

SJMOS N-MOSFET 650V, 0.27Ω, 13A

Features

- Much lower $R_{on} \cdot A$ performance for On-state efficiency
- Better efficiency due to very low FOM
- Qualified for industrial grade applications according to JEDEC

Applications

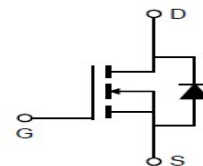
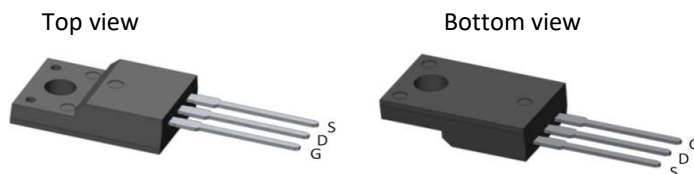
- LED/LCD/PDP TV and monitor Lighting
- Solar/Renewable/UPS-Micro Inverter System
- Charger
- Power Supply

Product Summary

$V_{DS,min}$	650V
$R_{DS(on),typ}$	0.27Ω
I_D	13A

100% DVDS Tested

100% Avalanche Tested



Package Marking and Ordering Information

Part #	Marking	Package	Packing	Reel Size	Tape Width	Qty
HMS13N65F	-	TO220F	Tube	N/A	N/A	50pcs

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Drain-source voltage	V_{DS}	650	V
Continuous drain current ¹⁾ $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_D	13 8	A
Pulsed drain current ²⁾ ($T_C = 25^\circ\text{C}$, t_p limited by $T_{j,max}$)	$I_{D,pulse}$	53	A
Avalanche energy, single pulse ($L=30\text{mH}$)	E_{AS}	120	mJ
MOSFET dv/dt ruggedness	dv/dt	50	V/ns
Gate-Source voltage	V_{GS}	± 30	V
Power dissipation ($T_C = 25^\circ\text{C}$)	P_{tot}	21	W
Continuous diode forward current ($T_C = 25^\circ\text{C}$)	I_S	13	A
Diode pulse current ²⁾ ($T_C = 25^\circ\text{C}$)	$I_{S,pulse}$	53	A
Recovery diode dv/dt ³⁾	dv/dt	50	V/ns
Operating junction and storage temperature	T_j, T_{stg}	-55...+150	$^\circ\text{C}$

1) Limited by $T_{j,max}$. Maximum Duty Cycle $D = 0.50$; TO-252 equivalent

2) Pulse width t_p limited by $T_{j,max}$

3) Identical low side and high side switch with identical R_g

Thermal Resistance

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Thermal resistance, junction – case	R_{thJC}	-	4.17	5.84	°C/W	
Thermal resistance, junction – ambient	R_{thJA}	-	-	64	°C/W	

Electrical Characteristic (at $T_j=25^{\circ}\text{C}$, unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

Static Characteristic

Drain-source breakdown voltage	BV_{DSS}	650	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{GS(th)}$	2.8	-	3.8	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	I_{DSS}	-	-	1	μA	$V_{DS}=650V, V_{GS}=0V$ $T_j=25^{\circ}\text{C}$
		-	5	-		$T_j=150^{\circ}\text{C}$
Gate-source leakage current	I_{GSS}	-	-	± 100	nA	$V_{GS}=\pm 30V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	0.27	0.30	Ω	$V_{GS}=10V, I_D=7.5A$ $T_j=25^{\circ}\text{C}$
		-	0.7	-		$T_j=150^{\circ}\text{C}$
Transconductance	g_{fs}	-	11	-	S	$V_{DS}=20V, I_D=7.5A$

