

T65N28

主要参数 MAIN CHARACTERISTICS

I_D	80A
V_{DS}	650V
$R_{ds(on)} (V_{GS}=18V)$	28m Ω (typ)

用途

- 负载开关
- 脉宽调制
- 电源管理

APPLICATIONS

- Load Switch
- PWM Application
- Power Management

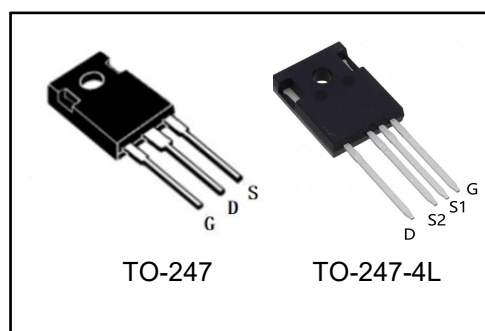
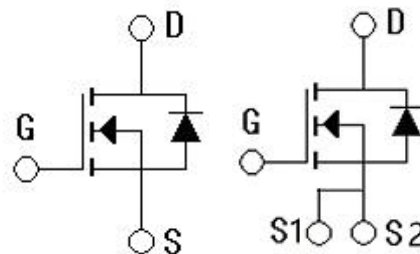
产品特性

- 符合环保标准
- 产品无卤素
- 湿敏等级3级

FEATURES

- RoHS and Reach Compliant
- Halogen and Antimony Free
- Moisture Sensitivity Level 3

封装 Package



产品中有毒有害物质或元素的名称及含量

部件名称 (含量要求)	有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
	≤0.1%	≤0.1%	≤0.01%	≤0.1%	≤0.1%	≤0.1%
引线框	○	○	○	○	○	○
塑封树脂	○	○	○	○	○	○
管 芯	○	○	○	○	○	○
内引线	○	○	○	○	○	○
焊 料	×	○	○	○	○	○
说 明	○: 表示该元素的含量在 SJ/T11363-2006 标准的限量要求以下。 ×: 表示该元素的含量超出 SJ/T11363-2006 标准的限量要求。 目前产品的焊料中含有铅 (Pb) 成分, 但属于欧盟 RoHS 指令豁免范围。					

绝对最大额定值 **ABSOLUTE RATINGS** ($T_c=25^{\circ}\text{C}$)

项 目 Parameter	符 号 Symbol	数 值 Value	单 位 Unit
最高漏极-源极直流电压 Drain-Source Voltage	V_{DS}	650	V
连续漏极电流 Drain Current-continuous	I_D $T=25^{\circ}\text{C}$ $T=100^{\circ}\text{C}$	80 58	A
最大脉冲漏极电流 Drain Current – pulse ^{Note 1}	I_{DM}	250	A
最高栅源电压 Gate-Source Voltage	V_{GS}	-5 ~ +20	V
耗散功率 Power Dissipation	P_D $T_c=25^{\circ}\text{C}$	294	W
最高结温及存储温度 Operating and Storage Temperature Range	T_J, T_{STG}	-55~+175	$^{\circ}\text{C}$

电特性 ELECTRICAL CHARACTERISTICS

项 目 Parameter	符 号 Symbol	测试条件 Tests conditions	最小 Min	典型 Typ	最大 Max	单位 Units
关态特性 Off –Characteristics						
漏—源击穿电压 Drain-Source Voltage	BV _{DSS}	I _D =100μA, V _{GS} =0V,T _J =25℃	650	-	-	V
零栅压下漏极漏电流 Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =650V,V _{GS} =0V, T _C =25℃	-	-	100	μA
正向栅极体漏电流 Gate-body leakage current, forward	I _{GSSF}	V _{DS} =0V, V _{GS} =20V	-	-	250	nA
反向栅极体漏电流 Gate-body leakage current, reverse	I _{GSSR}	V _{DS} =0V, V _{GS} = -5V	-	-	-100	nA
通态特性 On-Characteristics						
阈值电压 Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D =5mA	2.2	-	5.0	V
静态导通电阻 Static Drain-Source On-Resistance	R _{DS(ON)}	V _{GS} =15V,I _D =30A,T _J =25℃	-	38	-	mΩ
		V _{GS} =18V,I _D =30A,T _J =25℃	-	28	36	
		V _{GS} =18V, I _D =30A,T _J =150℃	-	30	-	
动态特性 Dynamic Characteristics						
输入电容 Input capacitance	C _{iss}	V _{DS} =400V, V _{GS} =0V, f=1MHz	-	2333	-	pF
输出电容 Output capacitance	C _{oss}		-	226	-	pF
反向传输电容 Reverse transfer capacitance	C _{rss}		-	13	-	pF

