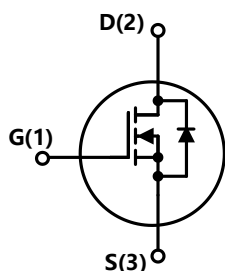
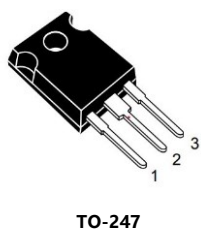


N-channel 650V 34mΩ (Typ) Power MOSFET

1 FEATURES

- 650V breakdown 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
GBS65041TOB	65041	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 GBS65041TOB provides very high efficiency in resonant switch topology.

The Ultra-fast body diode makes the GBS65041TOB suitable for high switching frequency application and supports high power density application. The GBS5041TOB is available in TO-247 package.

5 KEY PERFORMANCE PARAMETERS

PARAMETER	VALUE	UNIT
$V_{DS} @ T_{j_max}$	700	V
$R_{DS-ON} \text{ max } @ V_{GS}=10V$	38	mΩ
$Q_g \text{ (Typ)}$	149	nC
$I_{D-pulse}$	264	A
$E_{oss}@400V$	15.5	μJ
Body diode recovery time	166	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	$V_{GS}=0\text{V}$, $I_D=1\text{mA}$	650	V
I_D	Continuous drain current	$T_C=25^{\circ}\text{C}$	66	A
		$T_C=100^{\circ}\text{C}$	42	
$I_{D\text{-pulse}}$	Pulsed drain current		264	A
V_{GS}	Gate-source voltage		± 30	V
E_{AS}	Single pulsed avalanche energy ①	$V_{DD}=100\text{V}$	907	mJ
E_{AS}	Single pulsed avalanche energy ②	$V_{DD}=100\text{V}$	2323	mJ
E_{AR}	Repetitive avalanche energy	$V_{DD}=100\text{V}$	4.5	mJ
P_D	Power dissipation	$T_C=25^{\circ}\text{C}$	313	W
dv/dt	MOSFET dv/dt ruggedness	$V_{DS}=0\sim 400\text{V}$	90	V/ns
I_S	Continuous diode forward current	$T_C=25^{\circ}\text{C}$	66	A
$I_{S\text{-pulse}}$	Diode pulsed current	$T_C=25^{\circ}\text{C}$	264	A
dv/dt	Reverse diode dv/dt	$V_{DS}=0\sim 400\text{V}$, $I_{SD}<50\text{A}$	70	V/ns
T_J	Operating junction temperature		$-55 \sim 150$	$^{\circ}\text{C}$
T_{stg}	Storage temperature		$-55 \sim 150$	$^{\circ}\text{C}$

Note:

- ① $L=100\text{mH}$, $V_{DD}=100\text{V}$, $R_g=3\text{ohm}$, $T_J=25^{\circ}\text{C}$, Finish goods test condition
- ② $L=100\text{mH}$, $V_{DD}=100\text{V}$, $R_g=3\text{ohm}$, $T_J=25^{\circ}\text{C}$, Typical E_{AS}

6.2 THERMAL INFORMATION

SYMBOL	PARAMETER	VALUE	UNIT
$R_{\theta JC \text{ max.}}$	Max. Thermal resistance, junction - case	0.31	$^{\circ}\text{C/W}$
$R_{\theta JA \text{ max.}}$	Max. Thermal resistance, junction - ambient	62	$^{\circ}\text{C/W}$
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}	Drain-source breakdown voltage	V _{GS} =0V, I _D =1mA	650			V
V _{(GS)th}	Gate threshold voltage	V _{DS} =V _{GS} , I _D =1mA	3.4	4	4.6	V
R _{DS-ON}	Drain-source on state resistance	V _{GS} =10V, I _D =25A		34	38	mΩ
		V _{GS} =10V, I _D =25A, T _j =125°C		71		
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			5	uA
		V _{GS} =0V, V _{DS} =650V, T _j =125°C			500	
R _g	Gate resistance	F=1MHz, open drain		3		Ω
DYNAMIC CHARACTERISTICS						
C _{iss}	Input capacitance	V _{GS} =0V V _{DS} =400V, f=250KHz		6260		pF
C _{oss}	Output capacitance			93		pF
C _{rss}	Reverse transfer capacitance			13		pF
C _{o(er)}	Effective output capacitance, energy related	V _{GS} = 0V, V _{DS} = 0V~400V		194		pF
C _{o(tr)}	Effective output capacitance, time related			2240		pF
t _{d(on)}	Turn-on delay time	V _{GS} =15V, V _{DS} =400V, I _D =25A, R _G =3Ω		46		ns
t _r	Rise time			8		ns
t _{d(off)}	Turn-off delay time			165		ns
t _f	Fall time			10		ns
GATE CHARGE CHARACTERISTICS						
Q _g	Gate charge total	V _{DS} =400V, I _D =25A		149		nC
Q _{gd}	Gate to drain charge			69		nC



