MMQ65R130RF

650V 0.130Ω N-channel MOSFET

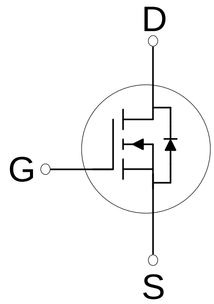
■ Description

MMQ65R130RF is power MOSFET using Magnachip's advanced super junction technology that can realize very low on-resistance and gate charge. It has low gate charge and ultra-fast body diode, so turn off action is improved. These user friendly devices give an advantage of Low EMI to designers as well as low switching loss in soft switching applications.

■ Key Parameters

Parameter	Value	Unit
V_{DS} @ $T_{j,max}$	700	V
$R_{DS(on),max}$	0.130	Ω
$V_{GS(th),typ}$	4.0	V
I_D	30	A
$Q_{g,typ}$	62.4	nC

■ Package & Internal Circuit



■ Features

- Ultra-fast body diode
- Low power loss by high speed switching and low on-resistance
- 100% avalanche tested
- Green package – Pb free plating, halogen free

■ Applications

- Premium OLED TV
- Soft-switching applications
- Server power supply
- Telecom

■ Ordering Information

Order Code	Marking	Temp. Range	Package	Packing	RoHS Status
MMQ65R130RFTH	65R130RF	-55 ~ 150 °C	TO-247	Tube	Compliant

■ Absolute Maximum Rating (T_c=25 ºC unless otherwise specified)

Parameter	Symbol	Rating	Unit	Note
Drain – Source voltage	V_{DSS}	650	V	
Gate – Source voltage	V_{GSS}	±30	V	
Continuous drain current[1)]	I_D	30	A	T_C=25 ºC
		19	A	T_C=100 ºC
Pulsed drain current[2)]	I_{DM}	90	A	
Power dissipation	P_D	278	W	
Single - pulse avalanche energy[3)]	E_{AS}	303	mJ	
MOSFET dv/dt ruggedness	dv/dt	50	V/ns	
Diode dv/dt ruggedness[4)]	dv/dt	50	V/ns	
Storage temperature	T_{stg}	-55 ~150	ºC	
Maximum operating junction temperature	T_j	150	ºC	

1) I_D limited by maximum junction temperature
2) Pulse width t_P limited by $T_{j,max}$
3) I_{AS} : 2A
4) $I_{SD} \le I_D$, $V_{DS\ peak} \le$ 400V, T_j=25ºC

■ Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case max	R_{thjc}	0.45	ºC/W
Thermal resistance, junction-ambient max	R_{thja}	62.5	ºC/W

■ Static Characteristics (T_c=25 °C unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Drain – Source breakdown voltage	$V_{(BR)DSS}$	650	-	-	V	V_{GS} = 0V, I_D = 1mA
Gate threshold voltage	$V_{GS(th)}$	3.0	4.0	5.0	V	V_{DS} = $V_{GS,}$ I_D = 250μA
Zero gate voltage drain current	I_{DSS}	-	-	10	μA	V_{DS} = 650V, V_{GS} = 0V
Gate leakage current	I_{GSS}	-	-	100	nA	V_{GS} = ±30V, V_{DS} = 0V
Drain-Source on state resistance	$R_{DS(ON)}$	-	0.115	0.130	Ω	V_{GS} = 10V, I_D = 15A

■ Dynamic Characteristics (T_c=25 °C unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Input capacitance	C_{iss}	-	2414	-	pF	V_{DS} = 400V, V_{GS} = 0V, f = 400kHz
Output capacitance	C_{oss}	-	56	-		
Reverse transfer capacitance	C_{rss}	-	7.9	-		
Effective output capacitance energy related[5)]	$C_{o(er)}$	-	97	-		V_{DS} = 0V to 640V, V_{GS} = 0V, f = 400kHz
Turn on delay time	$t_{d(on)}$	-	55	-	ns	V_{GS}=10V, R_G=25Ω V_{DD}=325V, I_D=30A
Rise time	t_r	-	139	-		
Turn off delay time	$t_{d(off)}$	-	159	-		
Fall time	t_f	-	49	-		
Total gate charge	Q_g	-	62.4	-	nC	V_{GS}=10V, V_{DD}=520V, I_D=30A
Gate – Source charge	Q_{gs}	-	15.8	-		
Gate – Drain charge	Q_{gd}	-	31.5	-		
Gate resistance	R_G	-	6.1	-	Ω	V_{GS} = 0V, f = 1.0MHz

