

# HMW60N075UF7

## N-Channel MOS UF7 Power MOSFET

600 V, 42 A, 75 mΩ

### Description

The 600V MOS UF7 series has ultra-fast body diode performance using E7 technology.

MOS UF7 is Power Master Semiconductor's advanced fast recovery Super Junction MOSFET family by utilizing charge balance technology for excellent body diode performance, low on-resistance and reduced gate charge.

It combines the benefits of a fast switching performance with ease of usage and robustness. Additionally, we offer low reverse recovery time (trr) and reverse recovery charge (Qrr) for the bridge structure topology, especially for resonant converters (LLC, PSFB, etc.).

### Features

$BV_{DSS}$ @ $T_{J,max}$	$I_D$	$R_{DS(on),max}$	$Q_{g,typ}$
650 V	42 A	75 mΩ	76 nC

- Reduced Switching & Conduction Losses
- Fast Recovery Body-Diode
- Lower Gate Resistance
- 100% Avalanche Tested
- Pb-free and RoHS Compliant



### Applications

- Soft Switching Topologies
- Telecom and Server Power Supplies
- EV Charger and Industrial Power Supplies

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

Symbol	Parameter		Value	Unit	
$V_{DSS}$	Drain to Source Voltage		600	V	
$V_{GSS}$	Gate to Source Voltage		$\pm 30$	V	
$I_D$	Drain Current	Continuous ( $T_C = 25^\circ\text{C}$ )	42	A	
		Continuous ( $T_C = 100^\circ\text{C}$ )	26.6		
$I_{DM}$	Drain Current	Pulsed (Note1)	126	A	
$E_{AS}$	Single Pulsed Avalanche Energy		(Note2)	254	mJ
$I_{AS}$	Avalanche Current		(Note2)	6.3	A
$E_{AR}$	Repetitive Avalanche Energy		(Note1)	3.29	mJ
$dv/dt$	MOSFET $dv/dt$		100	V/ns	
	Peak Diode Recovery $dv/dt$		(Note3)		
$P_D$	Power Dissipation	( $T_C = 25^\circ\text{C}$ )	329	W	
		Derate Above $25^\circ\text{C}$	2.63		
$T_J, T_{STG}$	Operating and Storage Temperature Range		-55 to 150	°C	
$T_L$	Maximum Lead Temperature for Soldering, 1/8" from Case for 10 Seconds		260	°C	

### Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.38	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	

**Package Marking and Ordering Information**

Part Number	Top Marking	Package	Packing Method	Quantity
HMW60N075UF7	HMW60N075UF7	TO-247	Tube	30 units

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

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

$\text{BV}_{\text{DSS}}$	Drain to Source Breakdown Voltage	$V_{\text{GS}} = 0 \text{ V}, I_D = 1 \text{ mA}$	600			V
		$V_{\text{GS}} = 0 \text{ V}, I_D = 1 \text{ mA}, T_J = 150^\circ\text{C}$	650			
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{\text{DS}} = 600 \text{ V}, V_{\text{GS}} = 0 \text{ V}$			10	$\mu\text{A}$
		$V_{\text{DS}} = 480 \text{ V}, V_{\text{GS}} = 0 \text{ V}, T_J = 125^\circ\text{C}$		30		
$I_{\text{GSS}}$	Gate-Source Leakage Current	$V_{\text{GS}} = \pm 30 \text{ V}, V_{\text{DS}} = 0 \text{ V}$			$\pm 100$	nA

**On Characteristics**

$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{GS}} = V_{\text{DS}}, I_D = 2.8 \text{ mA}$	3.0		5.0	V
$R_{\text{DS(on)}}$	Static Drain to Source On Resistance	$V_{\text{GS}} = 10 \text{ V}, I_D = 21.5 \text{ A}$		64	75	$\text{m}\Omega$