SYMBOL	PARAMETER	TEST CONDITION	MIN	TYP	MAX	UNIT
Q _{gs}	Gate to source charge	V _{GS} =0~10V		33		nC
V _{plateau}	Gate plateau voltage			6.2		V
BODY DIODE CHARACTERISTICS						
V _{SD}	Diode forward voltage	V _{GS} =0V, I _F =25A, T _j =25°C			1.3	V
t _{rr}	Reverse recovery time	V _R =400V, I _F =25A di _F /dt=100A/μs		166		ns
Q _{rr}	Reverse recovery charge			1.2		μC
I _{rr}	Peak reverse recovery current			14.5		A



7 Electrical Characteristic Diagram

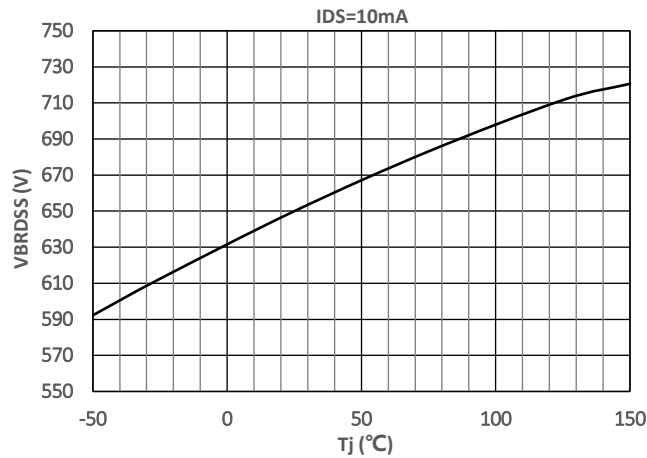


Figure 1. Drain-source Breakdown Voltage

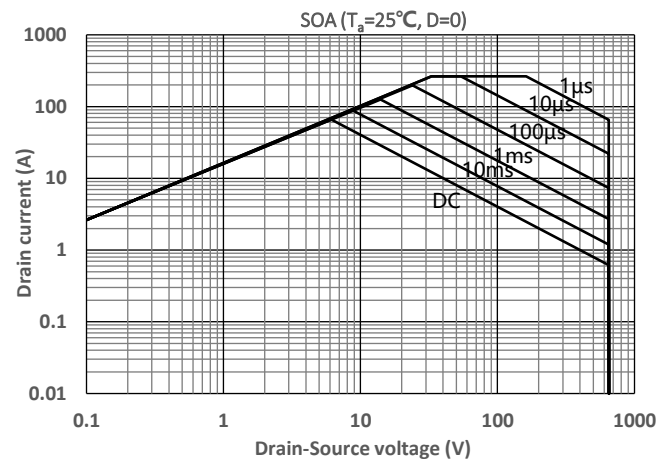


Figure 2. Safety Operating Area

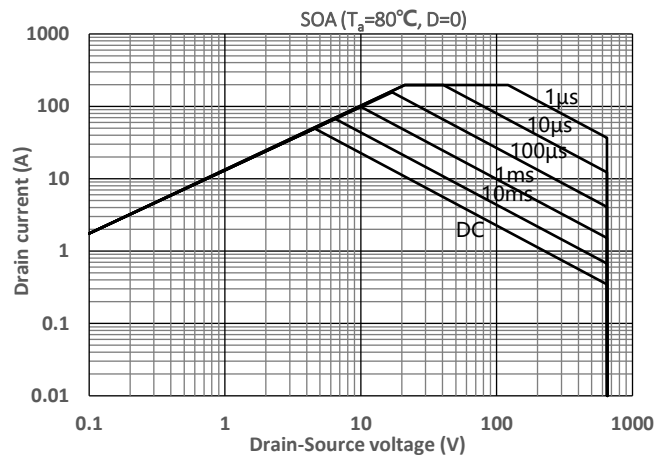


Figure 3. Safety Operating Area(Ta=80°C)