电特性 ELECTRICAL CHARACTERISTICS

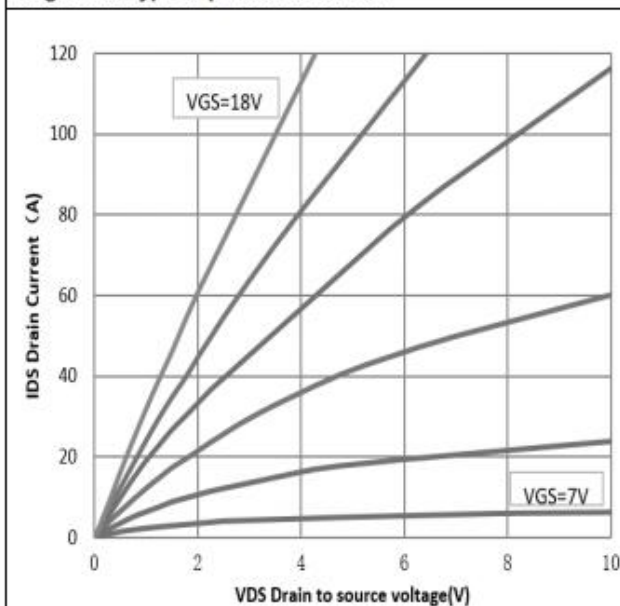
开关特性 Switching Characteristics							
延迟时间 Turn-On delay time	$t_{d(on)}$	VDD=400V, ID=33A, RG=2.5Ω TJ =25°C VGS=-4/18V L=59uH	-	11	-	ns	
上升时间 Turn-On rise time	t_r		-	17	-	ns	
延迟时间 Turn-Off delay time	$t_{d(off)}$		-	32	-	ns	
下降时间 Turn-Off Fall time	t_f		-	8	-	ns	
开通损耗 Turn-On energy	E _{on}		-	71	-	μJ	
关断损耗 Turn-off energy	E _{off}		-	84	-	μJ	
栅极电荷总量 Total Gate Charge	Q _g	V _{DS} =400V , I _D =33A V _{GS} =-4V/18V	-	98	-	nC	
栅-源电荷 Gate-Source charge	Q _{gs}		-	28	-	nC	
栅-漏电荷 Gate-Drain charge	Q _{gd}		-	26	-	nC	
栅极电阻 Gate Resistance	R _g	f=1MHz	-	5.1	-	Ω	
漏-源二极管特性及最大额定值 Drain-Source Diode Characteristics and Maximum Ratings							
正向压降 Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =30A	-	3.75	-	V	
反向恢复时间 Reverse Recovery Time	T _{RR}	VGS = -4 V, ISD = 33A, VR = 400 V di/dt = 1630 A/μs	-	20	-	ns	
反向恢复电荷 Reverse Recovery Charge	Q _{RR}		-	230	-	nC	
反向恢复电流 Peak reverse recovery current	I _{rr}		-	20	-	A	

热特性 THERMAL CHARACTERISTIC

项 目 Parameter	符号 Symbol	值 Value	单位 Unit
结到管壳的热阻 Thermal Resistance, Junction to Case	R _{th(j-c)}	0.51	°C/W
结到环境的热阻 Thermal Resistance, Junction-to-Ambient	R _{th(j-A)}	40	°C/W

