SL87N120A

1200V 17mΩ SiC MOSFET

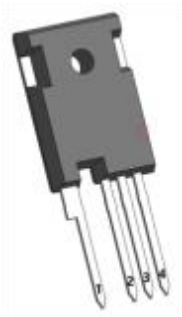
Features

- Recommended 18V gate voltage drive
- High voltage, low on-resistance
- High speed, small parasitic capacitance
- High operating junction temperature
- Fast recovery body diode
- Kelvin connection driver

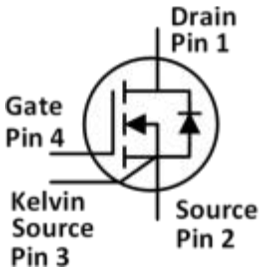
Application

- EV Main drive inverter
- Photovoltaic inverter
- Motor drive
- High voltage DC/DC converters
- Switching power supply

Packaging diagram:



TO247-4



Maximum ratings (T$_C$ =25°C, Unless otherwise specified)

Symbol	Parameter description	Typ	Unit	Test conditions	Remark
V_{DS}	Drain-source voltage	1200	V	VGS =0V, ID =100μA	
V_{GSmax} (DC)	Maximum DC gate-source voltage	-5 to 20	V	Static (DC)	
V_{GSmax} (Spike)	Maximum peak gate-source voltage	-10 to 23	V	Duty cycle <1%, pulse width <200ns	
V_{GSon}	Recommended turn-on gate-source voltage	18±0.5	V		
V_{GSoff}	Recommended turn-off gate-source voltage	-3.5 to -2	V		
I_D	Maximum drain-source current	118	A	VGS =18V, TC =25°C	Picture 23
		87	A	VGS =18V, TC =100°C	
I_{DM}	Maximum pulse drain-source current	295	A	Determined based on the device safe operating area	Picture 26
P_{TOT}	Maximum power dissipation	469	W	TC =25°C	Picture 24
T_{stg}	Storage temperature range	-55 to 175	°C		
T_J	Operating junction temperature range	-55 to 175	°C		
T_L	Soldering temperature	260	°C	Wave soldering at leads, 1.6 mm from case, for no more than 10 seconds	

Thermal resistance characteristics

Symbol	Parameter description	Typ	Unit	Remark
$R_{\theta(J-C)}$	Thermal resistance from junction to case	0.271	°C/W	Picture 25

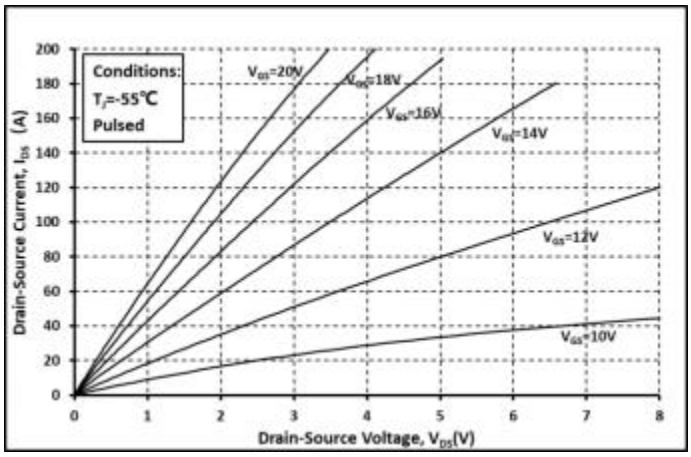
Electrical property （T_C =25°C, Unless otherwise specified）

Symbol	Parameter description	Standard value			Unit	Test conditions	Remark
		Min	Typ	Max			
I_{DSS}	Drain leakage current when turned off		5	100	μA	V_{DS}=1200V, V_{GS}=0V	
I_{GSS}	Gate leakage current			±100	nA	V_{DS}=0V, V_{GS}=-5~20V	
V_{TH}	Threshold voltage	1.8	2.8	4.5	V	V_{GS}=V_{DS}, I_D=20mA	Picture 8, 9
			2.1			V_{GS}=V_{DS},I_D=20mA @ T_J =175°C	
R_{ON}	On-resistance		17	22	mΩ	V_{GS}=18V, I_D=60A @T_J=25°C	Picture 4, 5, 6, 7
			34		mΩ	V_{GS}=18V, I_D=60A @T_J=175°C	
C_{iss}	Input capacitance		4410		pF	V_{DS}=800V, V_{GS}=0V, f=100kHz, VAC=25mV	Picture 16
C_{oss}	Output capacitor		211		pF		
C_{rss}	Reverse transfer capacitance		16.3		pF		
E_{oss}	Output capacitor stores energy		81		μJ		Picture 17
Q_g	Total gate charge		214		nC	V_{DS} =800V, I_D =60A, V_{GS} =-3 to 18V	Picture 18
Q_{gs}	Gate-source charge		55		nC		
Q_{gd}	Gate-drain charge		69		nC		
R_g	Gate input resistance		1.9		Ω	f=1MHz	
E_{on}	Opening energy		1280		μJ	V_{DS} =800V, I_D =60A, V_{GS} =-3.5 to 18V, $R_{G(ext)}$ =2.0Ω, L=200μH TJ =25°C	Picture 19 , 20
E_{off}	Shutoff energy		333.5		μJ		
$T_{d(on)}$	Turn-on delay time		17.1		ns		
t_r	Rise time		33.2				
$T_{d(off)}$	Turn-off delay time		35.5				
t_f	Fall time		15.1				
E_{on}	Open energy		1544		μJ	VDS =800V, ID =60A, VGS =-3.5 to 18V, RG(ext) =2.0Ω,L=200μH TJ =175°C	Picture 22
E_{off}	Shutoff energy		357.4		μJ		