5) $C_{o(er)}$ is a capacitance that gives the same stored energy as C_{OSS} while V_{DS} is rising from 0V to 80% $V_{(BR)DSS}$

■ Reverse Diode Characteristics (T_c=25 °C unless otherwise specified)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
Continuous diode forward current	I_{SD}	-	-	30	A	
Diode forward voltage	V_{SD}	-	-	1.4	V	I_{SD} = 30A, V_{GS} = 0V
Reverse recovery time	t_{rr}	-	324	-	ns	I_{SD} = 30A di/dt = 100A/μs V_{DD} = 100V
Reverse recovery charge	Q_{rr}	-	3.6	-	μC	
Reverse recovery current	I_{rrm}	-	22.1	-	A	

■ Characteristic Graph

Fig.1 On-Region Characteristics.

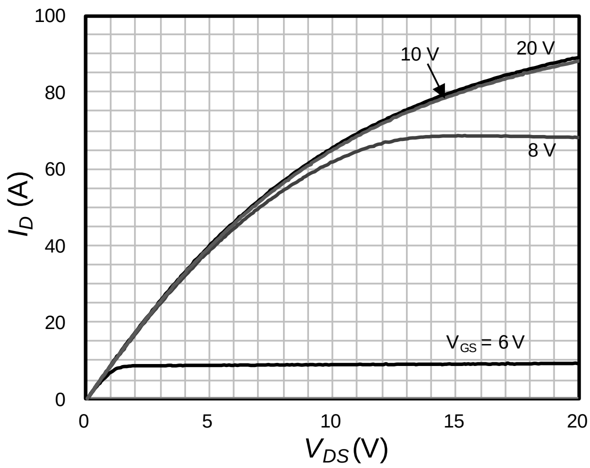


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

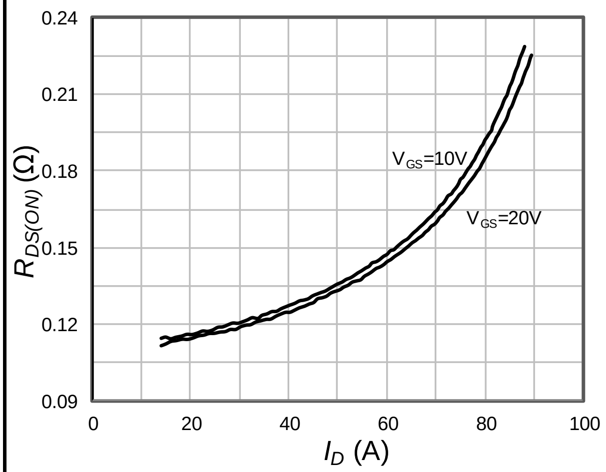


Fig.3 On-Resistance Variation with Temprature (Normalized)

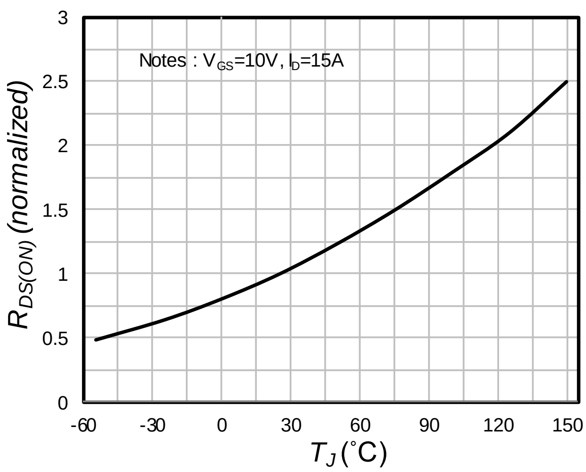


Fig.4 Breakdown Voltage Variation vs. Temperature (Normalized)

