Silicon Carbide MOSFET 1200V,50mΩ

General Description

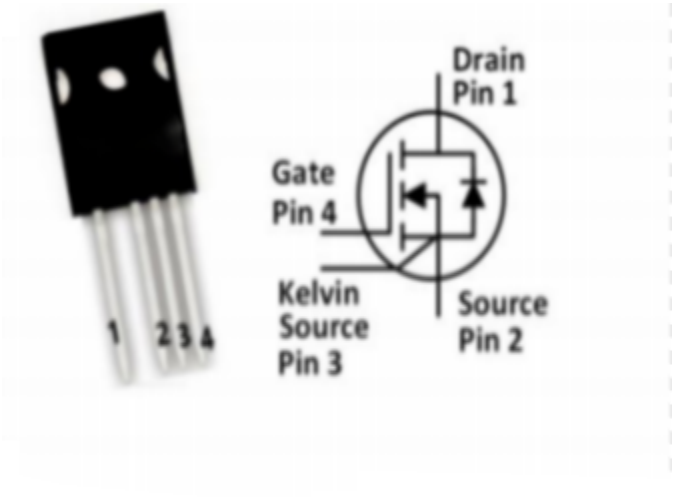
Features

- High voltage, low on resistance
- High speed, low parasitic capacitance
- High junction temperature
- Fast recovery diode
- Kelvin connection driver

Applications

- motor drive
- Photovoltaic inverter
- UPS power supply
- High voltage DC / DC converter
- Switching Mode Power Supply

Package:TO-247-4



Key performance parameters

Type	V_{DS}	I_D T_C=25℃	$R_{DS(ON)}$
TK3M50120K	1200V	58A	50mΩ

Maximum Ratings

T_C=25℃, unless otherwise specified

Parameter			Symbol	Value	Unit
Drain-source voltage	V_{GS} = 0V,	I_D =100 μ A	V_{DS}	1200	V
Gate-source voltage	Recommended maximum		V_{GS}	-5 to 20	V

Maximum Ratings

T_C=25℃, unless otherwise specified

Parameter	Symbol	Value	Unit
Continuous drain current : V_{GS} = 20V T_C = 25° C T_C = 100° C	I_D	 58 43	A
Pulsed drain current: Pulse width limited by SOA	I_{DM}	145	A
Power dissipation : T_C = 25° C	P_{TOT}	344	W
Storage temperature range :	T_{stg}	-55 to +175	°C
Operating and junction temperature:	T_j	-55 to +175	°C
Soldre temperature: Wave soldering only allowed at leads, 1.6 mm from case for 10 s	T_L	260	°C

Thermal Resistance

Parameter	Symbol	Typ.	Unit
Thermal resistance to shell	R_{thJC}	0.436	°C/W

Electrical Characteristic

T_C =25℃, unless otherwise specified

Parameter	Symbol	Value			Unit	Test Condition
		Min.	Typ.	Max.		
Zero gate voltage drain current	I_{DSS}		5	100	μA	V_{DS} = 1200V V_{GS} = 0V
Gate leakage current	I_{GSS}		1	±100	nA	V_{DS} = 0V V_{GS} = -5~20V
Gate threshold voltage	V_{TH}		3.2 2.2		V	V_{GS} = V_{DS} I_D = 6mA T_C =175° C
Drain-source on-state resistance	R_{ON}		50 80	65	mΩ	V_{GS} = 20V I_D = 20A T_J = 25℃ T_J = 175℃
Input capacitance	C_{iss}		2750		pF	V_{DS} = 800V V_{GS} = 0V f = 1MHz V_{AC} = 25mV
Output capacitance	C_{oss}		106			
Reverse transfer capacitance	C_{rss}		5.2			
The output capacitor stores energy	E_{oss}		43		μJ	
Total gate charge	Q_g		120		nC	V_{DS} = 800V I_D = 20A V_{GS} = -5 to 20V
Gate to source charge	Q_{gs}		25			
Gate to drain charge	Q_{gd}		48			
Gate input resistance	R_g		2.8		Ω	f =1MHz
Tuen-on switching energy	E_{ON}		455.4		μJ	V_{DS} = 800V, I_D = 30A, V_{GS} = -2 to 20V, $R_{G(ext)}$ =3.3 Ω, L = 450 μH
Turn-off switching energy	E_{OFF}		213.6		μJ	
Turn-on delay time	$t_{d(on)}$		8.9		ns	
Rise time	t_r		28.9			