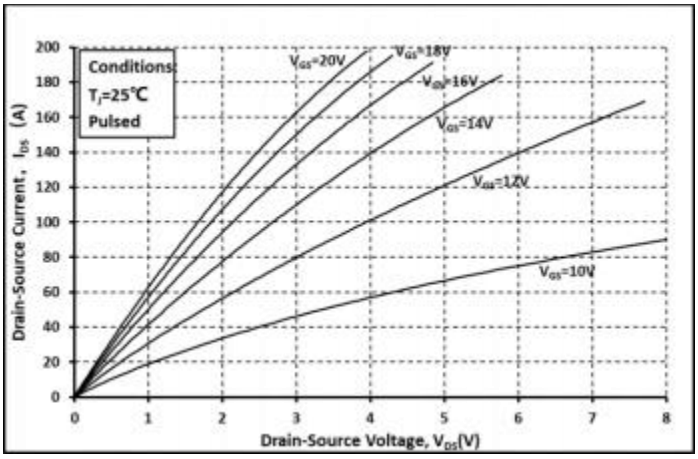
Built-in diode characteristics （T_C =25°C, Unless otherwise specified）

Symbol	Parameter description	Standard value			Unit	Test conditions	Remark
		Min	Typ	Max			
V_{SD}	Forward voltage		3.6		V	I_{SD} =30A, V_{GS} =0V	Picture 10, 11, 12
			3.4		V	I_{SD} =30A, V_{GS} =0V, T_J =175°C	
t_{rr}	Reverse recovery time		54		ns	V_{GS} =-3.5V/+18V, I_{SD} =60A, V_R =800V, $R_{G(ext)}$ =10Ω L=200μH di/dt=3000A/μs	
Q_{rr}	Reverse recovery charge		383.8		nC		
I_{RRM}	Reverse recovery peak current		25.3		A		

