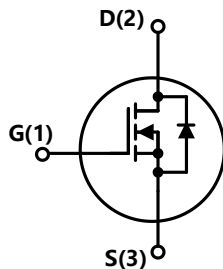
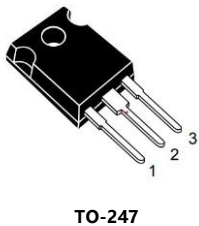




N-channel 650V 50mΩ (Typ) Power MOSFET

1 FEATURES

- 650V break down voltage
- Ultra-low R_{DS-ON} & FOM
- Ultra-fast body diode
- Fast switching on/off



2 APPLICATIONS

- Server power
- Telecom power
- EV charger
- Motor driver

3 ORDERING INFORMATION

TYPE	MARKING	PACKAGE
GBS65060TOB	65060	TO-247

4 DISCRIPTION

The 650V high voltage Super Junction MOSFET achieves ultra-low ON-resistance and gate charge. Thanks to excellent balance between switching performance and conduction performance, the GBS65060 provides very high efficiency in resonant switch topology.

The Ultra-fast recovery body diode makes the GBS65060 suitable for high switching frequency application and supports high power density application. The GBS65060 is available in TO-247 package.

5 KEY PERFORMANCE PARAMETERS

PARAMETER	VALUE	UNIT
V_{DS} @ T_{j_max}	700	V
R_{DS-ON} max @ $V_{gs}=10V$	60	mΩ
Q_g (Typ)	95	nC
$I_{D-pulse}$	146	A
$E_{oss}@400V$	12	μJ
Body diode recovery time	150	ns



6 SPECIFICATIONS

6.1 ABSOLUTE MAXIMUM RATINGS

$T_J=25^{\circ}\text{C}$ operating free-air temperature unless otherwise noted

SYMBOL	PARAMETER	TEST CONDITION	VALUE	UNIT
V_{DS}	Drain-source voltage		650	V
I_D	Continuous drain current	$T_C=25^{\circ}\text{C}$	36	A
		$T_C=100^{\circ}\text{C}$	23	
$I_{D\text{-pulse}}$	Pulsed drain current		146	A
V_{GS}	Gate-source voltage		± 30	V
E_{AS}	Single pulsed avalanche energy	$I_D=5.1\text{A}, V_{DD}=50\text{V}$	169	mJ
E_{AR}	Repetitive avalanche energy	$I_D=5.1\text{A}, V_{DD}=50\text{V}$	0.85	mJ
I_{AS}	Single pulsed avalanche current		5.1	A
P_D	Power dissipation		192	W
dv/dt	MOSFET dv/dt ruggedness	$V_{DS}=0\sim 400\text{V}$	60	V/ns
I_S	Continuous diode forward current		36	A
$I_{S\text{-pulse}}$	Diode pulsed current		146	A
dv/dt	Reverse diode dv/dt	$V_{DS}=0\sim 400\text{V}, I_{SD}<16.4\text{A}$	50	V/ns
di _F /dt	diode commutation speed	$V_{DS}=0\sim 400\text{V}, I_{SD}<16.4\text{A}$	1200	A/ μs
T_{stg}	Storage temperature		-55 ~ 150	$^{\circ}\text{C}$

6.2 THERMAL INFORMATION

SYMBOL	PARAMETER	VALUE	UNIT
$R_{\theta JC \text{ max.}}$	Max. Thermal resistance, junction - case	0.65	$^{\circ}\text{C}/\text{W}$
$R_{\theta JA \text{ max.}}$	Max. Thermal resistance, junction - ambient	62	$^{\circ}\text{C}/\text{W}$
T_{sold}	Soldering temperature	260	$^{\circ}\text{C}$

6.3 ELECTRICAL CHARACTERISTICS

$T_J=25^{\circ}\text{C}$ operating free-air temperature unless otherwise noted

SYMBOL	PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT
STATIC CHARACTERISTICS						
$V_{(BR)DSS}$		$V_{GS}=0\text{V}, I_D=10\text{mA}$	650			V