Turn-off delay time	$t_{d(off)}$		25.6			
Fall time	t_f		17.2			

Reverse Diode Characteristics

T_C =25°C, unless otherwise specified

Parameter	Symbol	Value			Unit	Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}		4.9 4.4		V	I_{SD} = 20A V_{GS} = 0V T_J = 175° C
Reverse recovery time	t_{rr}		44.4		ns	V_{GS}= -2V/+20V, I_{SD} = 30A, V_R = 800V, di/dt = 1000A/us, $R_{G(ext)}$ =10 Ω L = 450 μ H
Reverse recovery charge	Q_{rr}		212.6		nC	
Reverse recovery peak current	I_{RRM}		10.8		A	

Characteristics Curves

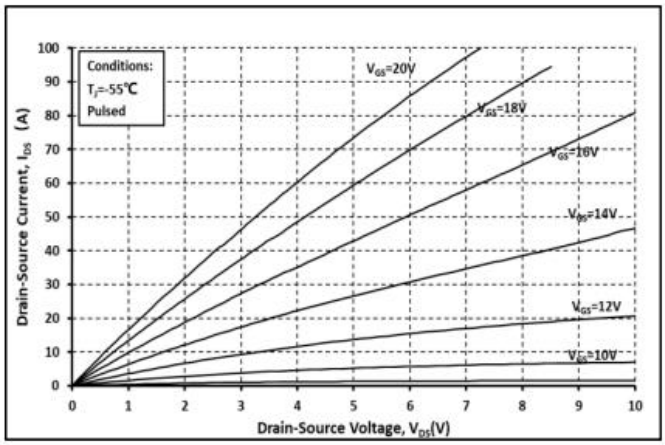


图. 1 输出曲线 @ T_j=-55°C

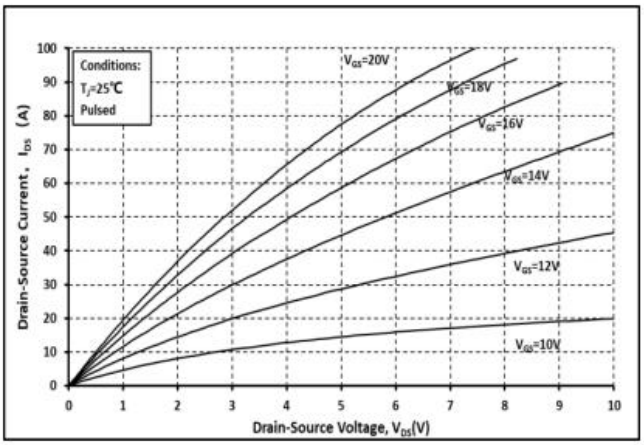


图. 2 输出曲线 @ T_j =25°C

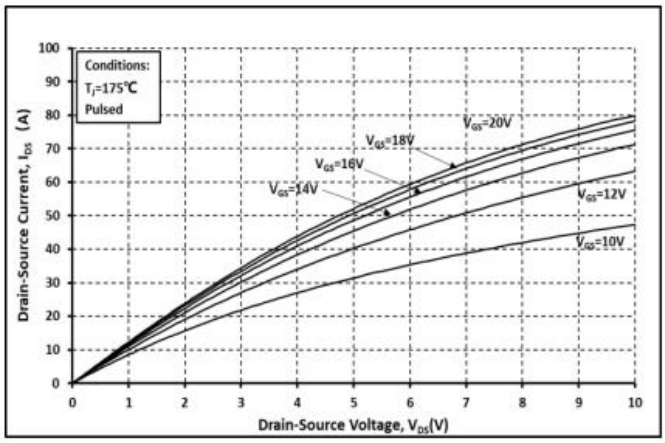


图. 3 输出曲线 @ T_j=175°C

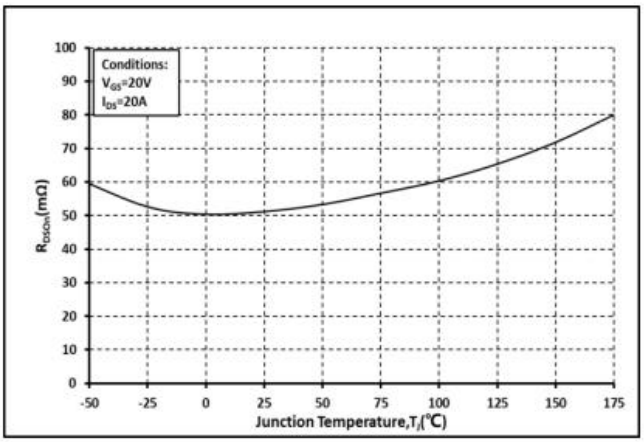


图. 4 Ron 和温度关系曲线

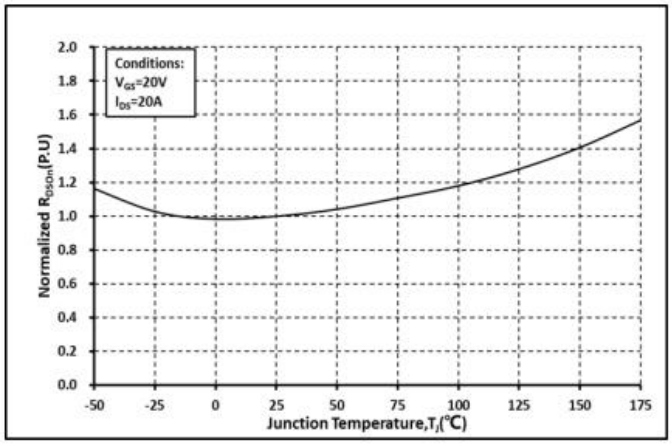


图. 5 归一化的 Ron 和温度关系曲线

