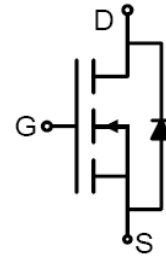


## N-Channel Power MOSFET

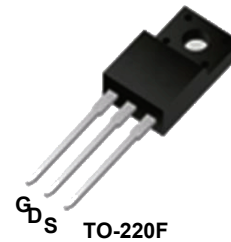
### Features

- Fast Switching
- Low ON Resistance( $R_{dson} \leq 2.4\Omega$ )
- Low Gate Charge (Typical Data:14.5nC)
- Low Reverse transfer capacitances(Typical:3.5pF)
- 100% Single Pulse avalanche energy Test
- Halogen Free



### Applications

Power switch circuit of adaptor and charger.



### Absolute (T<sub>c</sub>= 25°C unless otherwise specified ):

Symbol	Parameter	Rating	Units
V <sub>DSS</sub>	Drain-to-Source Voltage	650	V
I <sub>D</sub>	Continuous Drain Current	4.0	A
	Continuous Drain Current T <sub>C</sub> = 100 °C	2.5	A
I <sub>DM</sub> <sup>a1</sup>	Pulsed Drain Current	16	A
V <sub>GS</sub>	Gate-to-Source Voltage	±30	V
E <sub>AS</sub> <sup>a2</sup>	Single Pulse Avalanche Energy	200	mJ
dv/dt <sup>a3</sup>	Peak Diode Recovery dv/dt	5.0	V/ns
P <sub>D</sub>	Power Dissipation	30	W
	Derating Factor above 25°C	0.24	W/°C
T <sub>J</sub> , T <sub>stg</sub>	Operating Junction and Storage Temperature Range	150, -55 to 150	°C
T <sub>L</sub>	Maximum Temperature for Soldering	300	°C

### Electrical Characteristics (T<sub>c</sub>= 25°C unless otherwise specified):

OFF Characteristics						
Symbol	Parameter	Test Conditions	Rating			Unit
			Min.	Typ.	Max.	
V <sub>DSS</sub>	Drain to Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	650	--	--	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	Bvdss Temperature Coefficient	I <sub>D</sub> =250uA,Reference25°C	--	0.67	--	V/°C
I <sub>DSS</sub>	Drain to Source Leakage Current	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V, T <sub>a</sub> = 25°C	--	--	1	μA
		V <sub>DS</sub> =520V, V <sub>GS</sub> = 0V, T <sub>a</sub> = 125°C	--	--	100	μA
I <sub>GSS(F)</sub>	Gate to Source Forward Leakage	V <sub>GS</sub> =+30V	--	--	100	nA
I <sub>GSS(R)</sub>	Gate to Source Reverse Leakage	V <sub>GS</sub> =-30V	--	--	-100	nA

<b>ON Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$R_{DS(ON)}$	Drain-to-Source On-Resistance	$V_{GS}=10V, I_D=2A$	--	2.4	2.8	$\Omega$
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0	--	4.0	V
Pulse width $t_p \leq 300\mu s, \delta \leq 2\%$						
<b>Dynamic Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$g_{fs}$	Forward Transconductance	$V_{DS}=15V, I_D=2A$	--	3.5	--	S
$C_{iss}$	Input Capacitance	$V_{GS} = 0V, V_{DS} = 25V$ $f = 1.0MHz$	--	610	--	pF
$C_{oss}$	Output Capacitance		--	53	--	
$C_{rss}$	Reverse Transfer Capacitance		--	3.5	--	
<b>Resistive Switching Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$t_{d(ON)}$	Turn-on Delay Time	$I_D = 4A, V_{DD} = 325V$ $R_G = 10\Omega$	--	14	--	ns
$t_r$	Rise Time		--	16	--	
$t_{d(OFF)}$	Turn-Off Delay Time		--	32	--	
$t_f$	Fall Time		--	11	--	
$Q_g$	Total Gate Charge	$I_D = 4A, V_{DD} = 520V$ $V_{GS} = 10V$	--	14.5	--	nC
$Q_{gs}$	Gate to Source Charge		--	3	--	
$Q_{gd}$	Gate to Drain ("Miller") Charge		--	6.5	--	
<b>Source-Drain Diode Characteristics</b>						
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
$I_S$	Continuous Source Current (Body Diode)		--	--	4	A
$I_{SM}$	Maximum Pulsed Current (Body Diode)		--	--	16	A
$V_{SD}$	Diode Forward Voltage	$I_S=4A, V_{GS}=0V$	--	--	1.5	V
$t_{rr}$	Reverse Recovery Time	$I_S=4A, T_J = 25^\circ C$ $di_f/dt=100A/\mu s,$ $V_{GS}=0V$	--	256	--	ns
$Q_{rr}$	Reverse Recovery Charge		--	1200	--	nC
$I_{RRM}$	Reverse Recovery Current		--	9.4	--	A
Pulse width $t_p \leq 300\mu s, \delta \leq 2\%$						
Symbol	Parameter		Typ.			Units
$R_{\theta JC}$	Junction-to-Case		4.17			$^\circ C/W$
$R_{\theta JA}$	Junction-to-Ambient		62.5			$^\circ C/W$

