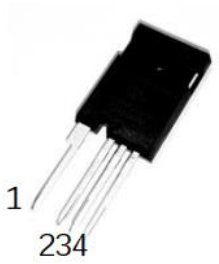
Silicon Carbide MOSFET

V_{DS}	1200V
I_D (T_C = 25°C)	87.5A
$R_{DS(on)}$	40mΩ

DESCRIPTION：
- Low gate charge
- Low Switching Losses
- Fast reverse recovery body diode
- Fast High frequency operation
- Tight variation of $R_{DS(on)}$ with temperature



TO-247-4L

TYPICAL APPLICATIONS：
- Energy Storage
- Uninterruptible power supplies (UPS)
- Motor drives
- Switch mode power supplies
- Solar inverters
- EV Storage

MAXIMUM RATINGS (at T_J = 25 °C, unless otherwise specified)

Characteristic	Condition	Symbol	Value	Unit
Drain-Source Voltage		V_{DSS}	1200	V
Gate-Source Voltage Recommend Drive Voltage	Max Transient Voltage,<1% duty cycle	V_{GSS} $V_{GS(OP)}$	-10/+22 -3/+18	V
Continuous Drain Current	V_{GS}=18V, Tc=25℃ V_{GS}=18V, Tc=110℃	I_D	87.5 64.2	A
Pulsed Drain Current	Pulse width tp limited by Tjmax, V_{GS} = 18V	$I_{D\ PULSE}$	140	A
Total power dissipation	Tc=25℃ Tc=110℃	P_{tot}	536 232	W
Operation Junction temperature		Tj	-55~+175	℃
Storage temperature		T_{STG}	-55~+150	℃
Soldering Temperature	1.6mm (0.063”) from case for 10s	T_L	260	℃
Mounting torque	M3 screw	M	1	Nm

THERMAL CHARACTERISTICS

Characteristic	Condition	Symbol	Typical	Unit
Thermal resistance, junction - case		$R_{th(j-C)}$	0.28	℃/W

ELECTRICAL CHARATERISTICS (at T_J = 25 °C, unless otherwise specified)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage VGS = 0V, ID = 100μA	$V_{(BR)DSS}$	1200			V
Zero Gate Voltage Drain Current VDS = 1200 V, VGS = 0 V Tj=25℃ VDS = 1200 V, VGS = 0 V Tj=175℃	I_{DSS}		0.08 11.09	100	uA
Gate-Source Leakage Current VGS = 22V, VDS = 0V VGS = -10V, VDS = 0V	I_{GSS}			100 100	nA
Gate-Source Threshold Voltage VDS = VGS, ID = 10mA Tj=25℃ VDS = VGS, ID = 10mA Tj=175℃	$V_{GE(th)}$	2	3.14 2.13	5	V
Drain-Source On-State Resistance VGS = 18V, ID = 35A Tj=25℃ VGS = 18V, ID = 35A Tj=175℃	$R_{DS(on)}$		39 58	60	mΩ
Transconductance ID = 30A Tj=25℃ ID = 30A Tj=175℃	G_{fs}		13.2 13.9		S
Internal Gate Resistance f=1MHz, VAC=25 mV	$R_{G(int)}$		1.35		Ω
Input capacitance f=1MHz, VAC=25 mV, VDS=800 V, VGS=0 V	C_{iss}		3726		pF
Output capacitance f =1MHz, VAC=25 mV, VDS=800 V, VGS=0 V	C_{oss}		214		pF
Reverse transfer capacitance f=1MHz, VAC=25 mV, VDS=800 V, VGS=0 V	C_{rss}		19		pF
C_{OSS} Stored Energy f=1MHz, VAC=25 mV, VDS=800 V, VGS=0 V	E_{oss}		140		uJ
Total Gate Charge VDD= 800V, ID= 30A,VGS= -3/18V, turn-on pulse	Q_G		227		nC

