80mΩ, 650V, Super Junction N-Channel Power MOSFET

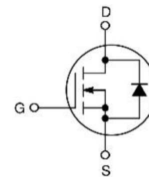
Description

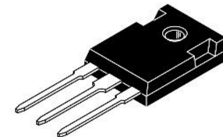
The LXP SEMI LX1S080N065FBW is a high voltage power MOSFET, fabricated using advanced super junction technology. The resulting device has extremely low on resistance, low gate charge and fast switching time, making it especially suitable for applications which require superior power density and outstanding efficiency.

The LX1S080N065FB break down voltage is 650V and it has a high rugged avalanche characteristic. The LX1S080N065FB is available in TO-247-3 package.

Key Features

- Low $R_{DS(on)}$ =65mΩ @ V_{GS} = 10V.
- Ultra Low Gate Charge, Q_g=60nC typ.
- Fast switching capability
- Robust design with better EAS performance
- Fast-Recovery Body Diode





TO-247-3

Applications

- Telecom Power
- EV Charger
- LED Lighting

Key performance

Parameter	Value	Unit
$V_{DS(Tj=25°C)}$	650	V
$R_{DS(on), max(Tj=25°C)}$	80	mΩ
$R_{DS(on), typic(Tj=25°C, ID=20 A)}$	65	mΩ
$I_{D(Tj=25°C)}$	45	A
$Q_{g, typic}$	62	nC
$Q_{rr, typic}$	1.2	μC
$t_{rr, typic}$	110	ns
$T_{j, max}$	150	ºC

Package Feature

Order code	Marking	Package	Packing
LX1S080N065FBW	**LX1S080N065FB**	**TO-247-3PIN**	**Tube**

1.Maximum Ratings (Tj=25°C unless otherwise specified)

Parameter		Symbol	Rating	Unit
Drain-Source Voltage		V_{DSS}	650	V
Gate-Source Voltage		V_{GSS}	±30	V
Continuous Drain Current	T_C=25ºC	I_D	45	A
	T_C=100ºC		29	
Pulsed Drain Current (Note 2)		I_{DM}	135	A
Avalanche Energy, Single Pulse (Note 3)		E_{AS}	1190	mJ
Avalanche Energy, Repetitive (Note 2)		E_{AR}	1.7	mJ
Avalanche Current, Repetitive (Note 2)		I_{AR}	8.8	A
Continuous Diode Forward Current		I_S	45	A
Diode Pulse Current		$I_{S.pulse}$	135	A
MOSFET dv/dt Ruggedness, V_{DS}≤400V		dv/dt	80	V/ns
Reverse diode dv/dt Ruggedness, V_{DS}≤400V		dv/dt	50	V/ns
Power Dissipation		P_{tot}	390	W
Operating Temperature/ Storage Temperature		T_J	-55~150	ºC

Note:

1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. Repetitive Rating: Pulse width limited by maximum junction temperature
3. I_{AS} = 8.8A, V_{DD} = 50V, R_g = 25Ω, Starting T_J = 25°C