<sup>a1</sup>: Repetitive rating; pulse width limited by maximum junction temperature

<sup>a2</sup>:  $L=10mH, I_D=6.3A, Start T_J=25^\circ C$

<sup>a3</sup>:  $I_{SD}=4A, di/dt \leq 100A/\mu s, V_{DD} \leq BV_{DS}, Start T_J=25^\circ C$

### Typical Performance Characteristics

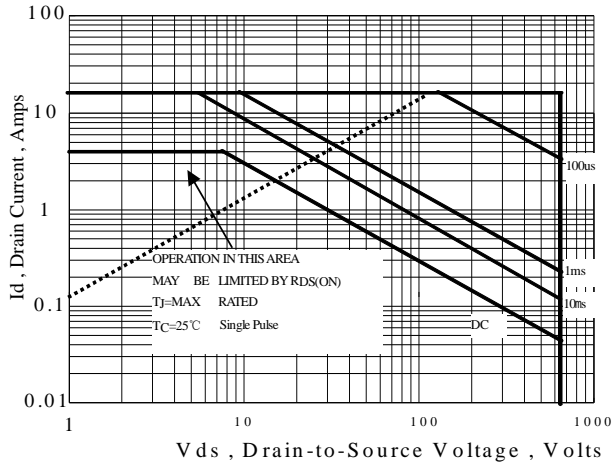


Figure 1 Maximum Forward Bias Safe Operating Area

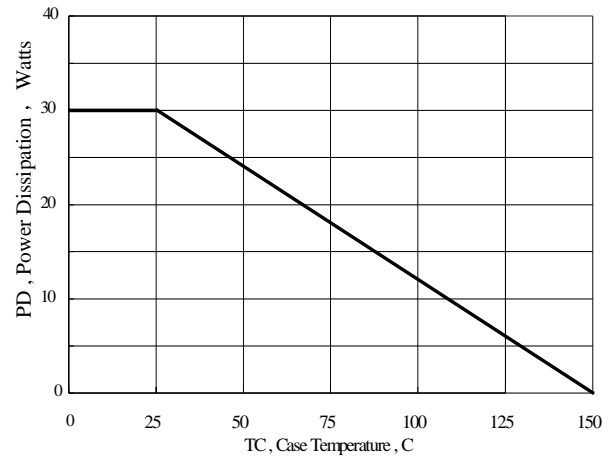


Figure 2 Maximum Power Dissipation vs Case Temperature