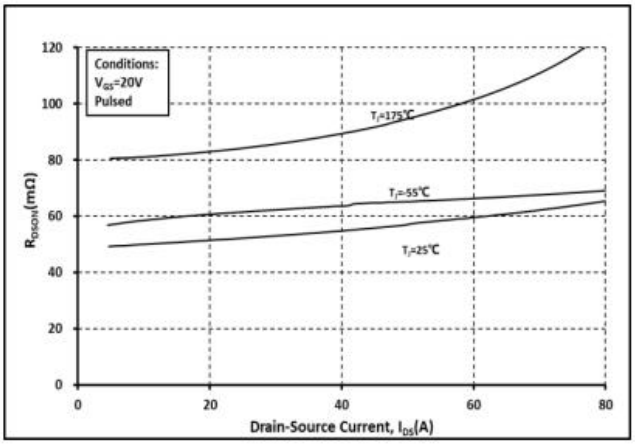


图 6 各温度下的 Ron 和 I_{DS} 关系曲线

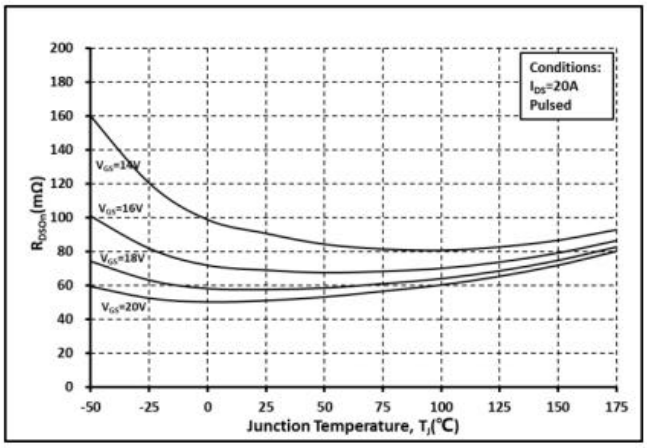


图. 7 各 V_{GS} 下的 Ron 和温度关系曲线

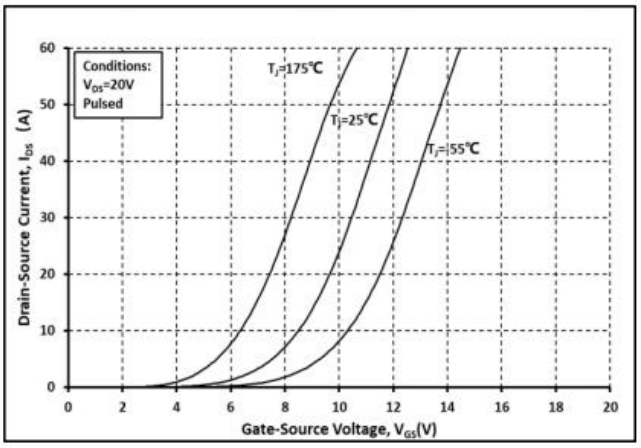


图. 8 各温度下的传输特性曲线

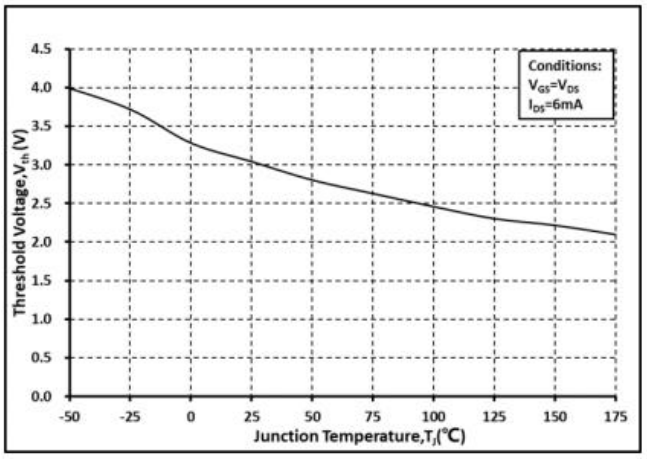


图. 9 阈值电压随温度变化曲线

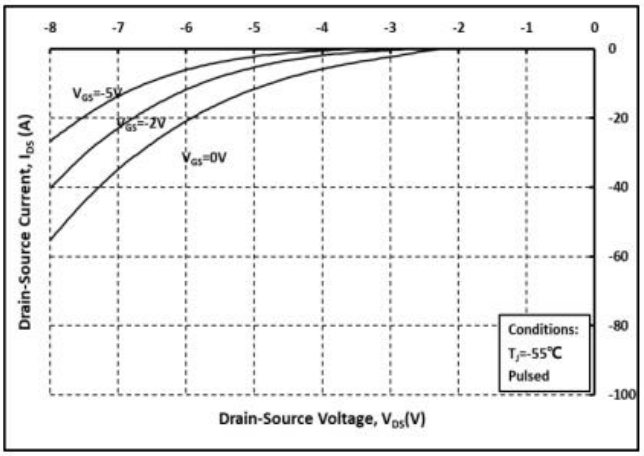


图. 10 体二极管导通曲线 @ T_J=-55°C

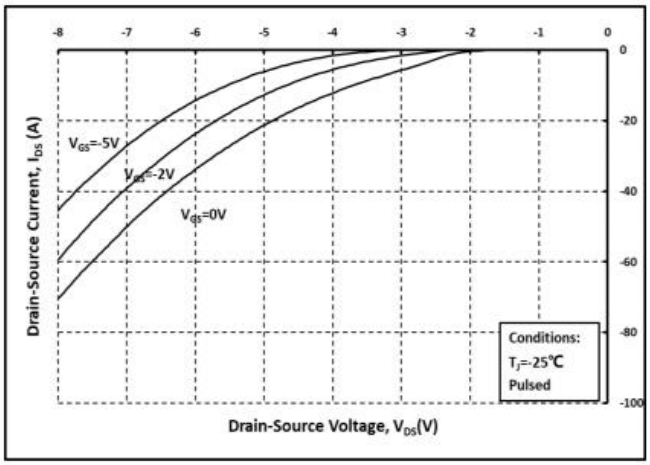


图. 11 体二极管导通曲线 @ T_J=25°C

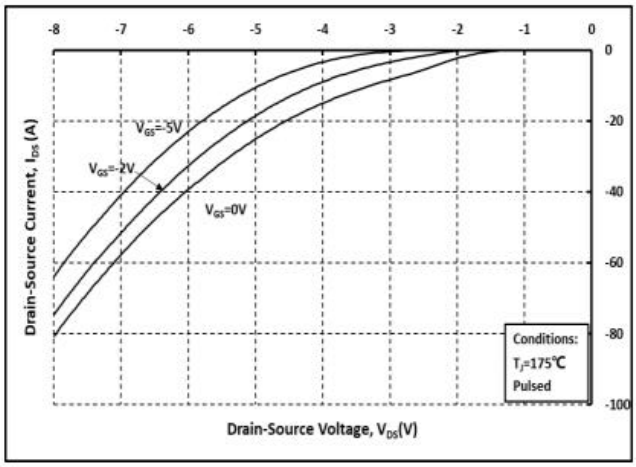


