

## MOSFET Silicon N-Channel MOS



### 1. Applications

Synchronous rectification in SMPS,  
Hard switching and High speed circuit  
DC/DC in telecoms and industrial

### 2. Features

Low drain-source on-resistance:  
TO263 RDS(on) = 3.7mΩ (typ.)  
TO220 RDS(on) = 3.9mΩ (typ.)  
High speed power switching  
Enhanced body diode dv/dt capability  
Enhanced avalanche ruggedness

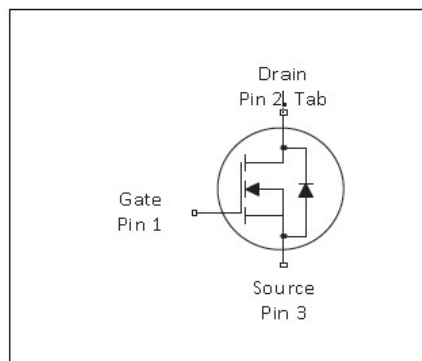
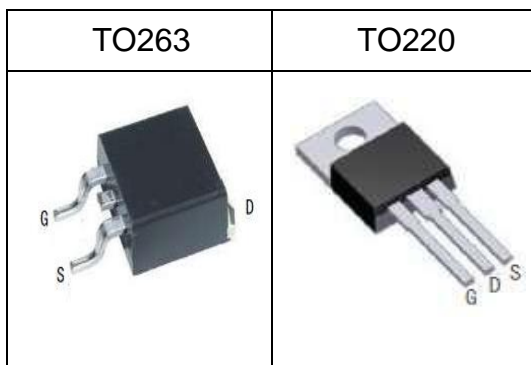


**Table 1 Key Performance Parameters**

Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	100	V
$R_{DS(on),max}$ TO263	4.0	mΩ
$R_{DS(on),max}$ TO220	4.2	mΩ
$Q_{g,typ}$	176.8	nC
$I_{D,pulse}$	486	A

### 3. Packaging and Internal Circuit

Part Name	Package	Marking
AUB040N10	TO263	AUB040N10
AUP042N10	TO220	AUP042N10



# 1 Maximum ratings

At  $T_j = 25^\circ\text{C}$ , unless otherwise specified

**Table 2 Maximum ratings**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current at sikicon <sup>1)</sup>	$I_D$		-	176	A	$T_C = 25^\circ\text{C}$
Continuous drain current at package <sup>1)</sup>	$I_D$		-	123	A	$T_C = 25^\circ\text{C}$
Continuous drain current at silicon <sup>1)</sup>	$I_D$			112	A	$T_C = 100^\circ\text{C}$
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	-		486	A	$T_C = 25^\circ\text{C}$
Avalanche energy, single pulse	$E_{AS}$	-	-	441	mJ	$T_C = 25^\circ\text{C}$ , $V_{DD} = 50\text{V}$ , $V_{gs} = 10\text{V}$ , $L = 0.5\text{mH}$ , $R_G = 25\Omega$
Avalanche current, single pulse	$I_{AR}$	-	-	42	A	$T_C = 25^\circ\text{C}$ , $V_{DD} = 50\text{V}$ , $L = 0.5\text{mH}$ , $R_G = 25\Omega$
Gate source voltage (static)	$V_{GS}$	-20	-	20	V	static;
Power dissipation	$P_{tot}$	-	-	229	W	$T_C = 25^\circ\text{C}$
Storage temperature	$T_{stg}$	-55	-	150	$^\circ\text{C}$	
Operating junction temperature	$T_j$	-55	-	150	$^\circ\text{C}$	
Soldering Temperature Distance of 1.6mm from case for 10s	$T_L$			260	$^\circ\text{C}$	