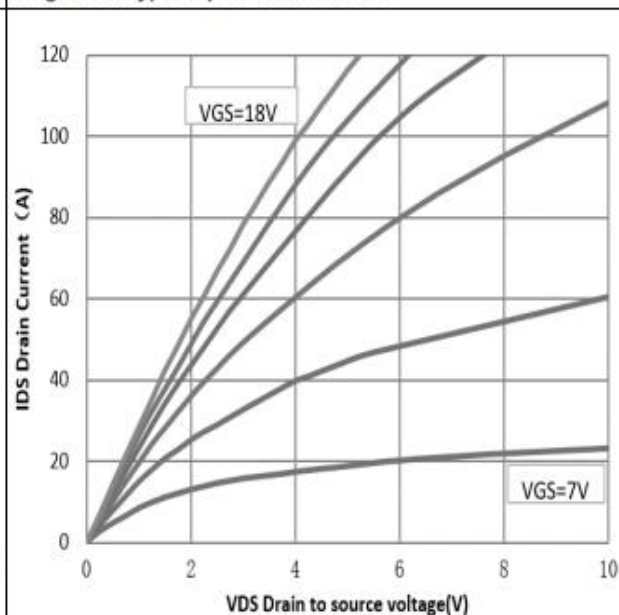
特征曲线 ELECTRICAL CHARACTERISTICS

Diagram 1: Typ. output characteristics



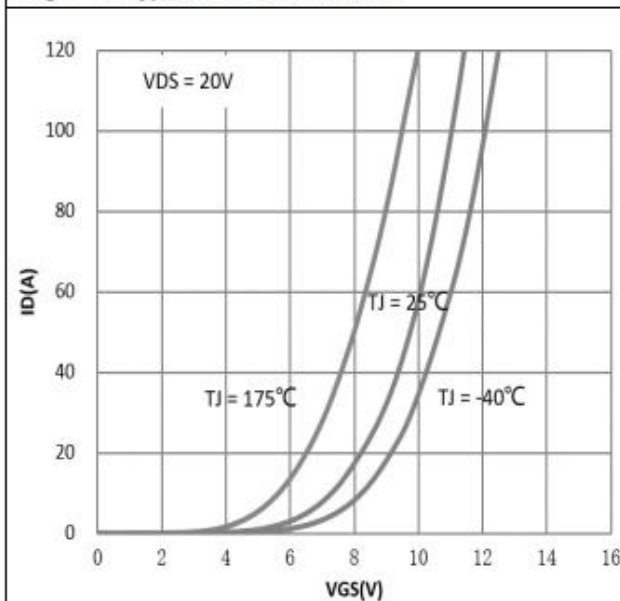
$I_D = f(V_{DS})$; $T_J = 25\text{ }^{\circ}\text{C}$; parameter: V_{GS} ; $V_{GS} = 7, 9, 11, 13, 15, 18\text{V}$

Diagram 2: Typ. output characteristics



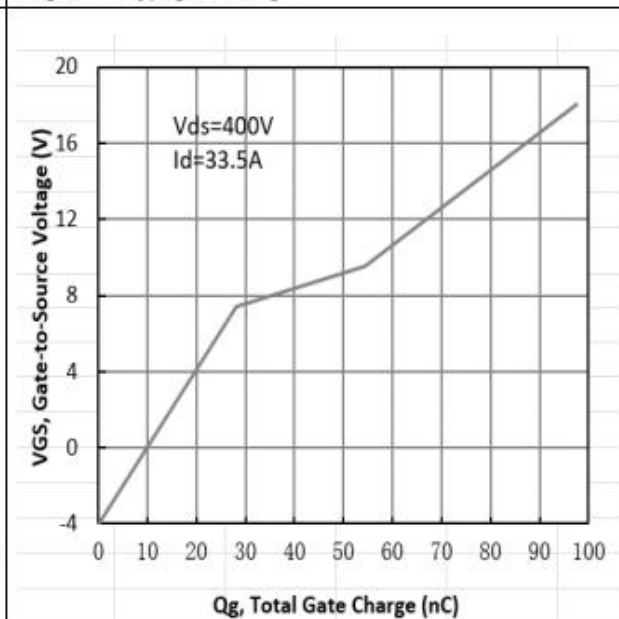
$I_D = f(V_{DS})$; $T_J = 175\text{ }^{\circ}\text{C}$; parameter: V_{GS} ; $V_{GS} = 7, 9, 11, 13, 15, 18\text{V}$

Diagram 3: Typ. transfer characteristics



$I_D = f(V_{GS})$; $V_{DS} = 20\text{V}$; parameter: T_J

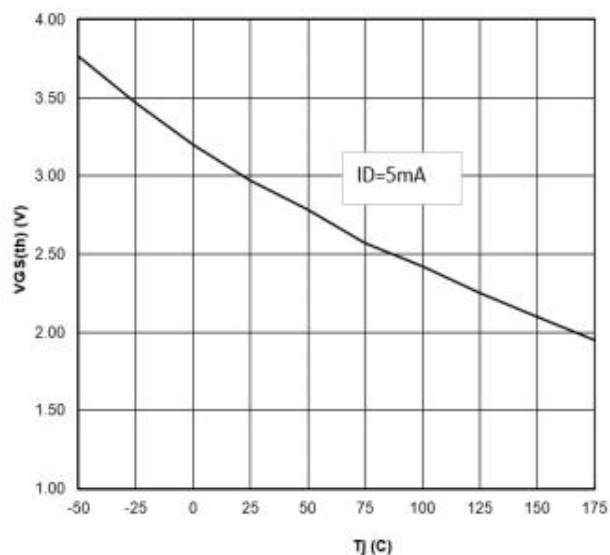
Diagram 4: Typ. gate charge



$V_{GS} = f(Q_{gate})$; $I_D = 33.5\text{A}$; $V_{DS} = 400\text{V}$; turn-on pulse

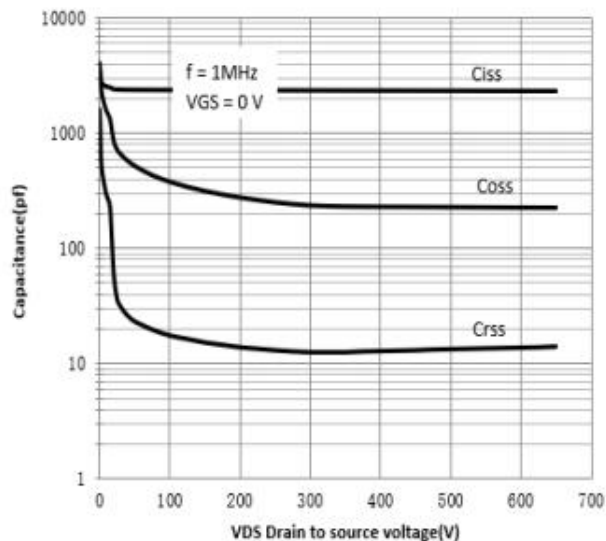
特征曲线 ELECTRICAL CHARACTERISTICS

Diagram 5: Typical gate-source threshold voltage as a function of junction temperature