图. 12 体二极管导通曲线 @ T_J=175°C

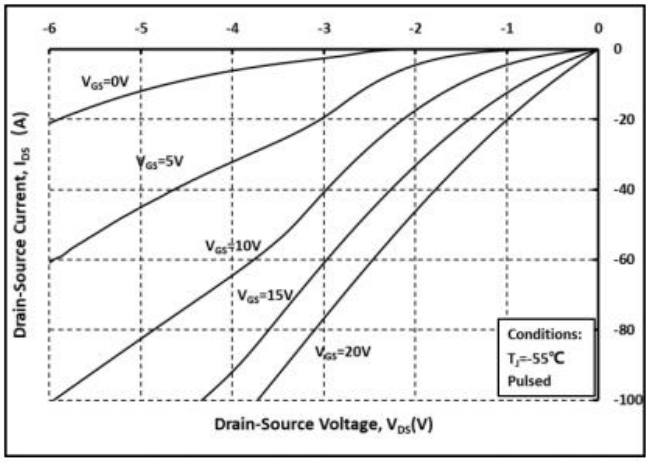


图. 13 第三象限曲线 @ T_j=-55°C

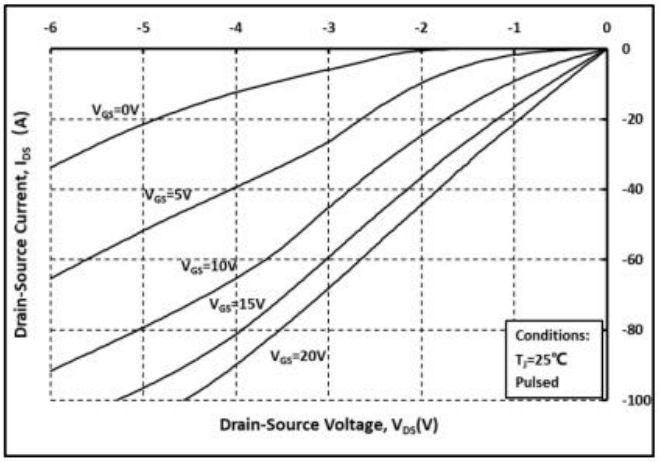


图. 14 第三象限曲线 @ T_j=25°C

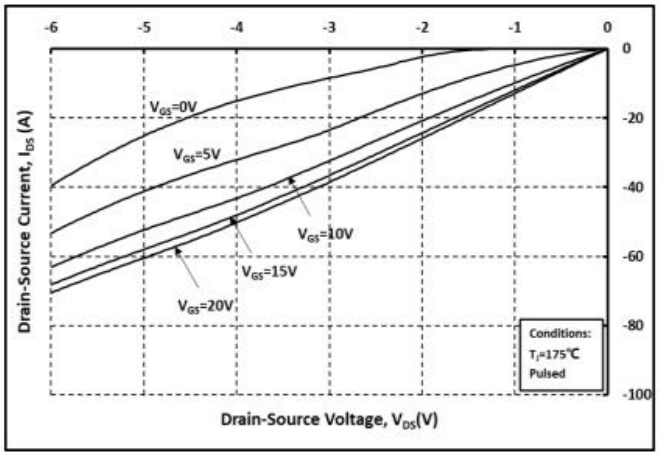


图. 15 第三象限曲线 @ T_j=175°C

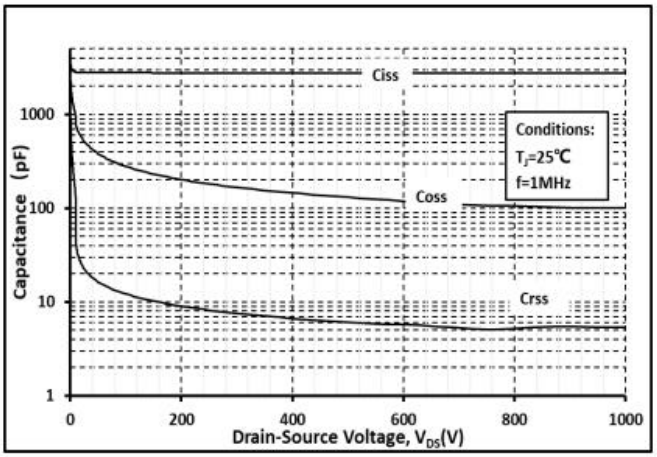


图. 16 各电容和 V_{DS} 关系曲线

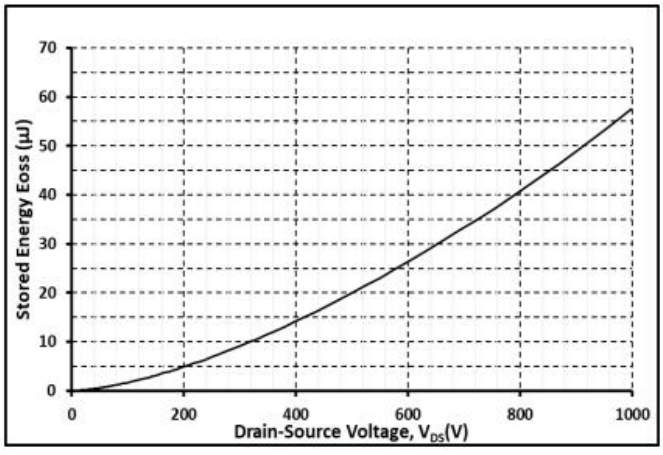


图. 17 输出电容存储能量曲线

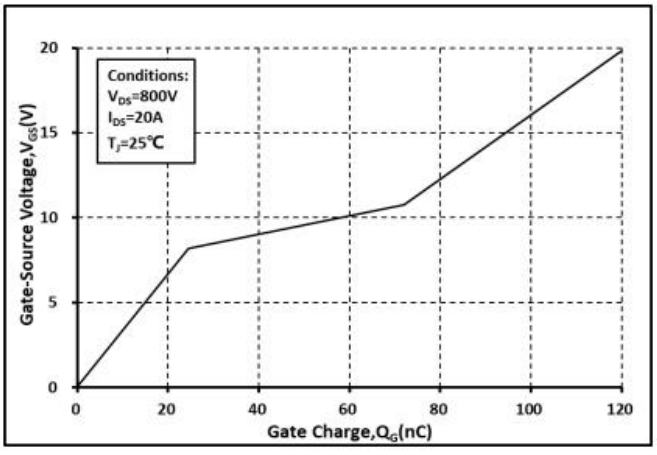


图. 18 栅电荷特征曲线