**Dynamic Characteristics**

$C_{\text{iss}}$	Input Capacitance	$V_{\text{DS}} = 400 \text{ V}, V_{\text{GS}} = 0 \text{ V}, f = 250 \text{ kHz}$		3080		pF
$C_{\text{oss}}$	Output Capacitance			83		pF
$C_{\text{o(tr)}}$	Time Related Output Capacitance	$V_{\text{DS}} = 0 \text{ V to } 400 \text{ V}, V_{\text{GS}} = 0 \text{ V}$		817		pF
$C_{\text{o(er)}}$	Energy Related Output Capacitance			131		pF
$Q_{\text{g(tot)}}$	Total Gate Charge at 10 V	$V_{\text{DS}} = 400 \text{ V}, I_D = 21.5 \text{ A}, V_{\text{GS}} = 10 \text{ V}$		76		nC
$Q_{\text{gs}}$	Gate to Source Charge			20		nC
$Q_{\text{gd}}$	Gate to Drain "Miller" Charge			40		nC
$R_G$	Gate Resistance	$f = 1 \text{ MHz}$		1		$\Omega$

**Switching Characteristics**

$t_{\text{d(on)}}$	Turn-On Delay Time	$V_{\text{DS}} = 400 \text{ V}, I_D = 21.5 \text{ A}, V_{\text{GS}} = 10 \text{ V}, R_G = 4.7 \Omega$ See Figure 13		20		ns
$t_r$	Turn-On Rise Time			12		ns
$t_{\text{d(off)}}$	Turn-Off Delay Time			61		ns
$t_f$	Turn-Off Fall Time			7		ns

**Source-Drain Diode Characteristics**

$I_S$	Maximum Continuous Diode Forward Current			42	A
$I_{\text{SM}}$	Maximum Pulsed Diode Forward Current			126	A
$V_{\text{SD}}$	Diode Forward Voltage	$V_{\text{GS}} = 0 \text{ V}, I_{\text{SD}} = 21.5 \text{ A}$		1.2	V
$t_{\text{rr}}$	Reverse Recovery Time	$V_{\text{DD}} = 400 \text{ V}, I_{\text{SD}} = 21.5 \text{ A}, dI_F/dt = 100 \text{ A}/\mu\text{s}$		134	ns
$Q_{\text{rr}}$	Reverse Recovery Charge			0.85	$\mu\text{C}$

※Notes:

1. Repetitive rating: pulse-width limited by maximum junction temperature.
2.  $I_{\text{AS}} = 6.3 \text{ A}, R_G = 25 \Omega$ , starting  $T_J = 25^\circ\text{C}$ .
3.  $I_{\text{SD}} \leq 21.5 \text{ A}, di/dt \leq 100 \text{ A}/\mu\text{s}, V_{\text{DD}} \leq 400 \text{ V}$ , starting  $T_J = 25^\circ\text{C}$ .