SYMBOL	PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT
	Drain-source breakdown voltage	$V_{GS}=0V, I_D=10mA, T_j=150^{\circ}C$	700			
$V_{(GS)th}$	Gate threshold voltage	$V_{DS}=V_{GS}, I_D=1mA$	4.0	4.5	5.0	V
R_{DS-ON}	Drain-source on state resistance	$V_{GS}=10V, I_D=16.4A$		50	60	mΩ
		$V_{GS}=10V, I_D=16.4A, T_j=125^{\circ}C$		110		
I_{GSS}	Gate-source leakage current	$V_{GS}=30V, V_{DS}=0V$			100	nA
I_{DSS}	Drain-source leakage current	$V_{GS}=0V, V_{DS}=650V$			1	μA
		$V_{GS}=0V, V_{DS}=650V, T_j=125^{\circ}C$			500	
DYNAMIC CHARACTERISTICS						
C_{iss}	Input capacitance	$V_{GS}=0V$		4300		pF
C_{oss}	Output capacitance			70		pF
C_{rss}	Reverse transfer capacitance	$V_{DS}=400V, f=250KHz$		4		pF
$C_{o(er)}$	Effective output capacitance, energy related			150		pF
$C_{o(tr)}$	Effective output capacitance, time related	$V_{GS} = 0V, V_{DS} = 0V\sim 400V$		1610		pF
$t_{d(on)}$	Turn-on delay time			30		ns
t_r	Rise time	$V_{GS}=15V, V_{DS}=400V,$		8		ns
$t_{d(off)}$	Turn-off delay time	$R_G=3\Omega$		95		ns
t_f	Fall time			9		ns
GATE CHARGE CHARACTERISTICS						
Q_g	Gate charge total			95		nC
Q_{gd}	Gate to drain charge	$V_{DS}=400V, I_D=16.4A$		33		nC
Q_{gs}	Gate to source charge	$V_{GS}=0\sim 10V$		28		nC
$V_{plateau}$	Gate plateau voltage			6.2		V
BODY DIODE CHARACTERISTICS						



SYMBOL	PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT
V_{SD}	Diode forward voltage	$V_{GS}=0V, I_F=16.4A,$ $T_j=25^\circ C$			1.3	V
t_{rr}	Reverse recovery time	$V_{DS}=400V, I_F=25A$ $di_F/dt=100A/\mu s$		150		ns
Q_{rr}	Reverse recovery charge			0.9		μC
I_{rr}	Peak reverse recovery current			12.5		A

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7 Electrical Characteristic Diagram

