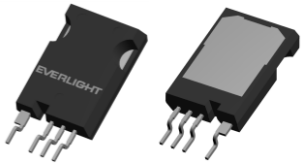
DATASHEET

TO-247-TSC 1200V N-Channel Enhancement SiC Power MOSFET
EL-MAKR04120PA-TC

Preliminary



V_{DSS}	=	1200	V
I_D	=	55	A
$R_{DS(on)}$	=	40	mΩ

Features

- High Blocking Voltage with Low On-Resistance
- Low gate resistance for high-frequency switching
- Low capacitances and low gate charge
- Best thermal conductivity and behavior
- Pb-Free Lead, Halogen Free, RoHS Compliant

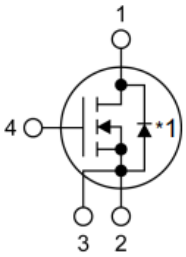
RoHS

Halogen-Free

Benefits

- Improve System Efficiency
- Increase Power Density
- Reduce Heat Sink Requirement
- Reduction of System Cost

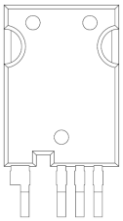
Schematic



Pin Configuration

1. Drain
2. Power Source
3. Driver Source
4. Gate

*1. Body Diode



Applications

- Solar Inverters
- EV Battery Chargers
- High Voltage DC/DC Converters
- Switch Mode Power Supply

Key Performance Parameters

Symbol	V_{DSmin}	V_{GSS}	I_D	I_{DP}	$T_{J,max}$	P_D
Parameter	Drain-Source Voltage	Gate-Source Voltage (DC)	Continuous Drain Current	Pulse Drain Current	Junction temperature	Power Dissipation
Value	1200V	-4/18V	55A	171A	175 °C	454W

Maximum Ratings

Parameter	Symbol	Value	Unit	Test Conditions
Drain - Source Voltage	V_{DSmin}	1200	V	V_{GS}= 0V, I_D= 250μA
Gate - Source Voltage (DC) Max	V_{GS}	-10 / +20	V	
Gate - Source Voltage (DC)	V_{GS}	-4 / +18	V	Recommended operating values
Continuous Drain Current	I_D *2	55	A	V_{GS}=20V, T_C=25℃
		39		V_{GS}=20V, T_C=100℃
Pulsed Drain Current	I_{DP}	171	A	
Power Dissipation	P_D *3	454	W	
Operating Junction	T_J	175	℃	
Storage Temperature	T_{stg}	-55 to +175	℃	
Solder Temperature	T_L	260	℃	
Mounting Torque	M_d	1 8.8	Nm lbf-in	M3 or 6-32 screw

*1 Please be advised not to use SiC-MOSFETs with V_{GS} below 12V as doing so may cause thermal runaway.
*2 Limited by maximum Ta and for Max. R_{thJC}
*3 P_W ≦ 10μs, Duty cycle ≦ 1%
*4 Tested after applying V_{GS} for 100ms.
*5 Pulsed

Electrical Characteristics

Parameter	Symbol	Value			Unit	Test Conditions
		Min	Typ	Max		
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	1200	-	-	V	V_{GS}= 0V, I_D= 250μA
Gate Threshold Voltage	$V_{GS(th)}$ *4	-	2.8	-	V	V_{GS}=V_{DS}, I_D=2mA
Zero Gate Voltage Drain Current	I_{DSS}	-	1	-	μA	V_{DS}= 1200V, V_{GS}= 0V
Gate-Source Leakage Current	I_{GSS+}	-	10	200	nA	V_{GS}= 20V, V_{DS}= 0V
Drain-Source On-State Resistance	$R_{DS(on)}$ *5	-	40	60	mΩ	V_{GS}= 18V, I_D= 24A
		-	68	100		V_{GS}= 18V, I_D= 24A,T_J= 175℃
Input Capacitance	C_{iss}	-	2910	-	pF	V_{GS}= 0V V_{DS}= 800V f= 1MHz
Output Capacitance	C_{oss}	-	103	-		
Reverse Transfer Capacitance	C_{rss}	-	10	-		
Turn-On Delay Time	$t_{d(on)}$	-	50	-	ns	V_{DS}=800V I_D=24A V_{GS}=-4V/+18V R_G=2.5Ω
Rise Time	t_r	-	20	-		
Turn-Off Delay Time	$t_{d(off)}$	-	45	-		
Fall Time	t_f	-	10	-		
Gate to Source Charge	Q_{gs}	-	40	-	nC	V_{DS}= 800V I_{DS}= 24A V_{GS}= +18V/-4V
Gate to Drain Charge	Q_{gd}	-	29	-		
Total Gate Charge	Q_g	-	115	-		
Gate resistance	R_G	-	1	-	Ω	f=1MHz, V_{AC}=25mV

