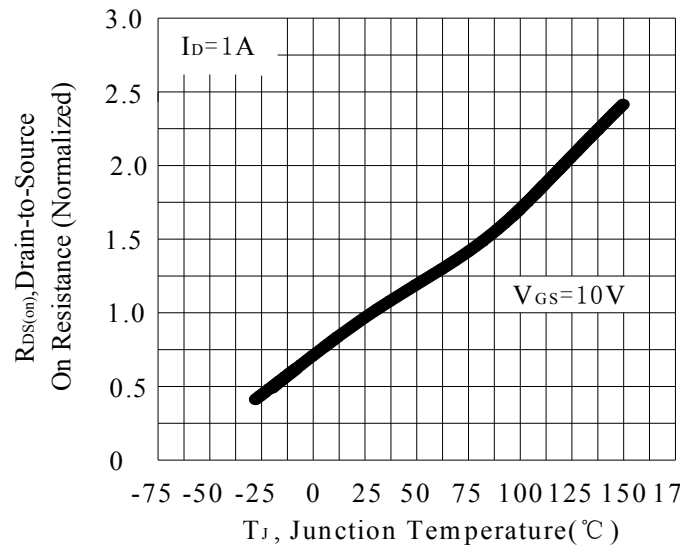
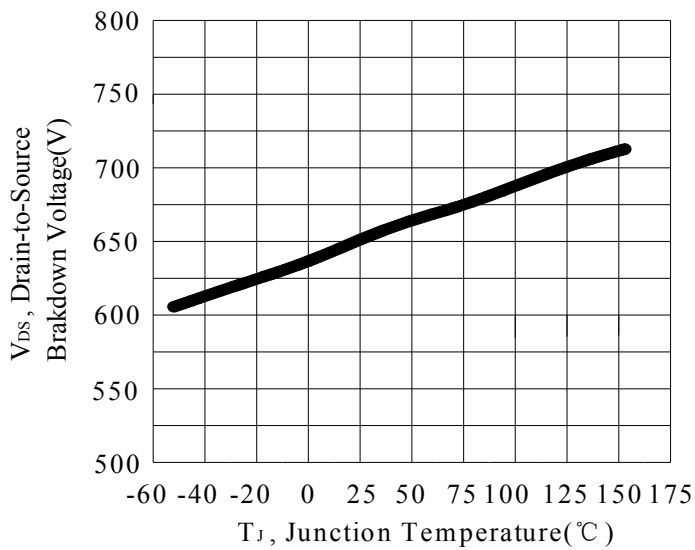
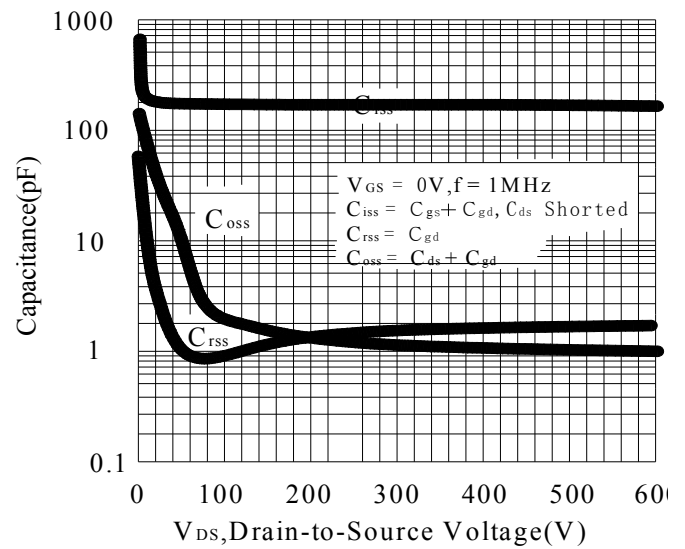