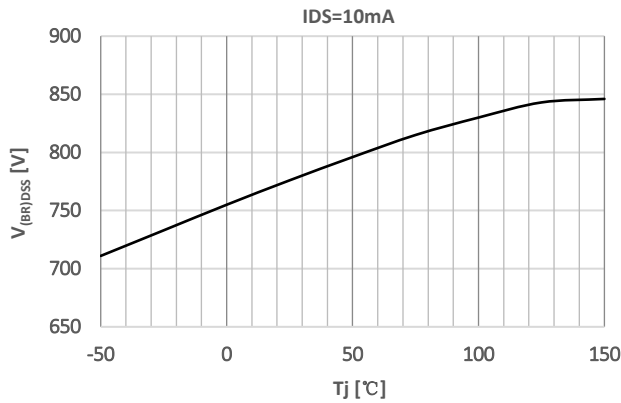


Figure 1. Drain-source Breakdown Voltage

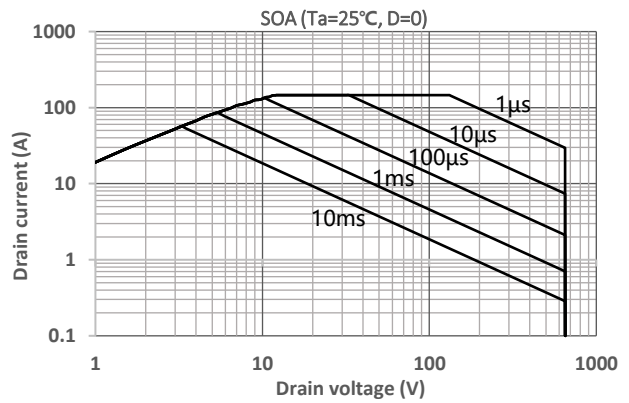


Figure 2. Safety Operating Area

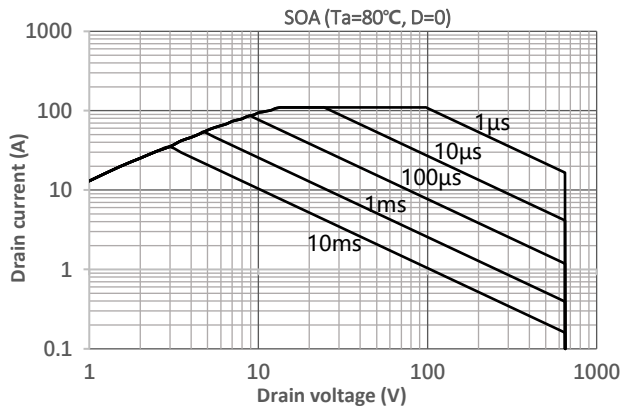


Figure 3. Safety Operating Area

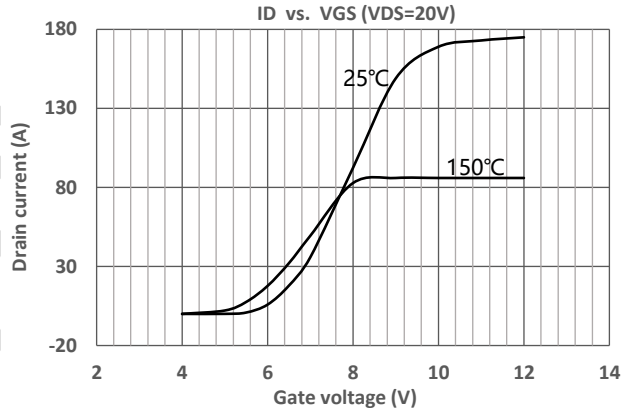


Figure 4. Typ. Transfer Characteristics

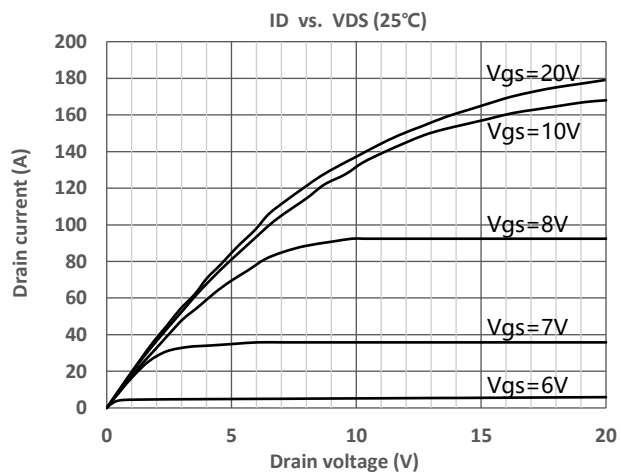