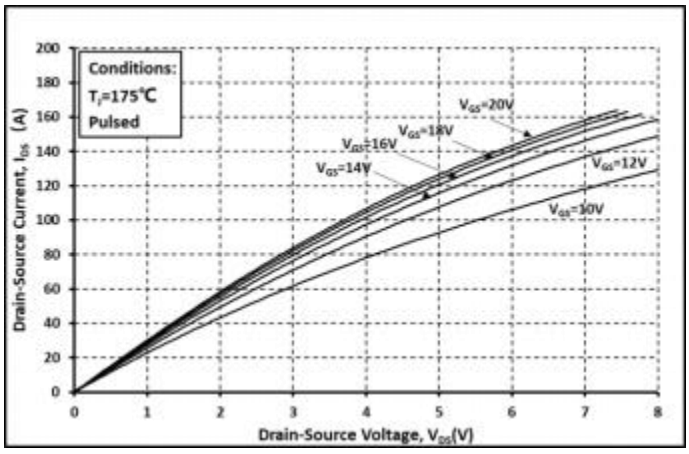
Typical characteristic curve



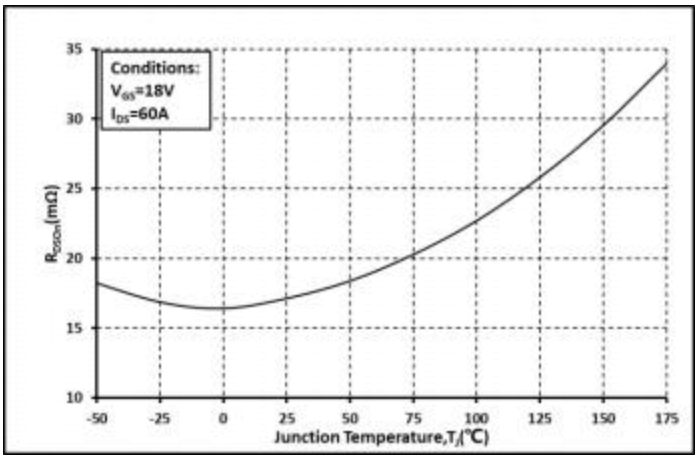
Picture 1. Output curve @ T_J =-55°C



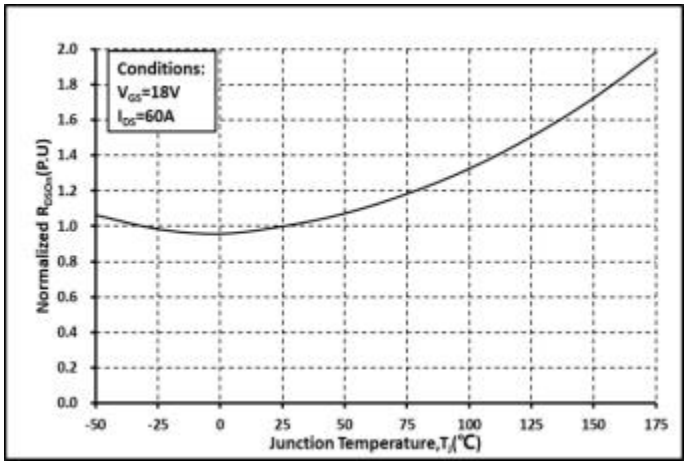
Picture 2. Output curve @ T_J =25°C



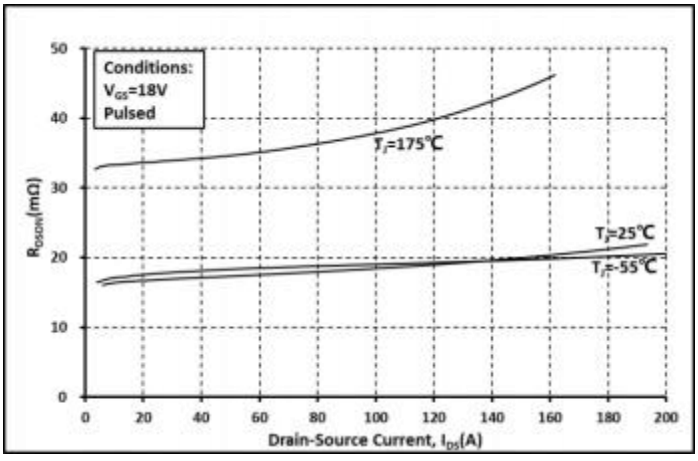
Picture 3. Output curve @ T_J =175°C



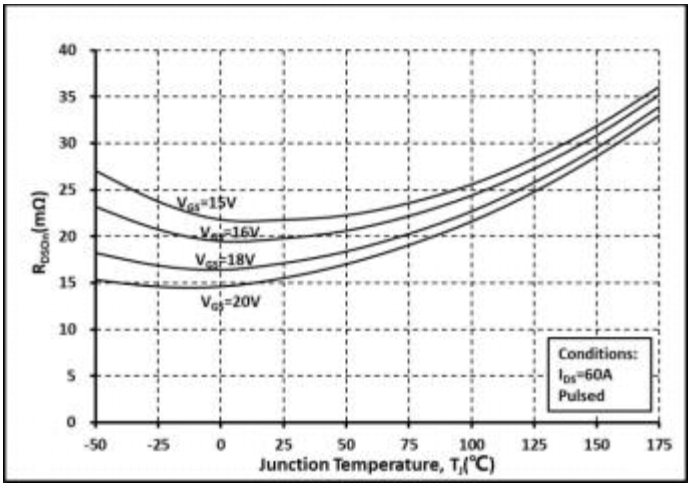
Picture 4. Ron and temperature relationship curve



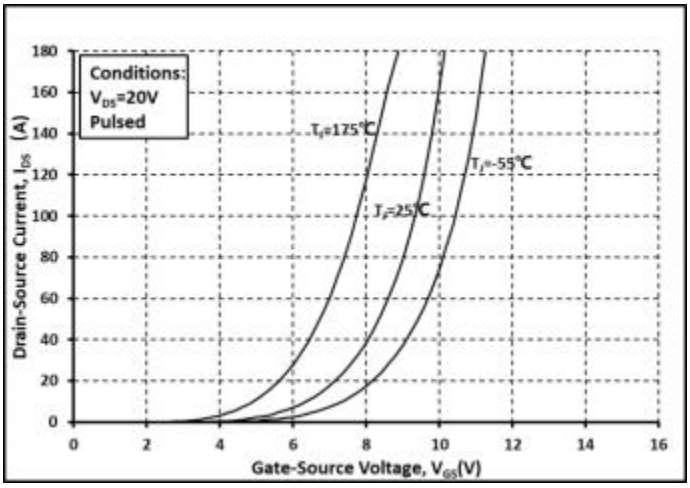
Picture 5. Normalized Ron vs. temperature curve



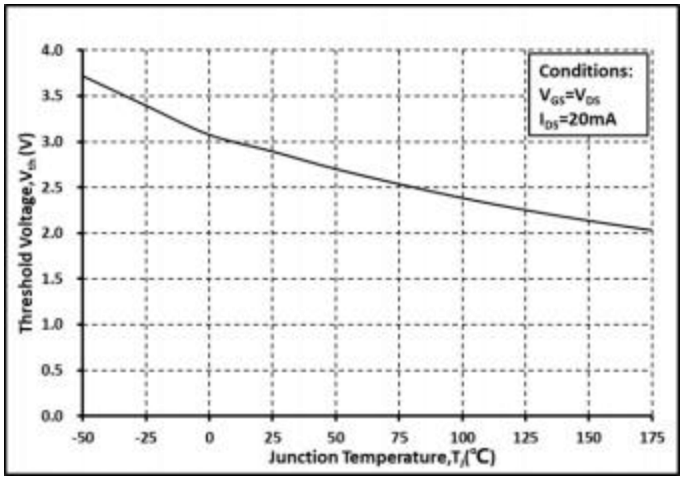
Picture 6. Ron and I_{DS} relationship curves at different temperatures