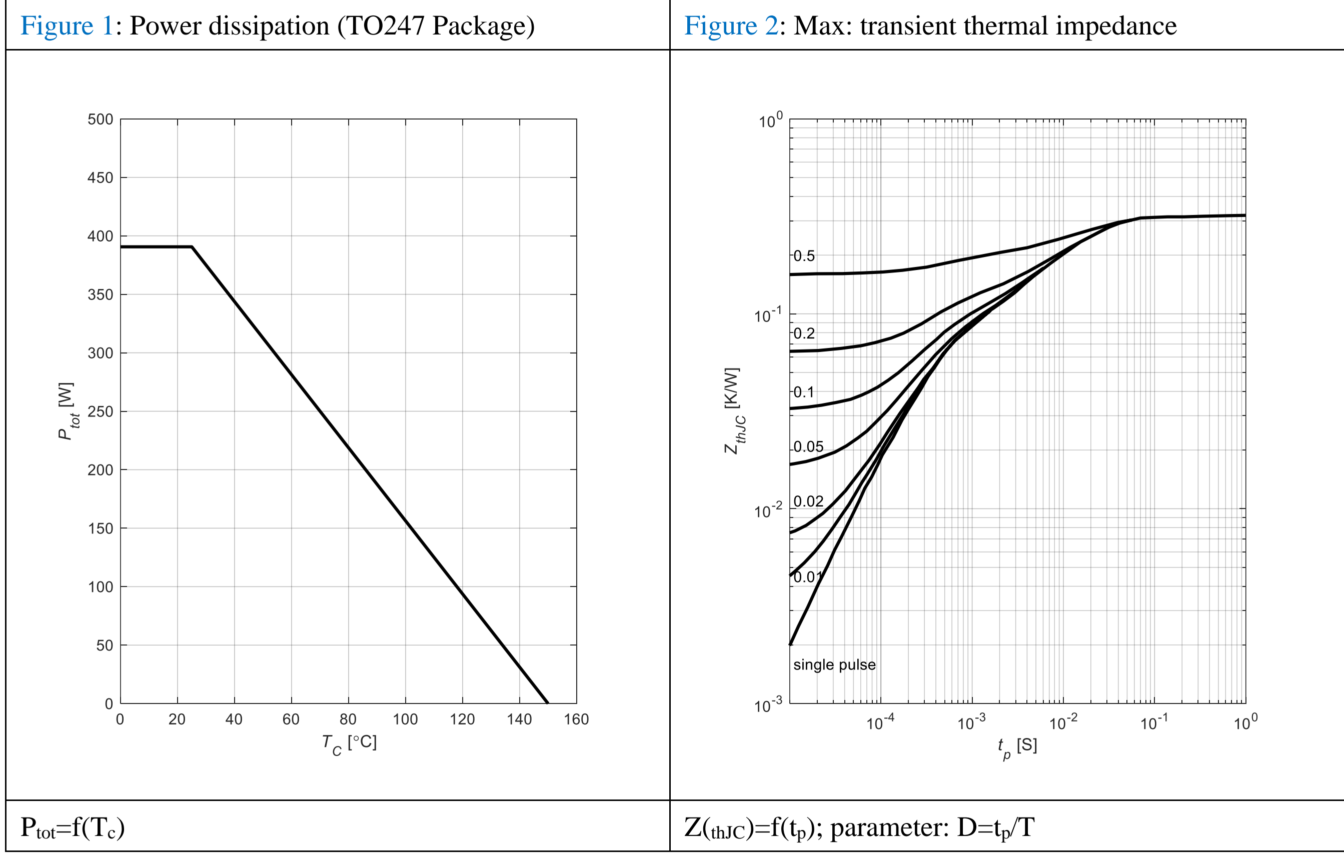
2.Thermal characteristics (TO247 Package)

Parameter	Symbol	Max. Value	Unit
Thermal resistance, junction-to-case	R_{thJC}	0.32	°C/W
Thermal resistance, junction-to-ambient	R_{thJA}	62	°C/W

3.Electrical Characteristics (T_{vj}=25°C unless otherwise specified)