Figure 5. Typ. Output Characteristics

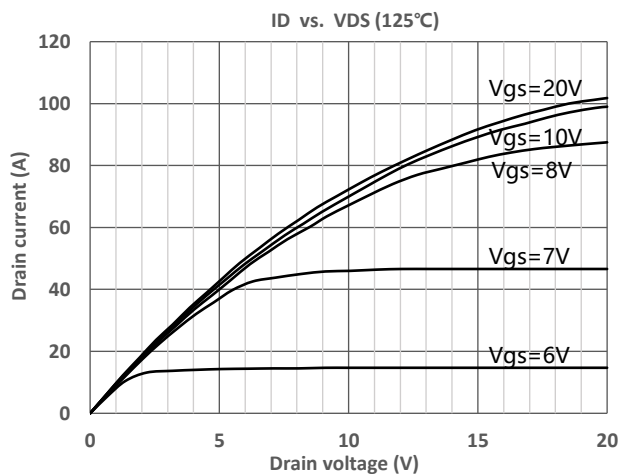


Figure 6. Typ. Output Characteristics

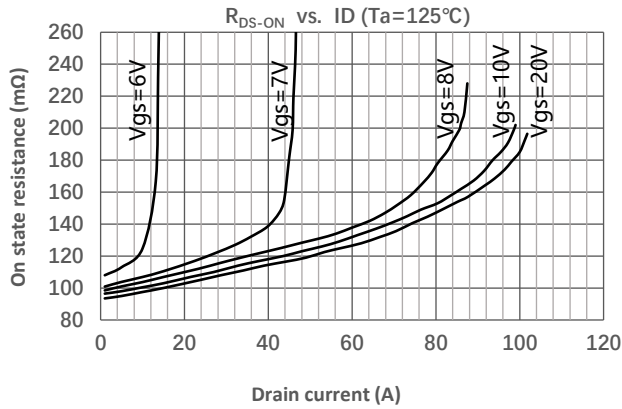


Figure 7. Typ. Drain Source On-state Resistance

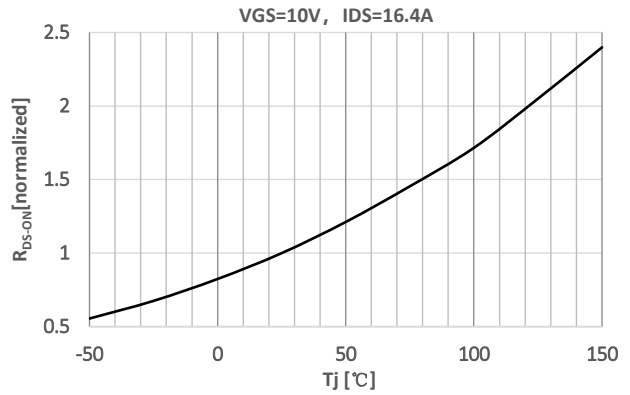


Figure 8. R_DS-ON vs. Tj

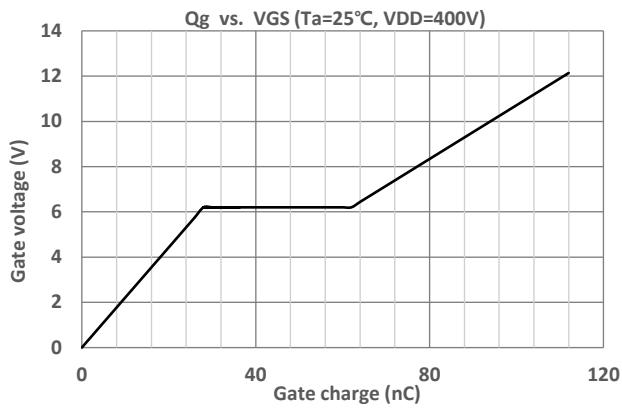


Figure 9. Typ. Gate Charge

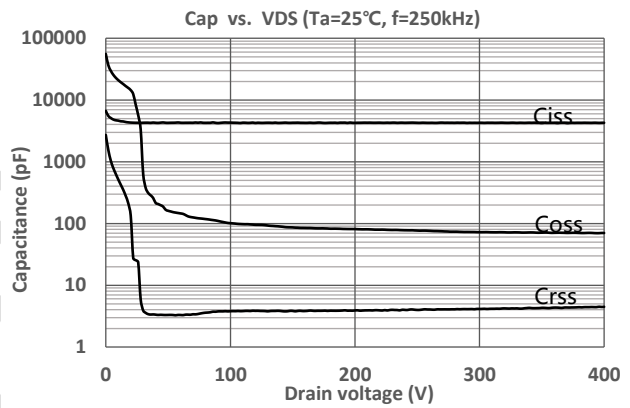


