



# BMF65N360E2

## Super Junction Power MOSFET

650 V, 11 A, 360 mΩ

### Description

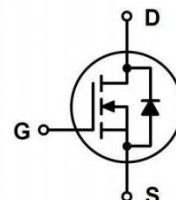
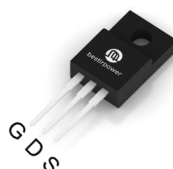
BMF65N360E2 is power MOSFET using bestirpower's advanced super junction technology that can realize very low on-resistance and gate charge.

It will provide much high efficiency by using optimized charge coupling technology. These user friendly devices give an advantage of Low EMI to designers as well as low switching loss.

$BV_{DSS} @ T_{J,max}$	$I_D$	$R_{DS(on),max}$	$Q_{g,typ}$
700 V	11 A	360 mΩ	19 nC

### Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply (UPS)
- Power Factor Correction (PFC)
- Charger



### Features

- Reduced Switching & Conduction Losses
- Lower Switching Noise
- 100% Avalanche Tested
- Halogen Free, and RoHS Compliant



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

Symbol	Parameter		Value	Unit	Note
$V_{DSS}$	Drain to Source Voltage		650	V	
$V_{GSS}$	Gate to Source Voltage		$\pm 30$	V	
$I_D$	Drain Current (continuous)	$V_{GS}=10\text{V}, T_C = 25^\circ\text{C}$	11	A	Fig 10
		$V_{GS}=10\text{V}, T_C = 100^\circ\text{C}$	7.4		
$I_{DM}$	Drain Current	Pulsed (Note1)	33	A	
$E_{AS}$	Single Pulsed Avalanche Energy (Note2)		245	mJ	
$I_{AS}$	Avalanche Current (Note2)		7	A	
dv/dt	MOSFET dv/dt		50	V/ns	
	Peak Diode Recovery dv/dt (Note3)		15		
$P_D$	Power Dissipation	$(T_C = 25^\circ\text{C})$	30	W	Fig 11
		Derate Above $25^\circ\text{C}$	0.24	W/ $^\circ\text{C}$	
$T_J, T_{STG}$	Operating and Storage Temperature Range		-55 to 150	$^\circ\text{C}$	

### Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	4.1	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	62	
$T_{sold}$	Soldering temperature, wave soldering only allowed at leads	260	$^\circ\text{C}$

**Electrical Characteristics** ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit	Note
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**Off Characteristics**

$BV_{DSS}$	Drain to Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	650	-	-	V	Fig 7
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}$	-	-	1	$\mu\text{A}$	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$	-	-	$\pm 100$	nA	

**On Characteristics**

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	2.0	3.0	4.0	V	Fig 9
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}, I_D = 4.8\text{ A}, T_J = 25^\circ\text{C}$	-	325	360	mΩ	Fig 3
		$V_{GS} = 10\text{ V}, I_D = 4.8\text{ A}, T_J = 150^\circ\text{C}$	-	813	900	mΩ	Fig 8

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	-	801	-	pF	Fig 5
$C_{oss}$	Output Capacitance		-	28	-	pF	
$C_{rss}$	Reverse transfer capacitance		-	3.8	-	pF	
$Q_{g(tot)}$	Total Gate Charge at 10 V	$V_{DS} = 400\text{ V}, I_D = 5.5\text{ A},$ $V_{GS} = 10\text{ V}$	-	19	-	nC	Fig 6
$Q_{gs}$	Gate to Source Charge		-	2.9	-	nC	
$Q_{gd}$	Gate to Drain "Miller" Charge		-	9.7	-	nC	
$R_G$	Gate Resistance	$f = 1\text{ MHz}, \text{Open Drain}$	-	5.6	-	Ω	

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = 400\text{ V}, I_D = 5.5\text{ A},$ $V_{GS} = 10\text{ V}, R_G = 10\text{ }\Omega$	-	16	-	ns	
$t_r$	Turn-On Rise Time		-	6	-	ns	
$t_{d(off)}$	Turn-Off Delay Time		-	29	-	ns	
$t_f$	Turn-Off Fall Time		-	22	-	ns	