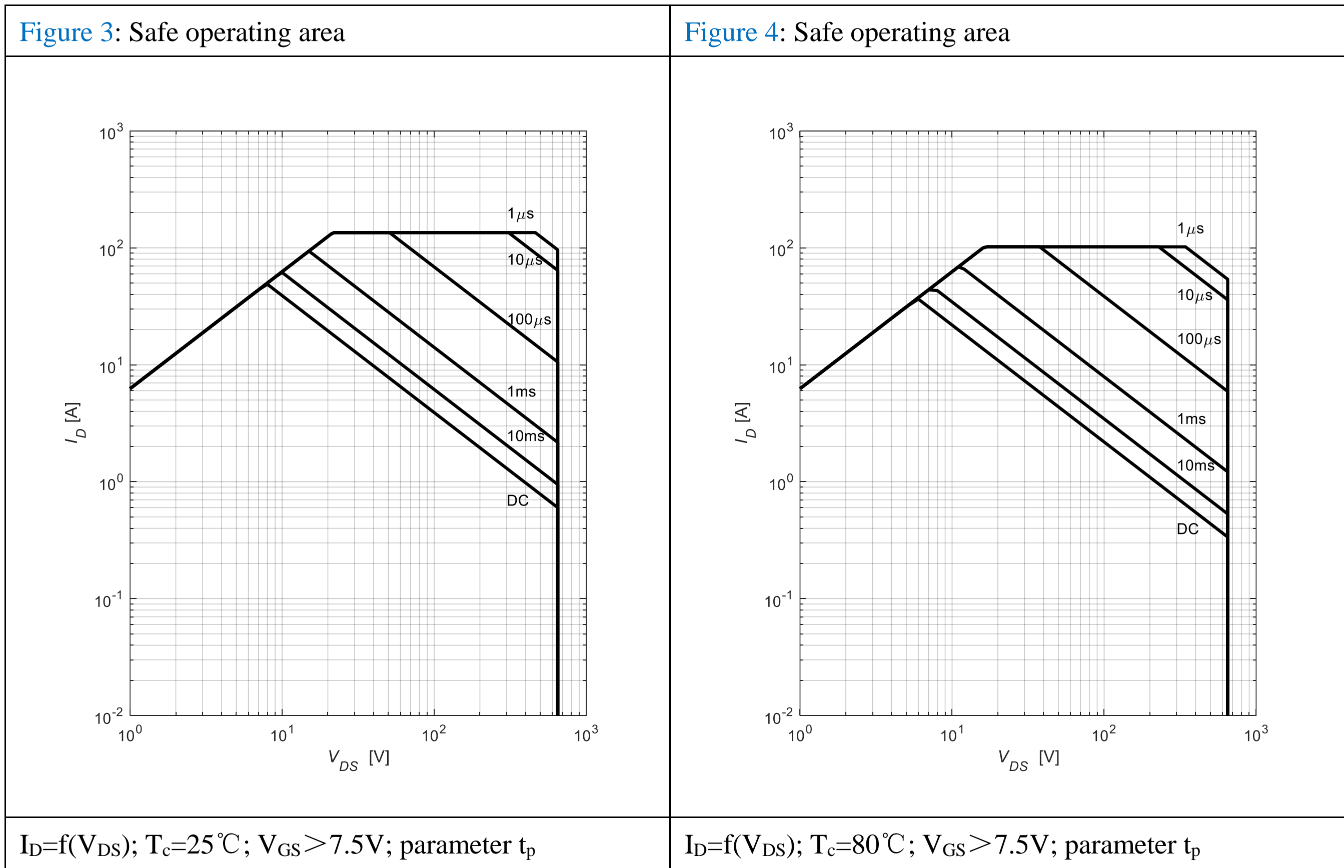
Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Statistic Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS} = 0 V, I_D = 250 μA	650			V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS} = 650 V, V_{GS} = 0 V			10	μA
Gate-Source Leakage Current	I_{GSSF}	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
	I_{GSSR}	V_{GS} = -20 V, V_{DS} = 0 V			-100	nA
Gate Threshold Voltage	$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 1.5 mA	3.8	4.3	4.8	V
Static Drain-Source On-Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 20 A		65	80	mΩ
		V_{GS} = 10 V, I_D = 20 A T_j =125 ºC		140		
Gate Resistance	R_G	f = 1 MHz，open drain		3.0		Ω
Dynamic Characteristics						
Input Capacitance	C_{ISS}	V_{GS} = 0 V V_{DS} = 100 V f = 1 MHz		4300		pF
Output Capacitance	C_{OSS}			150		
Reverse Transfer Capacitance	C_{RSS}			1		
Gate to Source Charge	Q_{gs}	V_{DS} = 520V V_{GS} = 0 to 10 V I_D = 20A		25		nC
Gate to Drain Charge	Q_{gd}			13		
Gate Charge Total	Q_g			62		
Switching Characteristics						
Turn-on delay time	$T_{d(on)}$	V_{DD} = 400 V, I_D = 20 A, R_G =10Ω, V_{GS} = 0/10 V		150		ns
Rise time	T_r			20		
Turn-off delay time	$T_{d(off)}$			125		
Fall time	T_f			6		
Turn-on switching energy	E_{on}			1.2		mJ
Turn-off switching energy	E_{off}			0.6		
Reverse Diode Characteristics						
Drain-Source Diode Forward Voltage	V_{SD}	V_{GS} = 0 V, I_{SD} = 20 A		0.9		V
		V_{GS} = 0 V, I_{SD} = 20 A T_j=125 ºC		0.8		
Reverse Recovery Time	t_{rr}	V_R = 400 V, I_F = 20 A, di/dt =150A/μs		110		ns
Reverse Recovery Charge	Q_{rr}			1.2		μC
Peak Reverse Recovery Current	I_{rrm}			15		A