Body Diode Characteristics

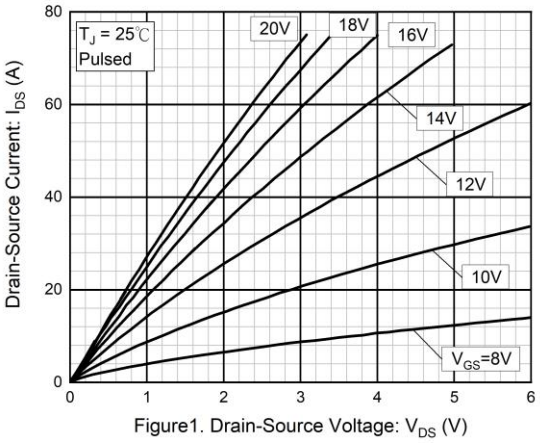
Parameter	Symbol	Value		Unit	Test Conditions
		Typ.	Max.		
Diode Forward Voltage	V_{SD}	4.6	-	V	V_{GS}= -4V, I_S= 24A
Continuous Diode Forward Current	I_S	-	40	A	

Thermal Characteristics (Measured conformable to JESD51-14.)

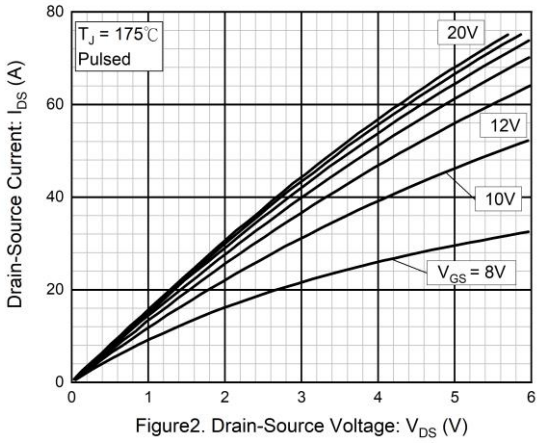
Parameter	Symbol	Value		Unit
		Typ	Max	
Thermal Resistance from Junction to Case	$R_{\theta JC}$	0.26	0.33	℃/W

Typical Performance

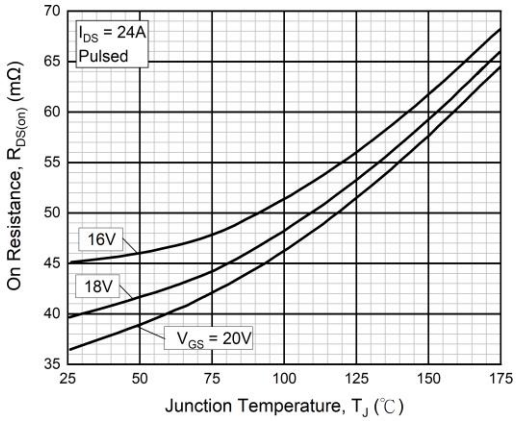
Typical Output Characteristics (I)



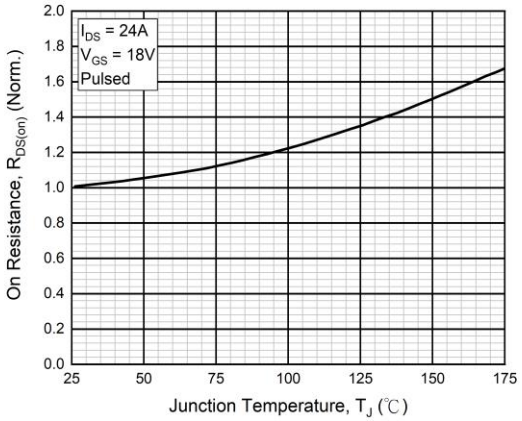
Typical Output Characteristics(II)