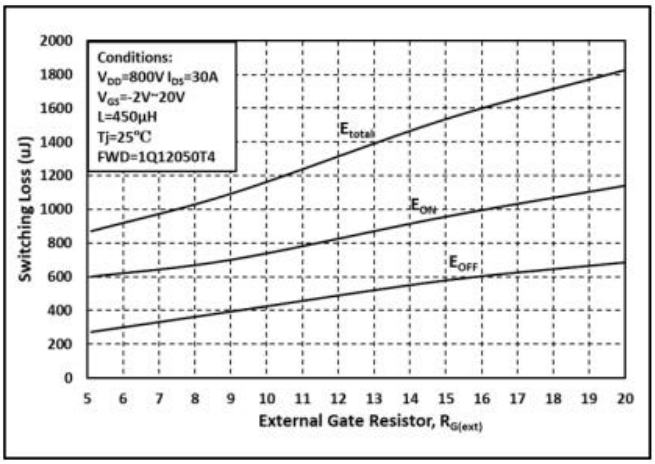


图. 19 开关能量和栅极电阻 $R_{G(ext)}$ 关系曲线

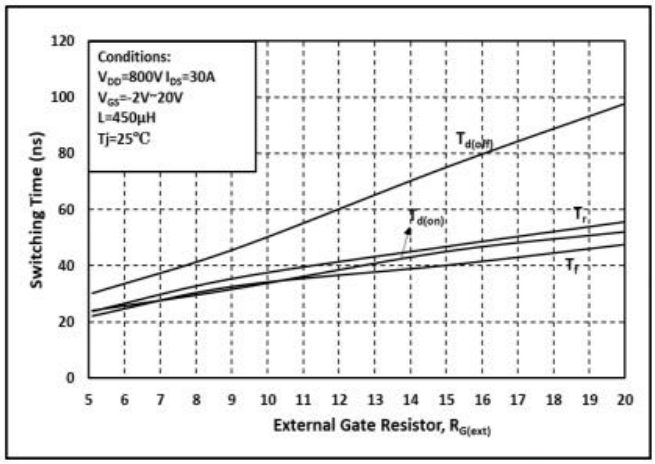


图. 20 开关时间和栅极电阻 $R_{G(ext)}$ 关系曲线

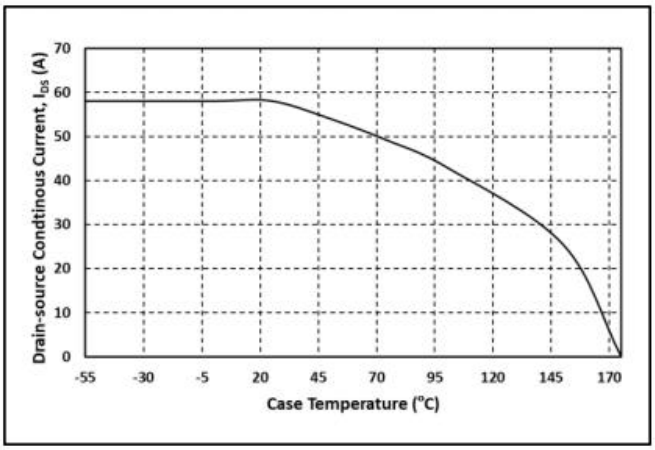


图. 21 漏端电流和温度关系曲线

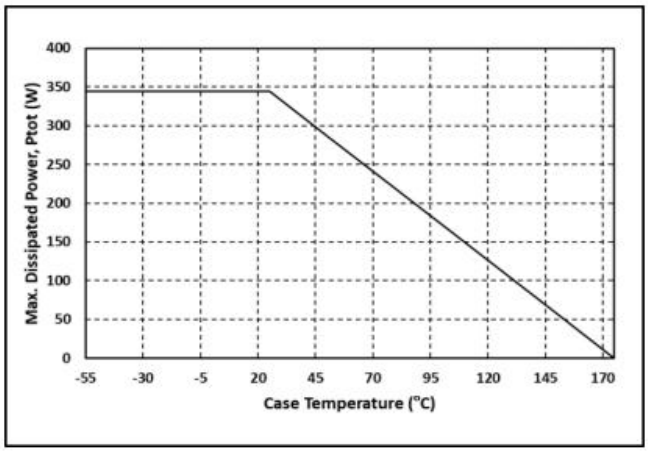


图. 22 最大功耗降额和温度关系曲线

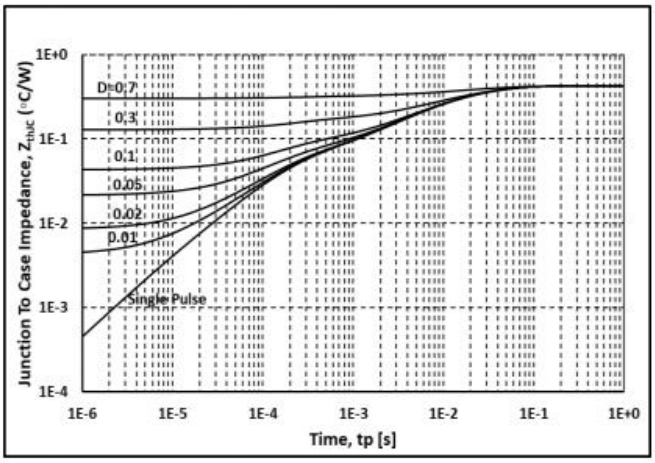


图. 23 热阻曲线

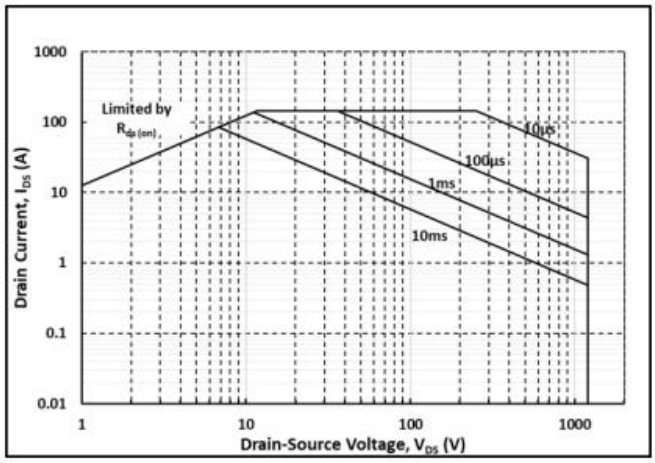
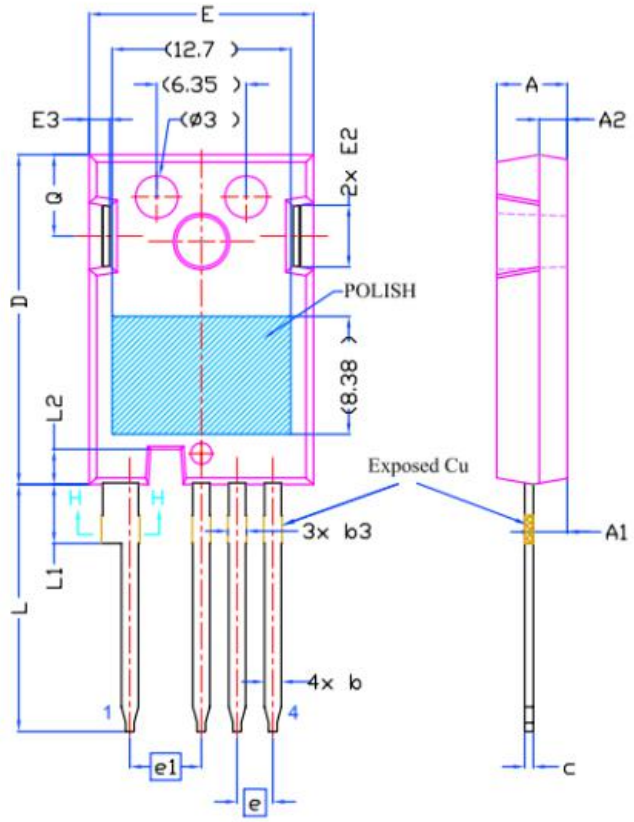