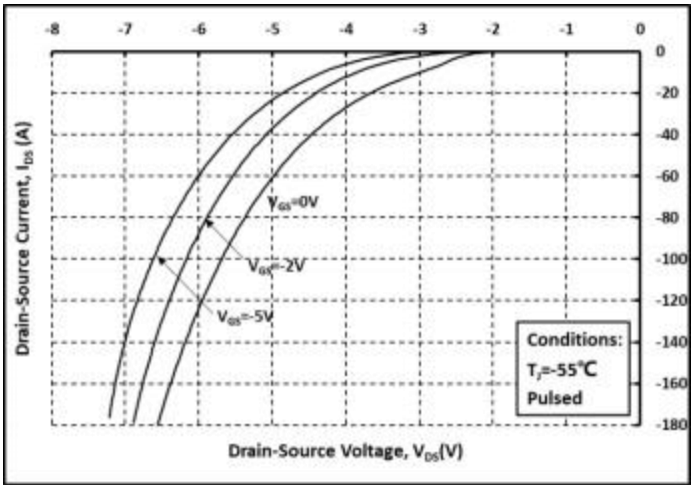
Picture 7. Ron and temperature curves at various V_{GS}



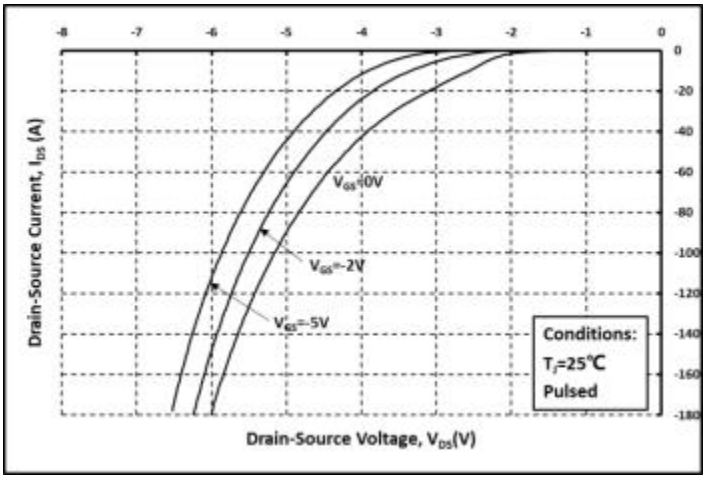
Picture 8. Transfer characteristic curves at various temperatures



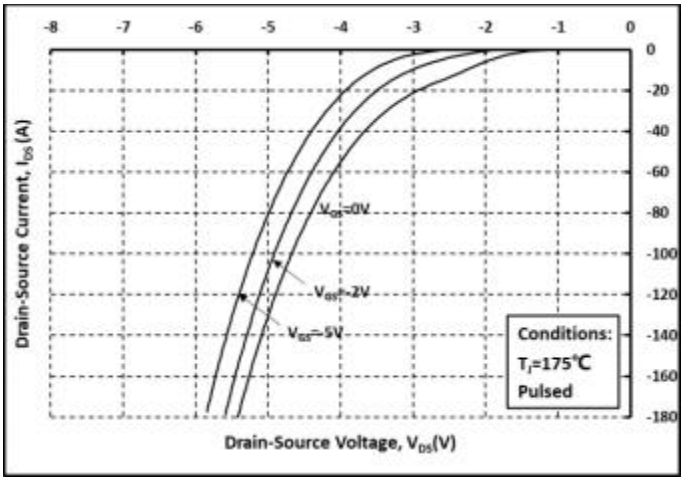
Picture 9. Threshold voltage variation curve with temperature



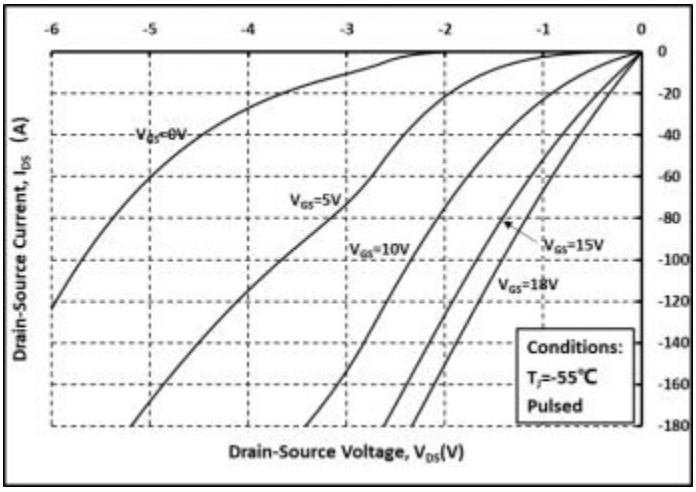
Picture 10. Body diode conduction curve @ T_J =-55°C