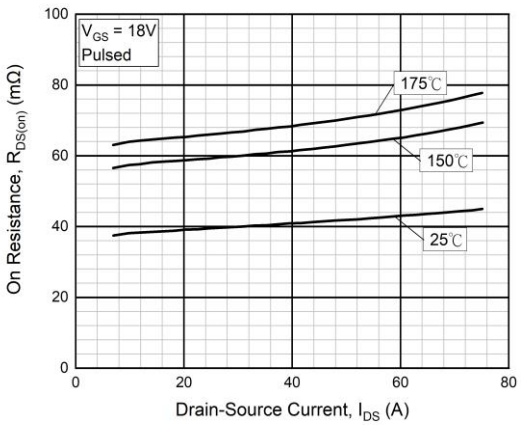
Typical on-resistance by various junction temperature and gate voltage



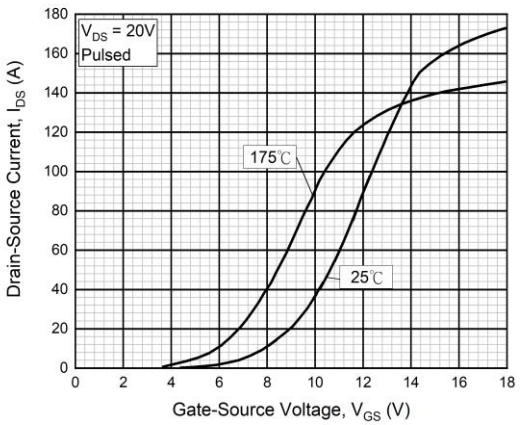
Normalized on-resistance by various junction temperature



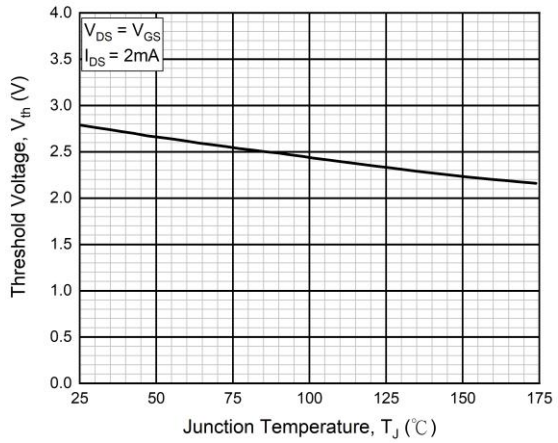
Typical on-resistance by various drain current and junction temperature



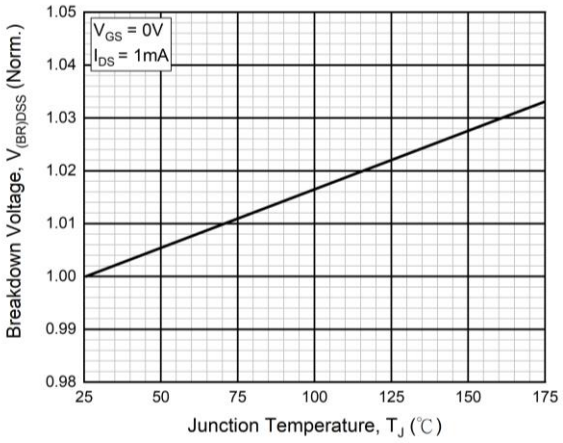
Typical transfer characteristics by various gate voltage and junction temperature



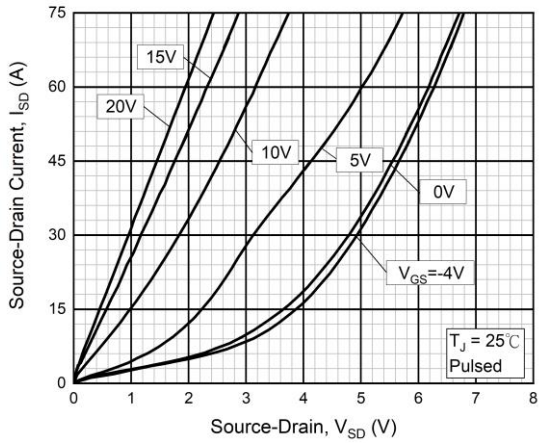
Typical threshold voltage by various junction temperature