<sup>1)</sup>Limited by  $T_{j,max}$ . Maximum Duty Cycle  $D = 0.50$

<sup>2)</sup>Pulse width  $t_p$  limited by  $T_{j,max}$

<sup>3)</sup>Identical low side and high side switch with identical  $R_G$

## 2 Thermal characteristics

**Table Thermal characteristics(TO263&TO220)**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	$R_{thJC}$	-	-	0.54	°C/W	-
Thermal resistance, junction - ambient	$R_{thJA}$	-	-	62	°C/W	device on PCB, minimal footprint

### 3 Electrical characteristics

at  $T_j=25^{\circ}\text{C}$ , unless otherwise specified

**Table 4 Static characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	100	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{(GS)th}$	2.5	3.0	4.5	V	$V_{DS}=V_{GS}, I_D=250\mu A$
Zero gate voltage drain current	$I_{DSS}$	-	-	1	$\mu A$	$V_{DS}=100V, V_{GS}=0V, T_j=25^{\circ}\text{C}$
Gate-source leakage current	$I_{GSS}$	-	-	+/-100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
Drain-source on-state resistance TO263	$R_{DS(on)}$	-	3.7	4.0	m $\Omega$	$V_{GS}=10V, I_D=20A, T_j=25^{\circ}\text{C}$
Drain-source on-state resistance TO220	$R_{DS(on)}$	-	3.9	4.2	m $\Omega$	$V_{GS}=10V, I_D=20A, T_j=25^{\circ}\text{C}$
Gate resistance (Intrinsic)	$R_G$	-	1.2	-	$\Omega$	$f=1\text{MHz}$ , open drain
Transconductance	$G_{fs}$		110		S	$V_{DS}=5V, I_D=50A$

**Table 5 Dynamic characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	$C_{iss}$	-	3929	-	PF	$V_{GS}=0V, V_{DS}=50V, f=1\text{MHz}$
Output capacitance	$C_{oss}$	-	483	-	PF	$V_{GS}=0V, V_{DS}=50V, f=1\text{MHz}$
Reverse transfer capacitance	$C_{riss}$	-	480	-	PF	$V_{GS}=0V, V_{DS}=50V, f=1\text{MHz}$
Turn-on delay time	$t_{d(on)}$	-	16.5	-	ns	$V_{DD}=50V, V_{GS}=10V, I_D=50A, R_G=3\Omega$
Rise time	$t_r$	-	120	-	ns	$V_{DD}=50V, V_{GS}=10V, I_D=50A, R_G=3\Omega$
Turn-off delay time	$t_{d(off)}$	-	62	-	ns	$V_{DD}=50V, V_{GS}=10V, I_D=50A, R_G=3\Omega$
Fall time	$t_f$	-	119	-	ns	$V_{DD}=50V, V_{GS}=10V, I_D=50A, R_G=3\Omega$

**Table 6 Gate charge characteristics**

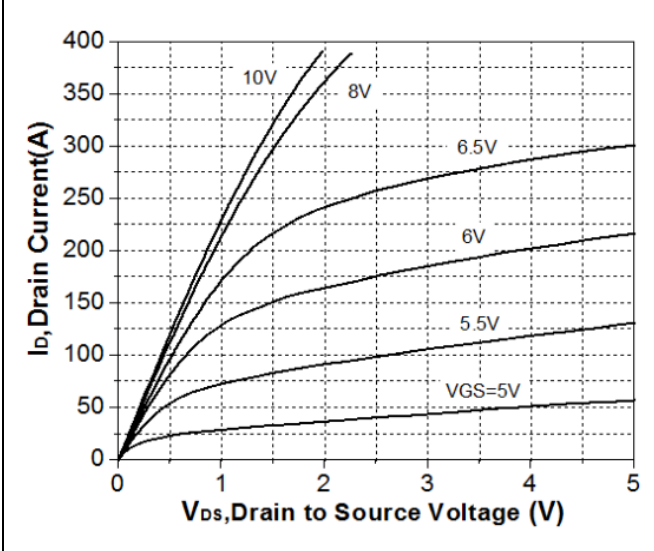
Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	$Q_{gs}$	-	21.7	-	nC	$V_{DD}=50V, I_D=20A, V_{GS}=10V$
Gate to drain charge	$Q_{gd}$	-	106.3	-	nC	$V_{DD}=50V, I_D=20A, V_{GS}=10V$
Gate charge total	$Q_g$	-	176.8	-	nC	$V_{DD}=50V, I_D=20A, V_{GS}=10V$

Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous Source Current at silicon	$I_{SD}$	-	-	176	A	Maximum Ratings
Diode forward voltage	$V_{SD}$	-	-	1.2	V	$V_{GS}=0V, I_s=1A, T_j=25^\circ C$
Reverse recovery time	$t_{rr}$	-	57	-	ns	$V_{GS}=0V, I_F=50A, di_F/dt=100A/\mu s$
Reverse recovery charge	$Q_{rr}$	-	111	-	nC	$V_{GS}=0V, I_F=50A, di_F/dt=100A/\mu s$
Peak Reverse Recovery Current	$I_{rrm}$	-	3.24	-	A	$V_{GS}=0V, I_F=50A, di_F/dt=100A/\mu s$

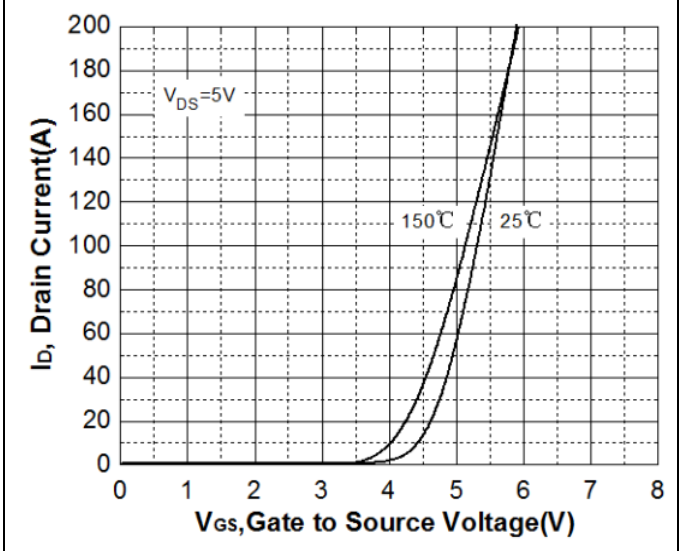
### 4 Electrical characteristics diagram

Diagram 1: Typ. Output characteristics



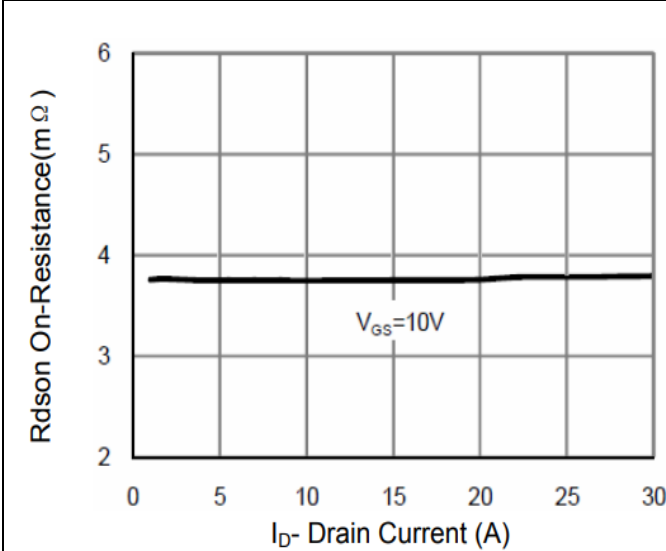
$I_D=f(V_{DS}); T_j=25\text{ }^\circ\text{C};$  parameter:  $V_{GS}$