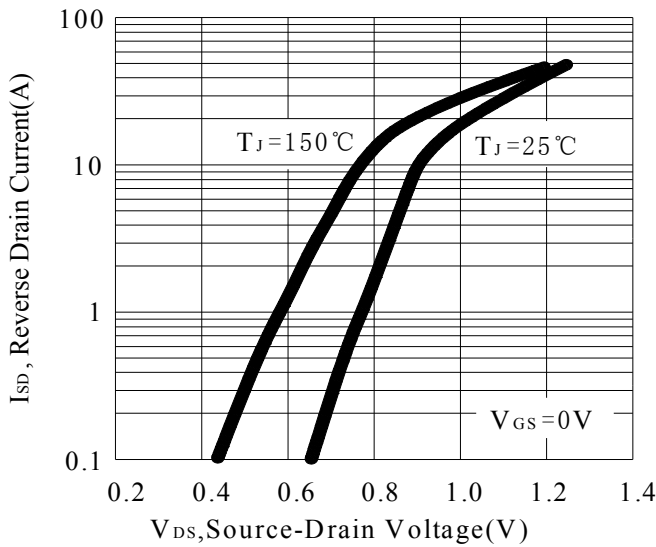
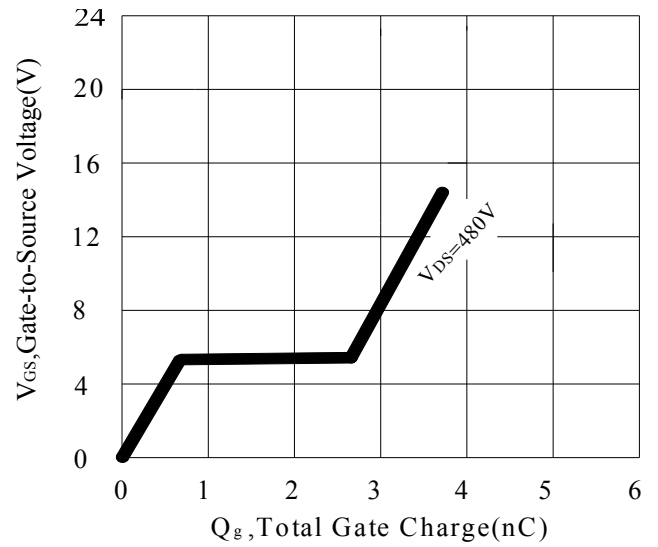
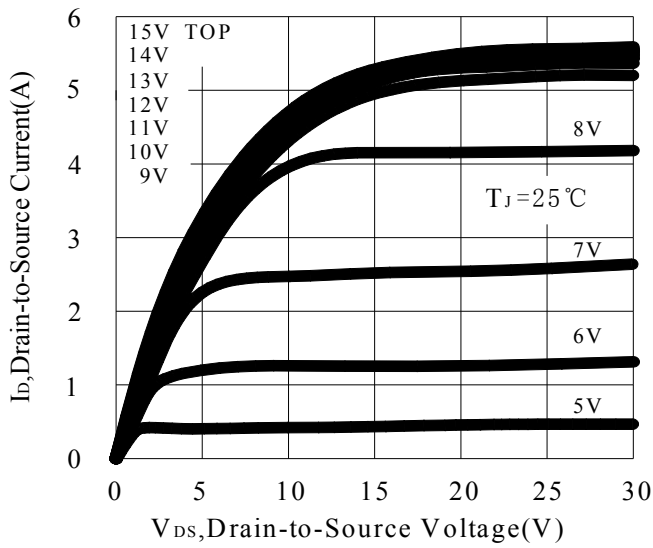