## Typical Performance Characteristics

Figure 1. On-Region Characteristics

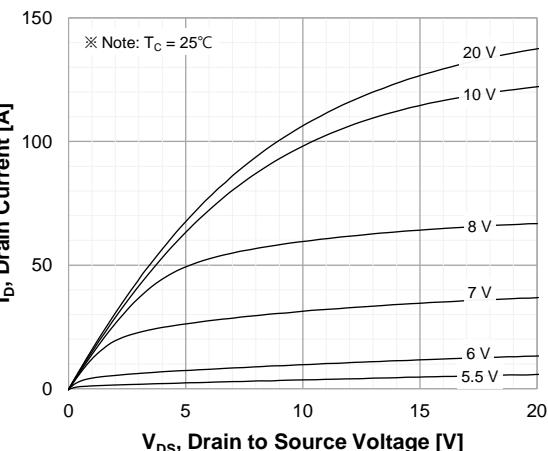


Figure 2. Transfer Characteristics

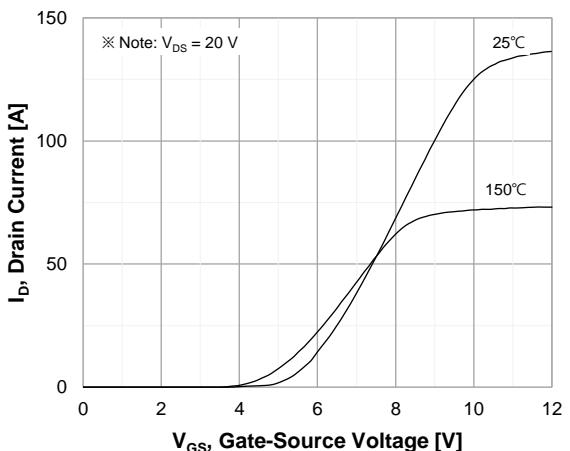


Figure 3. On-Resistance Characteristics vs. Drain Current and Gate Voltage

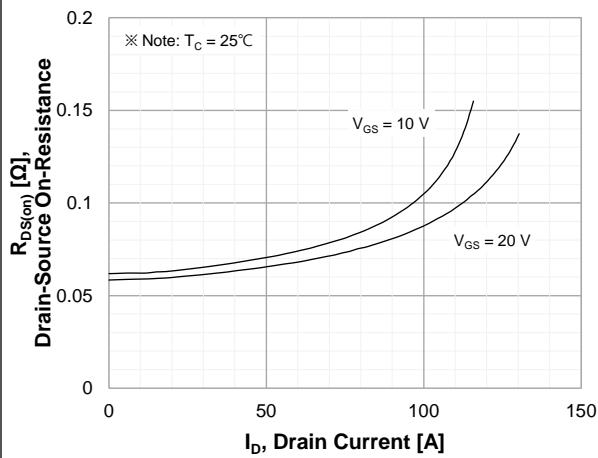


Figure 4. Diode Forward Voltage Characteristics vs. Source-Drain Current and Temperature