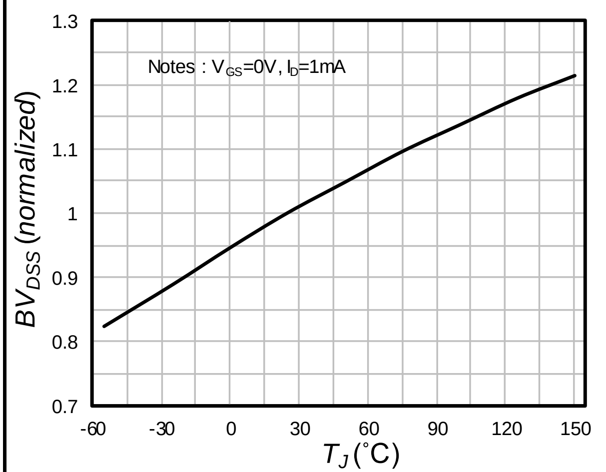


Fig.5 Transfer Characteristics

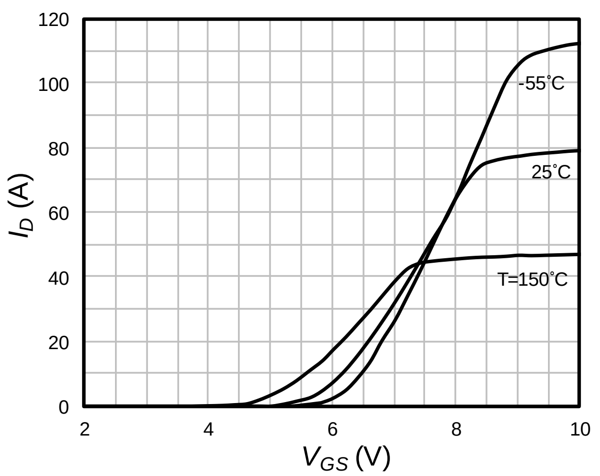


Fig.6 Body Diode Forward Voltage Variation
with Source Current and Temperature

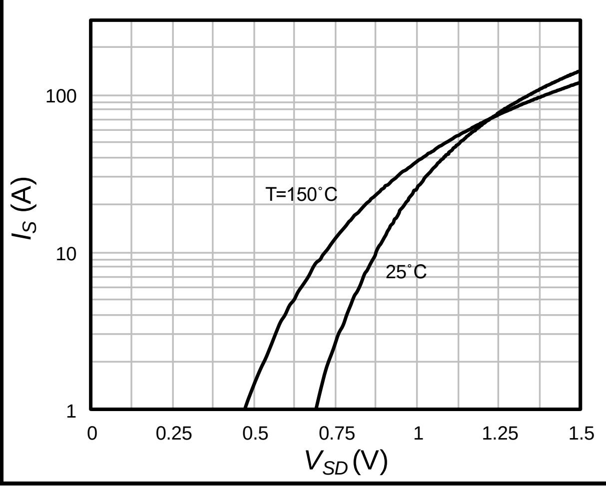


Fig.7 Gate Charge Characteristics

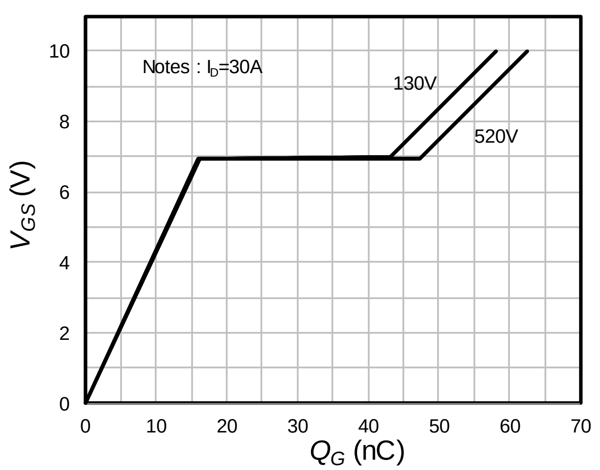


Fig.8 Capacitance Characteristics

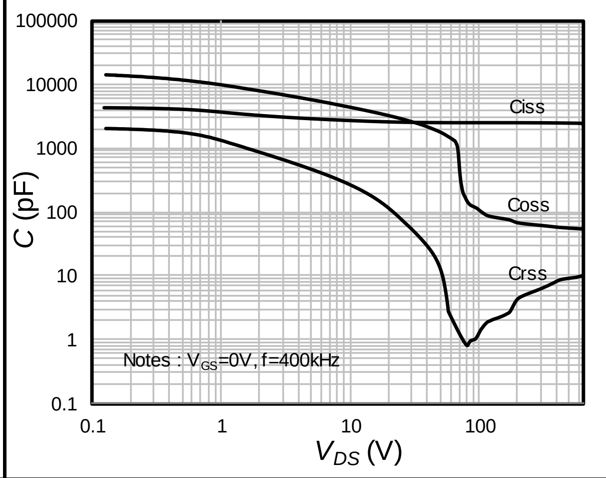


Fig.9 $V_{GS(th)}$ Variation with Temprature (Nomalized)