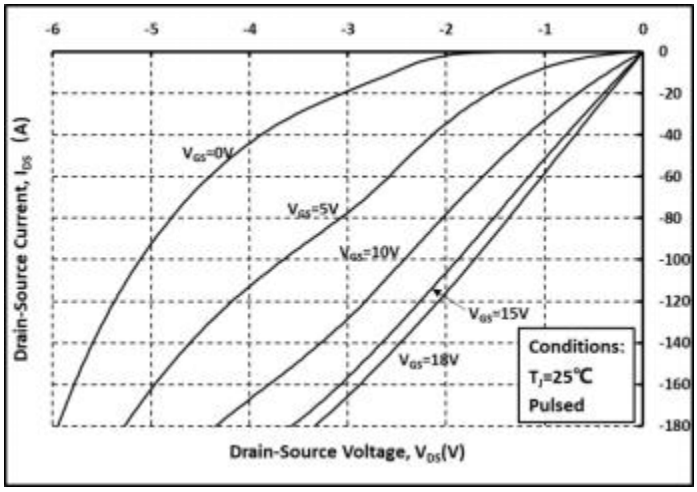
Picture 11. Body diode conduction curve @ TJ =25°C



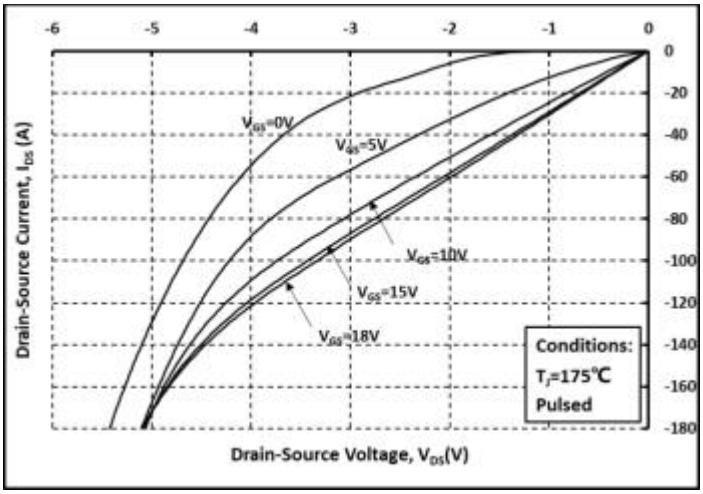
Picture 11. Body diode conduction curve @ T_J =175°C



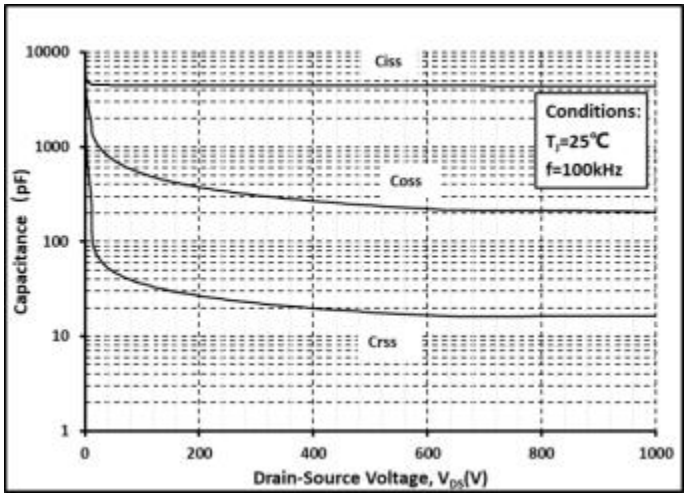
Picture 13. The third quadrant curve @ TJ =-55°C



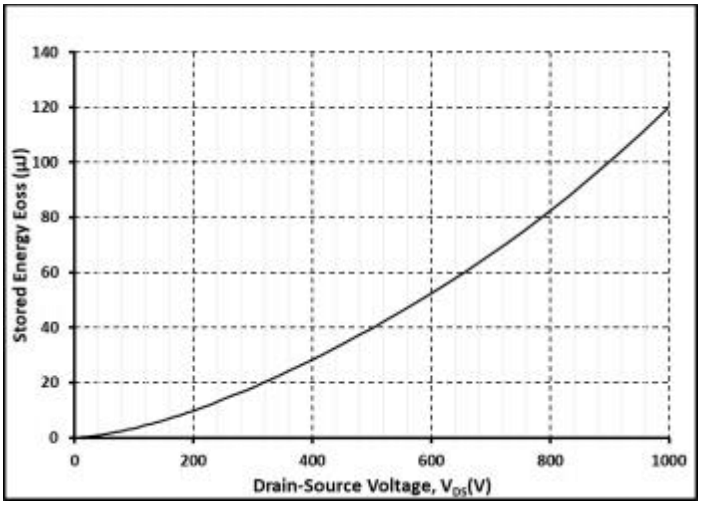
Picture 14. The third quadrant curve @ T_J =25°C