4.Electrical characteristic curves



$P_{tot}=f(T_c)$

$Z_{(thJC)}=f(t_p)$; parameter: $D=t_p/T$



$I_D=f(V_{DS})$; $T_c=25℃$; $V_{GS}>7.5V$; parameter t_p

$I_D=f(V_{DS})$; $T_c=80℃$; $V_{GS}>7.5V$; parameter t_p

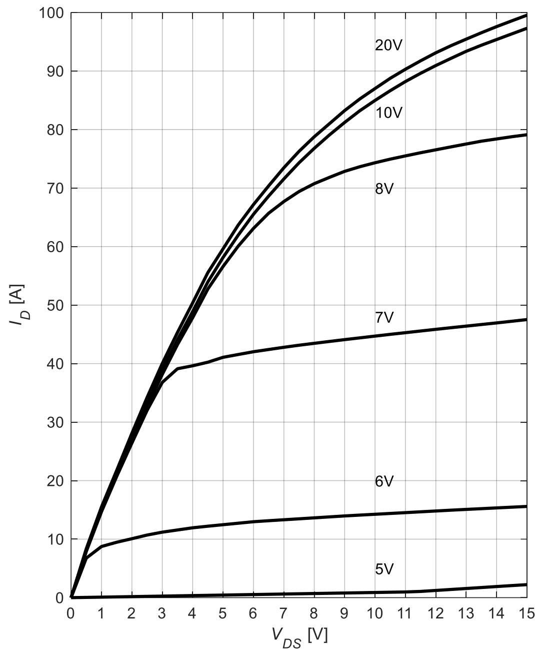
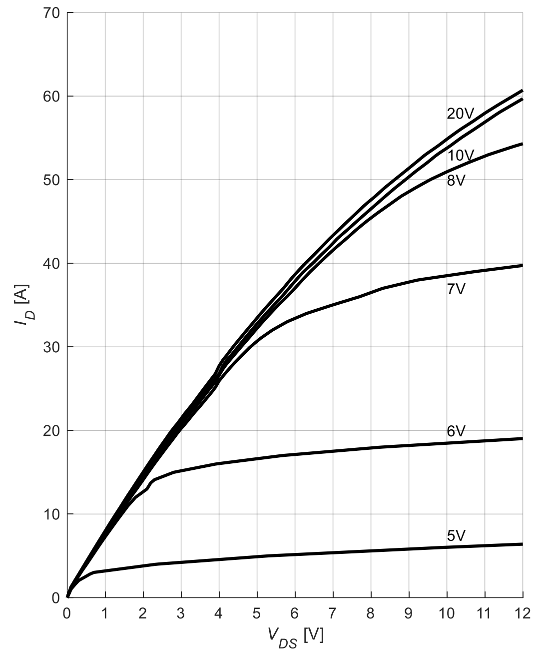
Figure 5: Typ. output characteristics	Figure 6: Typ. output characteristics
	
$I_D=f(V_{DS})$; $T_j=25$℃; parameter: V_{GS}	$I_D=f(V_{DS})$; $T_j=125$℃; parameter: V_{GS}

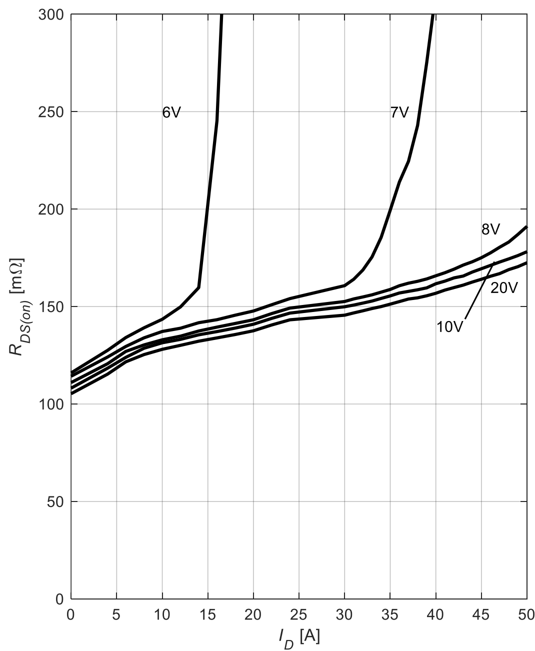
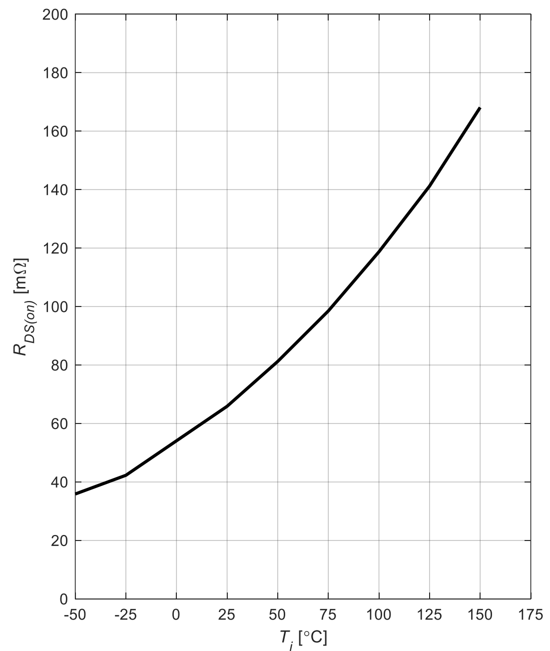
Figure 7: Typ. Drain-Source On-State Resistance	Figure 8: Typ. Drain-Source On-State Resistance
	