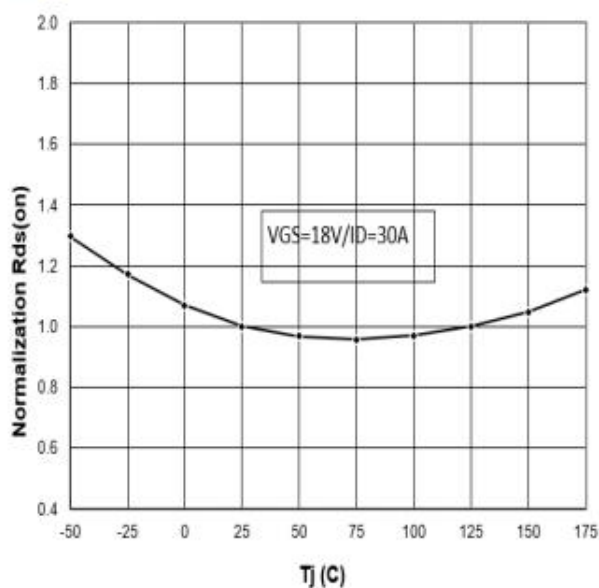
$V_{GS(th)} = f(T_J)$; $I_D = 5\text{mA}$; $V_{GS} = V_{DS}$

Diagram 6: Typ. Capacitance as a function of drain-source voltage



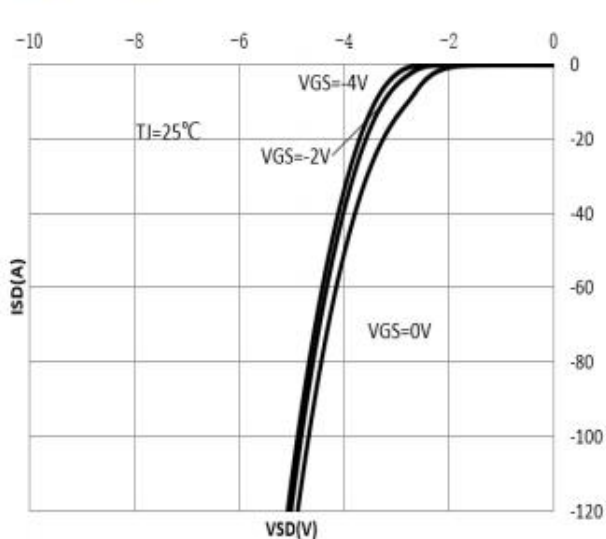
$C = f(V_{DS})$; $V_{GS} = 0\text{V}$; $f = 1\text{MHz}$

Diagram 7: Normalized on-resistance vs. junction temperature



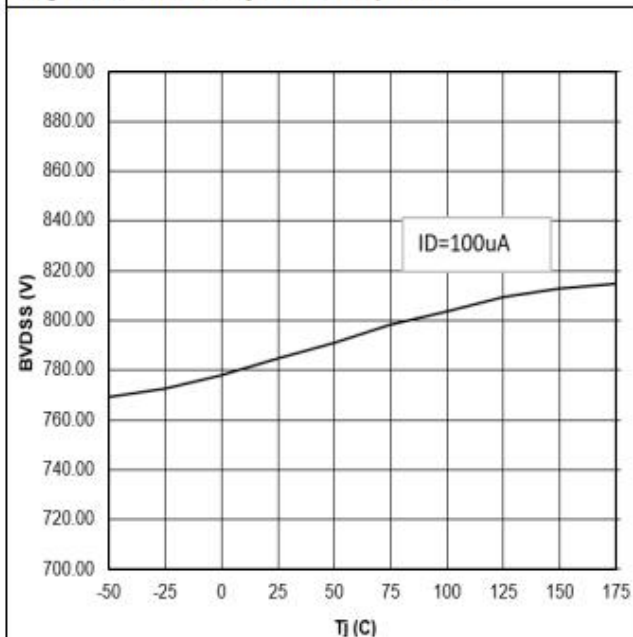
$R_{DS(on)} = f(T_J)$; $I_D = 30\text{A}$