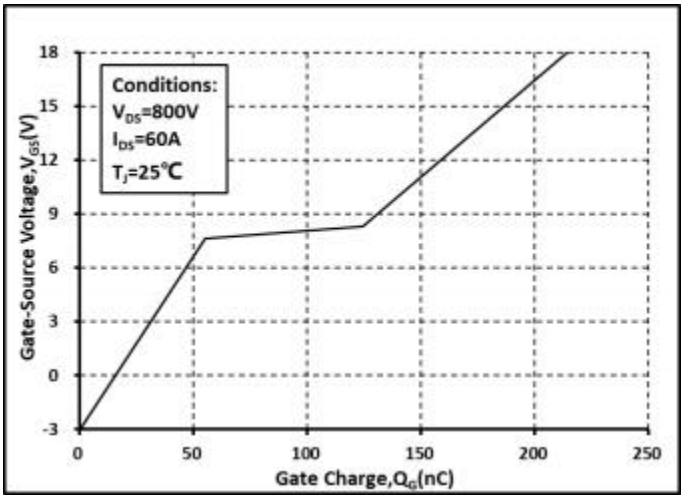
Picture 15. The third quadrant curve @ TJ =175°C



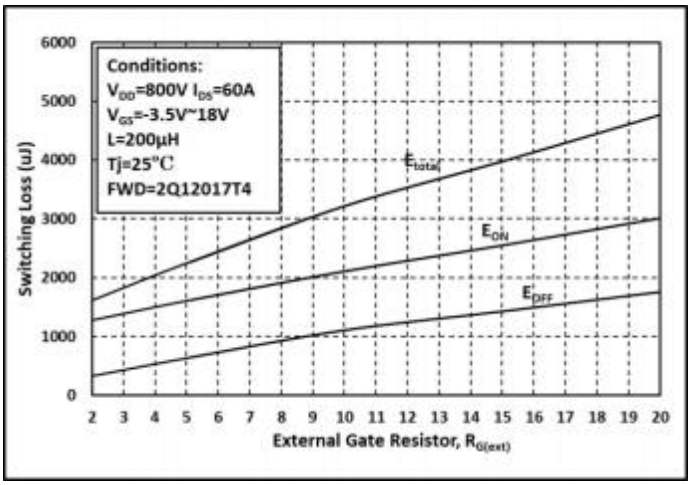
Picture 16. Relationship curves between each capacitor and V_{DS}



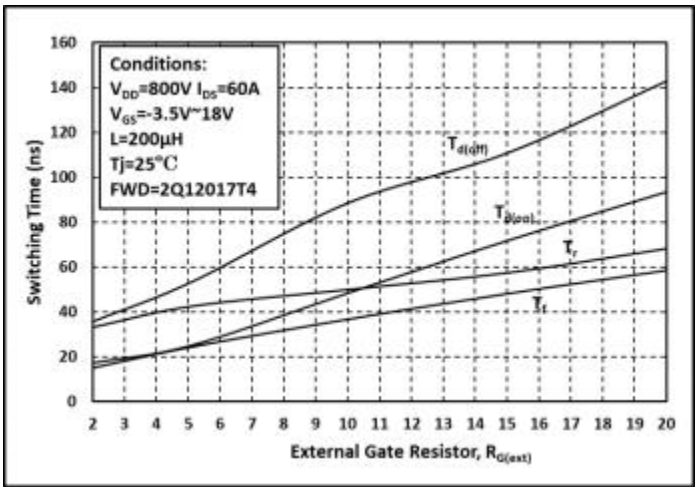
Picture 17. Output capacitor storage energy curve



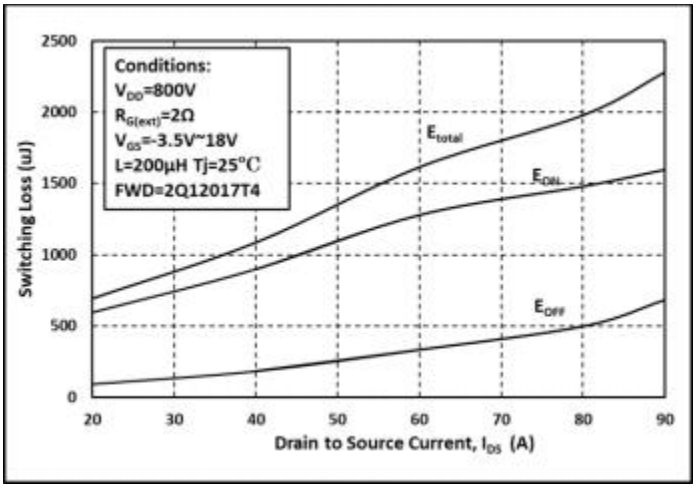
Picture 18.Gate charge characteristic curve