$R_{DS(on)}=f(I_D)$; $T_j=125$℃; parameter: V_{GS}	$R_{DS(on)}=f(T_j)$; $I_D=20A$; $V_{GS}=10V$

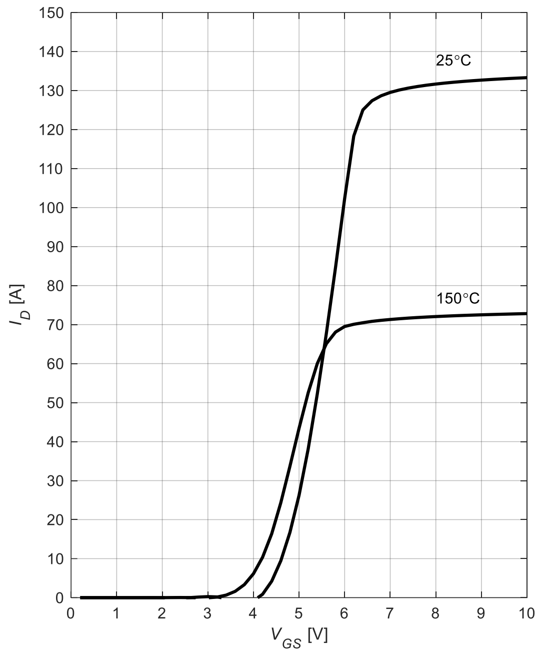
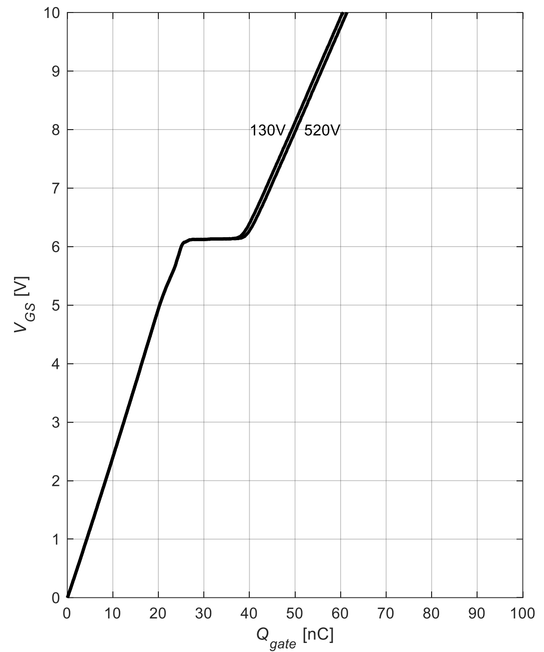
Figure 9: Typ. transfer characteristics	Figure 10: Typ. gate charge
	
I_D=f(V_{GS}); V_{DS}=20V	V_{GS}=f(Q_{gate}), I_D=20A pulsed

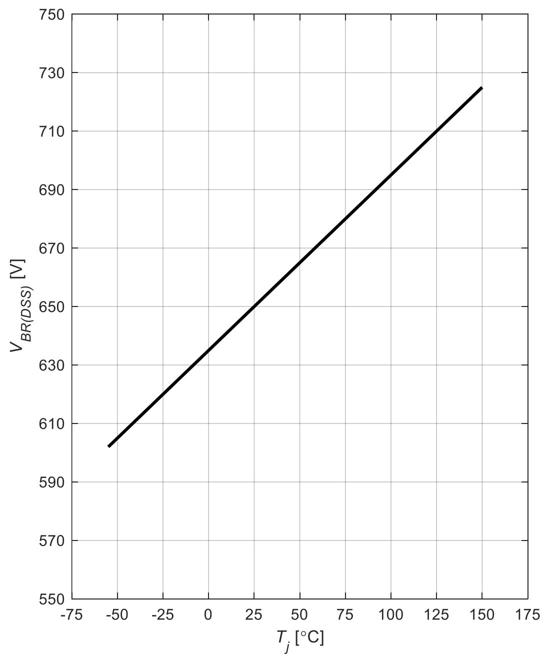
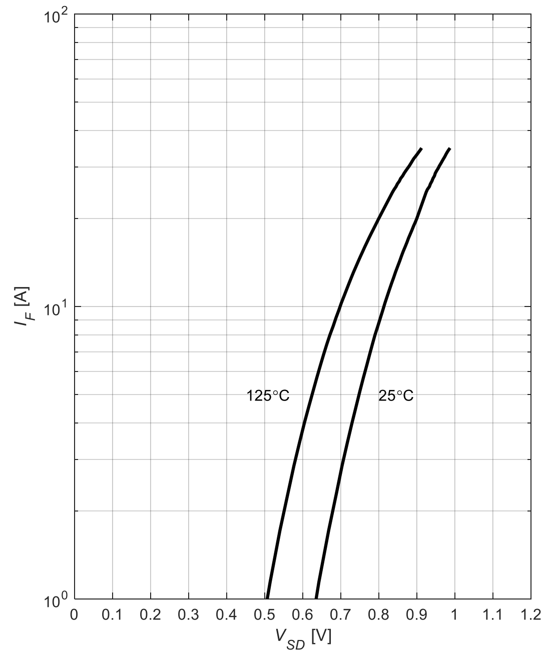
Figure 11: Drain-source breakdown voltage	Figure 12: Forward characteristics of reverse diode
	