Diagram 8: Typical body diodes Characteristics at 25°C



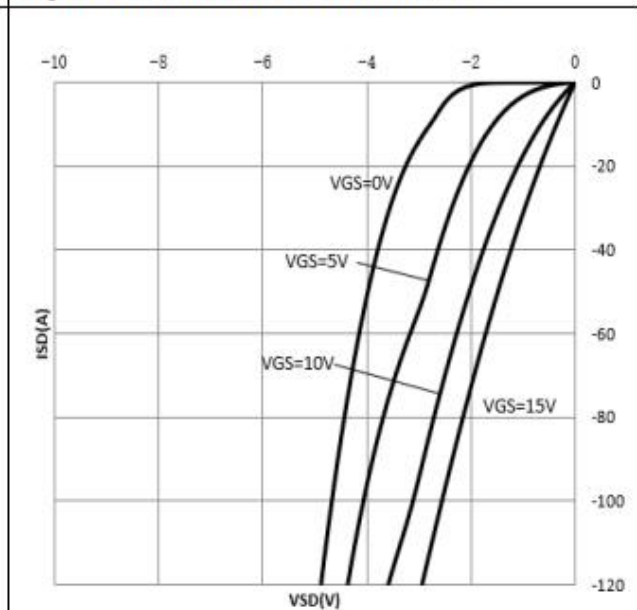
特征曲线 ELECTRICAL CHARACTERISTICS

Diagram 9: BVDSS VS junction temperature



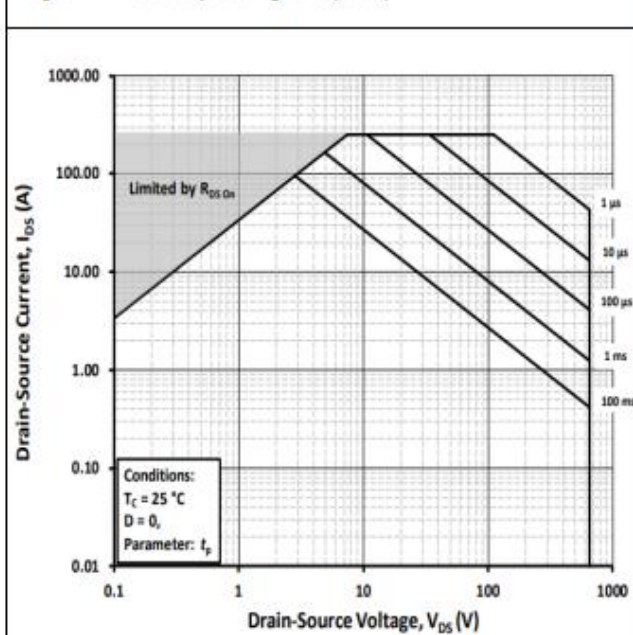
$$Bvdss=f(T_j)$$

Diagram 10: 3rd Quadrant Characteristic at 25 °C



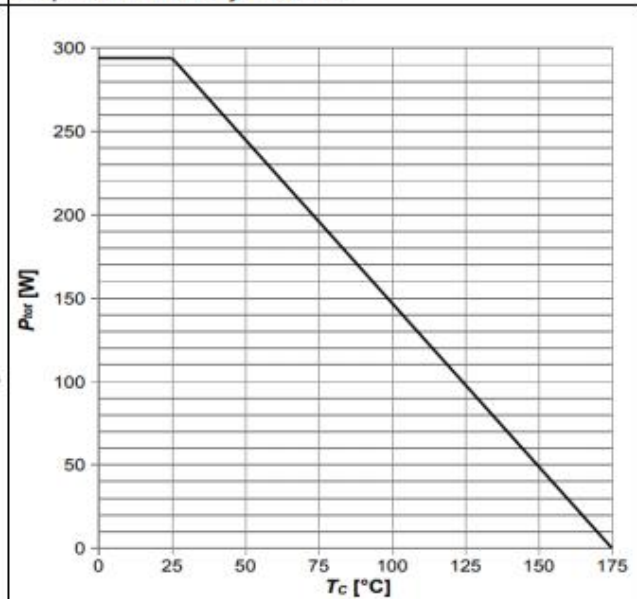
$$I_{SD}=f(V_{SD})$$

Diagram 11: Safe operating area(SOA)



$$V_{GS}=0/18V; T_C=25\text{ °C}; T_J<175\text{ °C}$$

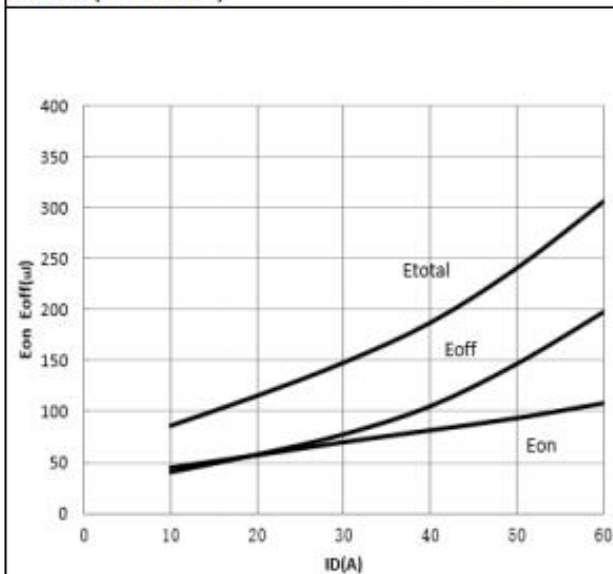
Diagram 12: Power dissipation as a function of case temperature limited by bond wire