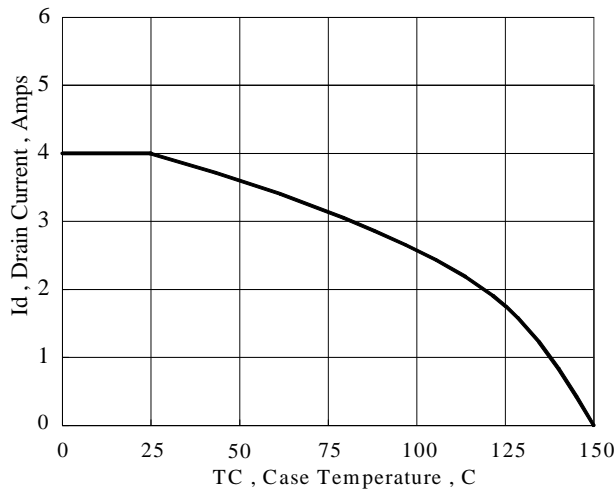


Figure 3 Maximum Continuous Drain Current vs Case Temperature

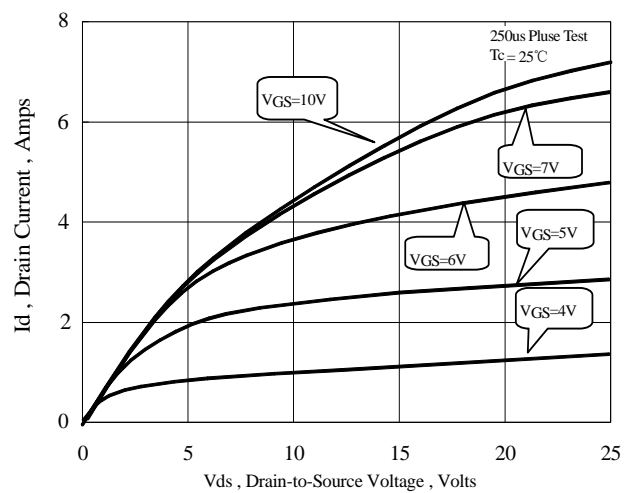


Figure 4 Typical Output Characteristics

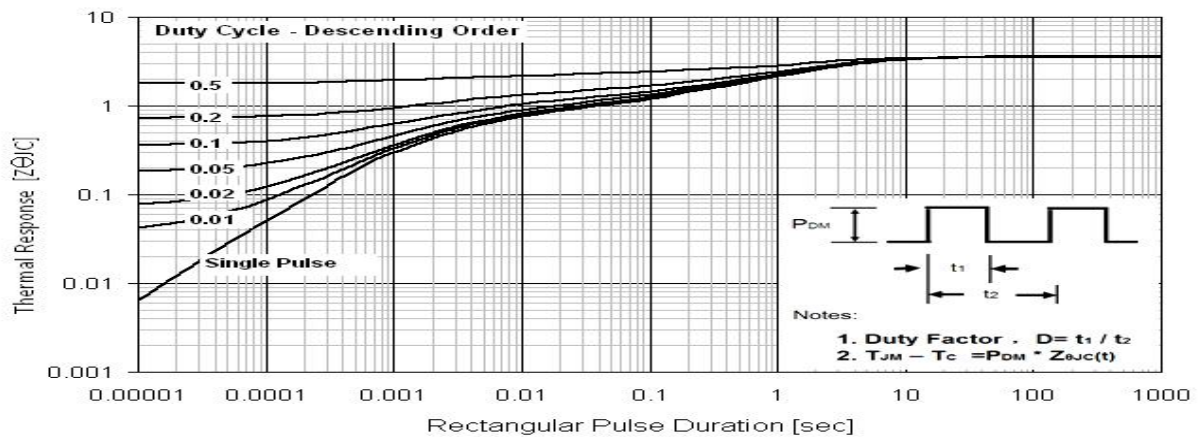


Figure 5 Maximum Effective Thermal Impedance, Junction to Case

### Typical Operating Characteristics (Cont.)

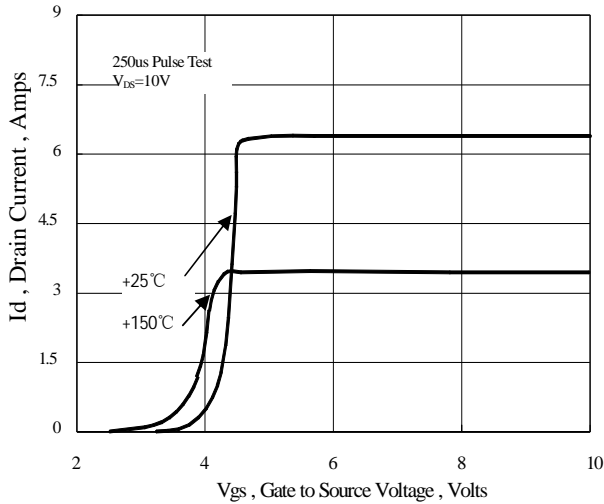


Figure 6 Typical Transfer Characteristics

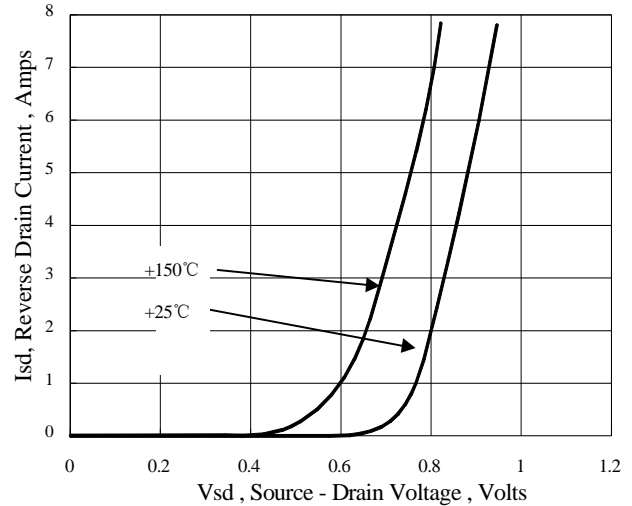


Figure 7 Typical Body Diode Transfer Characteristics