**Source-Drain Diode Characteristics**

$I_S$	Maximum Continuous Diode Forward Current		-	-	11	A	
$I_{SM}$	Maximum Pulsed Diode Forward Current		-	-	33	A	
$V_{SD}$	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_{SD} = 11\text{ A}$	-	0.9	1.2	V	Fig 4
$t_{rr}$	Reverse Recovery Time	$V_{DD} = 400\text{ V}, I_{SD} = 5.5\text{ A},$ $di_F/dt = 100\text{ A}/\mu\text{s}$	-	198	-	ns	
$Q_{rr}$	Reverse Recovery Charge		-	1.93	-	$\mu\text{C}$	

※Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2.  $L=10\text{mH}$ ,  $R_G = 25\text{ }\Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{SD} \leq 4\text{ A}$ ,  $di/dt \leq 100\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq 400\text{ V}$ , starting  $T_J = 25^\circ\text{C}$ .

Typical Performance Characteristics

Figure 1. On-Region Characteristics

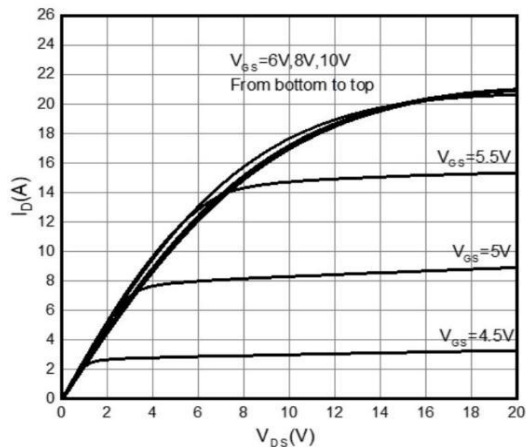


Figure 2. Transfer Characteristics

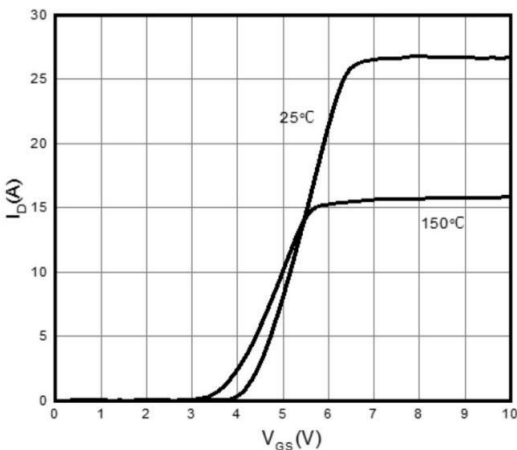


Figure 3. On-Resistance vs. Drain Current

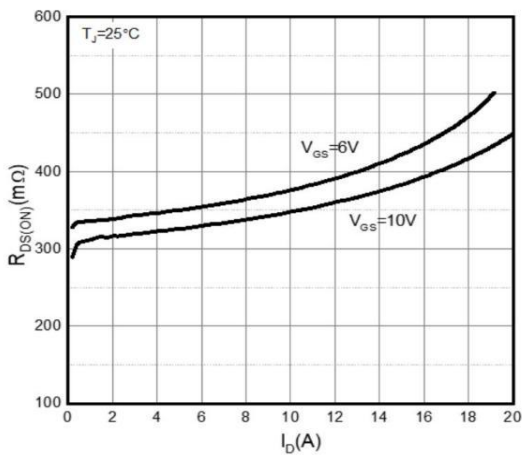


Figure 4. Body-Diode Characteristics

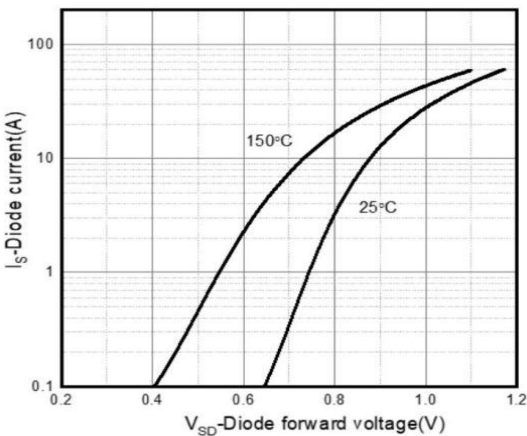


Figure 5. Capacitance Characteristics

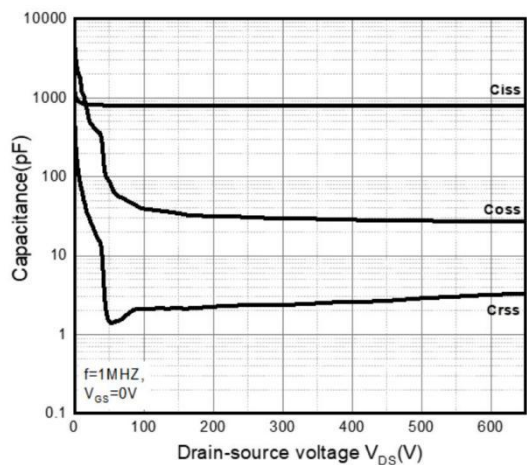
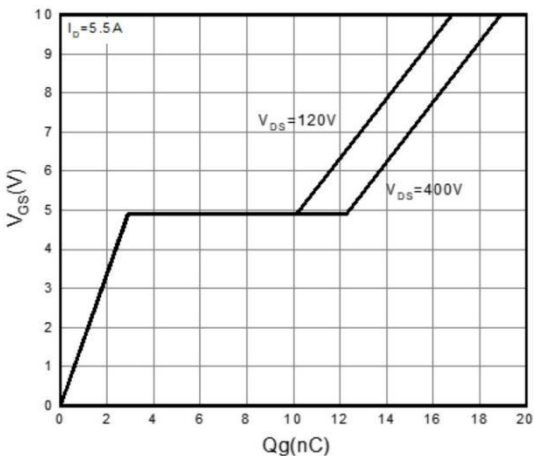