Dynamic Characteristic

Input Capacitance	C_{iss}	-	750	-	pF	$V_{GS}=0V, V_{DS}=100V,$ $f=1\text{MHz}$
Output Capacitance	C_{oss}	-	40	-		
Reverse Transfer Capacitance	C_{rss}	-	1.4	-		
Gate Total Charge	Q_g	-	23.5	-	nC	$V_{GS}=10V, V_{DS}=480V,$ $I_D=7.5A$
Gate-Source charge	Q_{gs}	-	5	-		
Gate-Drain charge	Q_{gd}	-	10	-		
Gate plateau voltage	$V_{plateau}$	-	5.6	-	V	
Turn-on delay time	$t_{d(on)}$	-	14	-	ns	$V_{GS}=10V, I_D=7.5A,$ $V_{DS}=400V, R_g=25\Omega$
Rise time	t_r	-	24	-		
Turn-off delay time	$t_{d(off)}$	-	97	-		
Fall time	t_f	-	22	-		
Gate resistance	$R_{g,int}$	-	6.5	-	Ω	$f=1\text{MHz}$

Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	V_{SD}	0.6	0.86	1.1	V	$V_{GS}=0V, I_{SD}=7.5A$
Body Diode Reverse Recovery Time	t_{rr}	-	250	-	ns	$I_{SD}=7.5A$ $di_F/dt=100A/\mu s$ $V_{DS}=100V$
Body Diode Reverse Recovery Charge	Q_{rr}	-	2.94	-	μC	
Body Diode Reverse Recovery Peak Current	I_{rrm}	-	21	-	A	

Typical Performance Characteristics

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

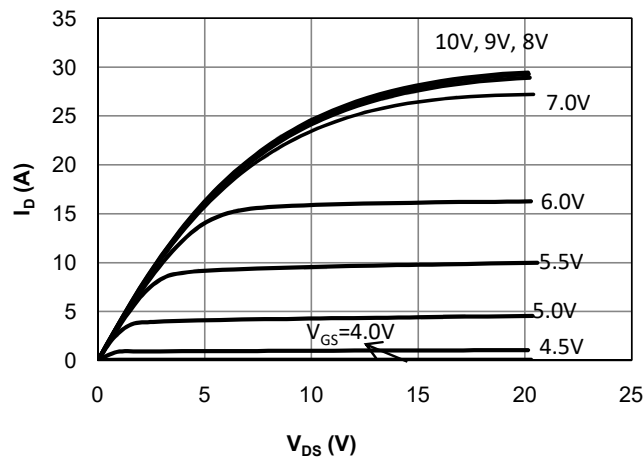


Fig 2. Output Characteristics ($T_J=150^{\circ}\text{C}$)