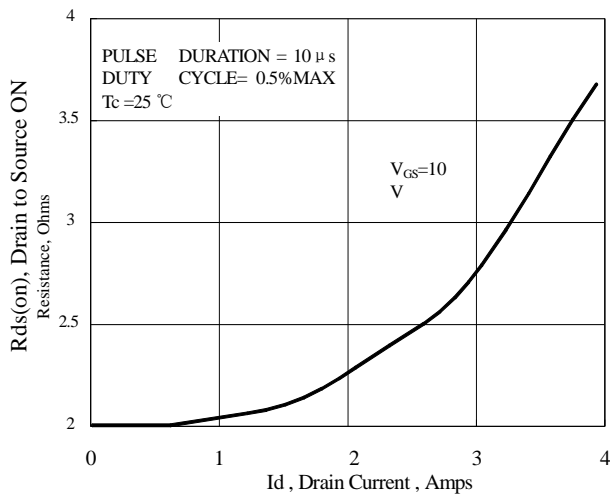


Figure 8 Typical Drain to Source ON Resistance vs Drain Current

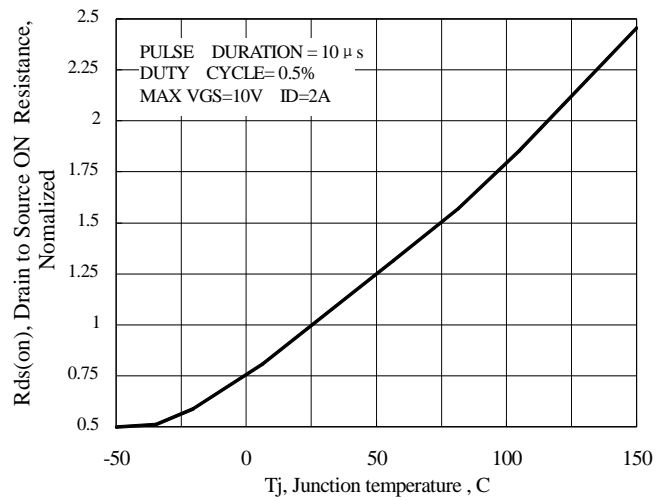


Figure 9 Typical Drain to Source on Resistance vs Junction Temperature

## Typical Operating Characteristics (Cont.)

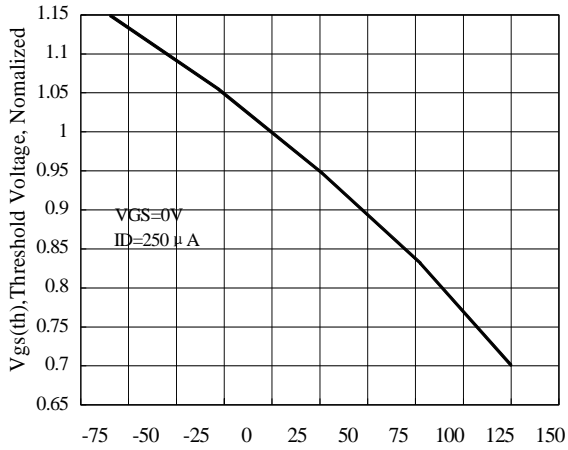


Figure 10 Typical Threshold Voltage vs Junction Temperature

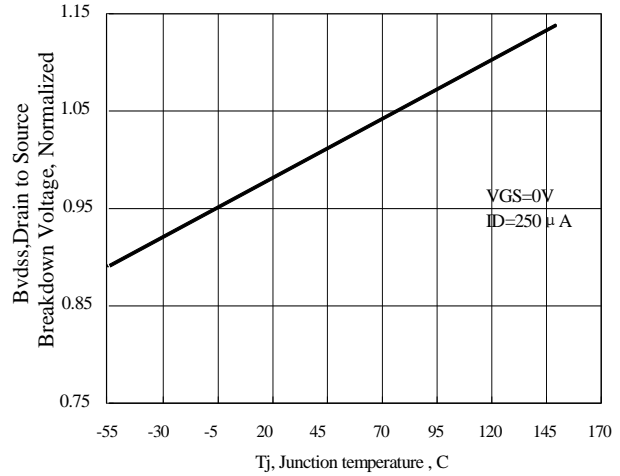


Figure 11 Typical Breakdown Voltage vs Junction Temperature