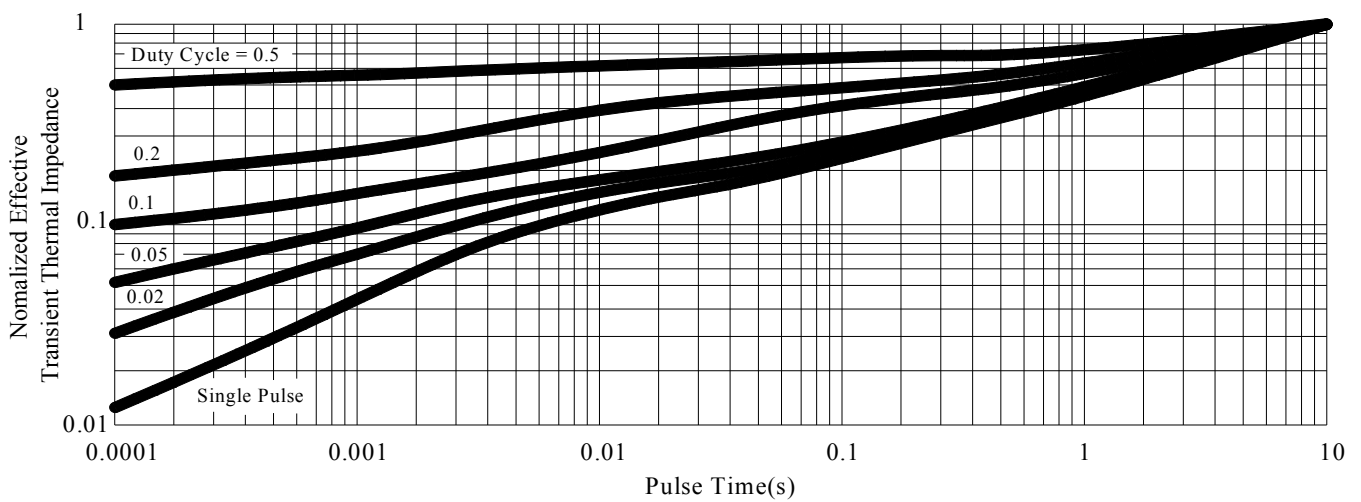
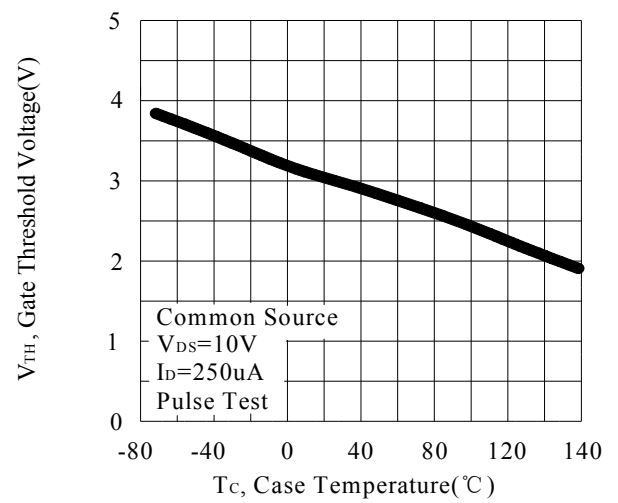
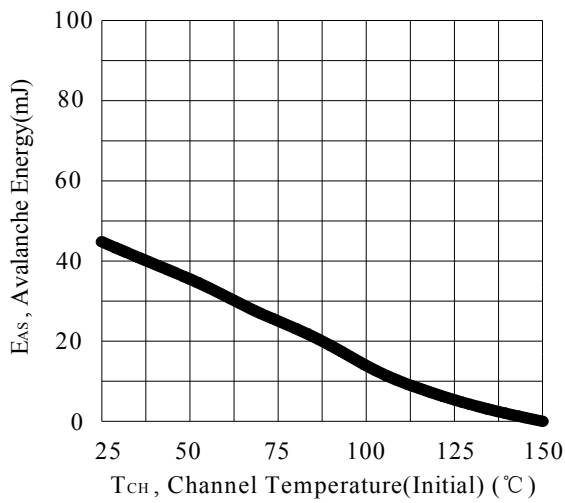
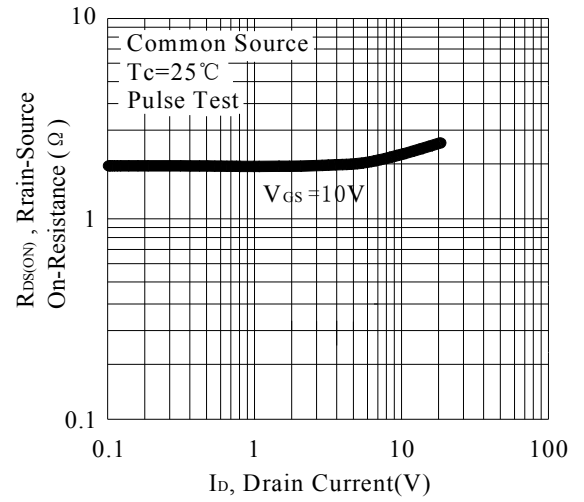
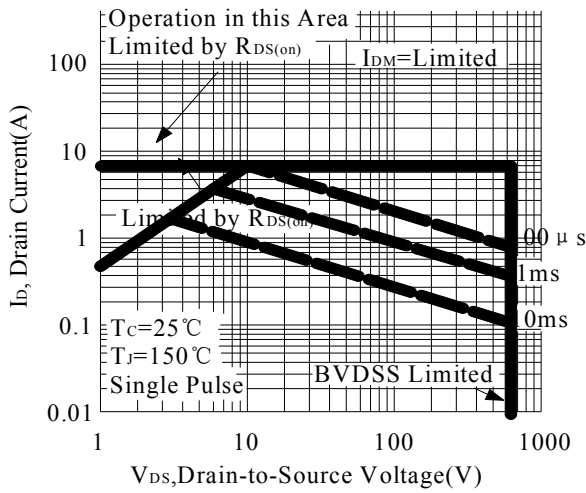
Unclamped Inductive Switching Test Circuit