Gate to Source Charge VDD= 800V, ID= 30A,VGS= -3/18V, turn-on pulse	Q_{GS}		40		nC
Gate to Drain Charge VDD= 800V, ID= 30A,VGS= -3/18V, turn-on pulse	Q_{GD}		80		nC
Turn-on delay time VDD=800 V, ID=30A, VGS= -3/18V, RG($_{EXT}$)=4.7Ω L_σ = 100uH, Body diode at VGS = -3V (inductive load)	td $_{(ON)}$		26.5		ns
Rise time I VDD=800 V, ID=30A, VGS= -3/18V, RG($_{EXT}$)=4.7Ω L_σ = 100uH, Body diode at VGS = -3V (inductive load)	tr		42.2		ns
Turn-off delay time VDD=800 V, ID=30A, VGS= -3/18V, RG($_{EXT}$)=4.7Ω L_σ = 100uH, Body diode at VGS = -3V (inductive load)	td $_{(OFF)}$		43.7		ns
Fall time VDD=800 V, ID=30A, VGS= -3/18V, RG($_{EXT}$)=4.7Ω L_σ = 100uH, Body diode at VGS = -3V (inductive load)	tf		13.7		ns
Turn-on Switching Energy VDD=800 V, ID=30A, VGS= -3/18V, RG($_{EXT}$)=4.7Ω L_σ = 100uH, Body diode at VGS = -3V (inductive load)	$E_{(ON)}$		644.7		uJ
Turn-off Switching Energy VDD=800 V, ID=30A, VGS= -3/18V, RG($_{EXT}$)=4.7Ω L_σ = 100uH, Body diode at VGS = -3V (inductive load)	$E_{(OFF)}$		191.2		uJ
Total Switching Energy VDD=800 V, ID=30A, VGS= -3/18V, RG($_{EXT}$)=4.7Ω L_σ = 100uH, Body diode at VGS = -3V (inductive load)	$E_{(TOT)}$		835.8		uJ

Body Diode

ELECTRICAL CHARATERISTICS (at TJ = 25 °C, unless otherwise specified)

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Diode Forward Voltage VGS = 0V, ISD = 20A Tj=25℃ VGS = 0V, ISD = 20A Tj=175℃	V_{SD}		3.57 3.27		V

Continuous Diode Forward Current VGS = -3V, Tj=25℃ VGS = -3V, Tj=100℃	I_{SD}			80 46	A
Revers Recovery Time VDD=800 V, ID=30A, VGS= -3V, di/dt = 1000A/us Tj=25℃	Trr		24.2		ns
Revers Recovery Charge VDD=800 V, ID=30A, VGS= -3V, di/dt = 1000A/us Tj=25℃	Qrr		144		nC
Peak Revers Recovery Current VDD=800 V, ID=30A, VGS= -3V, di/dt = 1000A/us Tj=25℃	I_{rrm}		9.26		A

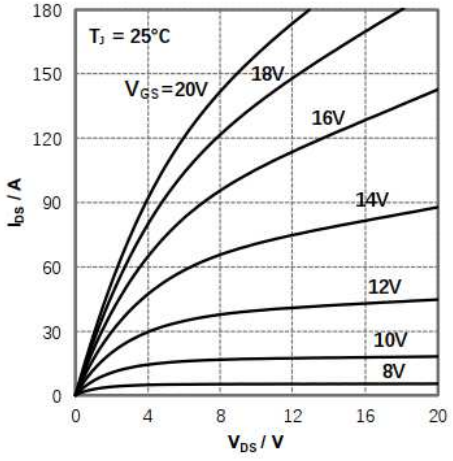


Figure 1. Typical output characteristics (Tj=25℃)

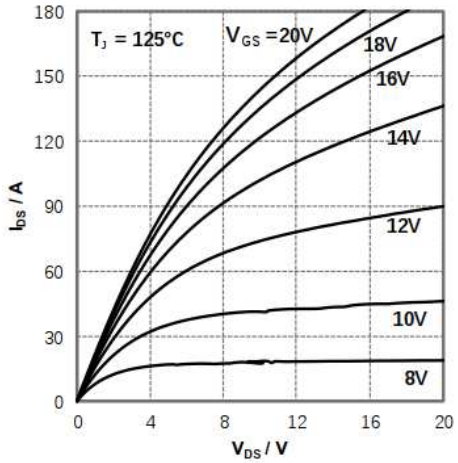


Figure 2. Typical output characteristics (Tj=125℃)