Diagram 2: Typ. Transfer characteristics



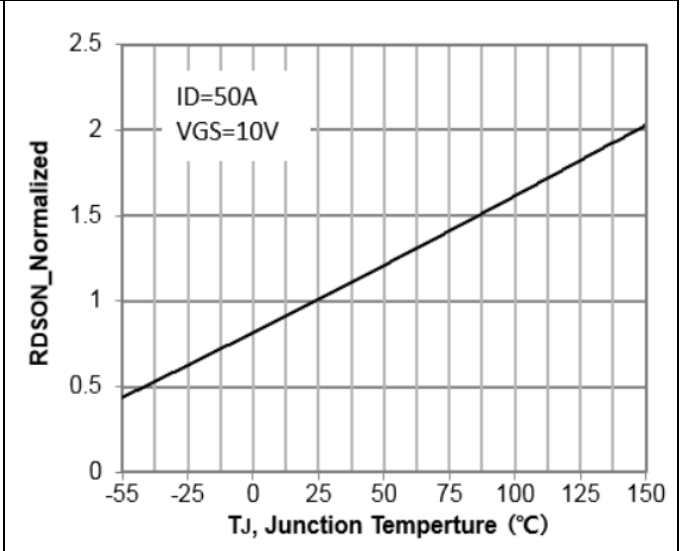
$I_D=f(V_{GS});$  parameter:  $T_j$

Diagram 3: Typ. Rds(on) vs. Drain Current



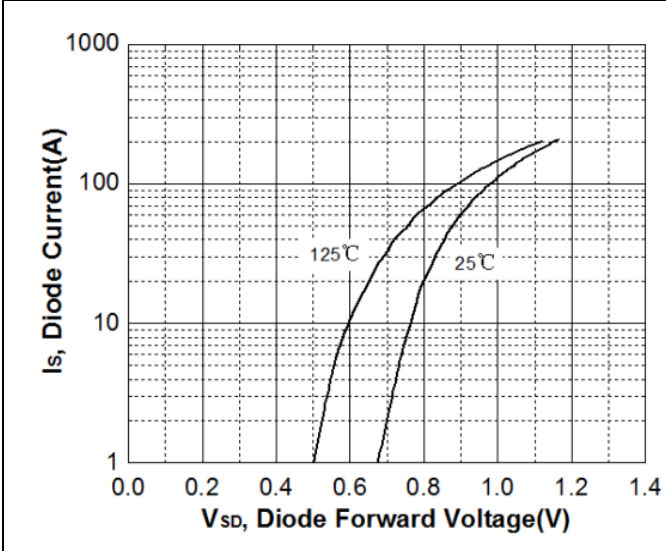
$R_{ds(on)}=f(I_D); V_{GS}=10V$

Diagram 4: Typ. Rds(on) – Junction Temperature



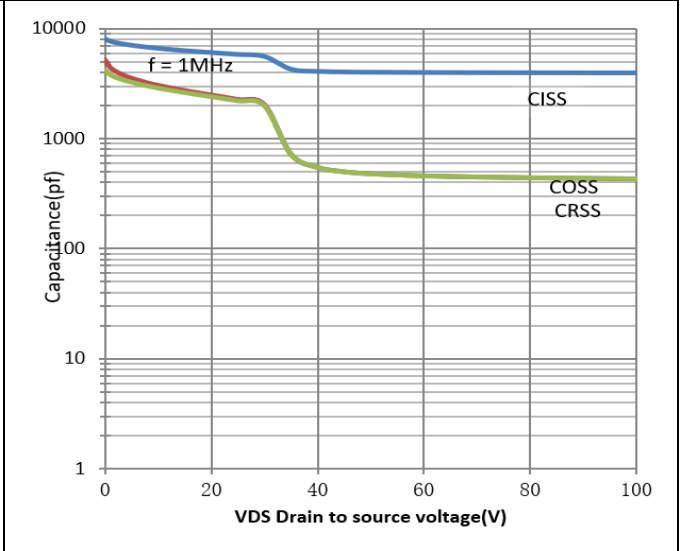