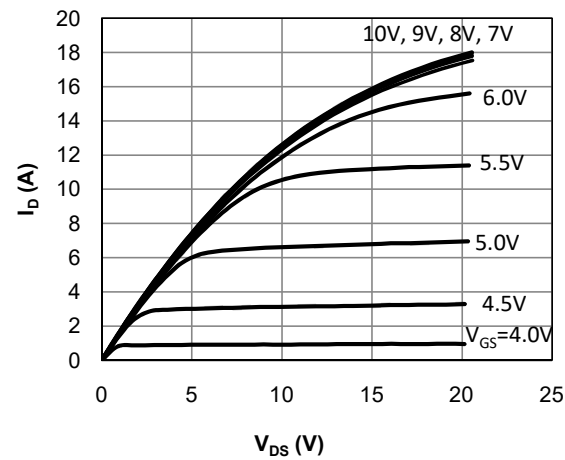


Fig 3: Transfer Characteristics

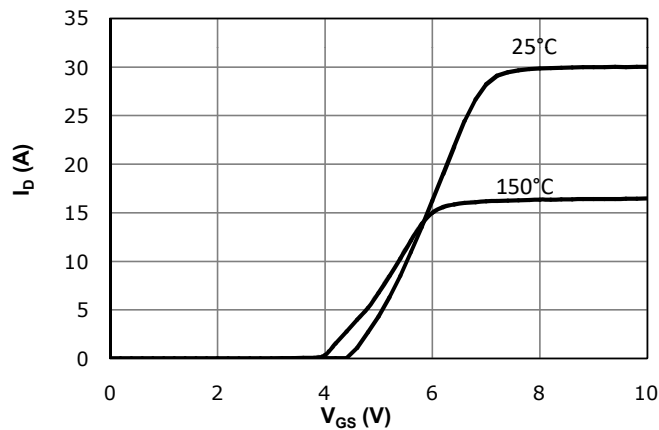


Fig 4: V_{TH} vs. T_J Temperature Characteristics

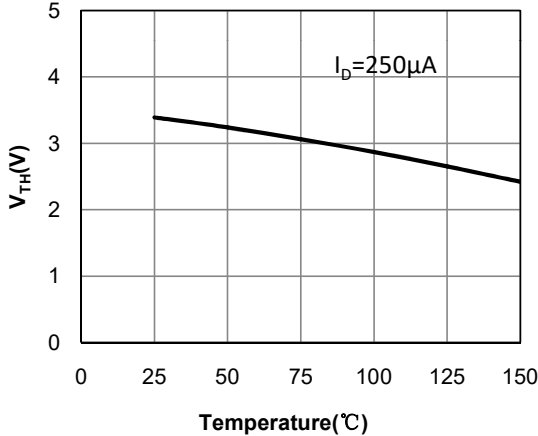


Fig 5: $R_{DS(on)}$ vs. I_{DS} Characteristics ($T_J=25^{\circ}\text{C}$)