Figure 6. Gate Charge Characteristics



Typical Performance Characteristics

Figure 7. Breakdown Voltage vs. Temperature

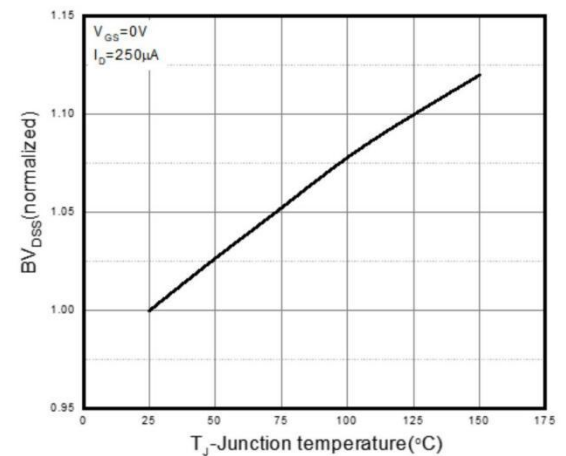


Figure 8. On-Resistance vs. Temperature

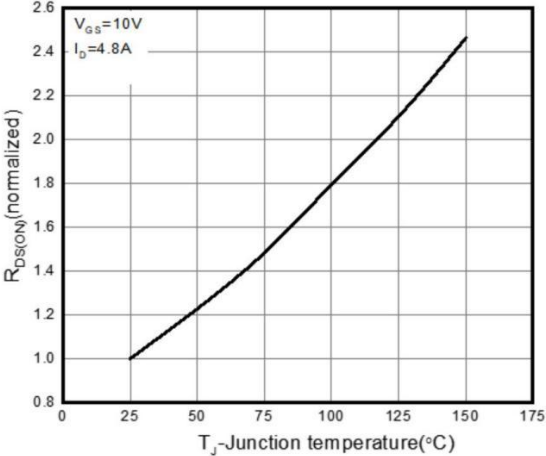


Figure 9. Threshold Voltage vs. Temperature

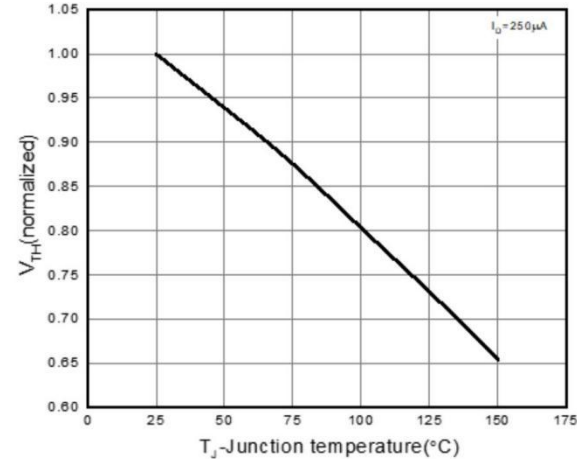


Figure 10. Drain Current vs. Temperature