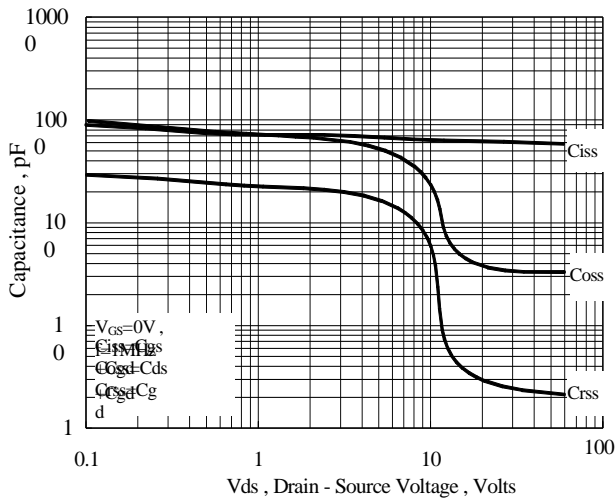


Figure 12 Typical Capacitance vs Drain to Source Voltage

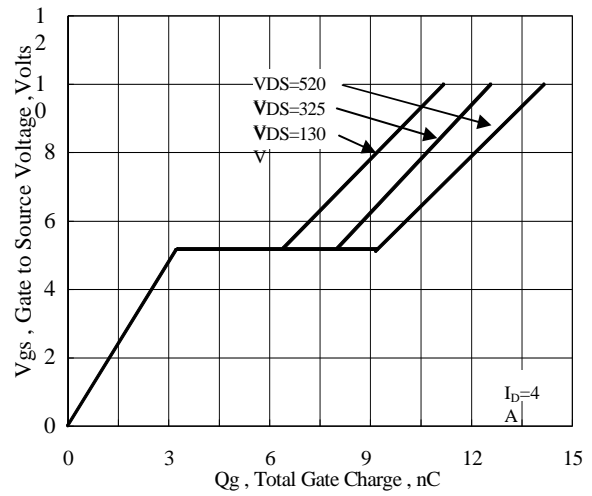


Figure 13 Typical Gate Charge vs Gate to Source Voltage

## Test Circuit and Waveform

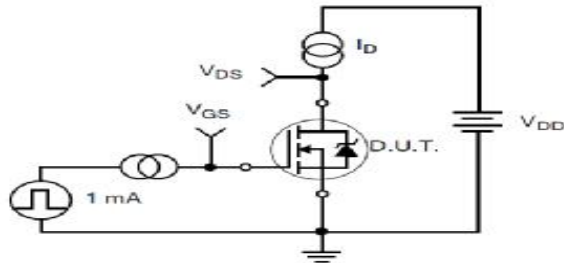


Figure 17. Gate Charge Test Circuit

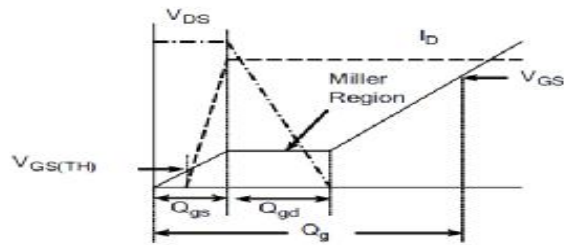


Figure 18. Gate Charge Waveform

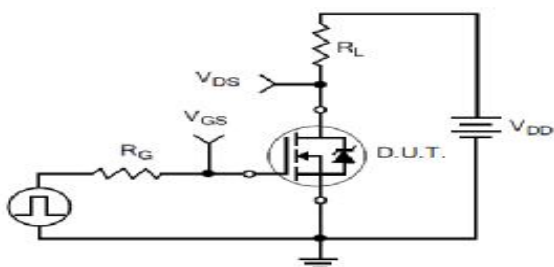


Figure 19. Resistive Switching Test Circuit

