

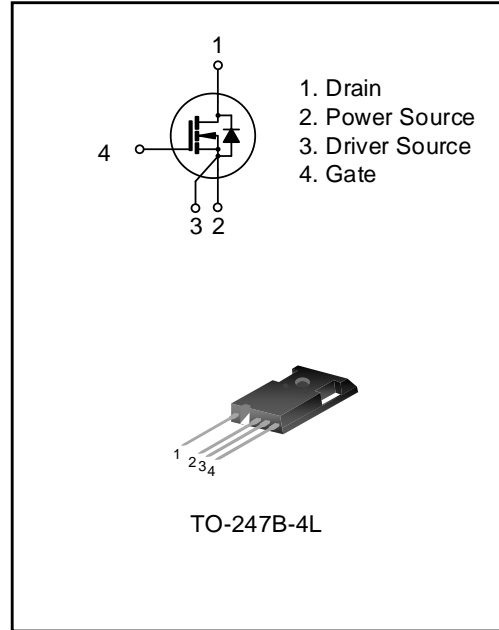
13.5mΩ, 1200V SiC MOS POWER TRANSISTOR

DESCRIPTION

SCDP120R013N2P4B is an N-channel enhancement mode high voltage power MOSFET produced using Silan's Silicon Carbide technology. It achieves low conduction loss and switching losses. It leads the design engineers to their power converters with high efficiency, high power density, and superior thermal behavior. Furthermore, it's universal applicable, i.e., suitable for switching power supplies, inverters, and DC-DC converters.

FEATURES

- ◆ 138A, 1200V, $R_{DS(on)}(typ.) = 13.5m\Omega @ V_{GS}=15V$
- ◆ Silicon Carbide technology
- ◆ Low switching loss
- ◆ Low reverse recovery charge
- ◆ Reduced requirement for heat dissipation
- ◆ 100% avalanche tested
- ◆ Pb-free lead plating
- ◆ RoHS compliant



KEY PERFORMANCE PARAMETERS

Characteristics	Ratings	Unit
V_{DS}	1200	V
$V_{GS(th)}$	1.8~3.6	V
$R_{DS(on),max.}$	17	mΩ
$I_{D,pulse}$	276	A
$Q_{g,typ.}$	226	nC

ORDERING INFORMATION

Part No.	Package	Marking	Hazardous Substance Control	Packing Type
SCDP120R013N2P4B	TO-247B-4L	P120R013N2	Halogen free	Tube

ABSOLUTE MAXIMUM RATINGS (UNLESS OTHERWISE NOTED, $T_J=25^{\circ}\text{C}$)

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Drain-source Voltage	V_{DS}	--	--	--	1200	V
Gate-source Voltage (Static)	V_{GS}	--	-4	--	15	V
Gate-source Voltage (Dynamic)	V_{GS}	AC($f>1\text{Hz}$)	-8	--	19	V
Drain Current (Note 1)	I_D	$V_{GS}=15\text{V}$, $T_C=25^{\circ}\text{C}$	--	--	138	A
		$V_{GS}=15\text{V}$, $T_C=100^{\circ}\text{C}$	--	--	97	A
Pulsed Drain Current (Note 2)	I_{DM}	$T_C=25^{\circ}\text{C}$	--	--	276	A
Power Dissipation (Note 3)	P_D	$T_C=25^{\circ}\text{C}$	--	--	469	W
Single Pulsed Avalanche Energy	E_{AS}	$L=5\text{mH}$, $V_{DD}=100\text{V}$, $R_G=25\Omega$, starting temperature $T_J=25^{\circ}\text{C}$	--	--	1562	mJ
Single Pulsed Current	I_{AS}	--	--	--	25	A
Operation Junction Temperature Range	T_J	--	-55	--	175	$^{\circ}\text{C}$
Storage Temperature Range	T_{stg}	--	-55	--	175	$^{\circ}\text{C}$
Continuous Diode Forward Current	I_S	$T_C=25^{\circ}\text{C}$, integral reverse P-N junction diode in the MOSFET	--	--	138	A
Diode Pulse Current	$I_{S,pulse}$		--	--	276	A

THERMAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Thermal Resistance, Junction-case, Bottom	$R_{\theta JC}$	--	--	--	0.32	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-ambient	$R_{\theta JA}$	--	--	--	40	$^{\circ}\text{C/W}$
Soldering Temperature (in line)	T_{sld}	15^{+2}_{-0} sec, 1time	--	--	260	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS (UNLESS OTHERWISE NOTED, $T_J=25^{\circ}\text{C}$)

Static characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Drain-source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=250\mu A$	1200	--	--	V
Drain-source Leakage Current	I_{DSS}	$V_{DS}=1200V, V_{GS}=0V, T_J=25^{\circ}\text{C}$	--	--	50	μA
		$V_{DS}=1200V, V_{GS}=0V, T_J=150^{\circ}\text{C}$	--	1.0	--	μA
Gate-source Leakage Current	I_{GSS}	$V_{GS}=15V, V_{DS}=0V$	--	--	1.0	μA
		$V_{GS}=-4V, V_{DS}=0V$	--	--	-1.0	μA
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS}=V_{DS}, I_D=20mA, T_J=25^{\circ}\text{C}$	1.8	--	3.6	V
		$V_{GS}=V_{DS}, I_D=20mA, T_J=175^{\circ}\text{C}$	--	1.6	--	V
Static Drain-source On State Resistance	$R_{DS(on)}$	$V_{GS}=15V, I_D=75A$	--	13.5	17.0	$m\Omega$
Transconductance	G_{fs}	$V_{DS}=20V, I_D=75A, T_J=25^{\circ}\text{C}$	--	85	--	S
		$V_{DS}=20V, I_D=75A, T_J=175^{\circ}\text{C}$	--	63	--	S
Gate Resistance	R_G	$f=1MHz$	--	2.9	--	Ω

Dynamic characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Input Capacitance	C_{iss}	$f=1MHz, V_{GS}=0V, V_{DS}=1000V$	--	6713	--	pF
Output Capacitance	C_{oss}		--	210	--	
Reverse Transfer Capacitance	C_{rss}		--	15	--	
Output Capacitance Loss	E_{oss}		--	121	--	μJ
Turn-on Switching Loss	E_{on}	$V_{DS}=800V, V_{GS}=-4/15V, R_G=2.5\Omega, I_D=75A, T_J=175^{\circ}\text{C}$	--	0.96	--	mJ
Turn-off Switching Loss	E_{off}		--	0.97	--	
Turn-on Delay Time	$t_{d(on)}$	$V_{DD}=800V, V_{GS}=-4/15V, R_G=2.5\Omega, I_D=75A, L=50\mu H$ (Notes 4,5)	--	21	--	ns
Turn-on Rise Time	t_r		--	14	--	
Turn-off Delay Time	$t_{d(off)}$		--	80	--	
Turn-off Fall Time	t_f		--	25	--	
Total Gate Charge	Q_g	$V_{DD}=800V, V_{GS}=-4/15V, I_D=75A$ (Notes 4,5)	--	226	--	nC
Gate-source Charge	Q_{gs}		--	59	--	
Gate-drain Charge	Q_{gd}		--	50	--	