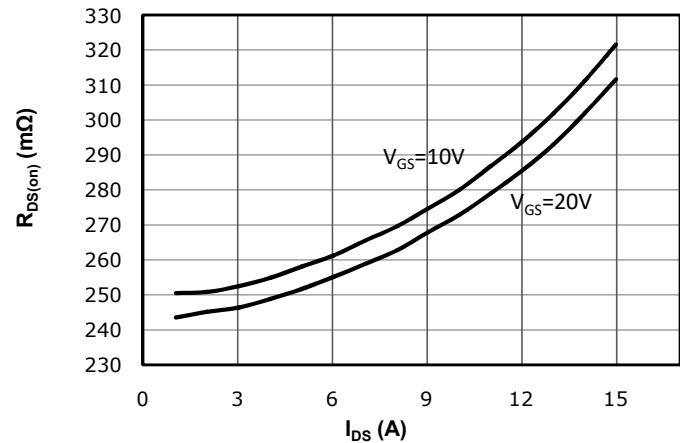


Fig 6: $R_{DS(on)}$ vs. Temperature

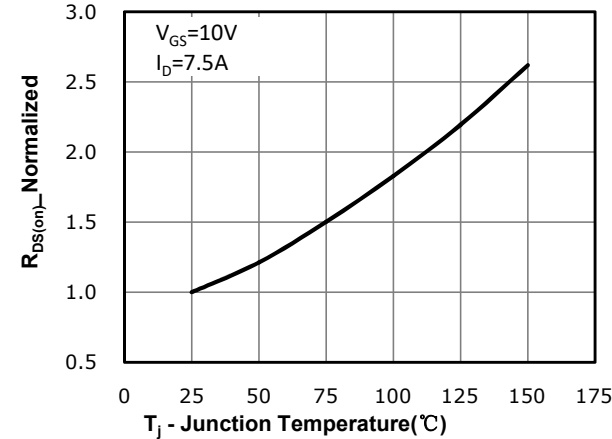


Fig 7: BV_{DSS} vs. Temperature

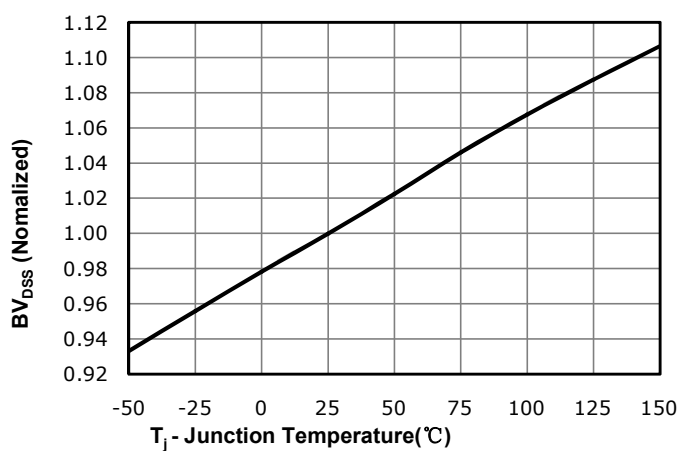


Fig 8: $R_{DS(on)}$ vs. Gate Voltage

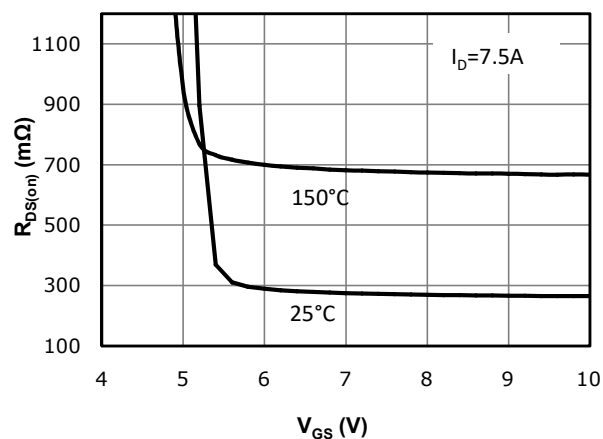


Fig 9: Body-diode Forward Characteristics