$R_{ds(on)}=f(T_j); V_{GS}=10V/I_D=50A$

Diagram 5: Typ. Body-Diode Characteristics



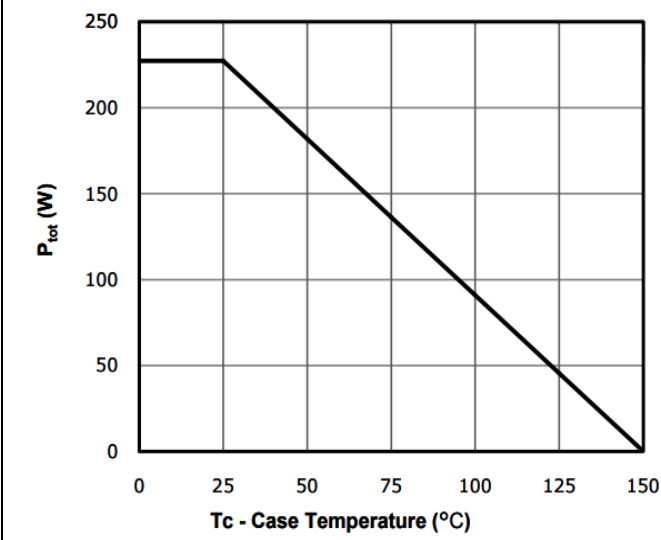
$I_f=f(V_{DS});$  parameter:  $T_j$

Diagram 6: Typ. Capacitance vs. Vds



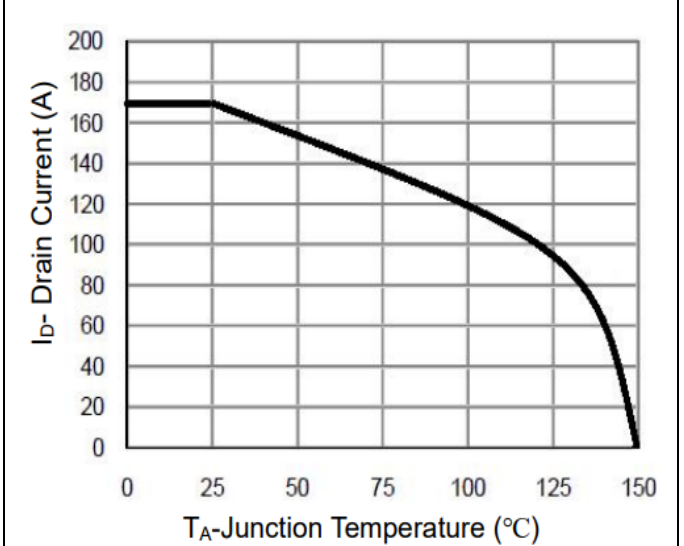
$C=f(V_{DS}); V_{GS}=0V; f=1MHz$