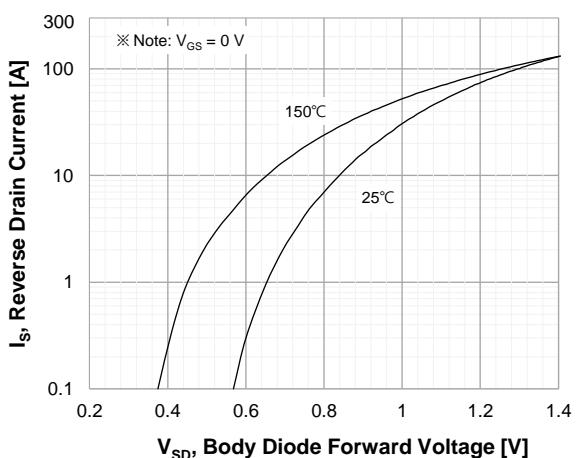


Figure 5. Capacitance Characteristics

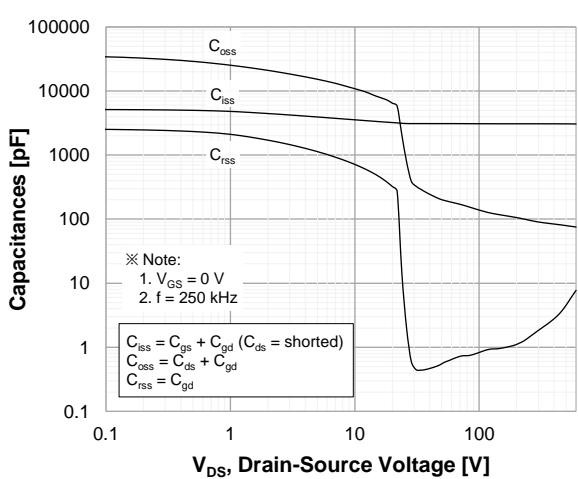
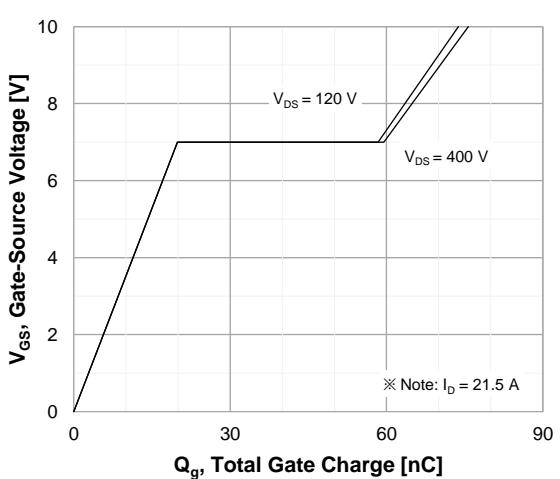
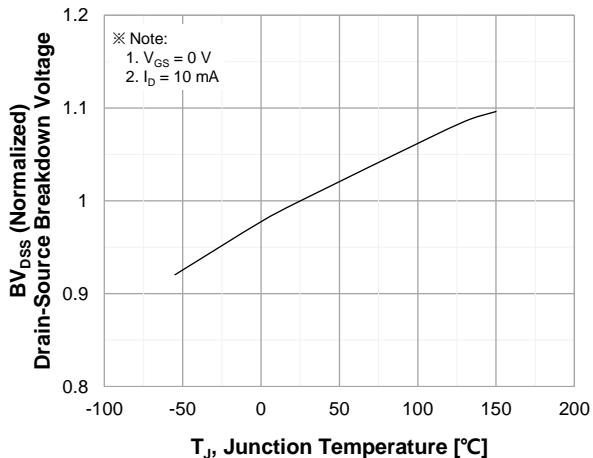


Figure 6. Gate Charge Characteristics

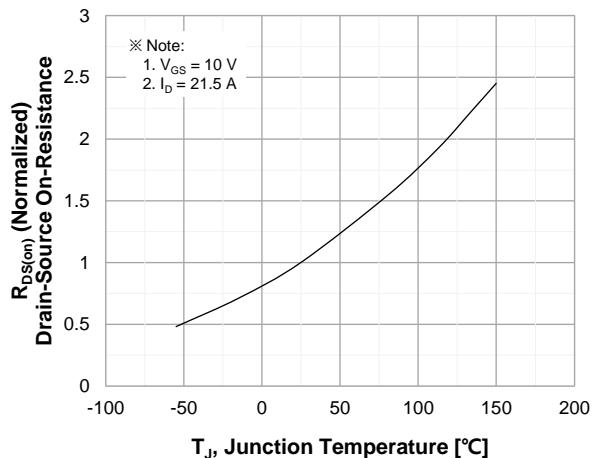


### Typical Performance Characteristics

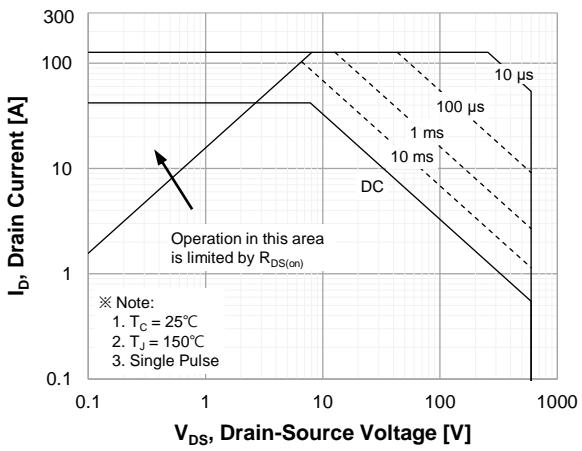
**Figure 7. Breakdown Voltage Characteristics vs. Temperature**



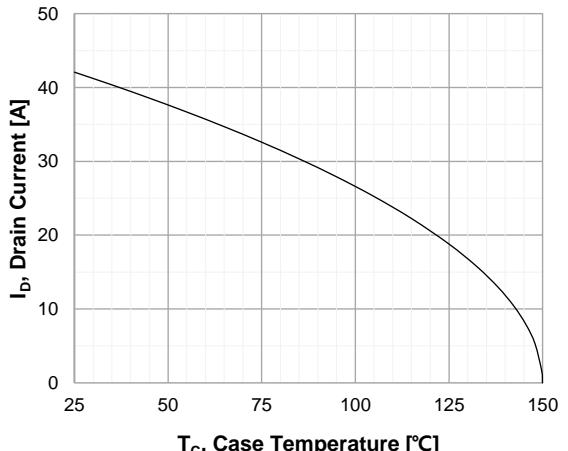
**Figure 8. On-Resistance Characteristics vs. Temperature**