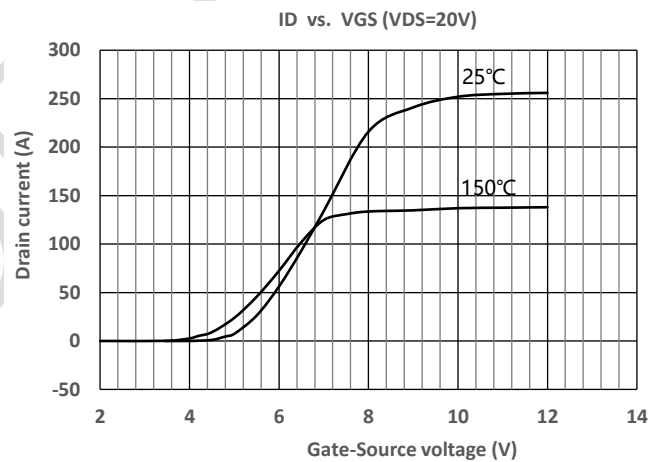


Figure 4. Typ. Transfer Characteristics

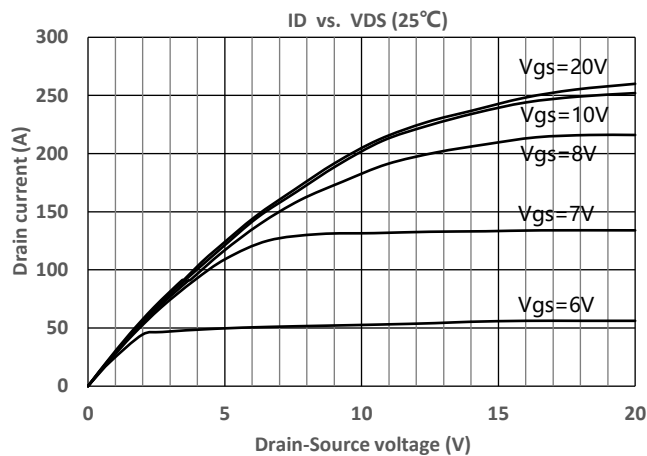


Figure 5. Typ. Output Characteristics

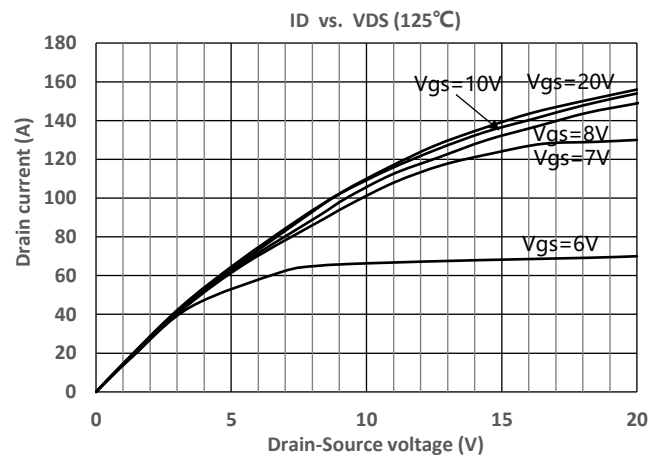


Figure 6. Typ. Output Characteristics

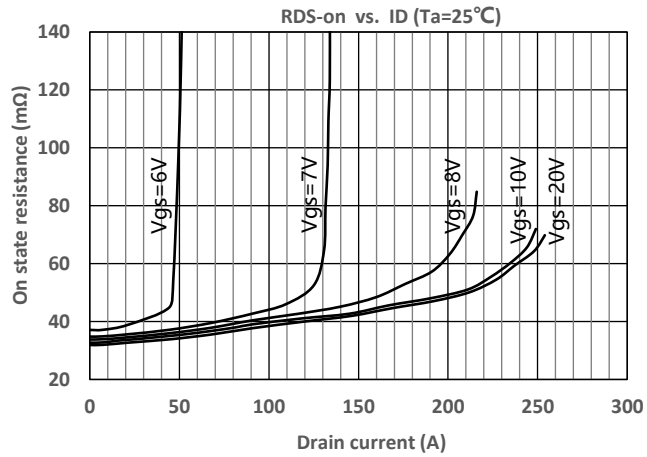