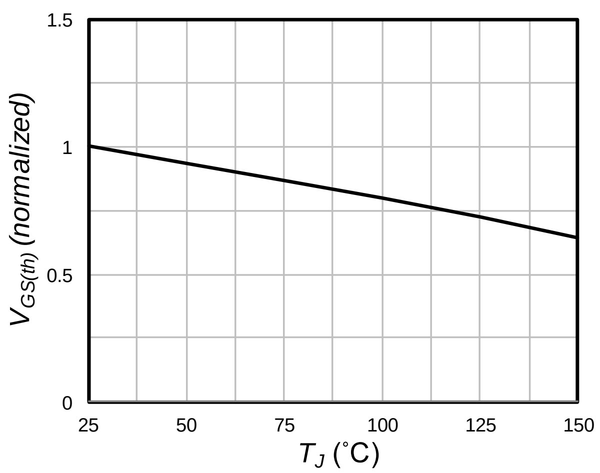


Fig.10 Maximum Drain Current vs. Case Temperature

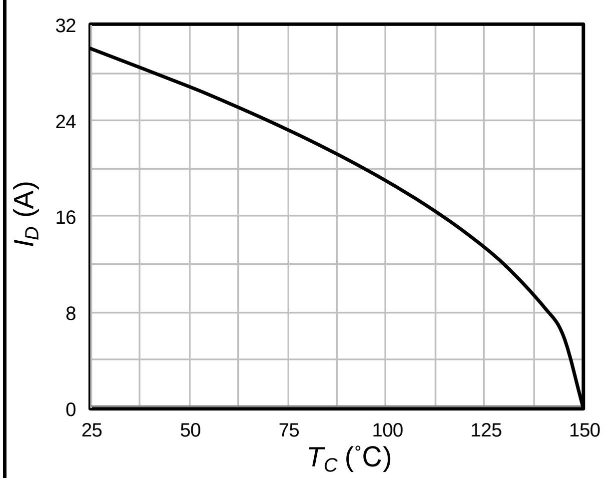


Fig.11 Single Pulse Maximum Power Dissipation