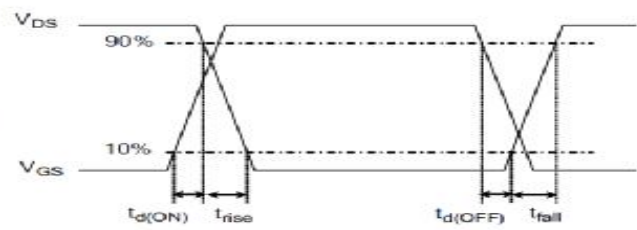


Figure 20. Resistive Switching Waveforms

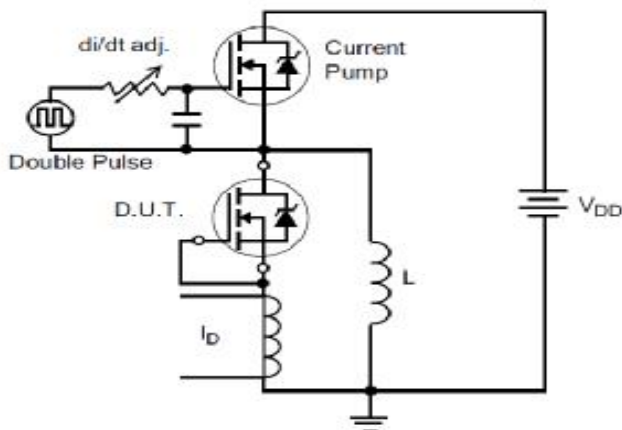


Figure 21. Diode Reverse Recovery Test Circuit

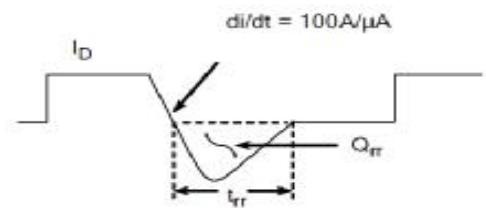


Figure 22. Diode Reverse Recovery Waveform

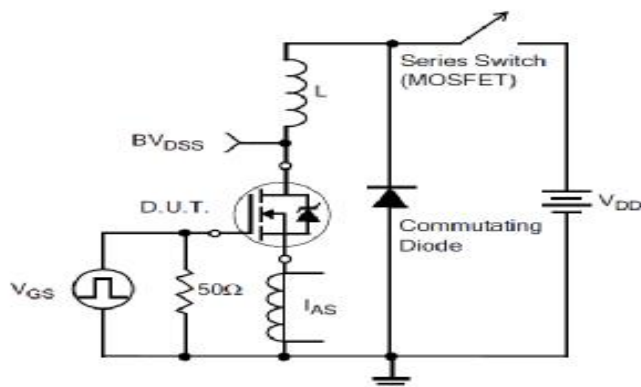


Figure 23. Unclamped Inductive Switching Test Circuit

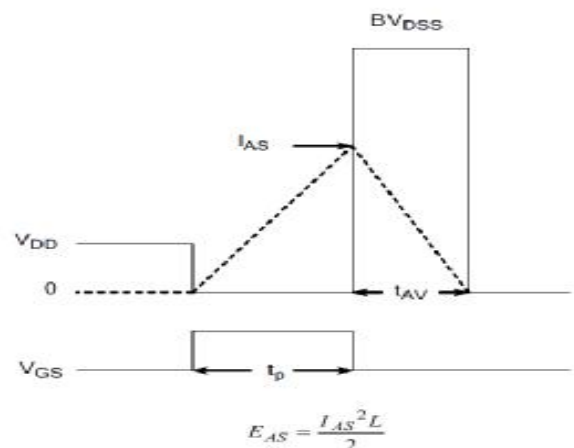
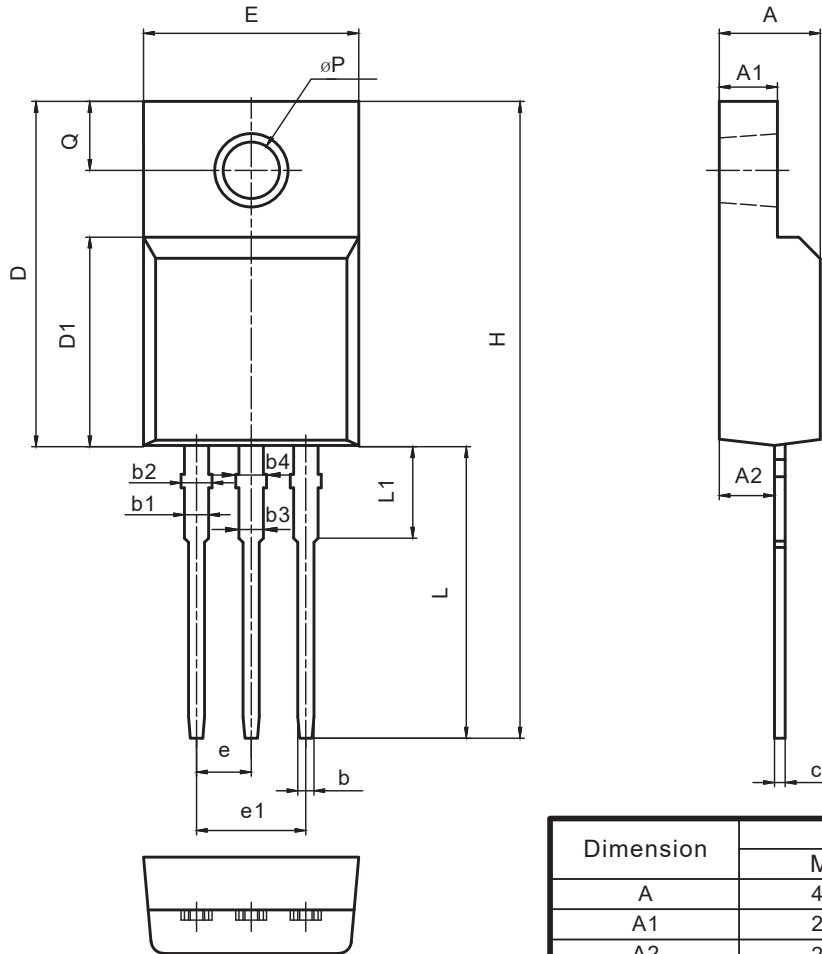


Figure 24. Unclamped Inductive Switching Waveforms

### Package Outlines



Dimension	Millimeters	
	Min.	Max.
A	4.50	4.90
A1	2.34	2.85
A2	2.42	2.86
b	0.65	0.90
b1	0.95	1.38
b2	0.95	1.51
b3	0.65	1.38
b4	0.65	1.51
c	0.40	0.63
D	15.67	16.15
D1	8.97	9.83
E	10.00	10.65
e	2.54 (BSC)	
e1	5.08	
H	28.70	29.75
L	12.78	13.75
L1	2.83	3.45
$\phi P$	2.95	3.38
Q	3.15	3.50

Figure 1 Outline PG-TO220F, dimensions in mm

### Revision history

Date	Revision	Changes
28-May-2020	1.0	Initial release

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