Figure 7. Typ. Drain Source On-state Resistance

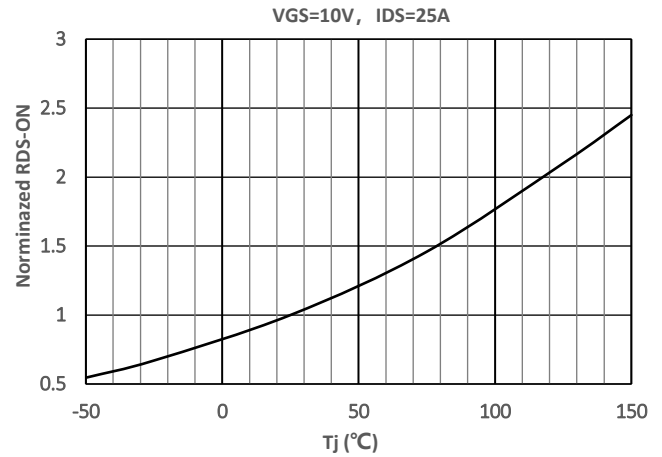


Figure 8. RDS-ON vs. Tj

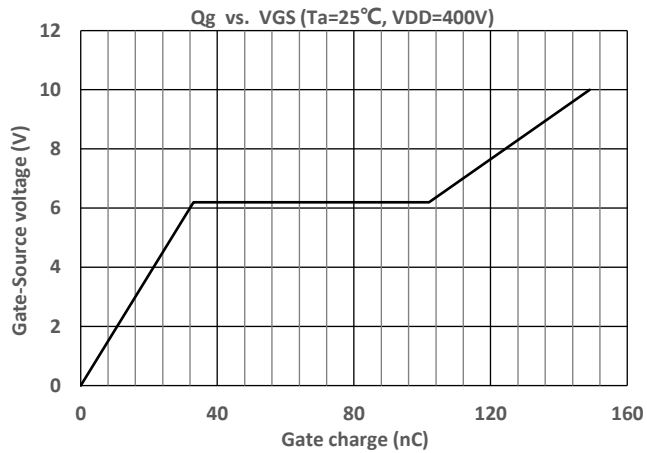


Figure 9. Typ. Gate Charge

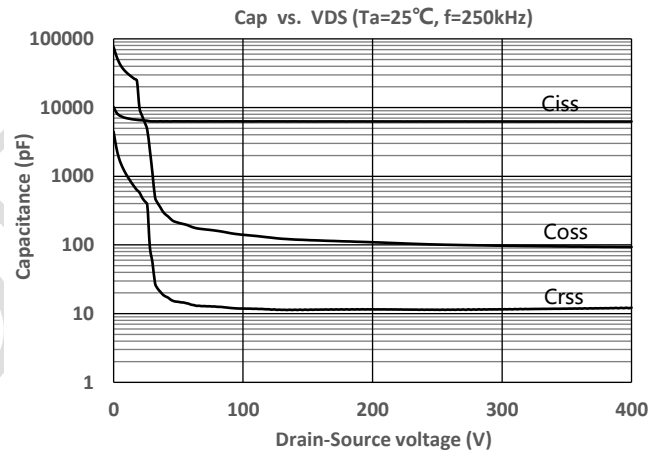


Figure 10. Typ. Capacitance

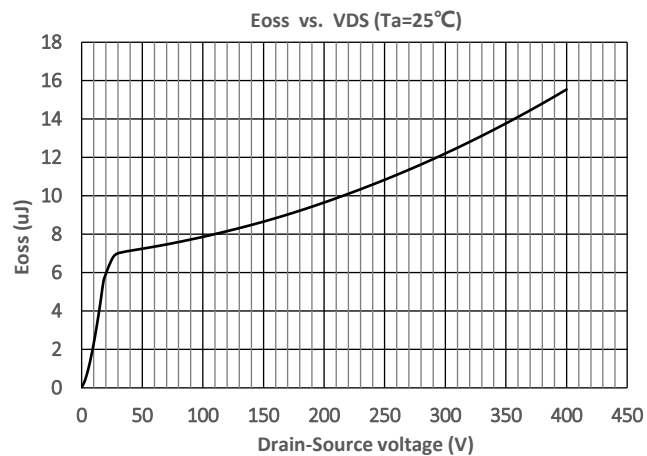