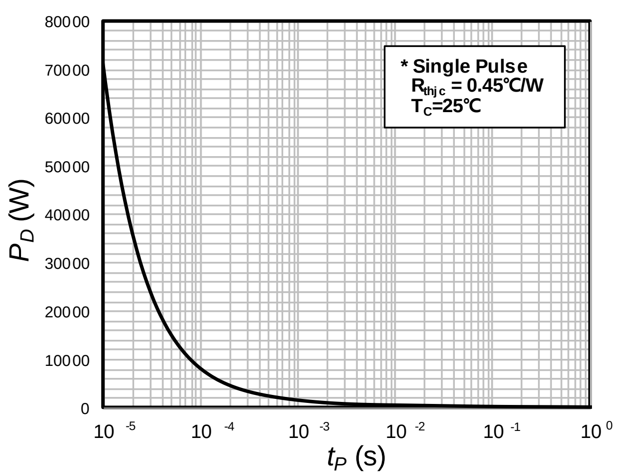


Fig.12 Output Capacitance Stored Energy

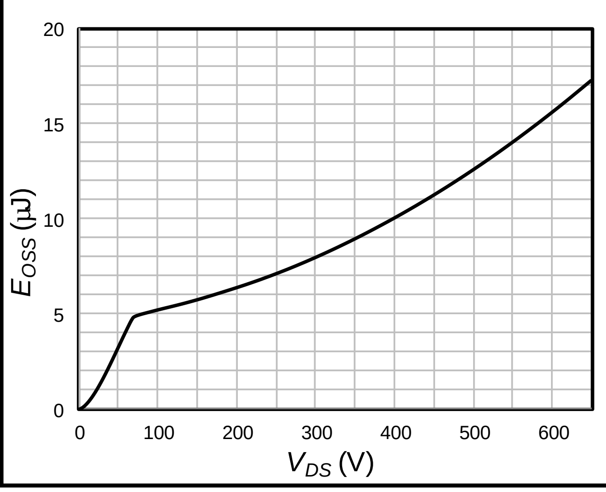
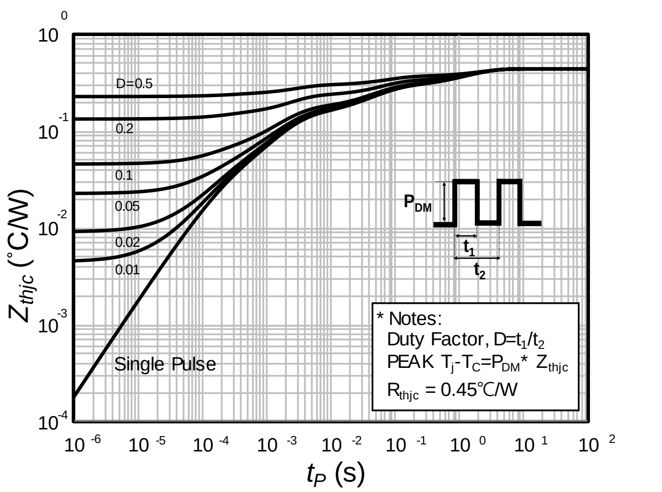
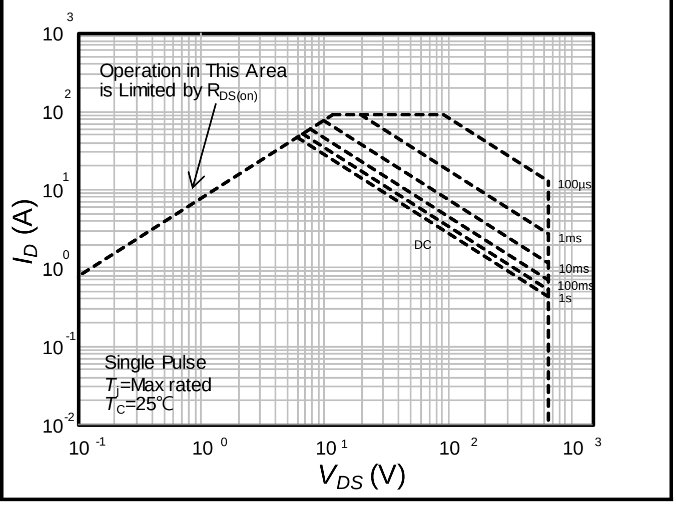