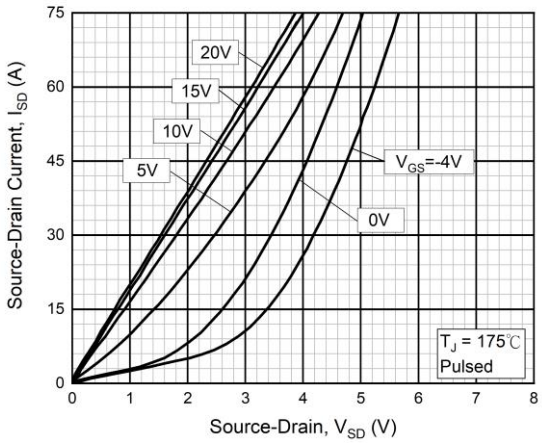
Normalized breakdown voltage by various junction temperature



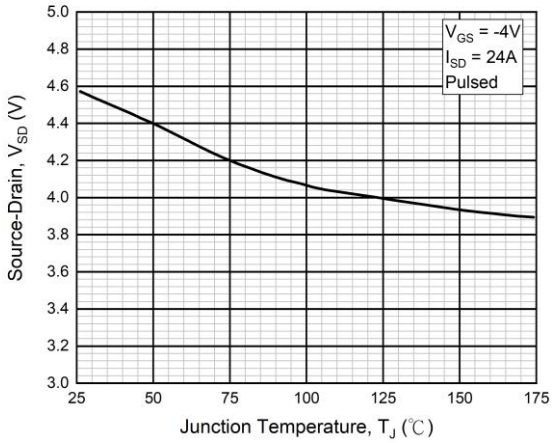
Typical body diode forward current by various forward voltage and gate voltage(I)



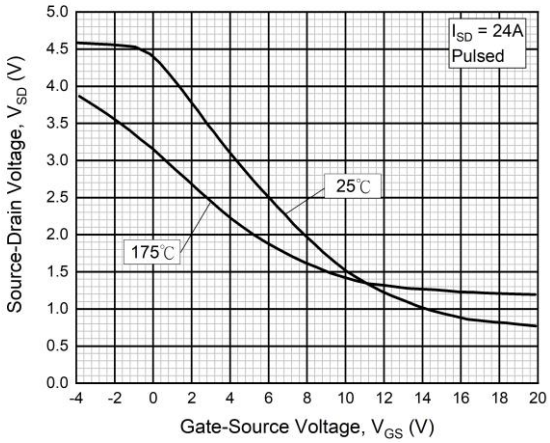
Typical body diode forward current by various forward voltage and gate voltage(II)



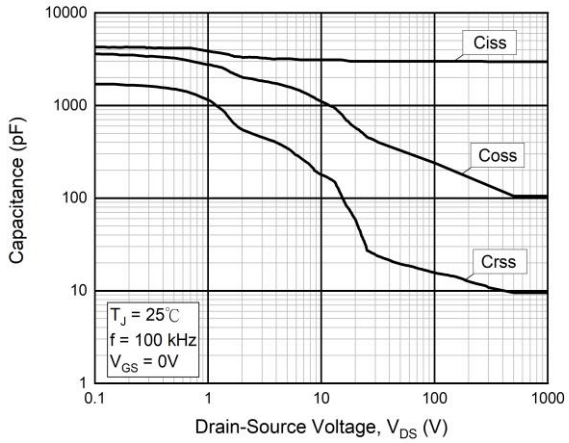
Typical body diode forward voltage by various junction temperature



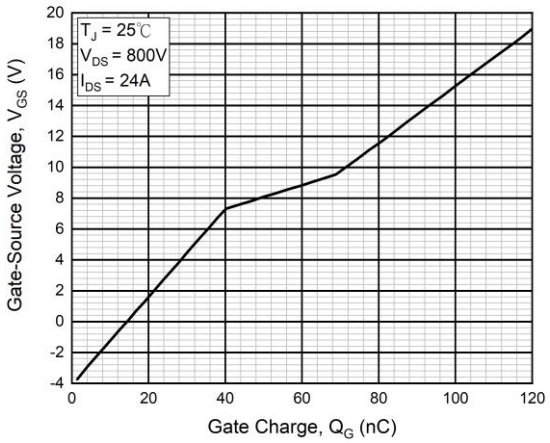
Typical body diode forward voltage by various gate voltage and junction temperature