Figure 10. Typ. Capacitance

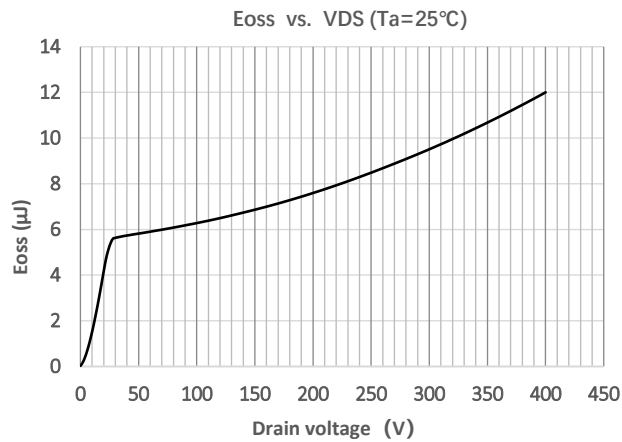


Figure 11. Typ. Coss Stored Energy

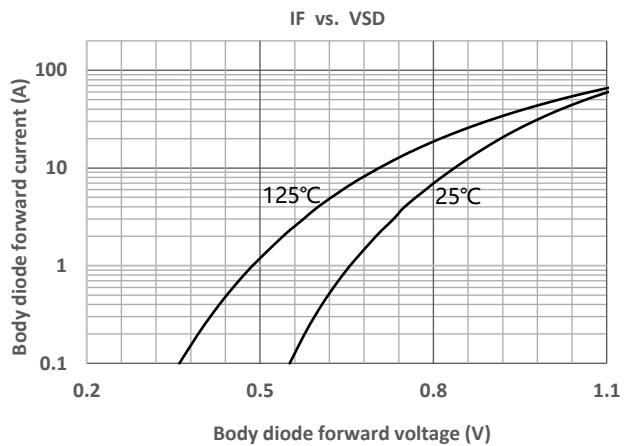


Figure 12. Body diode forward characteristics

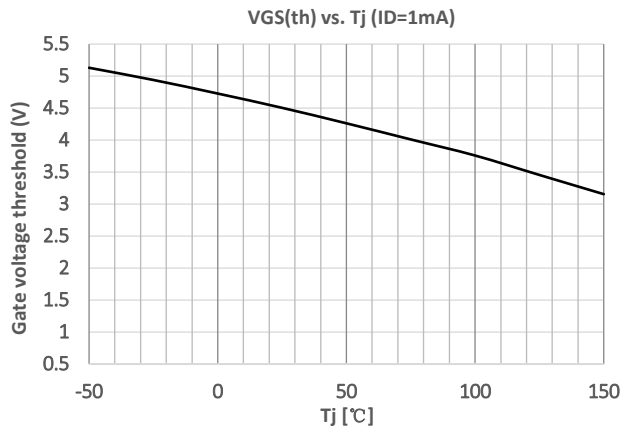


Figure 13. Threshold Voltage vs. Tj

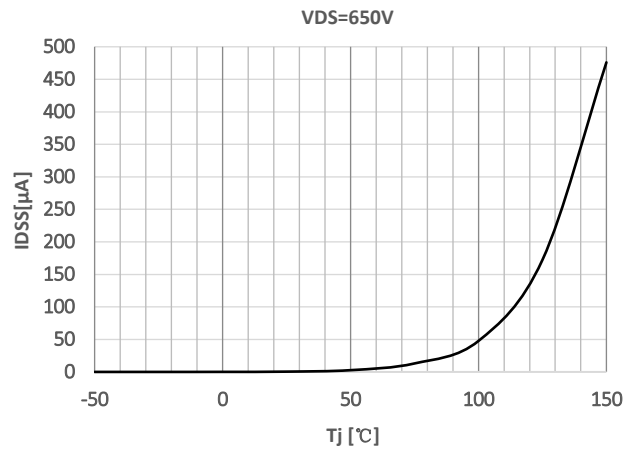


Figure 14. Maximum drain leakage current vs. Case temperature