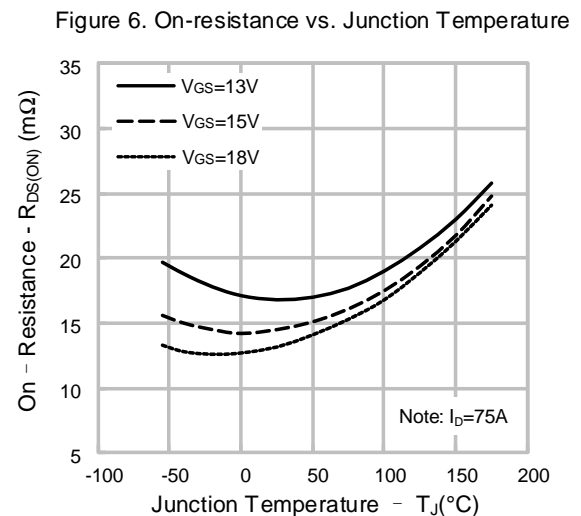
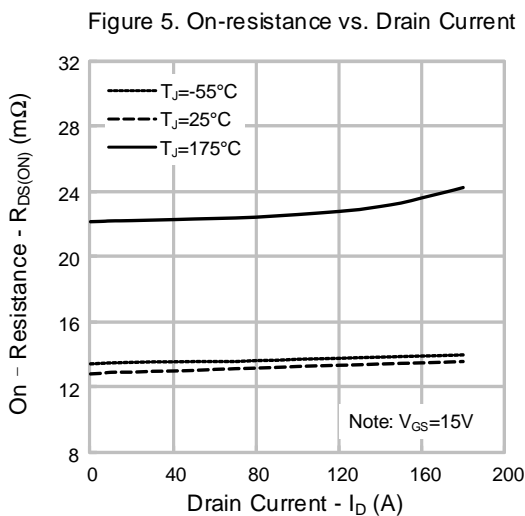
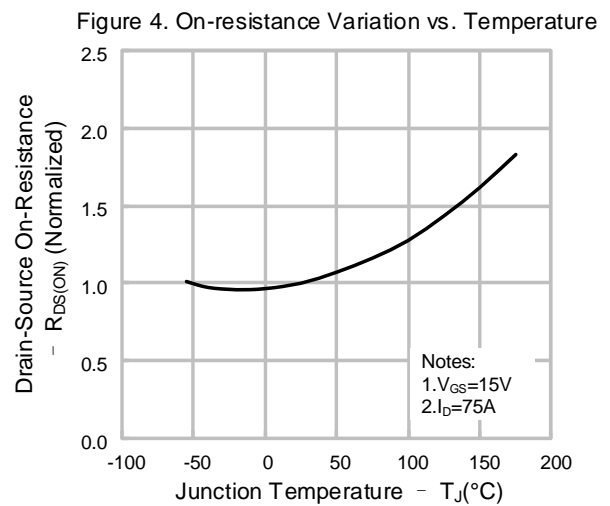
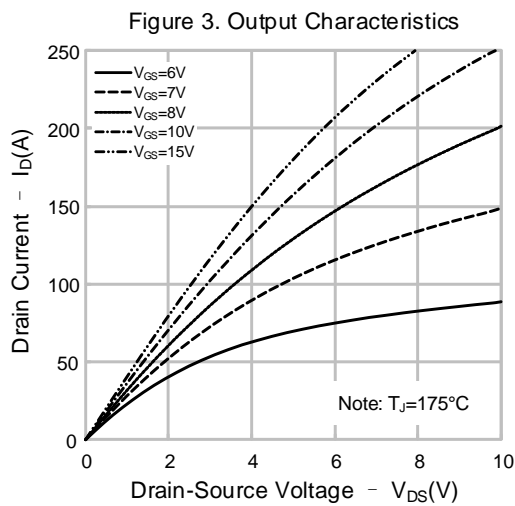
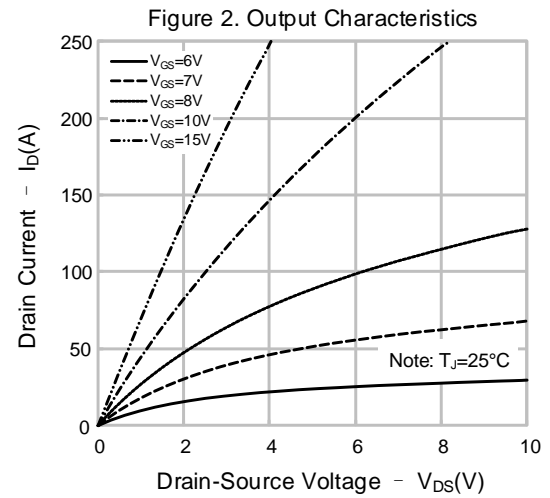
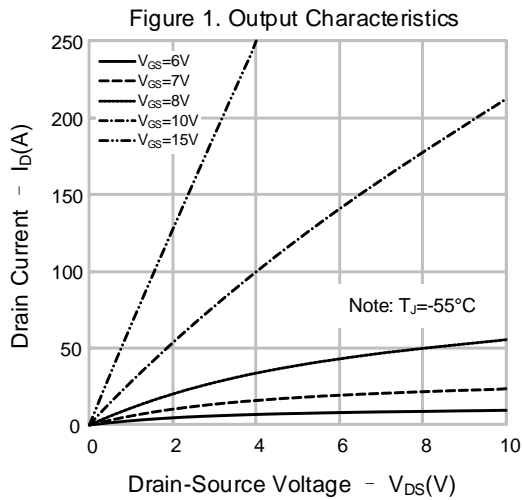
Reverse diode characteristics