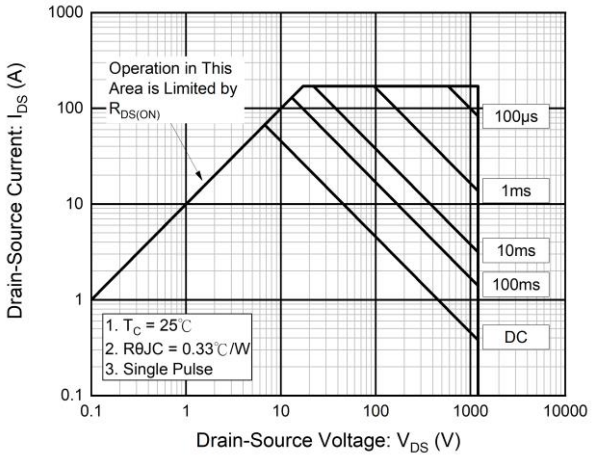
Typical capacitance by various drain voltage



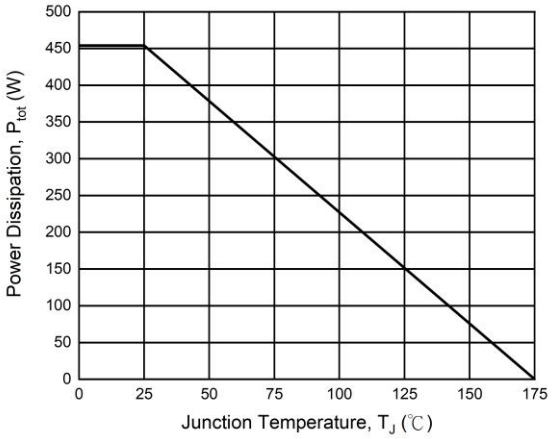
Typical gate charge characteristic



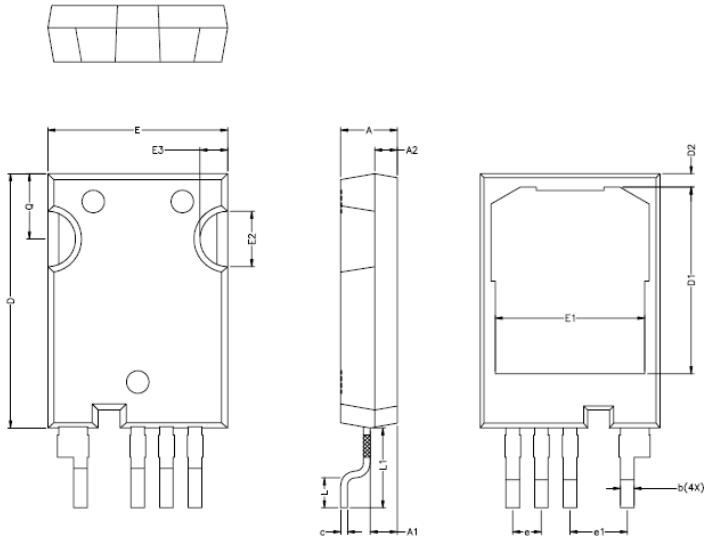
Maximum Safe Operating Area (SOA)



Power dissipation vs. Junction Temperature



Package Outlines



DIM	MILLIMETERS		
	MIN	TYP.	MAX
A	4.82	5.02	5.22
A1	2.21	2.41	2.61
A2	1.8	2	2.2
b	0.95	1.2	1.45
c	0.35	0.6	0.85
D	22.34	22.54	22.74
D1	16.3	16.55	16.8
D2	0.99	1.19	1.39
E	15.74	15.94	16.14
E1	13.01	13.26	13.51
E2	4.71	4.91	5.11
E3	2.26	2.46	2.66
e	2.54BSC.		
e1	5.08BSC.		
L	-	-	-
L1	-	-	-
Q	5.59	5.79	5.99

Unit : mm

Drawing and Dimensions

DISCLAIMER

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