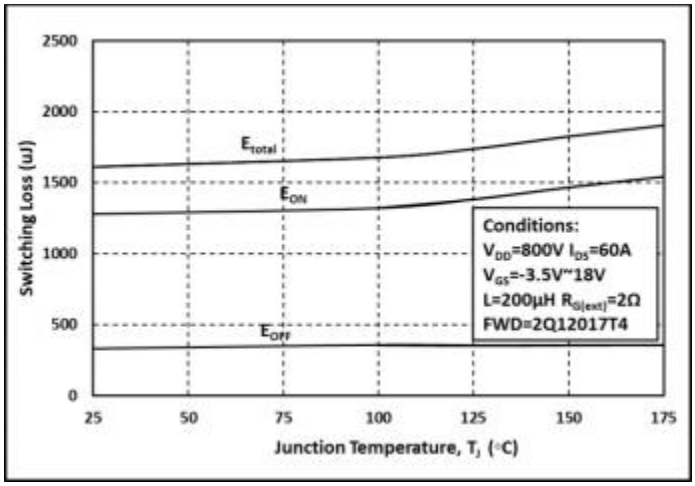
Picture 19. Switching energy and gate resistance $R_{G(ext)}$ relationship curve



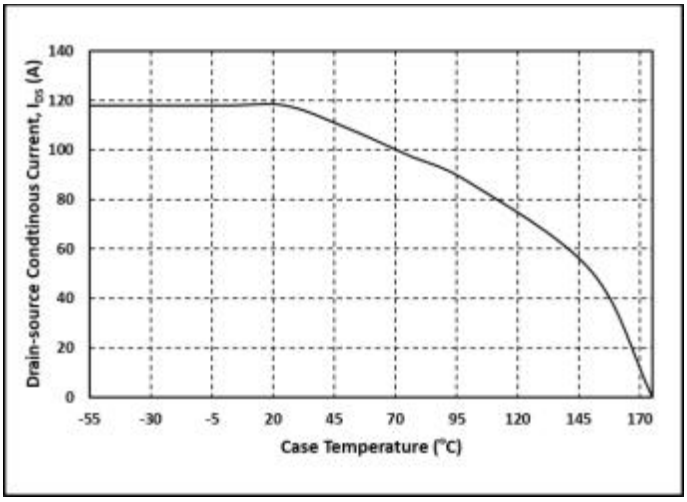
Picture 20. Switching energy and gate resistance $R_{G(ext)}$ relationship curve



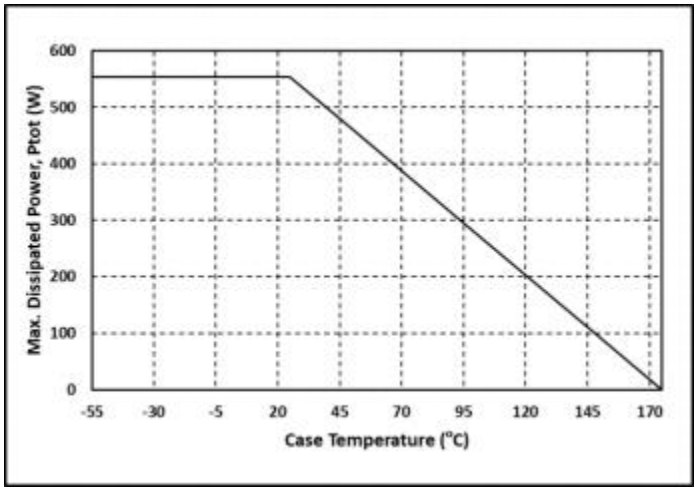
Picture 21. Switching energy and drain current I_{DS} relationship curve



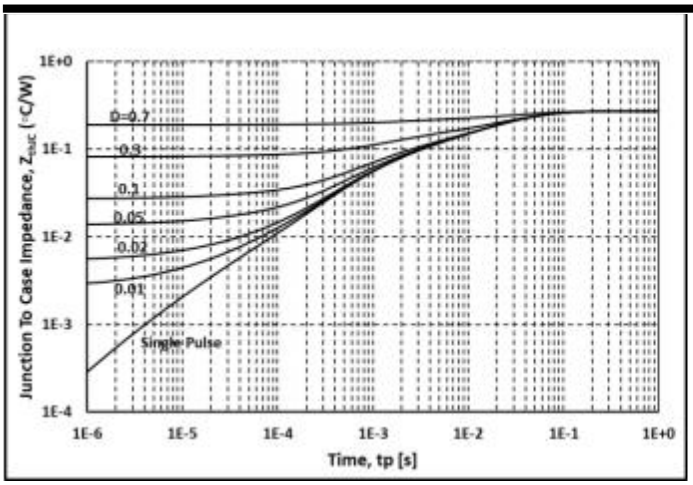
Picture 22. Switching energy and temperature relationship curve