Characteristics	Symbol	Test conditions	Ratings			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V_{SD}	$I_S=75A$, $V_{GS}=-4.0V$	--	--	10	V
Reverse Recovery Time	T_{rr}	$I_S=75A$, $V_{GS}=-4.0V$, $V_R=800V$,	--	22	--	ns
Reverse Recovery Charge	Q_{rr}	$dI_F/dt=6500A/\mu s$, $T_J=175^\circ C$	--	798	--	nC
Reverse Recovery Peak Current	I_{rrm}	(Note 4)	--	55	--	A

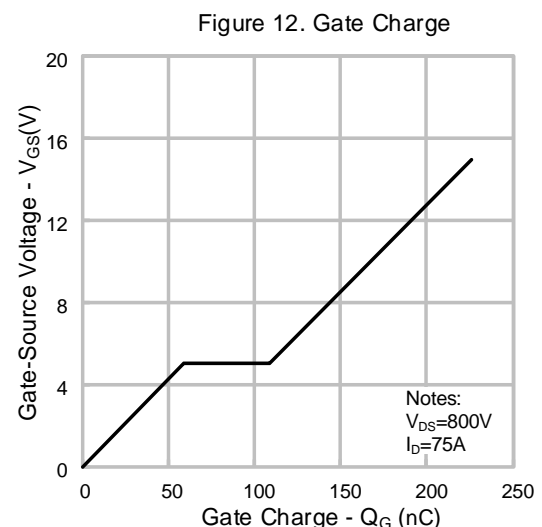
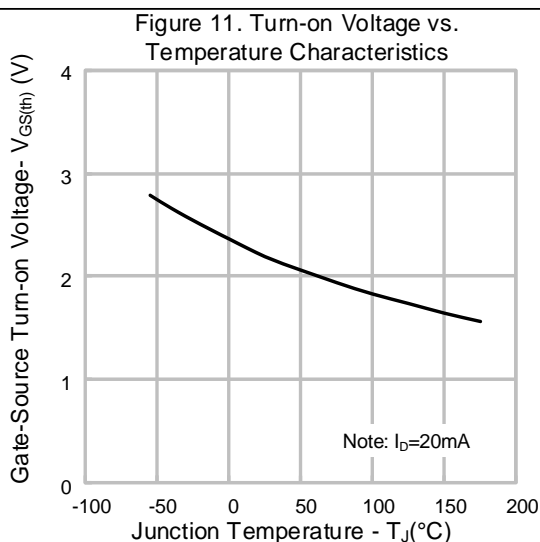
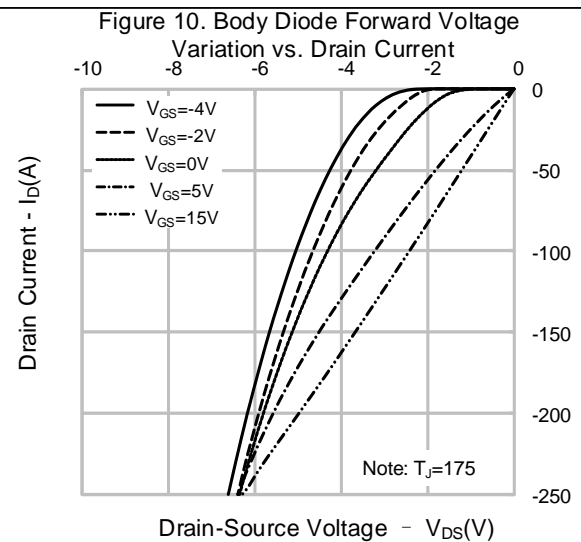
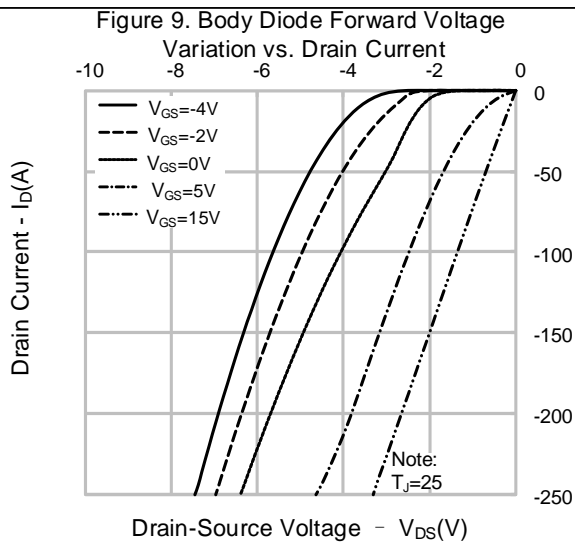
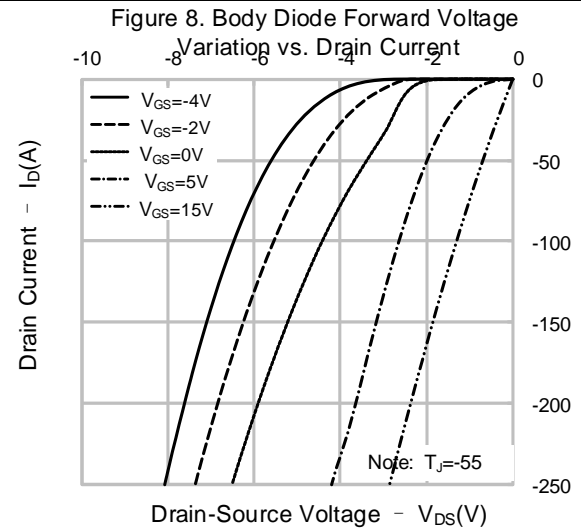
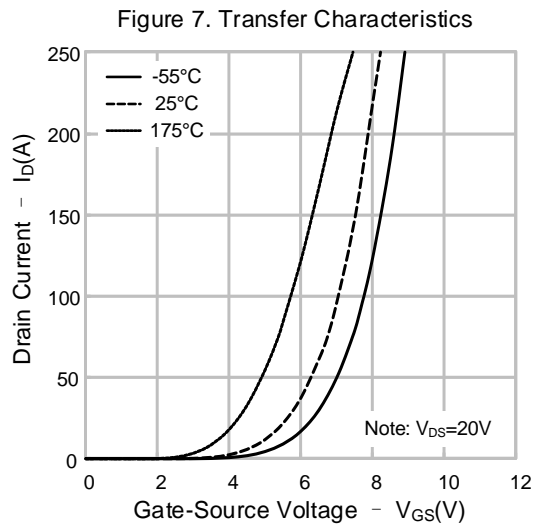
Notes:

1. The rated value only refers to the maximum absolute value at the case temperature of 25°C in the specification. If the case temperature is higher than 25°C, it should be derated according to the actual environmental conditions;
2. Pulse time 5μs; pulse width is limited by the maximum junction temperature;
3. The dissipation power will change with temperature, derating above 25°C: 3.13W/°C;
4. Pulse Test: Pulse width ≤300μs, Duty cycle≤2%;
5. Essentially independent of operating temperature.

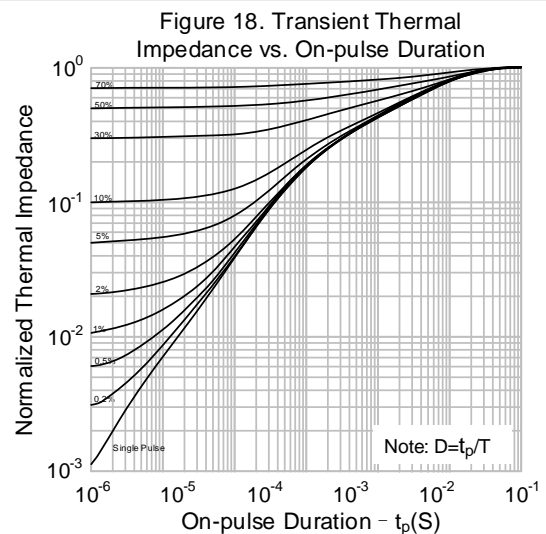
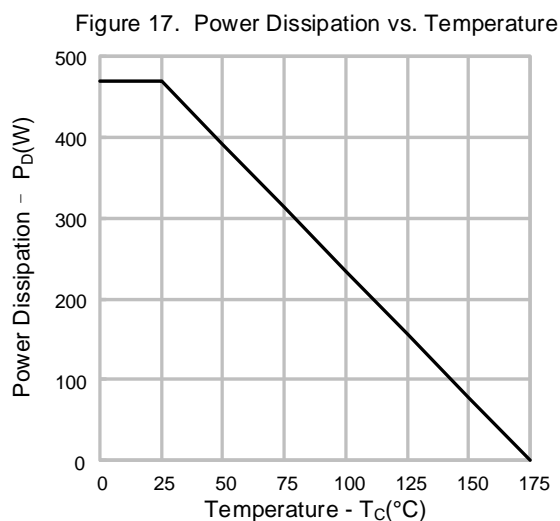
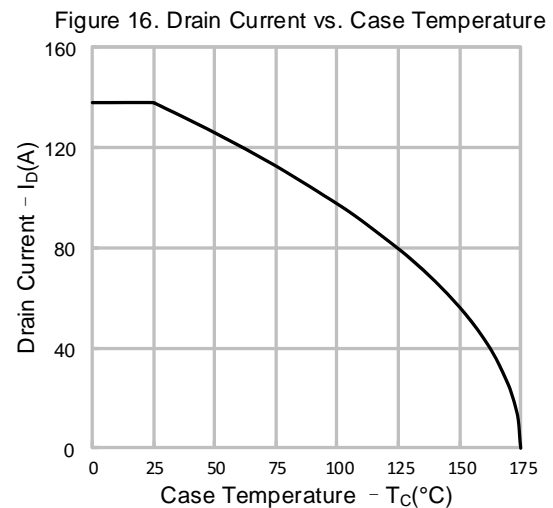
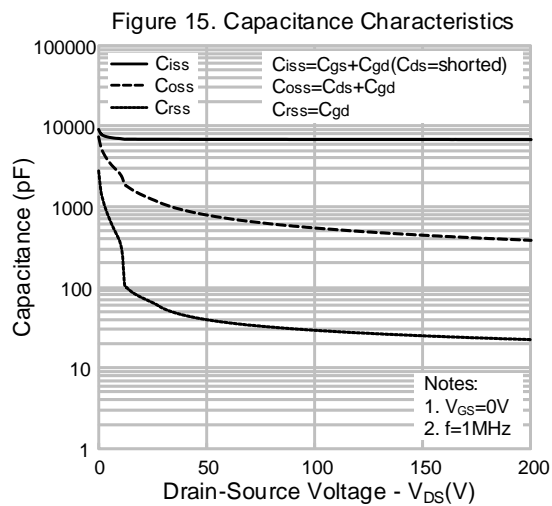
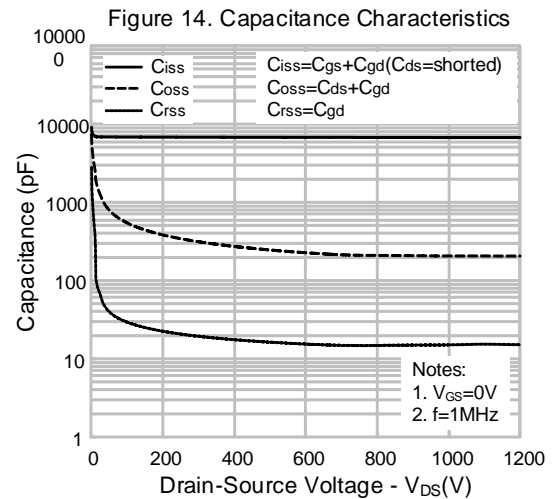
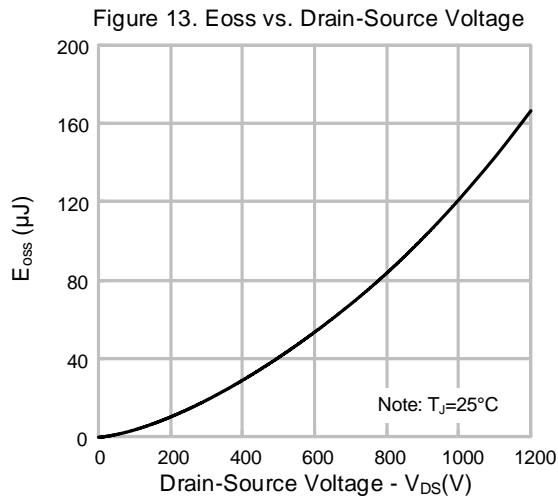
TYPICAL CHARACTERISTICS