Unclamped Inductive Switching Waveforms

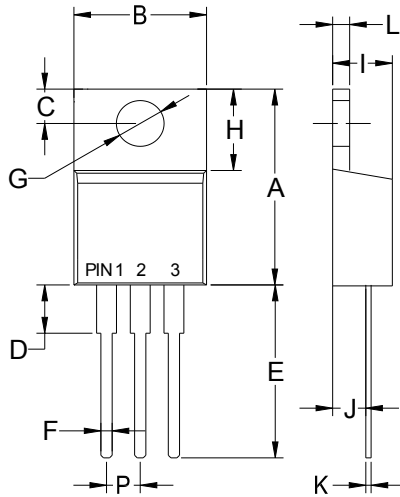
RATING AND CHARACTERISTIC CURVES





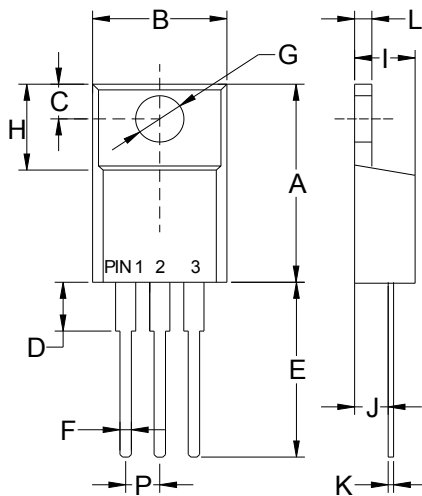
PACKAGE OUTLINE DIMENSIONS

TO-220AB



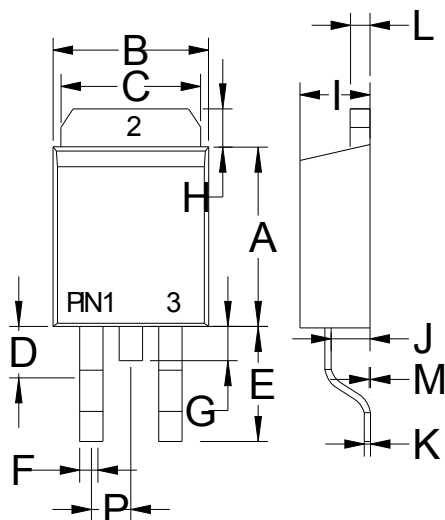
TO-220AB		
Dim	Min	Max
A	.573 (14.55)	.603 (15.32)
B	—	.412 (10.5)
C	.103 (2.62)	.113 (2.87)
D	.140 (3.56)	.160 (4.06)
E	.510 (13.0)	.560 (14.3)
F	.027 (0.68)	.037 (0.94)
G	.148 (3.74)	.154 (3.91)
H	.230 (5.84)	.270 (6.86)
I	.175 (4.44)	.185 (4.86)
J	.100 (2.54)	.110 (2.79)
K	.014 (0.35)	.025 (0.64)
L	.045 (1.14)	.055 (1.40)
P	.095 (2.41)	.105 (2.67)

ITO-220AB



ITO-220AB		
Dim	Min	Max
A	.571 (14.5)	.610 (15.5)
B	.383 (9.72)	.406 (10.3)
C	.110 (2.80)	.126 (3.20)
D	.133 (3.38)	.162 (4.10)
E	.512 (13.0)	.551 (14.0)
F	.028 (0.70)	.035 (0.90)
G	.114 (2.90)	.138 (3.50)
H	.268 (6.80)	.291 (7.40)
I	.162 (4.10)	.185 (4.70)
J	.102 (2.60)	.110 (2.80)
K	.018 (0.45)	.026 (0.65)
L	.097 (2.46)	.113 (2.86)
P	.890 (2.25)	.113 (2.85)