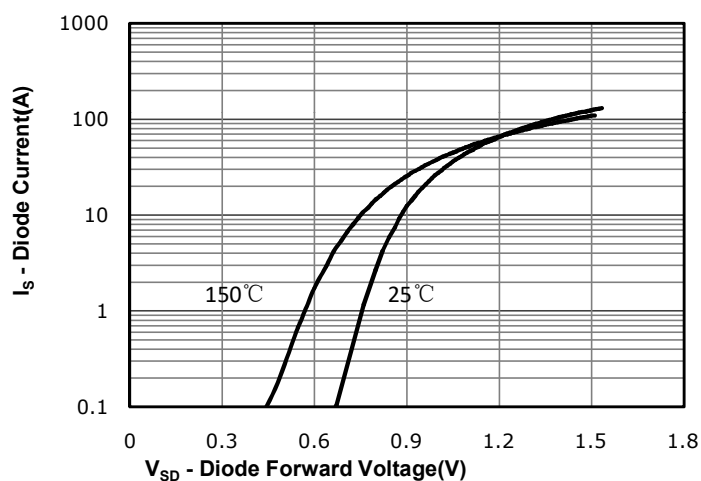


Fig 10: Gate Charge Characteristics

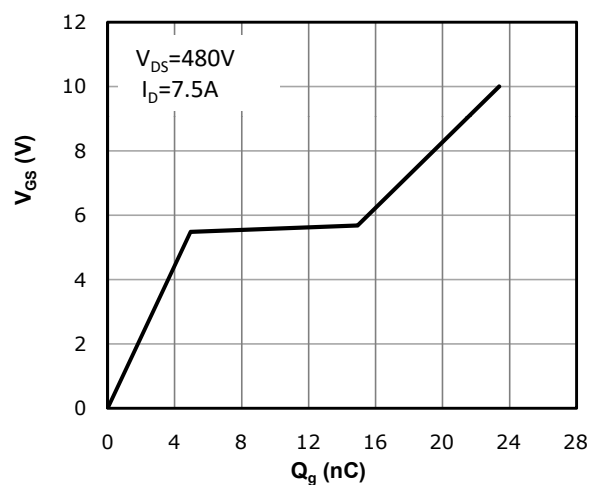


Fig 11: Capacitance Characteristics

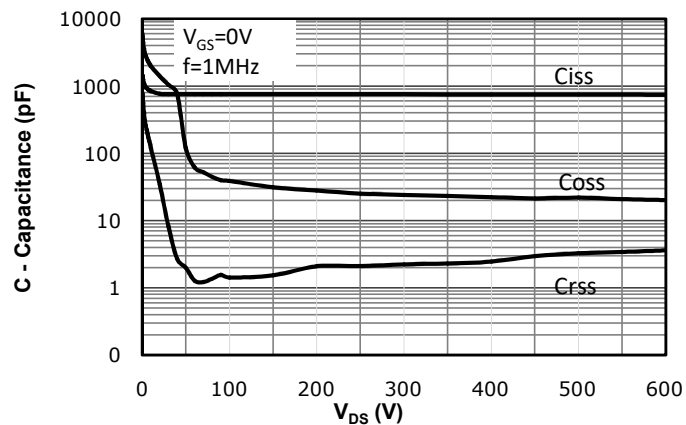
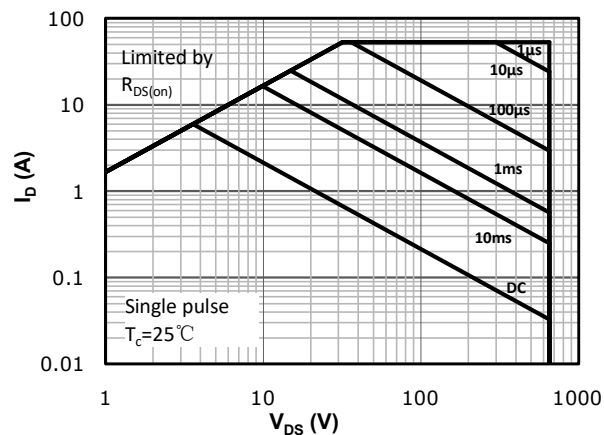
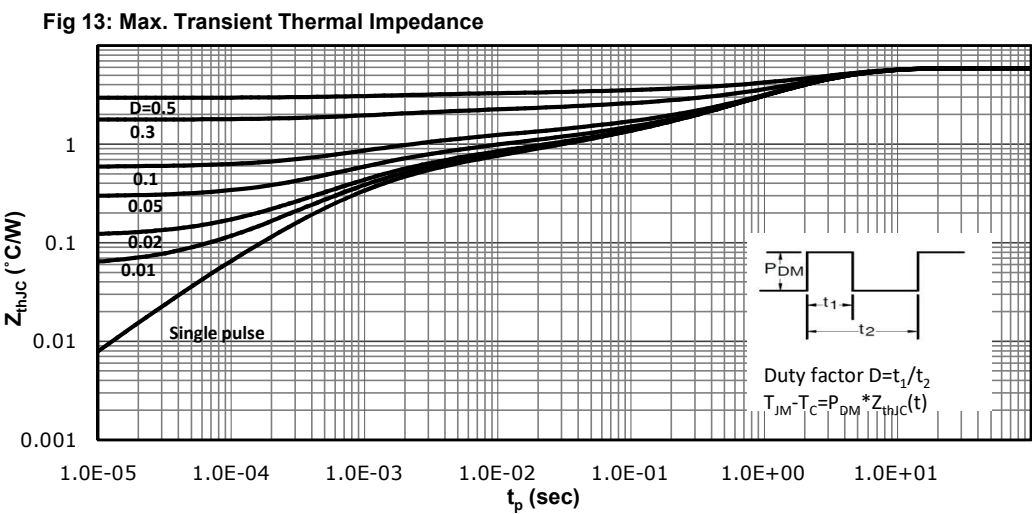