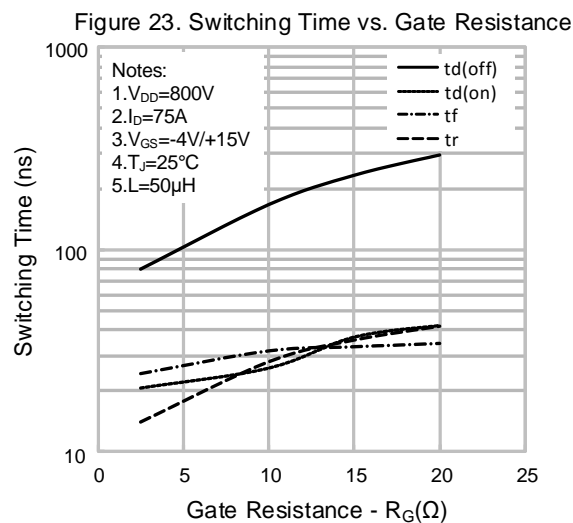
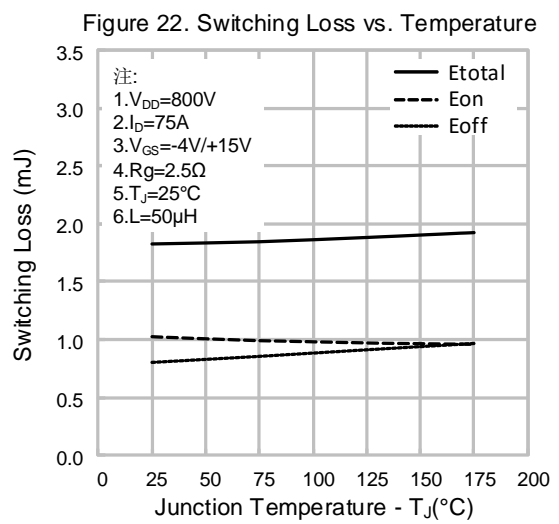
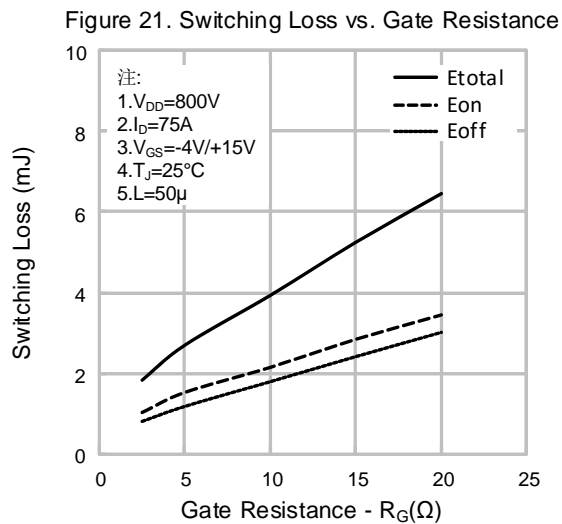
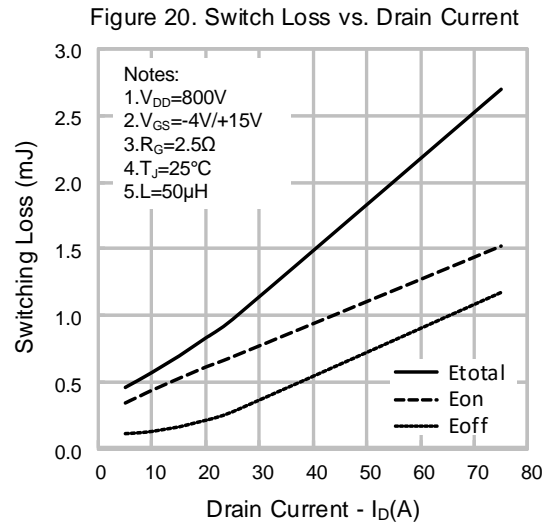
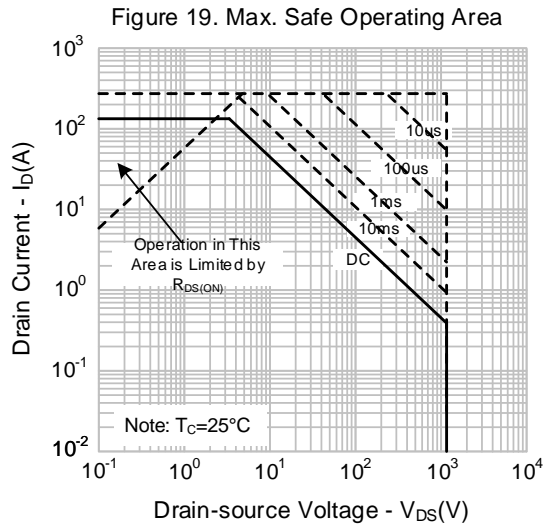
TYPICAL CHARACTERISTICS (CONTINUED)