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8 Test Circuit

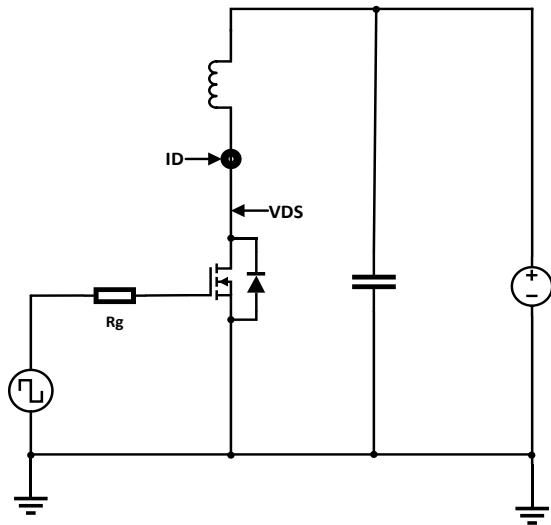
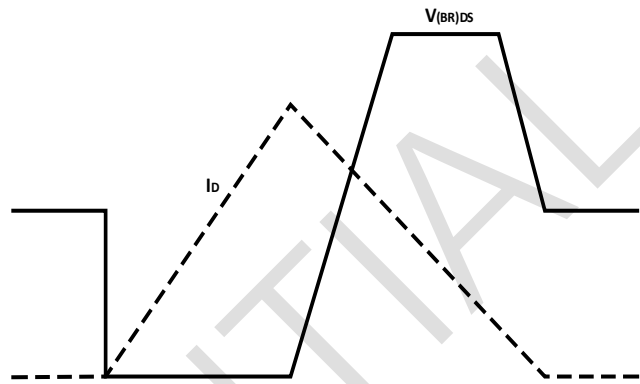


Figure 15. Unclamped inductive switching test circuit



Waveform 1. Unclamped inductive switching waveform

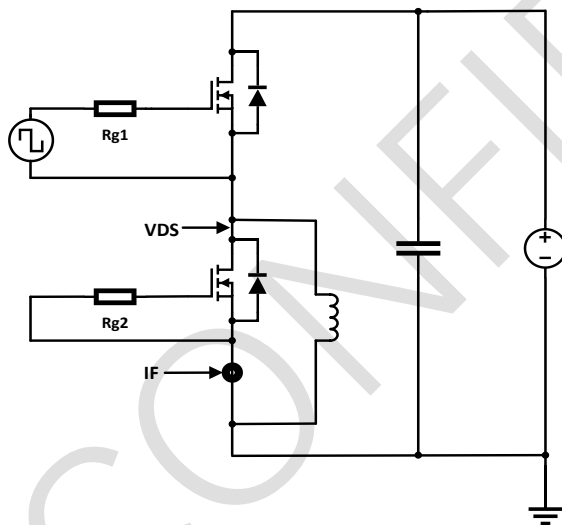
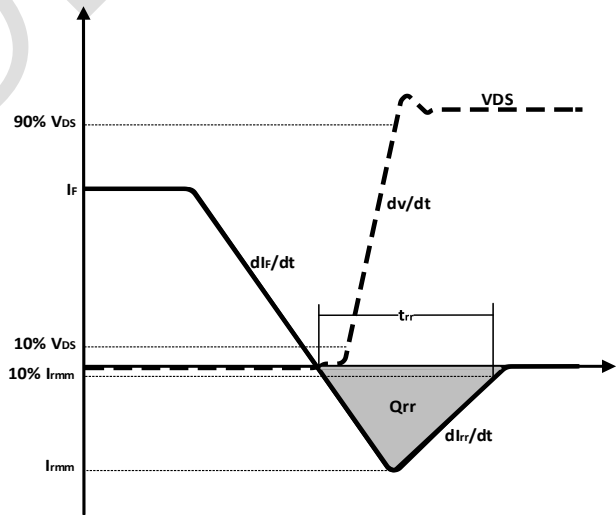