Figure 11. Typ. Coss Stored Energy

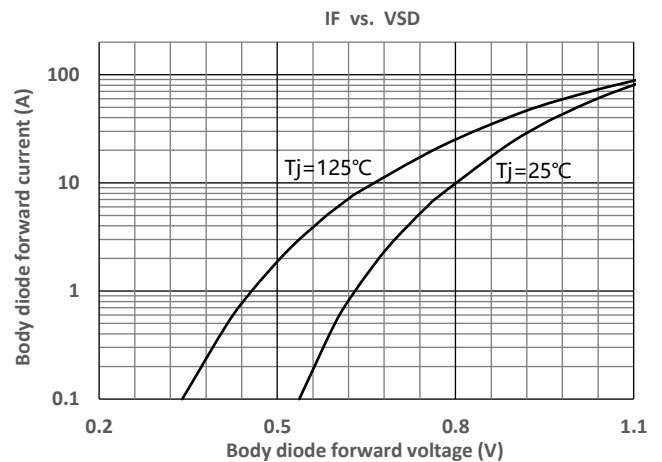


Figure 12. Body diode forward characteristics

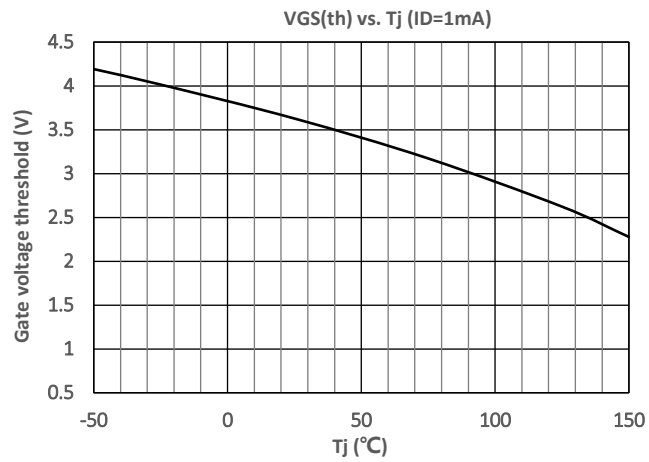


Figure 13. Threshold Voltage vs. Tj

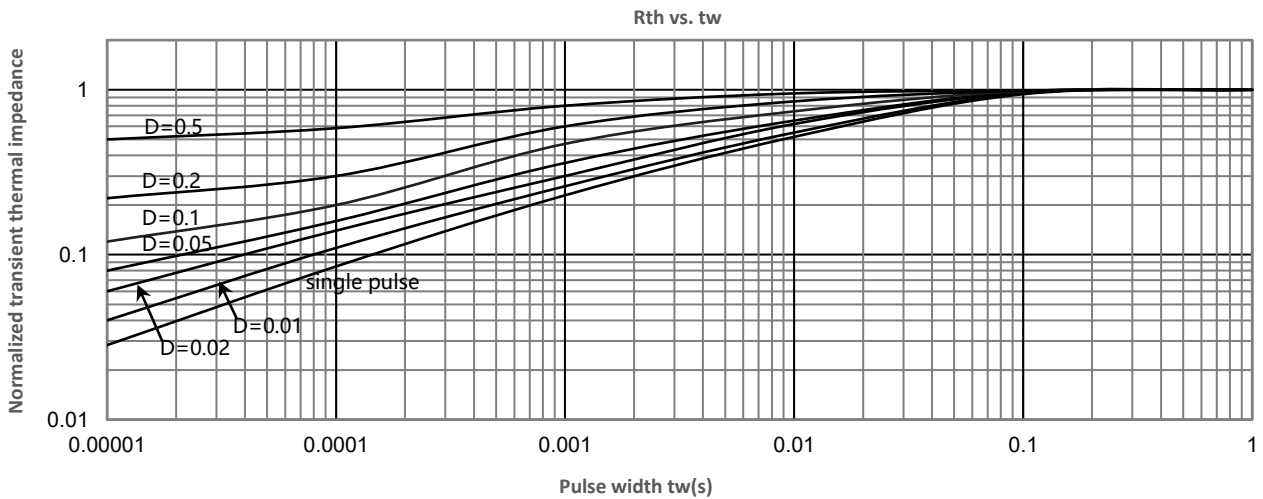


Figure 14. Rth vs. Tw