$V_{BR(DSS)}$=f(T_j); I_D=1mA	I_F=f(V_{SD}); parameter: T_j

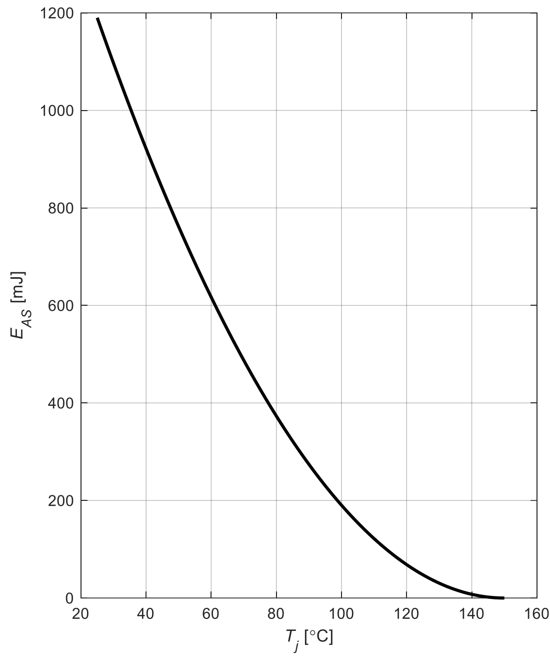
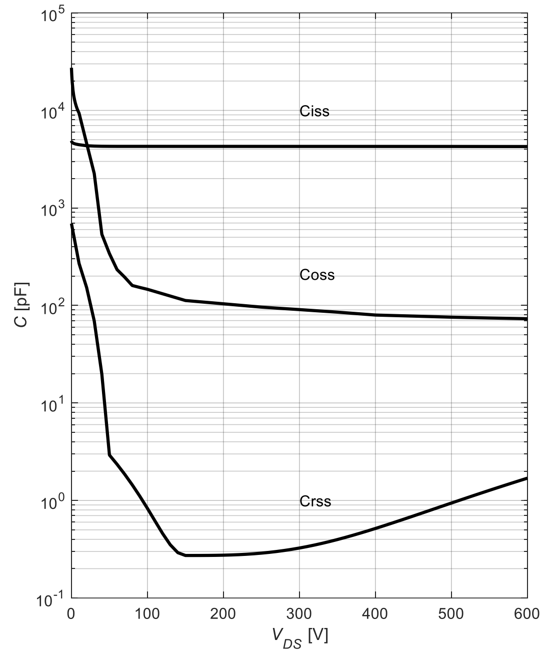
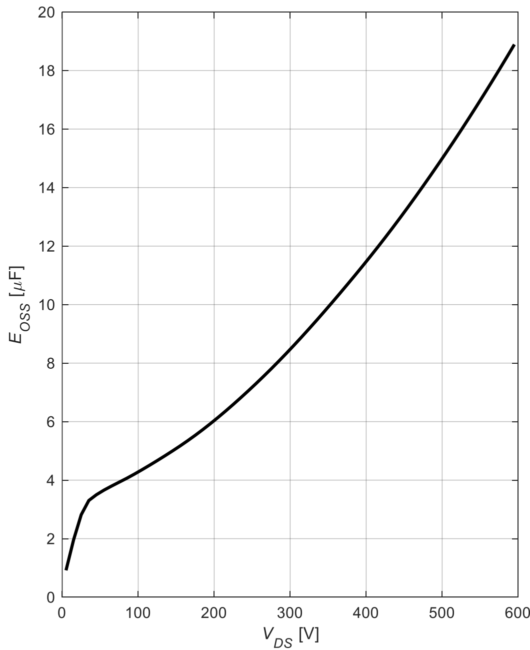
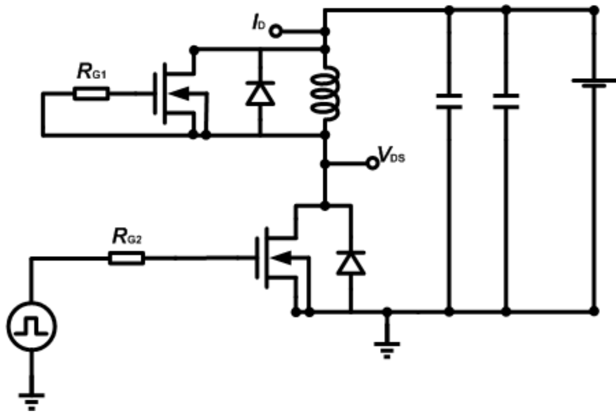
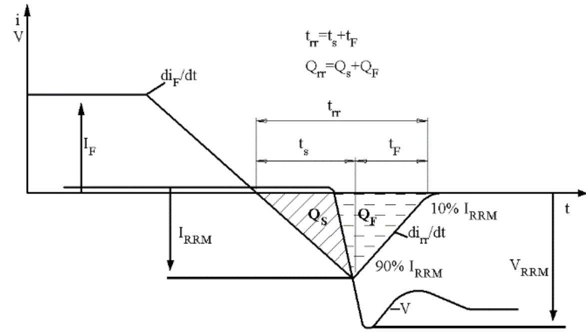
Figure 13: Avalanche energy	Figure 14: Typ. capacitances
	