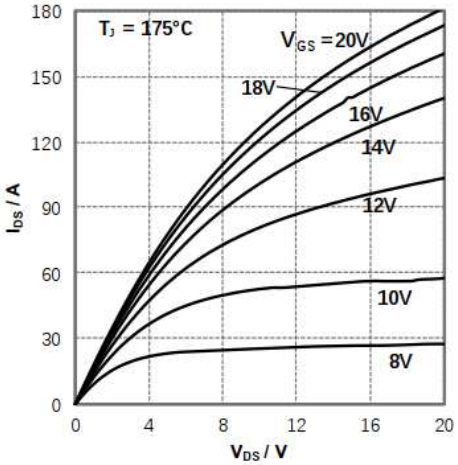


Figure 3. Typical output characteristics (Tj=175℃)

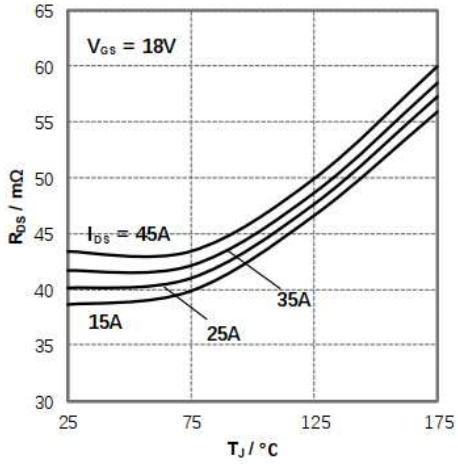


Figure 4. Typical On-Resistance vs. Temperature For Various Drain Current)