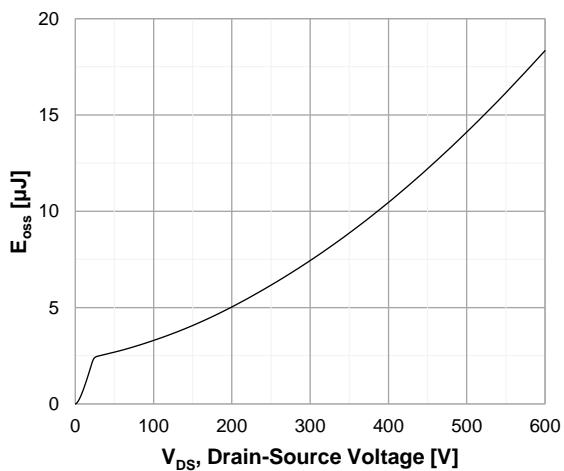
**Figure 9. Maximum Safe Operating Area**



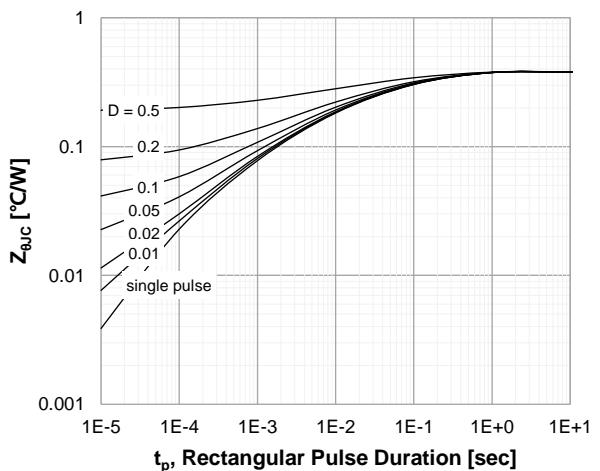
**Figure 10. Maximum Drain Current vs. Case Temperature**