Diagram 7: Typ. Power Dissipation



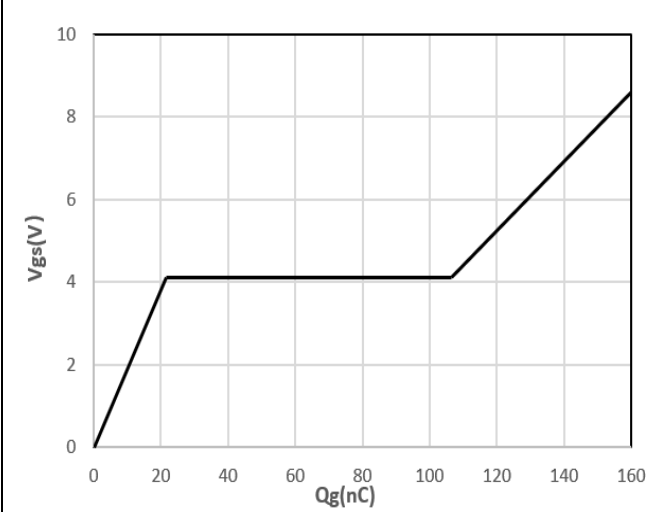
$P_{tot}=f(T_c)$

Diagram 8: Typ. Drain Current De-rating



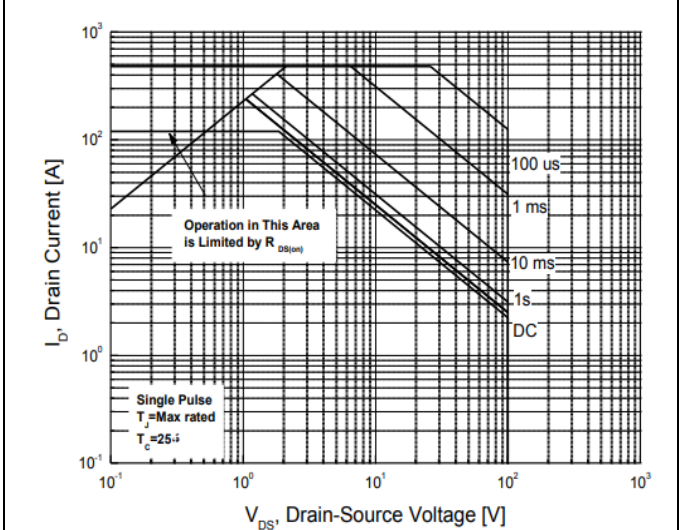
$I_d=f(T_c)$

Diagram 9: Typ. Gate charge



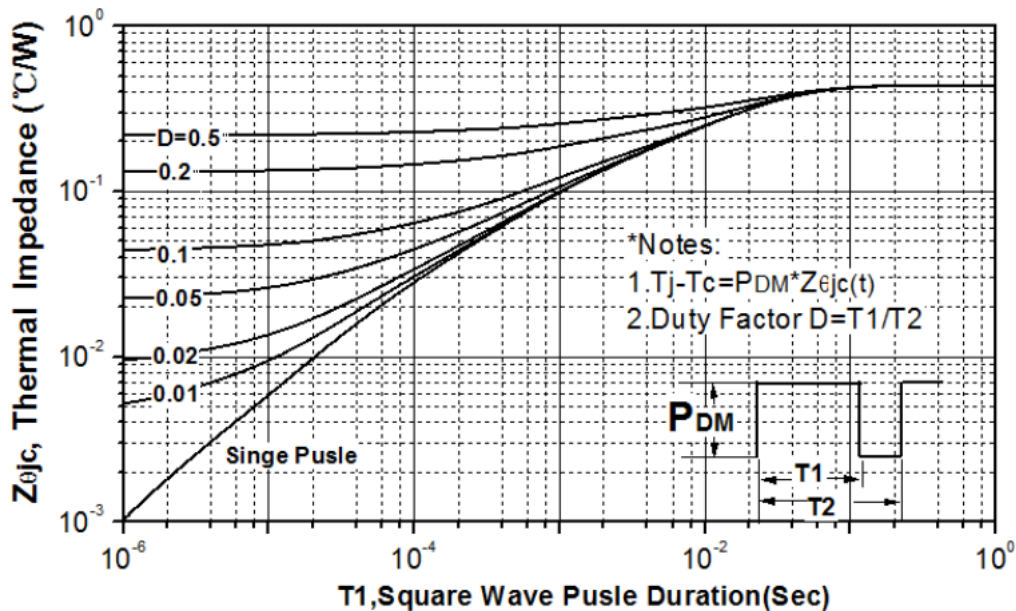
$V_{GS}=f(Q_{gate}); I_D=20A$  pulsed; parameter: V<sub>DD</sub>