Figure 16. Body diode characteristics test circuit



Waveform 2. Body diode characteristics waveform

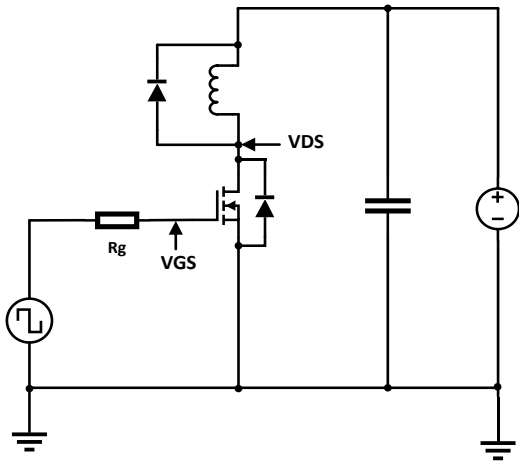
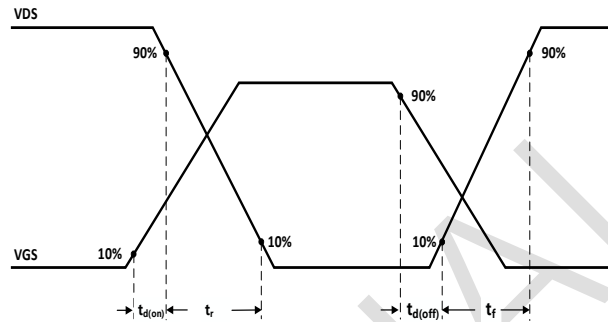


Figure 17. Switching time test circuit

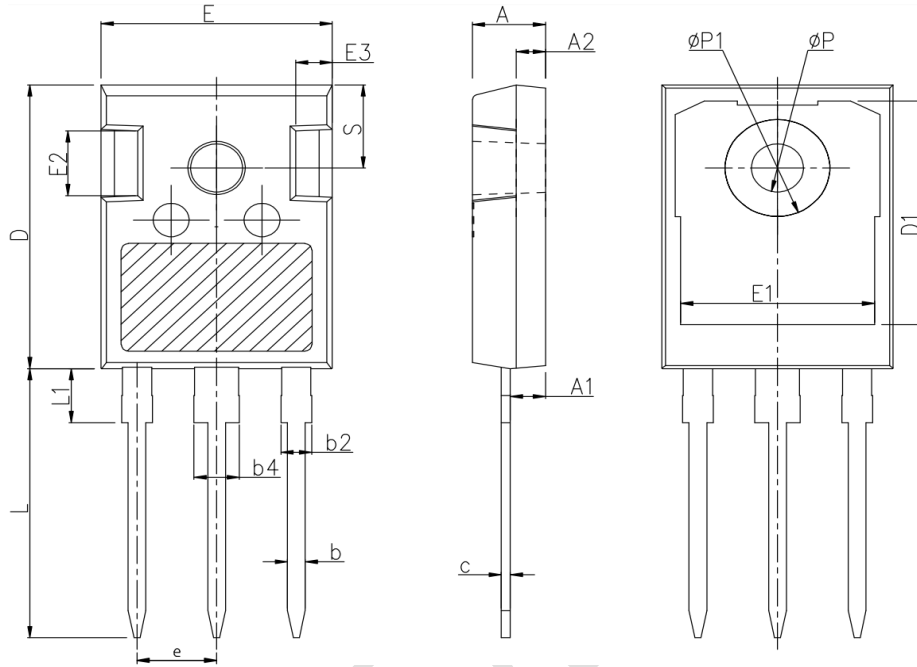


Waveform 3. Switching time waveform

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PACKAGE INFORMATION



SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.80	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.82	19.92	20.22
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.15BSC		