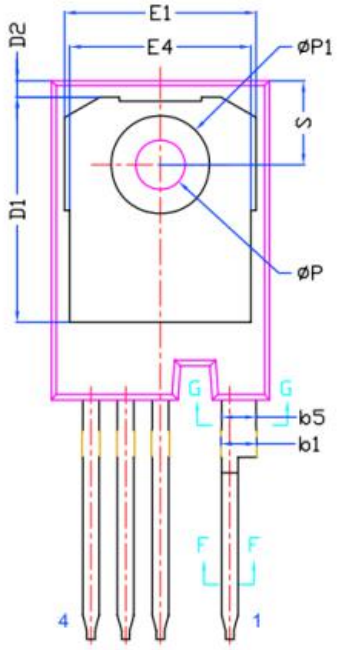


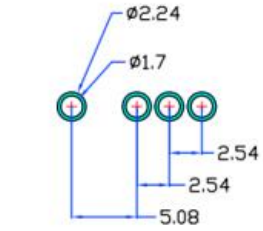
图. 24 安全工作区示意图

Package Outline:TO-247-4

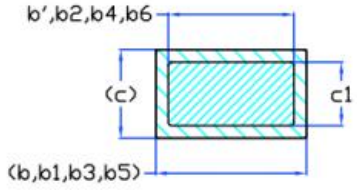




SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.83	5.02	5.21
A1	2.29	2.41	2.54
A2	1.91	2.00	2.16
b'	1.07	1.20	1.28
b	1.07	1.20	1.33
b1	2.39	2.67	2.94
b2	2.39	2.67	2.84
b3	1.07	1.30	1.60
b4	1.07	1.30	1.50
b5	2.39	2.53	2.69
b6	2.39	2.53	2.64
c	0.55	0.60	0.68
c1	0.55	0.60	0.65
D	23.30	23.45	23.60
D1	16.25	16.55	17.65
D2	0.95	1.19	1.25
E	15.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
e	2.54 BSC		
e1	5.08 BSC		
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
ØP	3.51	3.61	3.65
ØP1	7.19 REF.		
Q	5.49	5.79	6.00
S	6.04	6.17	6.30



Recommended Solder Pad Layout



Section F--F, G--G, H--H

说明：

1. 封装标准参考：：JEDEC TO247, Variation AD
2. 以上单位为：毫米
3. 需要开槽，槽口可为圆形
4. 尺寸 D 和 E 不包括模具溢料