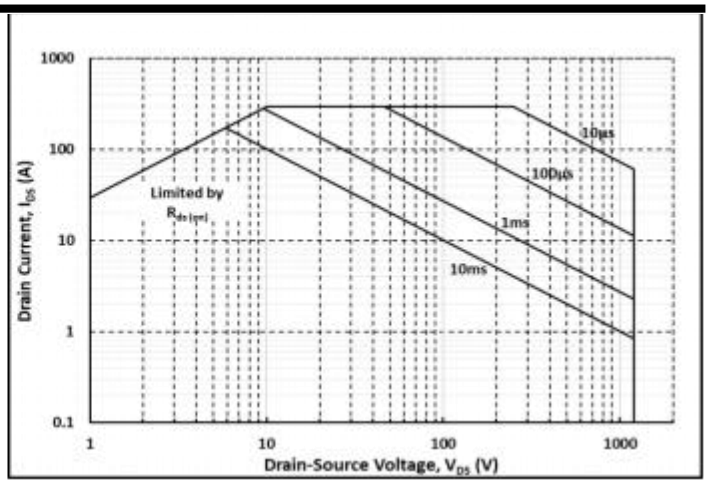
Picture 23. Drain current and temperature relationship curve



Picture 24. Maximum power consumption derating and temperature relationship curve

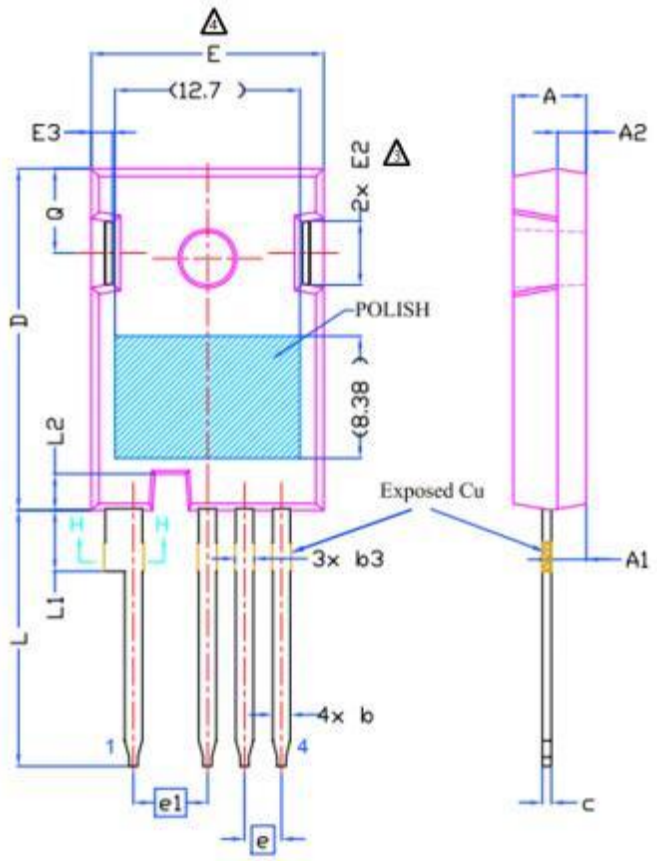


Picture 25. Thermal resistance curve

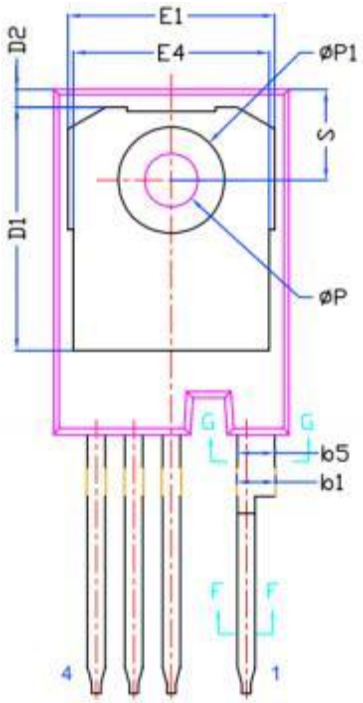


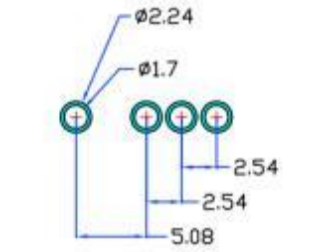
Picture 26. Safe working area diagram

Package size

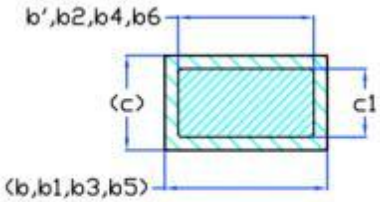


Dimensions In Millimeters		
SYMBOL	MIN.	MAX.
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b	1.07	1.33
b‘	1.07	1.28
b1	2.39	2.94
b2	2.39	2.84
b3	1.07	1.60
b4	1.07	1.50
b5	2.39	2.69
b6	2.39	2.64
c	0.55	0.68
c1	0.55	0.65
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
e	2.54 BSC	
e1	5.08 BSC	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
N	4	
ΦP	3.51	3.65
ΦP1	7.18 REF.	
Q	5.49	6
S	6.04	6.3





Recommended Solder Pad Layout



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

Note:

1. Packaging standard reference: : JEDEC TO247, Variation AD
2. Unit is: MM
3. Need to slot, the slot can be round
4. Dimensions D and E do not include mold flash
5. Subject to change without prior notice