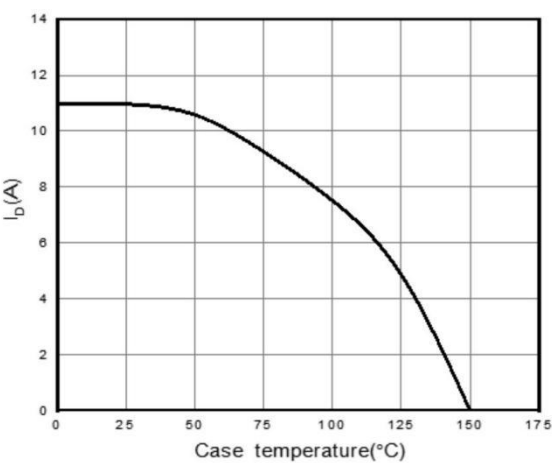


Figure 11. Power Dissipation vs. Temperature

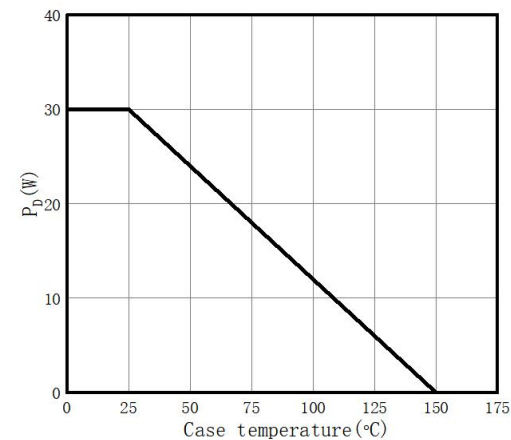


Figure 12. Maximum Safe Operating Area

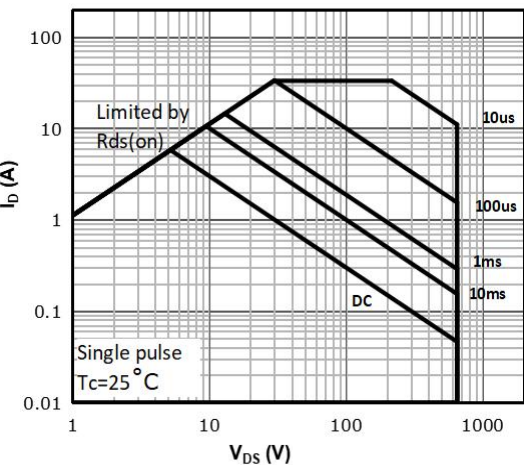
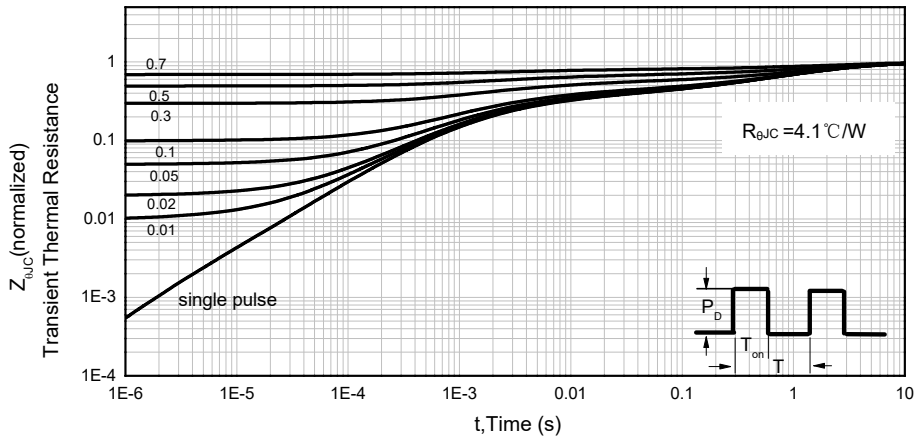


Figure 13. Normalized Maximum Transient Thermal Impedance



Test Circuits

Figure 14. Switching times test circuit for inductive load and Switching times waveform