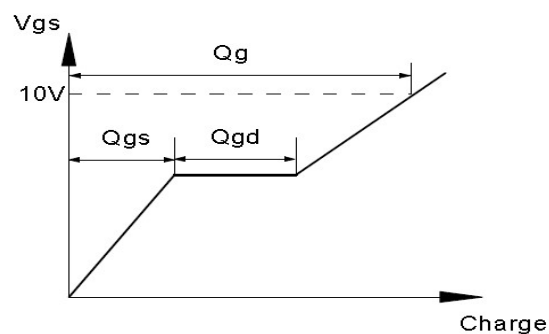
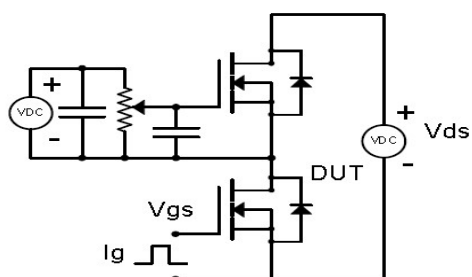
Fig 12: Safe Operating Area



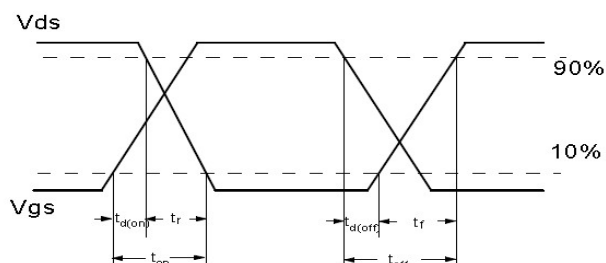
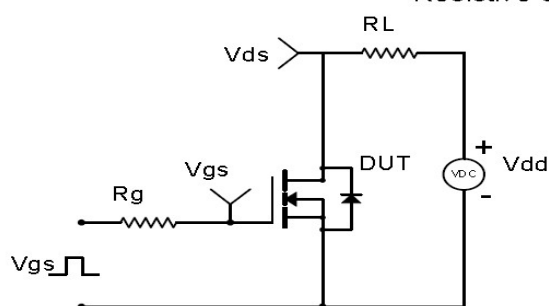


Test Circuit & Waveform

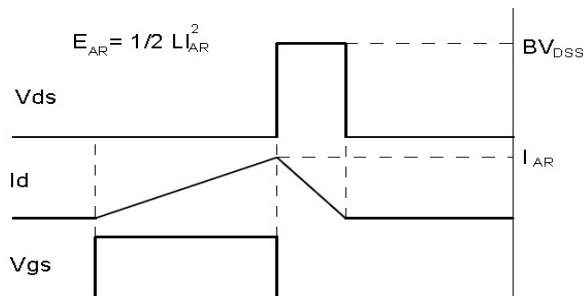
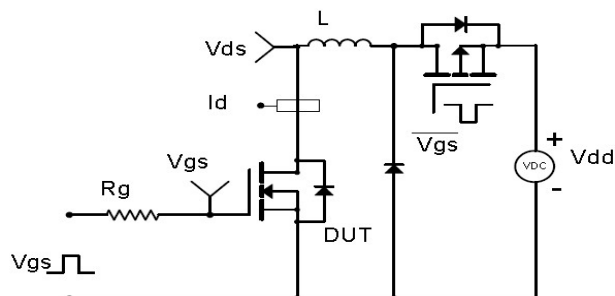
Gate Charge Test Circuit & Waveform