E_{AS}=f(T_j); I_D=8.8A; V_{DD}=50V	C=f(V_{DS}); V_{GS}=0; f=1MHz

Figure 15: C_{OSS} stored energy

E_{OSS}=f(V_{DS})

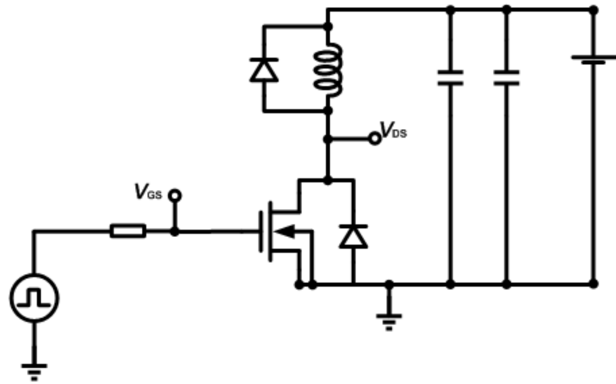
5.Test Circuits

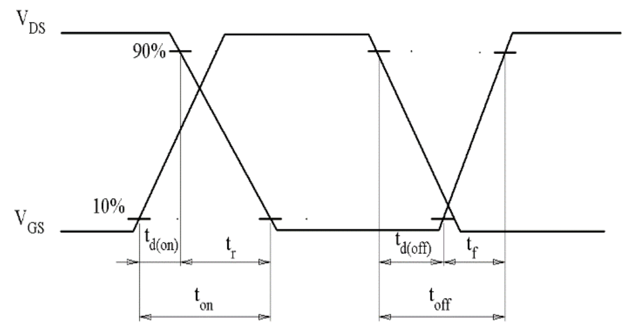
1) Test circuit and waveform for diode characteristics