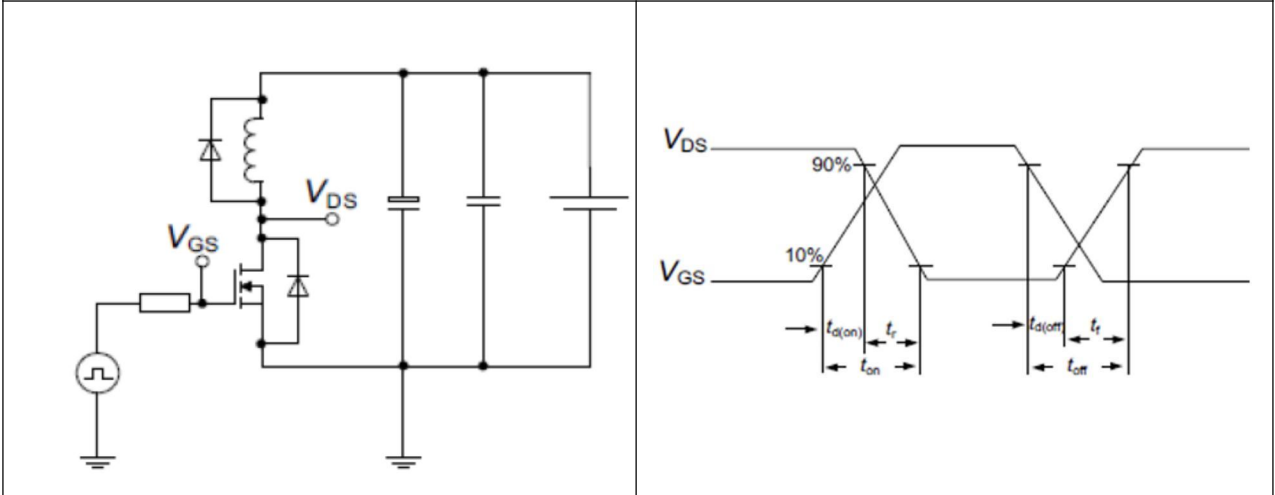


Figure 15. Test circuit for diode characteristics and Diode recovery waveform

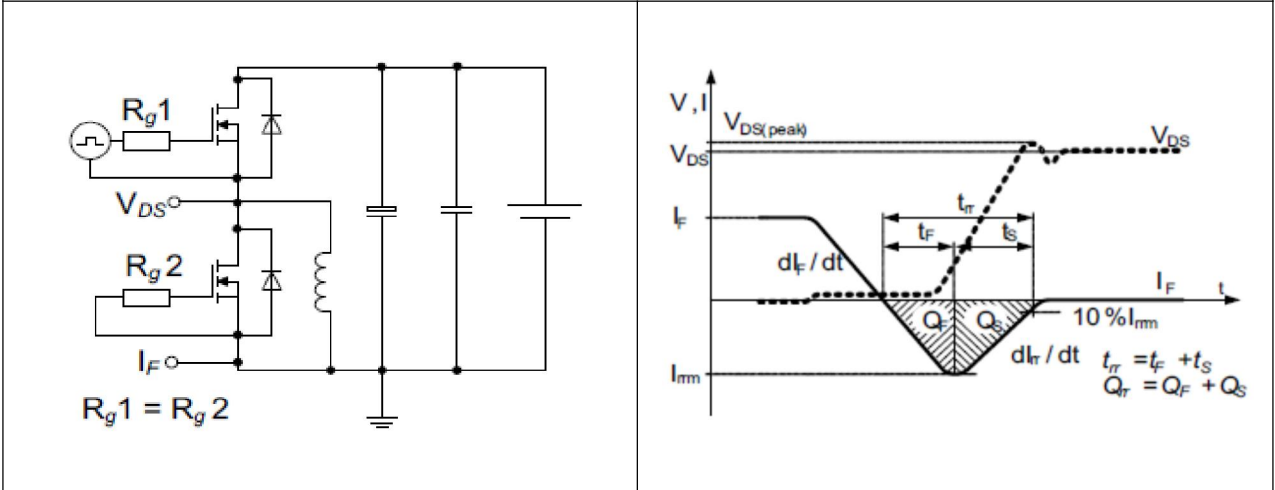
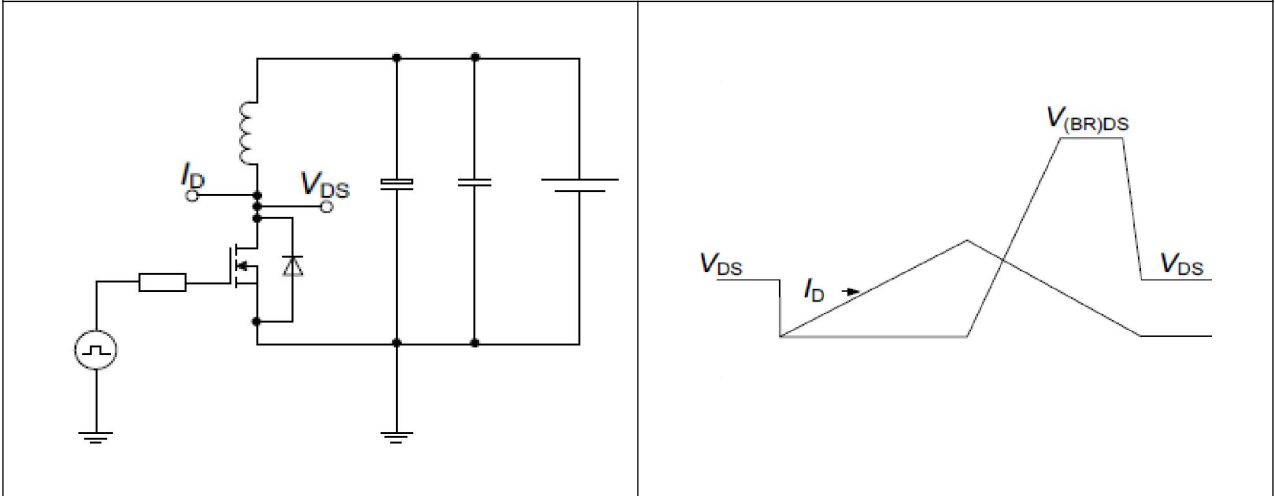
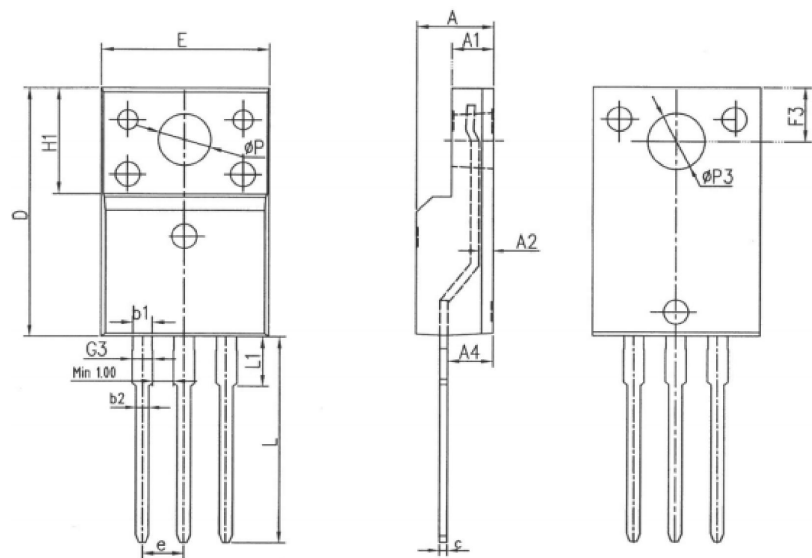


Figure 16. Unclamped inductive load test circuit and Unclamped inductive waveform



Package Outlines  
TO220F



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
E	10.00	10.20	10.40
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.65	0.85	1.30
A4	2.55	2.75	2.95
c	0.40	0.50	0.65
D	15.57	15.87	16.17
H1	6.70REF		
e	2.54BSC		
Φ P	3.183REF		
L	12.68	12.98	13.28
L1	3.25	3.45	3.65
Φ P3	3.45REF		
F3	3.10	3.30	3.50
G3	1.10	1.30	1.50
b1	1.05	1.20	1.35
b2	0.70	0.80	0.92

\* Dimensions in millimeters

## Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BMF65N360E2	BMF65N360E2	TO220F	Tube	50 units

## Disclaimer

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