$$P_{tot}=f(T_C)$$

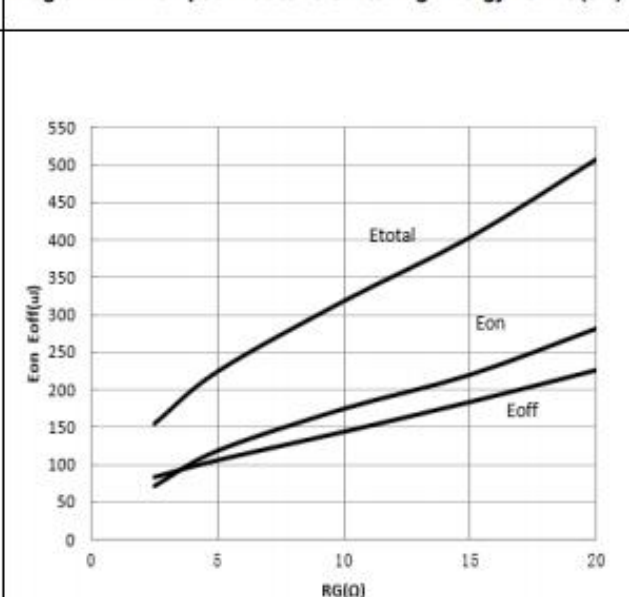
特征曲线 ELECTRICAL CHARACTERISTICS

Diagram 13: Clamped Inductive Switching Energy vs. Drain Current (VDD = 400V)



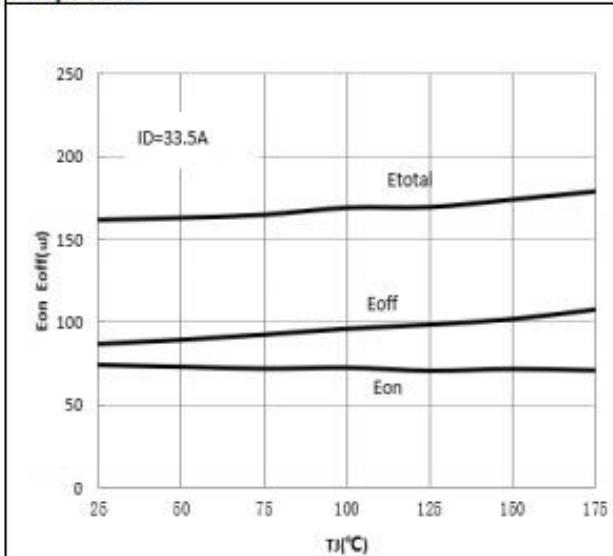
VCC=400V, TJ=25°C, RG=2.5Ω, VGE=-4/18V

Diagram 14: Clamped Inductive Switching Energy vs. RG(ext)



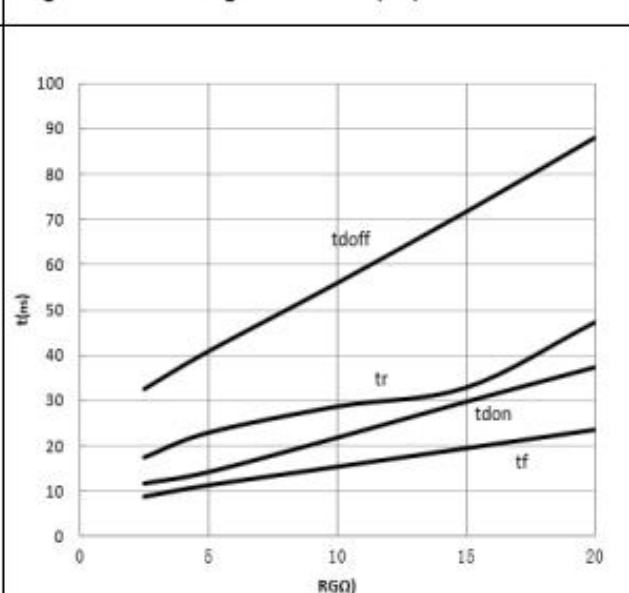
VCC=400V, TJ=25°C, RG=0-10Ω, VGE=-4/18V, ID=33.5A

Diagram 15: Clamped Inductive Switching Energy vs. Temperature



VCC=400V, TJ=25-175°C, RG=2.5Ω, VGE=-4/18V, ID=33.5A

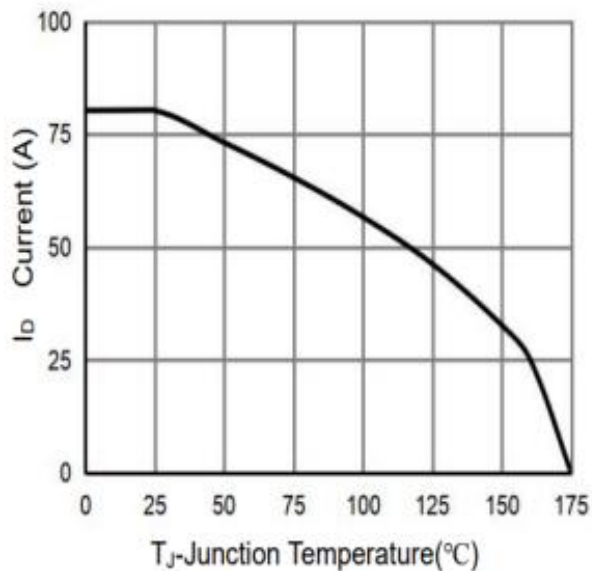
Diagram 16: Switching Times vs. RG(ext)