**Figure 11.  $E_{oss}$  vs. Drain to Source Voltage**

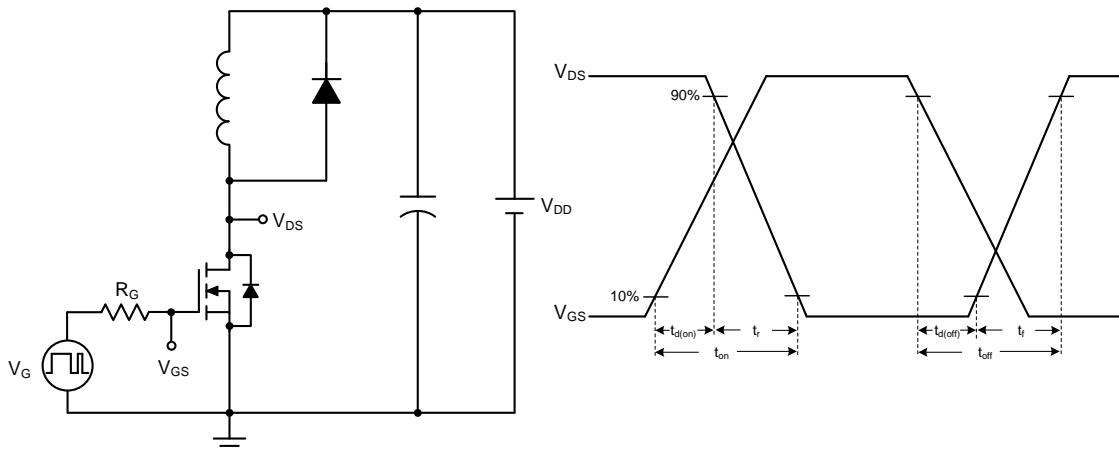


**Figure 12. Transient Thermal Response Curve**

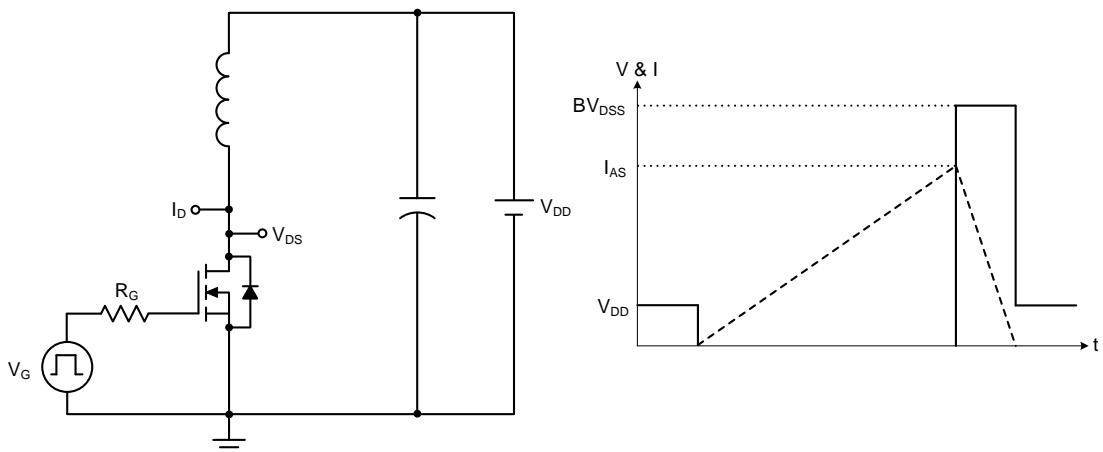


## Test Circuits

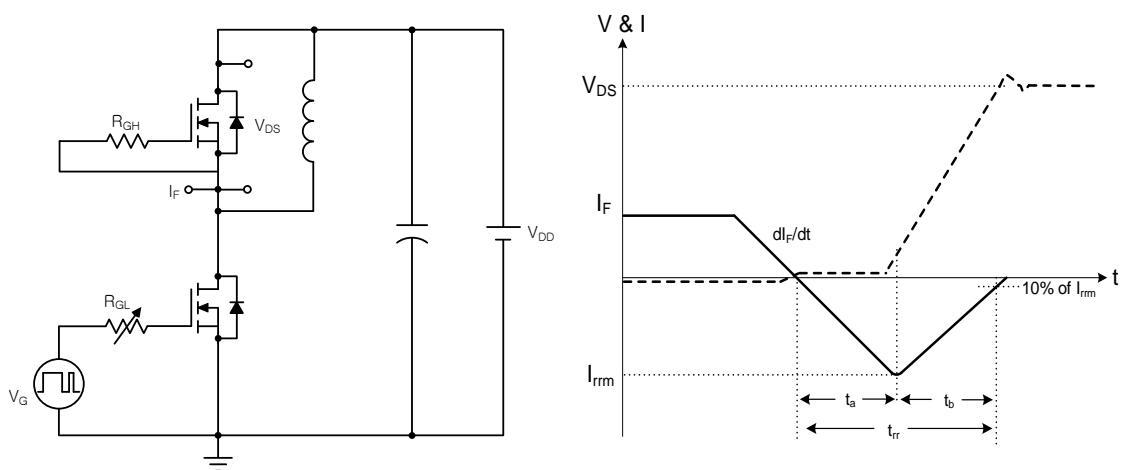
**Figure 13. Inductive Load Switching Test Circuit and Waveforms**