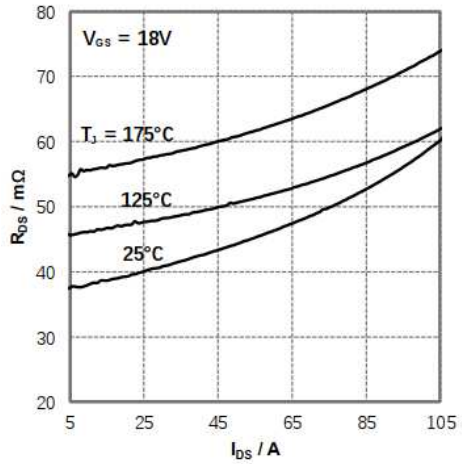


Figure 5. On-Resistance vs. Drain Current For Various Temperature

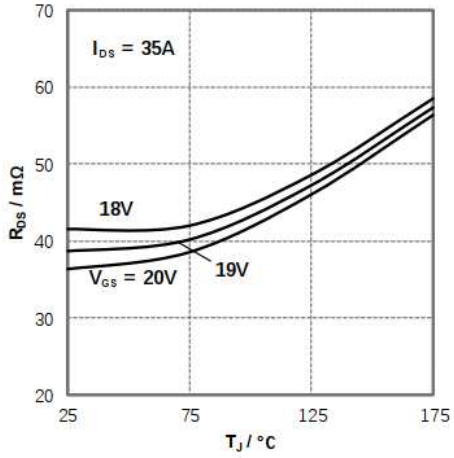


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

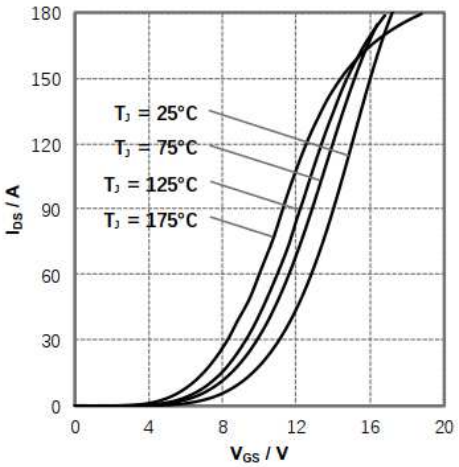


Figure 7. Transfer Characteristics

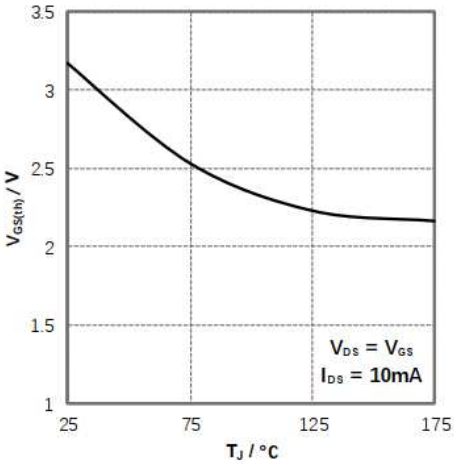


Figure 8. Threshold Voltage vs. Temperature

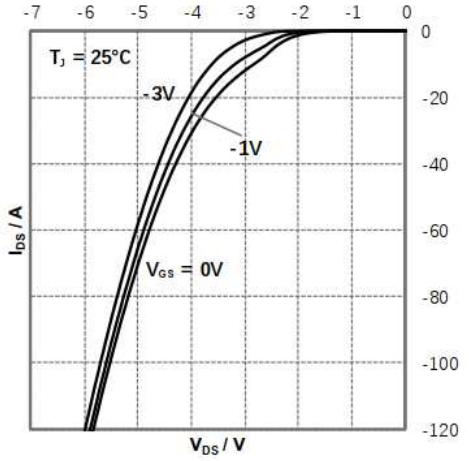


Figure 9. Body Diode Characteristics TJ=25℃

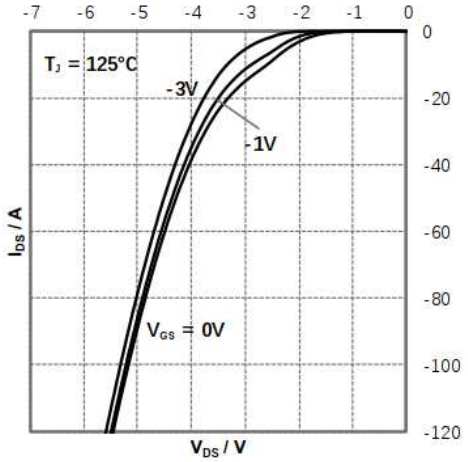


Figure 10. Body Diode Characteristics TJ=·125℃

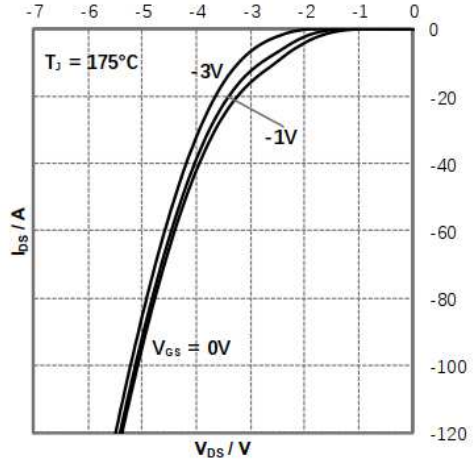