Diagram 10: Typ. Maximum Safe Operating Area

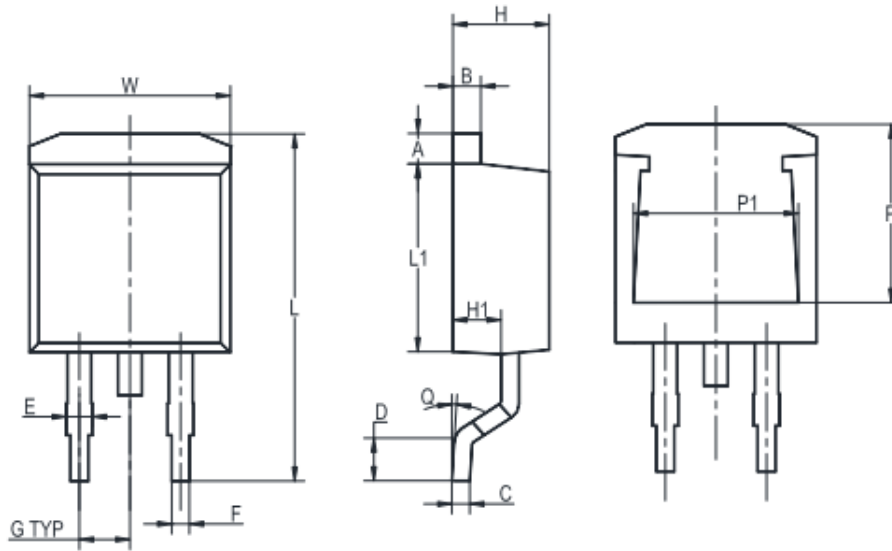


$I_D=f(V_{DS}); T_c=25^\circ C; V_{GS}>7V; D=0$ ; parameter tp

Figure 11 Normalized Maximum Transient Thermal Impedance



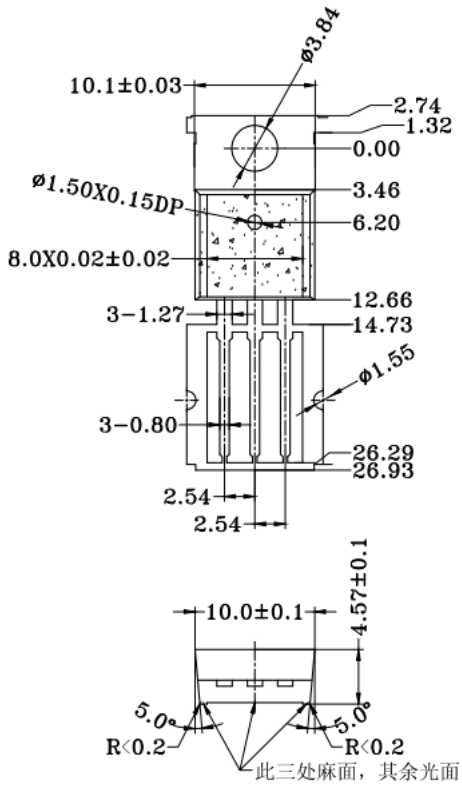
### 5. Package Outlines



UNIT	A	B	C	D	E	F	G	W	H	H1	L	L1	Q	P	P1
mm	1.5	1.5	0.5	2.60	1.6	0.94	2.54	10.5	4.8	2.9	16.5	8.7	8°	7.6	8.2
	1.1	1.1	0.3	2.15	1.1	0.68	TYP	9.6	4.4	2.5	14.5	8.2	MAX	7.1	7.4

Figure1: Outline PG-TO263(HC&LM)





注：如图麻面Ra0.8~1.0

Figure2: Outline PG-T0220(HT)

**Revision History**

Revision	Date	Subjects (major changes since last revision)
1.0	2023-02-10	Preliminary version
1.1	2023-02-17	Updated diagram of capacitance
1.2	2023-02-20	Changed TO263 part number