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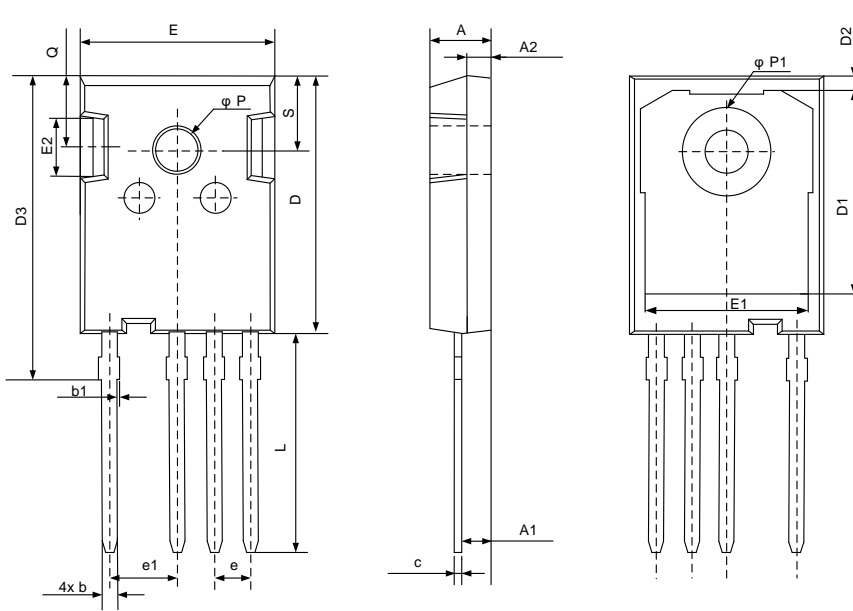
TYPICAL CHARACTERISTICS (CONTINUED)



PACKAGE OUTLINE

TO-247B-4L

UNIT: mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16	—	1.29
b1	0	—	0.20
c	0.59	—	0.66
D	20.90	21.00	21.10
D1	16.25	16.55	16.85
D2	1.05	1.20	1.35
D3	24.97	25.12	25.27
E	15.70	15.80	15.90
E1	13.10	13.30	13.50
E2	4.90	5.00	5.10
e	2.44	2.54	2.64
e1	4.98	5.08	5.18
L	19.80	19.92	20.10
P	3.50	3.60	3.70
P1	—	—	7.40
Q	5.60	—	6.00
S	6.15 BSC		



MOS DEVICES OPERATE NOTES:

Electrostatic charges may exist in many things. Please take following preventive measures to prevent effectively the MOS electric circuit as a result of the damage which is caused by discharge:

- The operator must put on wrist strap which should be earthed to against electrostatic.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- MOS devices should be packed in antistatic/conductive containers for transportation.

Important notice :

1. Silan reserves the right to make changes of this instruction without notice.
2. Customers should obtain the latest relevant information when purchasing and should verify whether such information is latest and complete. Please read this instruction and application manual and related materials carefully before using products, including the circuit operation precautions, etc.
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Rev.: 1.0

Revision History:

1. First release