Figure 11. Body Diode Characteristics TJ=·175℃

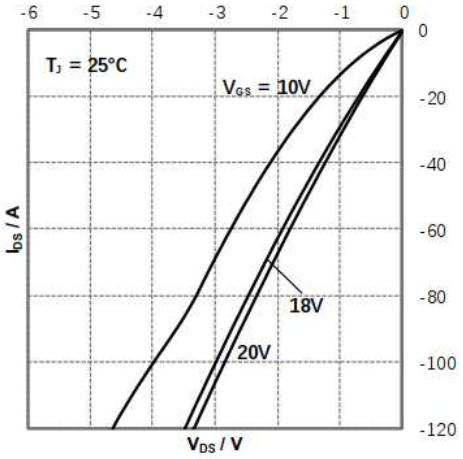


Figure 12. 3rd Quadrant Characteristics TJ=·25℃

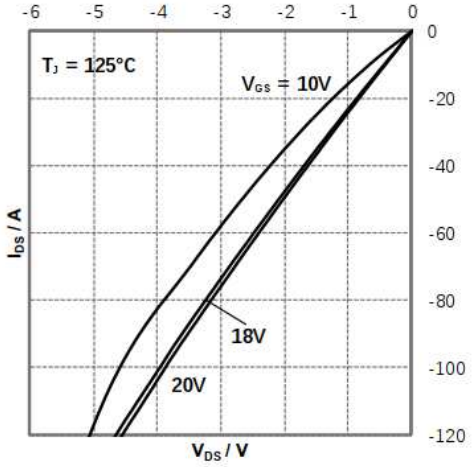


Figure 13. 3rd Quadrant Characteristics TJ=·125℃

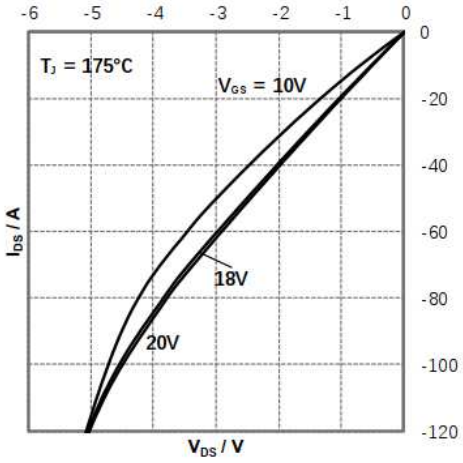


Figure 14. 3rd Quadrant Characteristics TJ=·175℃

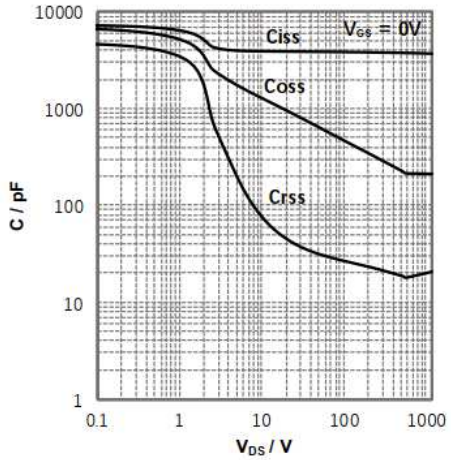


Figure 15. Capacitances vs. Drain-Source Voltage

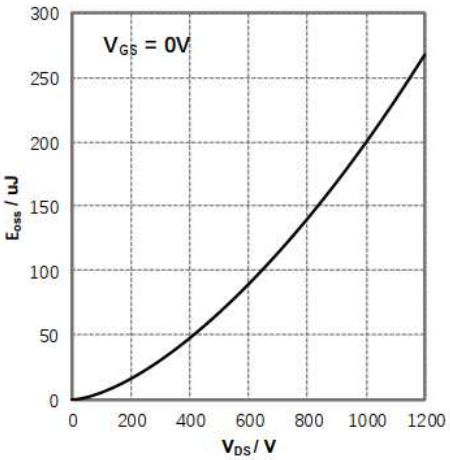


Figure 16. Output Capacitor Stored Energy

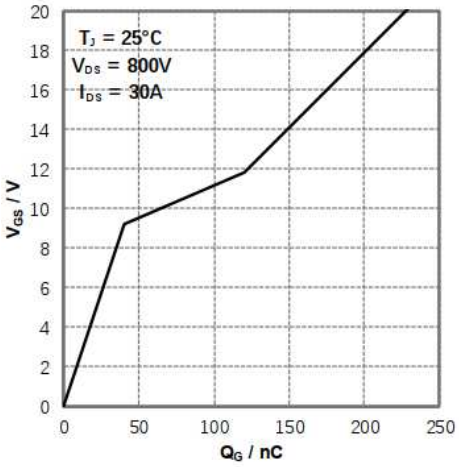


Figure 17. Gate Charge Characteristics