VCC=400V, TJ=25°C, RG=0-10Ω, VGE=-4/18V, ID=33.5A

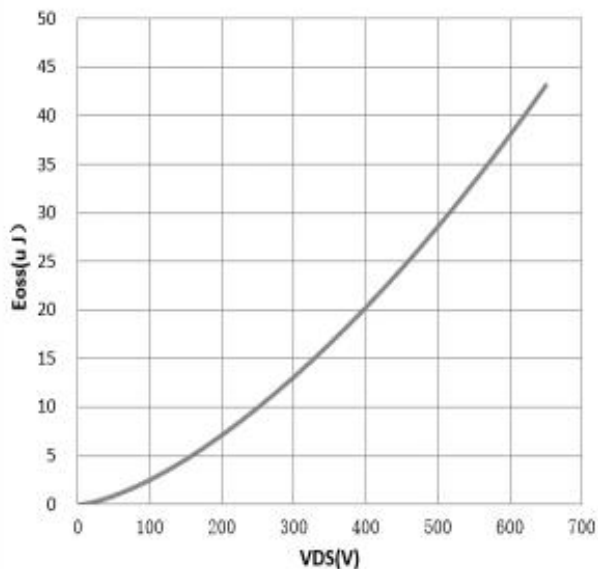
特征曲线 ELECTRICAL CHARACTERISTICS

Diagram 17: Continuous Drain Current Derating vs. Case Temperature



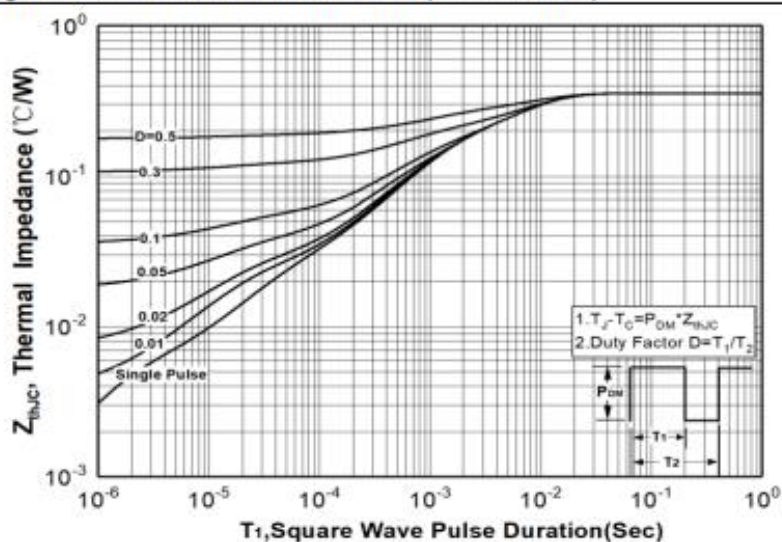
$$I_{DS} = f(T_C)$$

Diagram 18: Output Capacitor Stored Energy



$$E_{oss} = f(V_{DS})$$

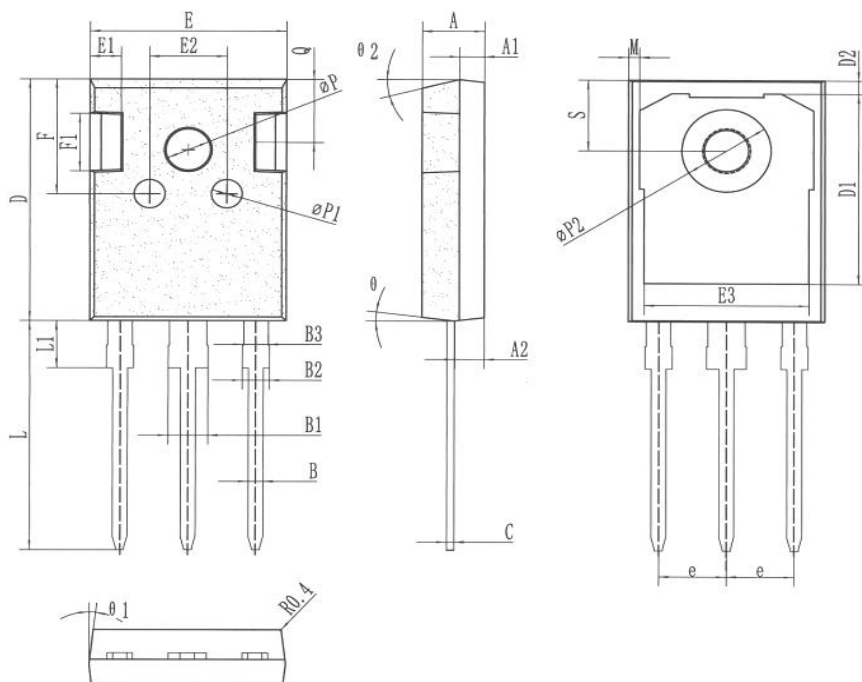
Diagram 19: Max. transient thermal resistance(MOSFET/diodes)