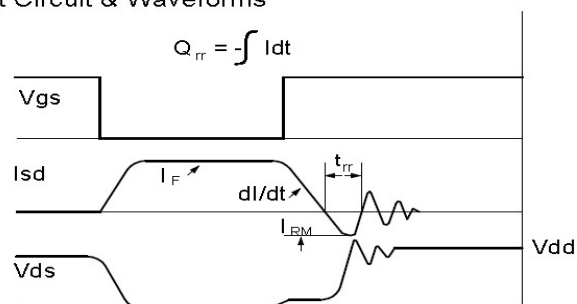
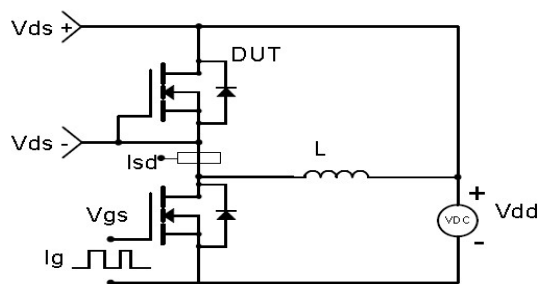
Resistive Switching Test Circuit & Waveforms



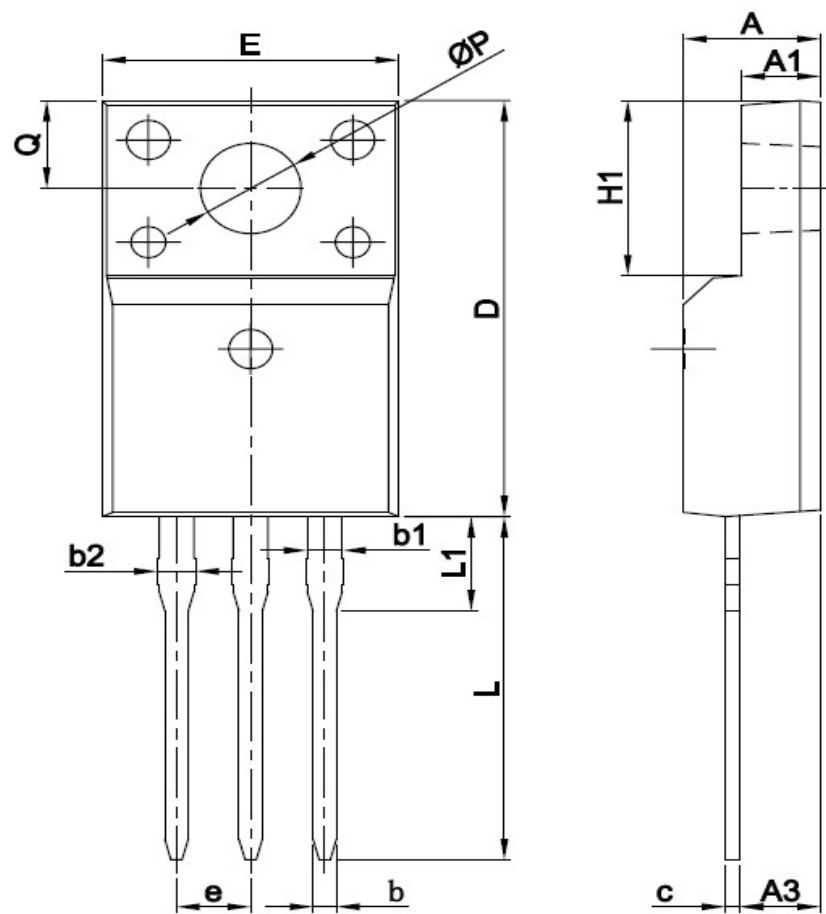
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outline: TO-220F



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.30	4.90	0.169	0.193
A1	2.34	2.87	0.092	0.113
A3	2.20	2.96	0.087	0.117
b	0.60	0.90	0.024	0.035
b1	0.95	1.45	0.037	0.057
b2	1.15	1.55	0.045	0.061
c	0.40	0.70	0.016	0.028
D	15.50	16.17	0.610	0.637
e	2.54 BSC		0.100 BSC	
E	9.70	10.66	0.382	0.420
H1	6.70 REF		0.264 REF	
L	12.46	13.75	0.491	0.541
L1	2.80	3.80	0.110	0.150
Q	3.05	3.55	0.120	0.140
P	2.98	3.38	0.117	0.133