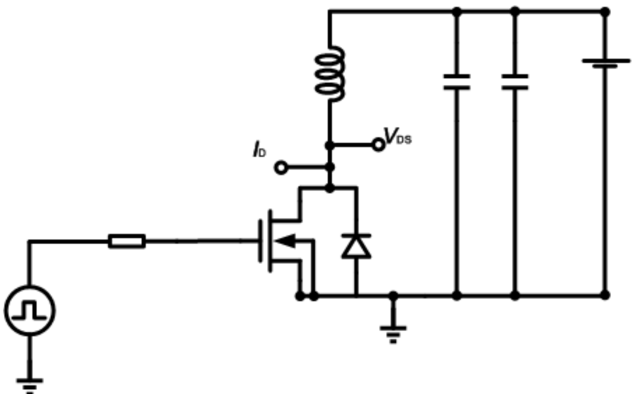


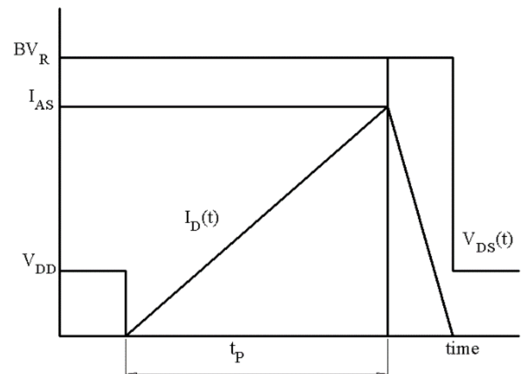
2) Switch time test circuit



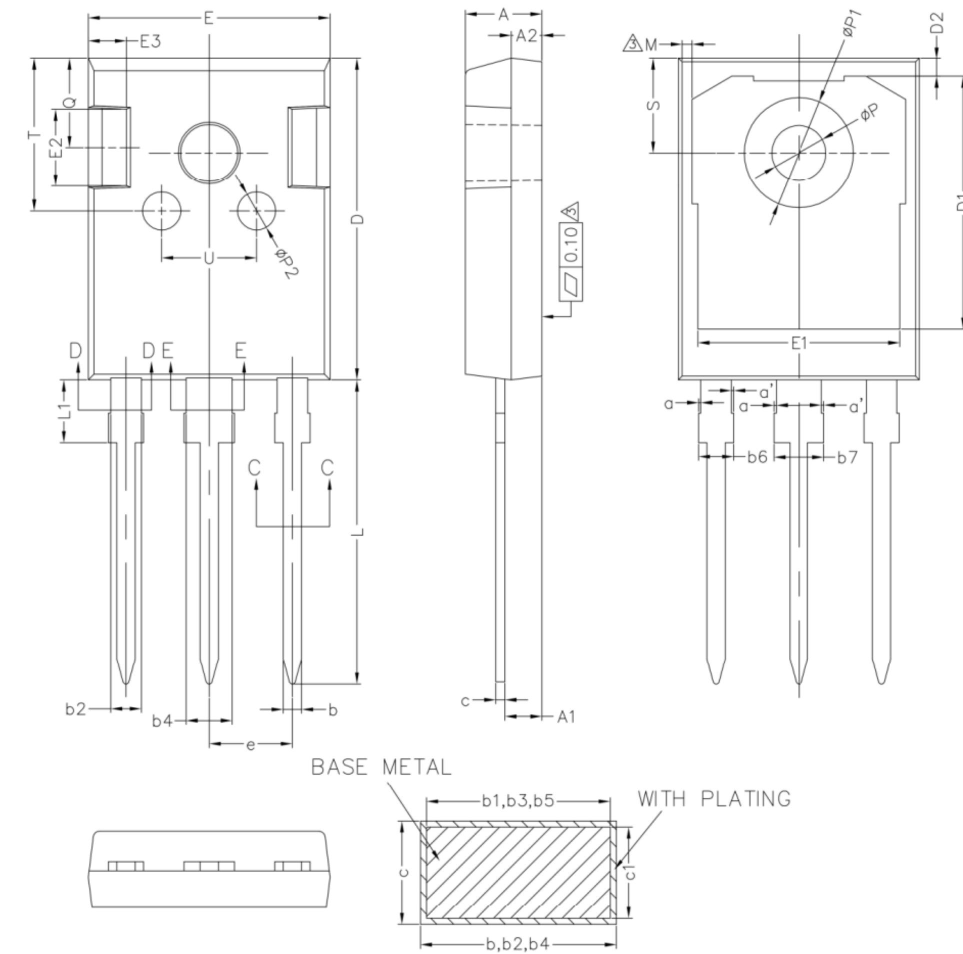


3) Unclaimed inductive switching test circuit & waveforms





6.Package outline dimensions



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

Note	SYMBOL	MIN	NOM	MAX
	A	4.90	5.00	5.10
	A1	2.31	2.41	2.51
	A2	1.90	2.00	2.10
△2	a	0	–	0.15
△2	a'	0	–	0.15
	b	1.16	–	1.26
	b1	1.15	1.2	1.22
	b2	1.96	–	2.06
	b3	1.95	2.00	2.02
	b4	2.96	–	3.06
	b5	2.95	3.00	3.02
△2	b6	–	–	2.25
△2	b7	–	–	3.25
	c	0.59	–	0.66
	c1	0.58	0.60	0.62
	D	20.90	21.00	21.10
	D1	16.25	16.55	16.85
	D2	1.05	1.20	1.35
	E	15.70	15.80	15.90
	E1	13.10	13.30	13.50
	E2	4.90	5.00	5.10
	E3	2.40	2.50	2.60
△2	e	5.34	5.44	5.54
	L	19.80	19.92	20.10
△4	L1	3.95	4.13	4.30
△3	M	0.35	–	0.95
	P	3.50	3.60	3.70
△3	P1	7.00	–	7.40
	P2	2.40	2.50	2.60
	Q	5.60	–	6.00
△2	S	6.05	6.15	6.25
	T	9.80	–	10.20
	U	6.00	–	6.40

NOTES:
1.ALL DIMENSIONS REFER TO JEDEC STANDARD TO-247 AD DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
2.EJECTION MARK DEPTH $0.10^{+0.15}_{-0.05}$.

7.Revision History

Revision	Description	Date
1.0	Initial version	2023/09/06

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