$$Z_{thJC,max} = f(t_p), \text{ parameter } D = t_p / T$$

外形尺寸 PACKAGE MECHANICAL DATA

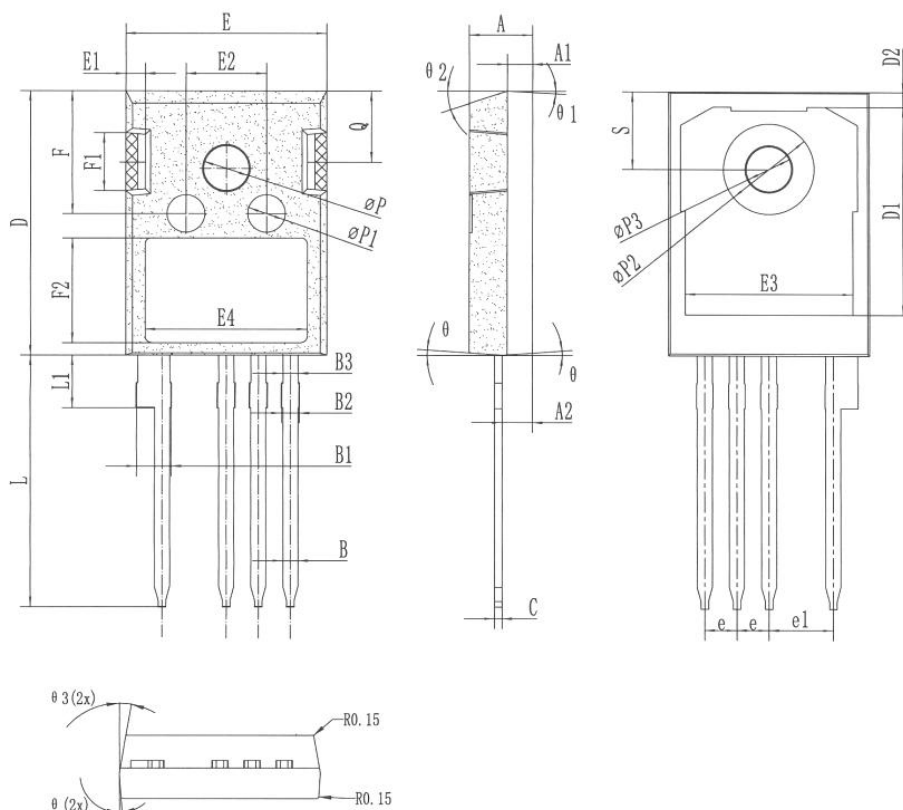
TO-247



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	1.90	2.00	2.10
A2	2.30	2.40	2.50
B	1.15	1.20	1.25
B1	3.05	3.15	3.25
B2	2.00	2.10	2.20
B3	1.90	2.00	2.10
C	0.55	0.60	0.65
D	20.90	21.00	21.10
D1	16.35	16.55	16.75
D2	1.02	1.17	1.32
E	15.70	15.80	15.90
E1	2.40	2.50	2.60
E2	6.10	6.20	6.30
E3	13.10	13.30	13.50
F	9.80	10.00	10.20
F1	4.90	5.00	5.10
e	5.44 BSC		
L	19.72	19.92	20.12
L1	3.90	4.10	4.30
φP	3.50	3.60	3.70
φP1	2.40	2.50	2.60
φP2	7.10	7.20	7.30
S	6.05	6.15	6.25
M	0.45	—	0.95
Q	5.60	5.80	6.00
θ	5°	7°	9°
θ 1	5°	7°	9°
θ 2	13°	15°	17°

TO-247-4L



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
A	4.90	5.00	5.10
A1	1.90	2.00	2.10
A2	2.31	2.41	2.51
B	1.15	1.20	1.25
B1	2.50	2.65	2.80
B2	1.20	1.35	1.45
B3	1.15	1.20	1.25
C	0.55	0.60	0.65
D	20.75	20.95	21.15
D1	16.35	16.55	16.75
D2	1.02	1.17	1.32
E	15.70	15.90	16.10
E1	1.45	1.55	1.65
E2	6.25	6.35	6.45
E3	13.05	13.25	13.45
E4	12.70	12.80	12.90
F	9.55	9.75	9.95
F1	4.50	4.60	4.70
F2	8.20	8.30	8.40
e	2.54 BSC		
e1	5.08 BSC		
L	19.80	20.00	20.20
L1	3.97	4.17	4.37
φP	3.70	3.80	3.90
φP1	2.90	3.00	3.10
φP2	7.10	7.20	7.30
φP3	3.50	3.60	3.70
S	6.05	6.15	6.25
Q	5.50	5.60	5.70
θ	2°	4°	6°
θ 1	1°	3°	5°
θ 2	16°	18°	20°
θ 3	8°	10°	12°