**Figure 14. Unclamped Inductive Switching Test Circuit and Waveforms**

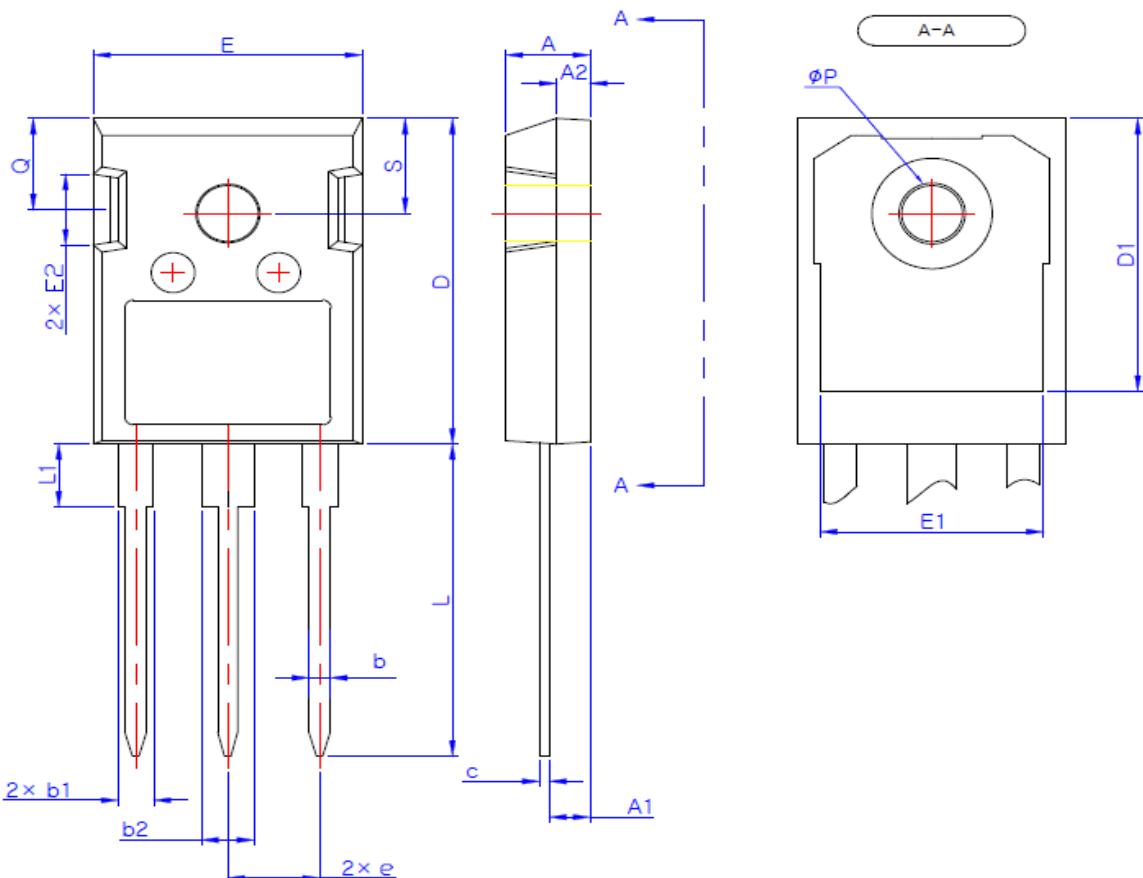


**Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit and Waveforms**



## Package Outlines

**TO-247**



SYMBOL	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.29	2.42	2.54
A2	1.90	2.00	2.10
b	1.10	1.20	1.30
b1	1.91	2.06	2.20
b2	2.92	3.06	3.20
c	0.50	0.60	0.70
D	20.80	21.07	21.34
D1	17.43	17.63	17.83
E	15.75	15.94	16.13
E1	13.06	13.26	13.46
E2	4.32	4.58	4.83
e	5.45 BSC		
L	19.85	20.05	20.25
L1	4.05	4.27	4.49
ΦP	3.55	3.60	3.65
Q	5.59	5.89	6.19
S	6.15 BSC		

\* Dimensions in millimeters