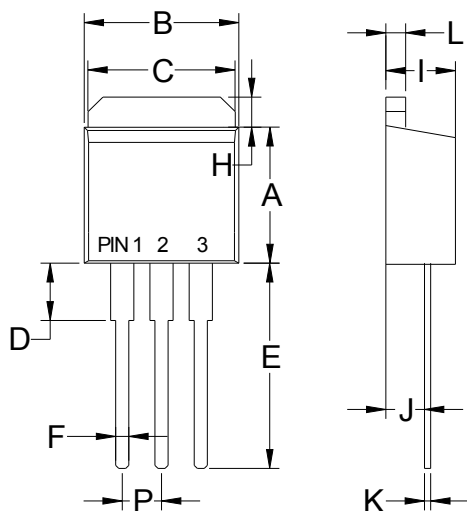
TO-263



TO-263		
Dim	Min	Max
A	.323 (8.20)	.348 (8.85)
B	.394 (10.0)	.413 (10.5)
C	.394 (10.0)	.402 (10.2)
D	.077 (1.95)	.100 (2.55)
E	.204 (5.17)	.227 (5.77)
F	.027 (0.68)	.037 (0.94)
G	--	.067 (1.70)
H	.046 (1.17)	.053 (1.34)
I	.175 (4.44)	.191 (4.86)
J	.100 (2.54)	.110 (2.79)
K	.014 (0.35)	.025 (0.64)
L	.047 (1.20)	.055 (1.40)
M	.000 (0.00)	.010 (0.25)
P	.095 (2.41)	.105 (2.67)

Dimensions in inches and (millimeters)

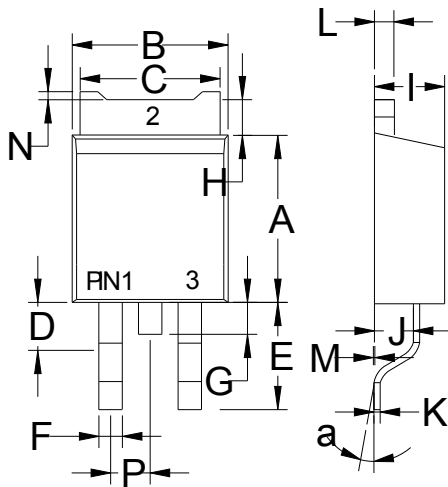
TO-262



TO-262		
Dim	Min	Max
A	.323 (8.20)	.348 (8.85)
B	.394 (10.0)	.413 (10.5)
C	.394 (10.0)	.402 (10.2)
D	.140 (3.56)	.160 (4.06)
E	.510 (13.0)	.560 (14.3)
F	.027 (0.68)	.037 (0.94)
H	.046 (1.17)	.053 (1.34)
I	.175 (4.44)	.185 (4.86)
J	.100 (2.54)	.110 (2.79)
K	.014 (0.35)	.025 (0.64)
L	.045 (1.14)	.055 (1.40)
P	.095 (2.41)	.105 (2.67)

Dimensions in inches and (millimeters)

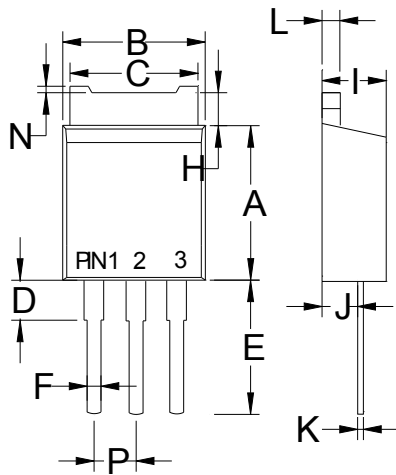
TO-252



TO-252		
Dim	Min	Max
A	.230 (5.85)	.246 (6.25)
B	.250 (6.35)	.264 (6.75)
C	.207 (5.27)	.218 (5.54)
D	.037 (0.93)	.045 (1.14)
E	.106 (2.70)	.138 (3.50)
F	.028 (0.72)	.033 (0.84)
G	.024 (0.60)	.041 (1.05)
H	.028 (0.72)	.043 (1.10)
I	.085 (2.15)	.096 (2.45)
J	.037 (0.95)	.047 (1.20)
K	.018 (0.45)	.026 (0.65)
L	.018 (0.45)	.024 (0.60)
P	.081 (2.05)	.094 (2.40)
M	.000 (0.00)	.006 (0.15)
N	--	.008 (0.20)
a	0°	10°

Dimensions in inches and (millimeters)

TO-251



TO-251		
Dim	Min	Max
A	.230 (5.85)	.246 (6.25)
B	.250 (6.35)	.266 (6.75)
C	.207 (5.27)	.218 (5.54)
D	.037 (0.93)	.045 (1.14)
E	.173 (4.40)	.205 (5.20)
F	.028 (0.72)	.033 (0.84)
H	.028 (0.70)	.043 (1.10)
I	.085 (2.15)	.096 (2.45)
J	.037 (0.95)	.047 (1.20)
K	.018 (0.45)	.026 (0.65)
L	.018 (0.45)	.024 (0.60)
N	--	.008 (0.20)
P	.081 (2.05)	.094 (2.40)

Dimensions in inches and (millimeters)