Fig.13 Transient Thermal Response Curve	Fig.14 Maximum Safe Operating Area
	

■ Test Circuit

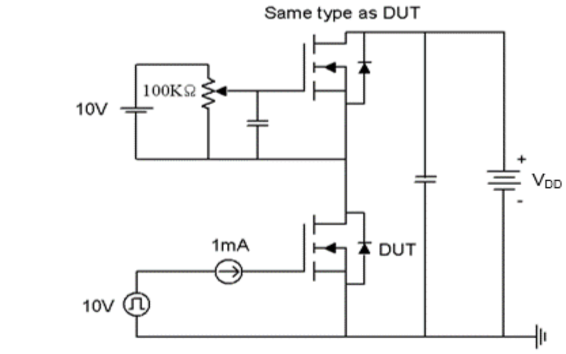


Fig15-1. Gate charge measurement circuit

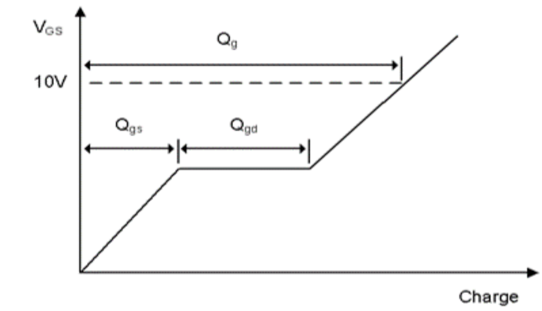


Fig15-2. Gate charge waveform

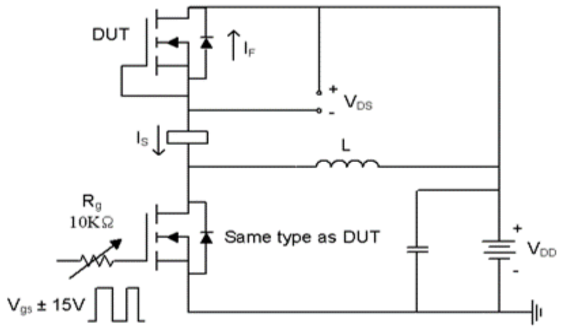


Fig16-1. Diode reverse recovery test circuit

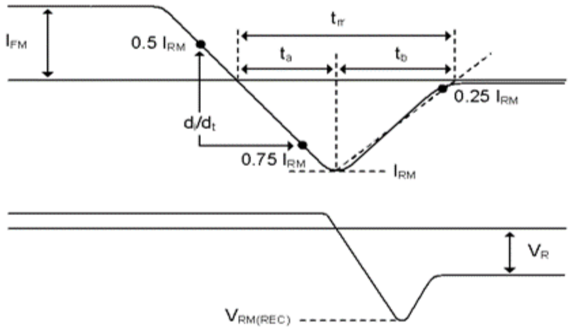


Fig16-2. Diode reverse recovery test waveform

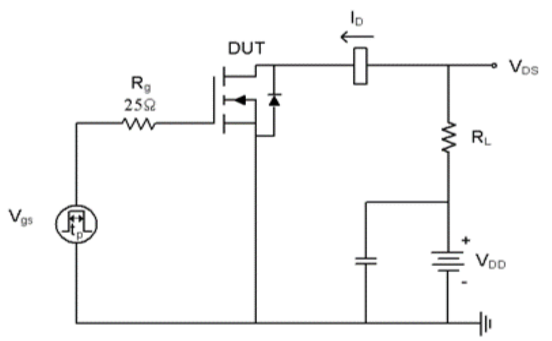


Fig17-1. Switching time test circuit for resistive load

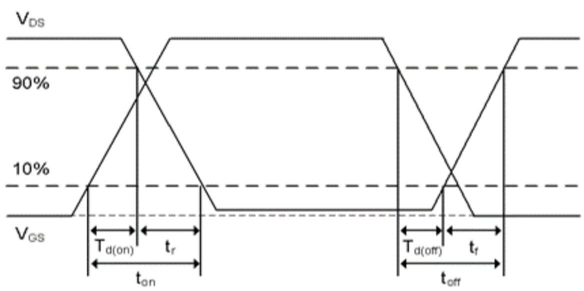


Fig17-2. Switching time waveform

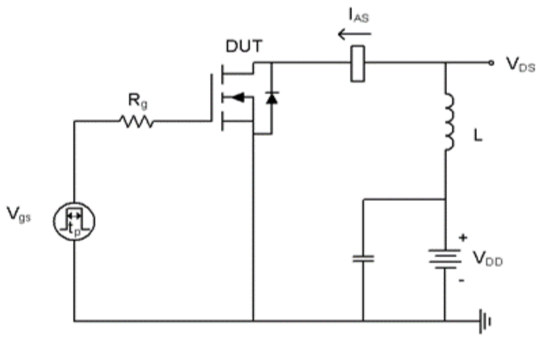


Fig18-1. Unclamped inductive load test circuit

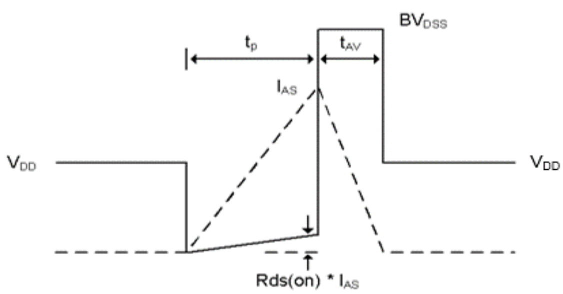
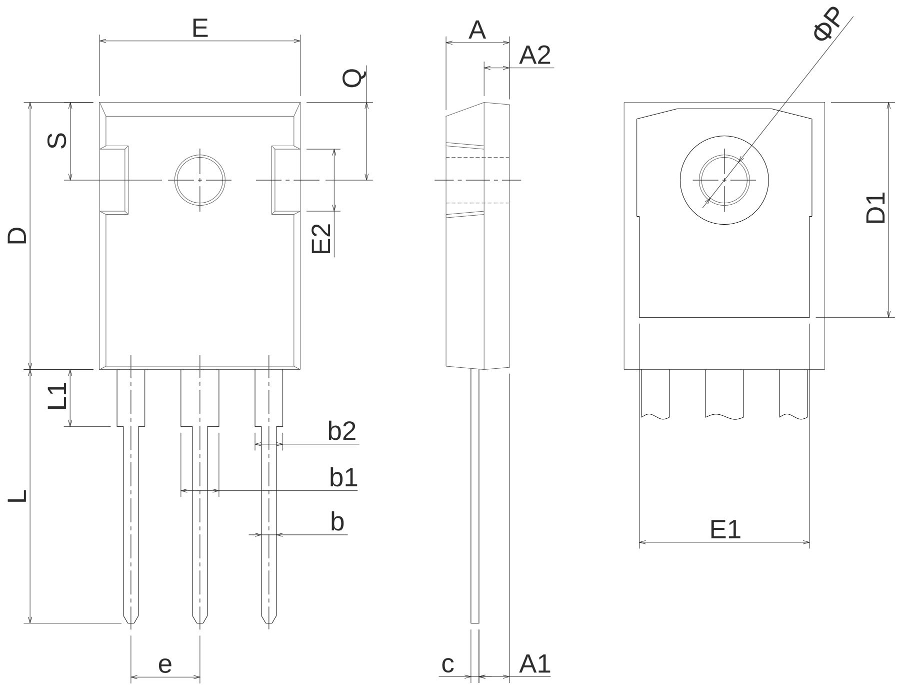


Fig18-2. Unclamped inductive waveform

■ Physical Dimension

TO-247

Dimensions are in millimeters, unless otherwise specified



Dimension	Min(mm)	Max(mm)
A	4.70	5.31
A1	2.20	2.60
A2	1.50	2.49
b	0.99	1.40
b1	2.59	3.43
b2	1.65	2.39
c	0.38	0.89
D	20.30	21.46
D1	13.08	-
E	15.45	16.26
E1	13.06	14.02
E2	4.32	5.49
e	5.45BSC	
L	19.81	20.57
L1	-	4.50
ΦP	3.50	3.70
Q	5.38	6.20
S	6.15BSC	

DISCLAIMER:

The Products are not designed for use in hostile environments, including, without limitation, aircraft, nuclear power generation, medical appliances, and devices or systems in which malfunction of any Product can reasonably be expected to result in a personal injury. Seller's customers using or selling Seller's products for use in such applications do so at their own risk and agree to fully defend and indemnify Seller.