8 Test Circuit

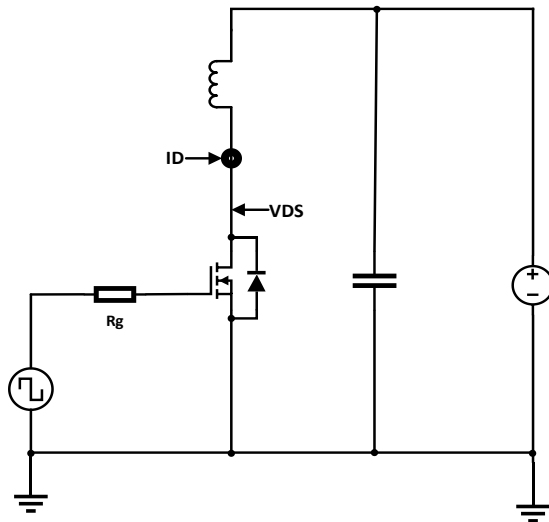
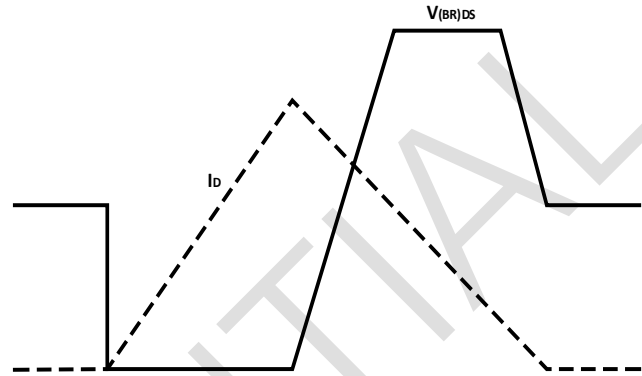


Figure 15. Unclamped inductive switching test circuit



Waveform 1. Unclamped inductive switching waveform

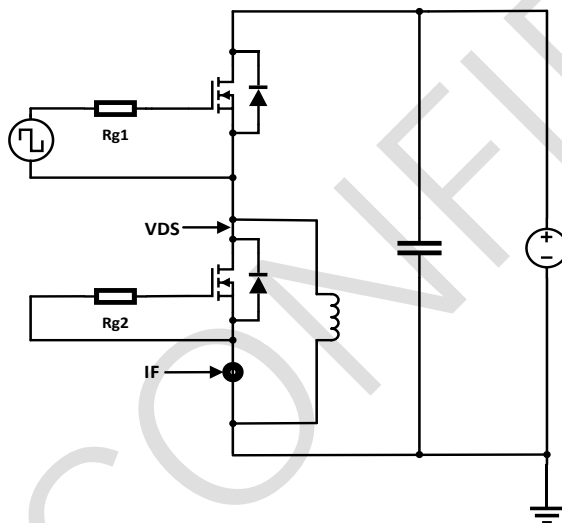
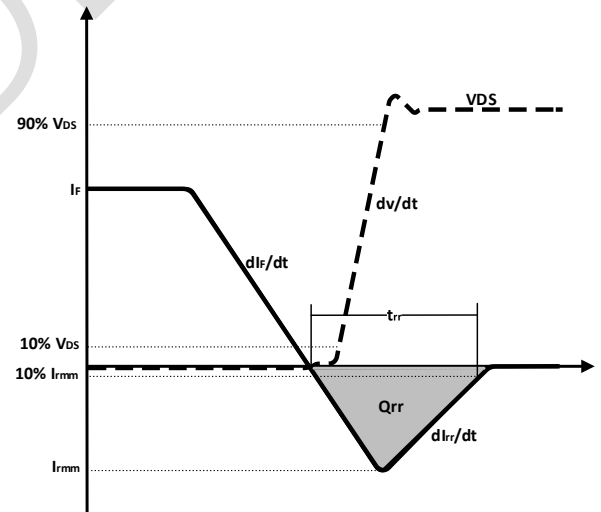


Figure 16. Body diode characteristics test circuit



Waveform 2. Body diode characteristics waveform

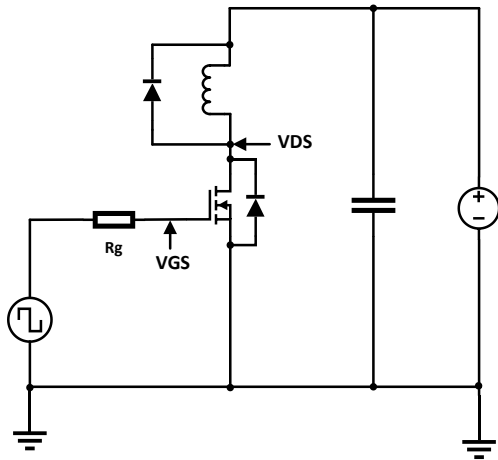
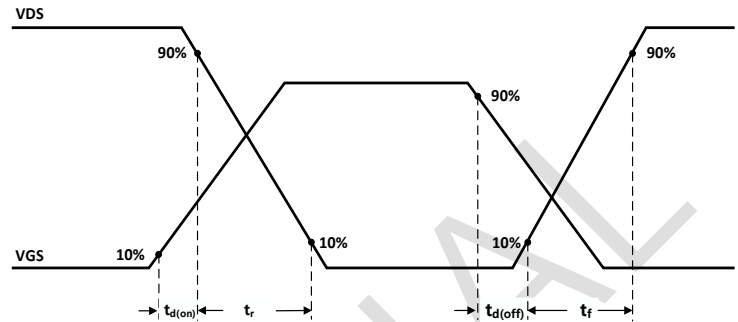
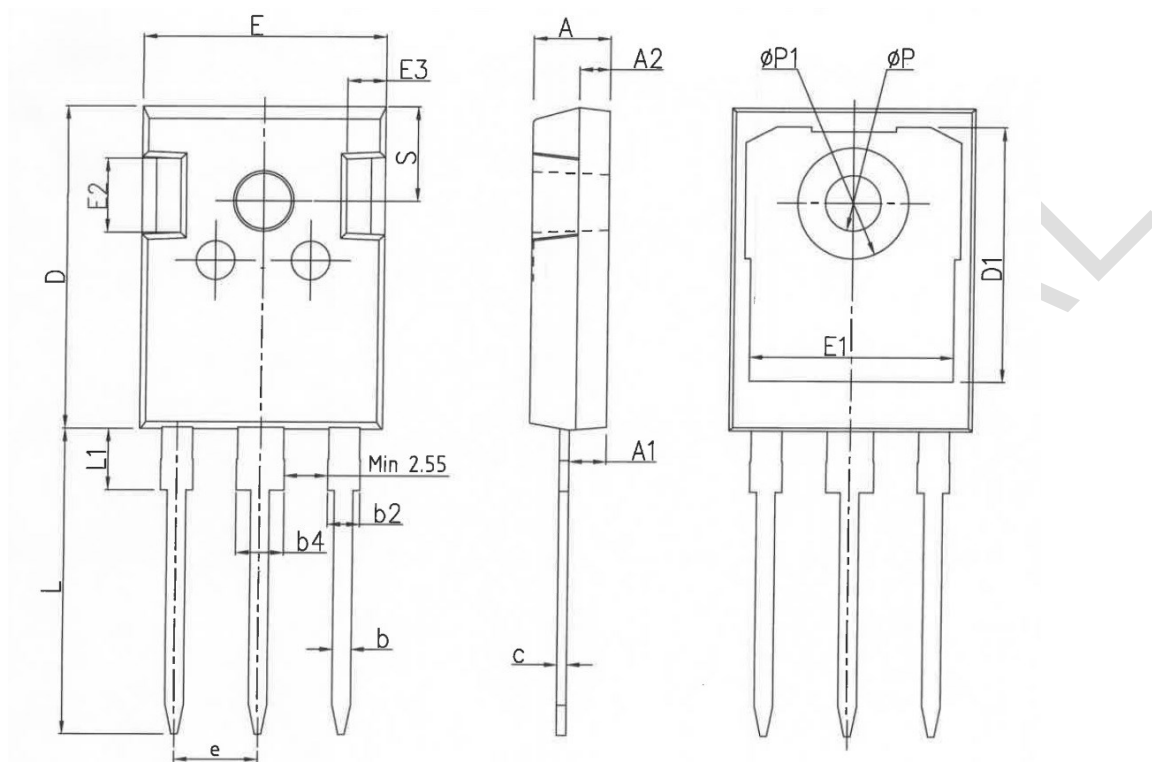


Figure 17. Switching time test circuit



Waveform 3. Switching time waveform

**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	20.70	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	19.62	19.92	20.22
L1	-	-	4.30
ϕP	3.40	3.60	3.80
$\phi P1$	-	-	7.30
S	6.15BSC		