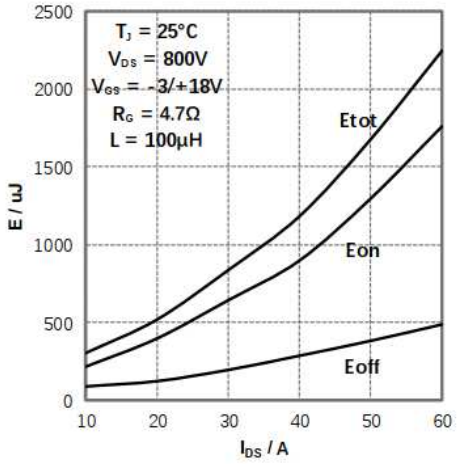


Figure 18. Switching Energy vs. Drain Current

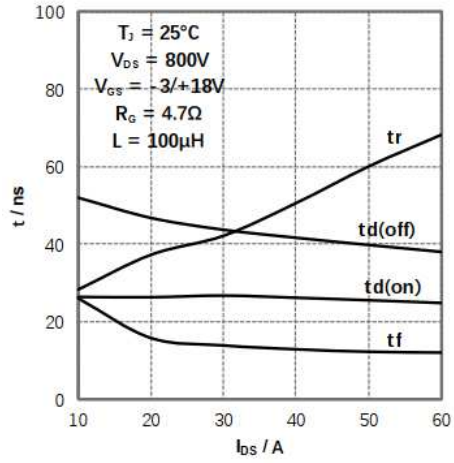


Figure 19. Switching Time vs. Drain Current

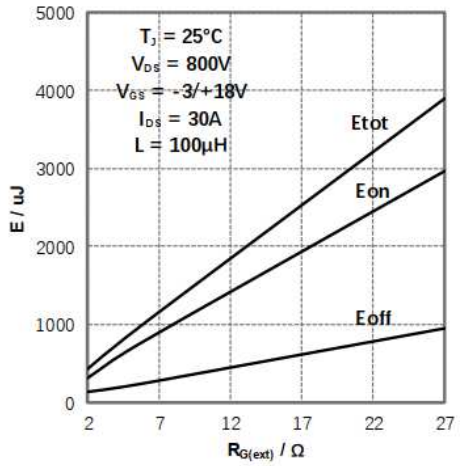


Figure 20. Switching Energy vs. RG(ext)

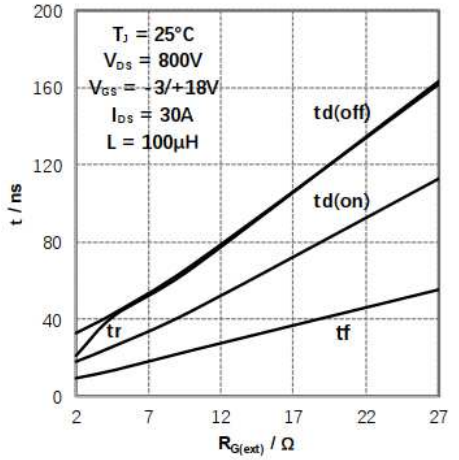


Figure 21. Switching Time vs. RG(ext)

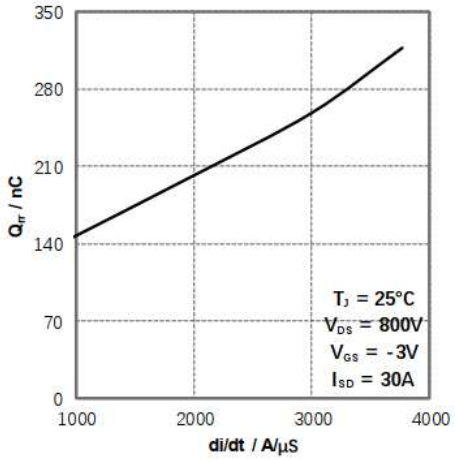


Figure 22. Reverse Recovery Charge vs. di/dt

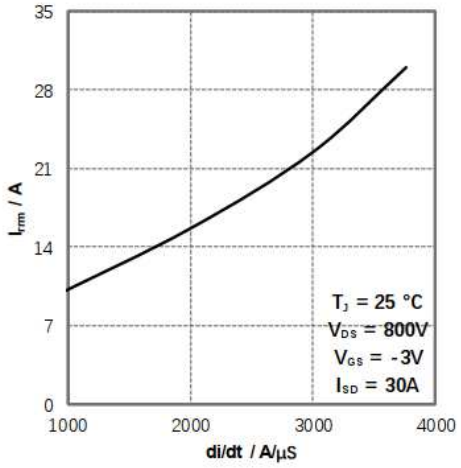


Figure 23. Reverse Recovery Current vs. di/dt

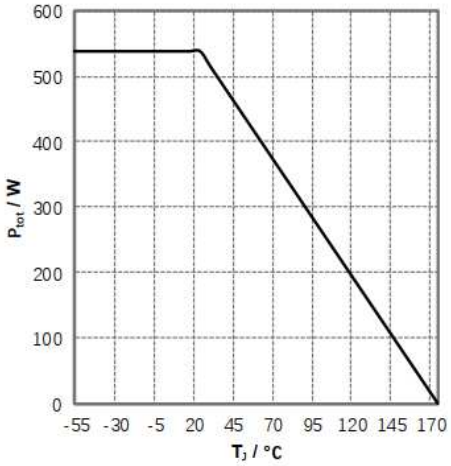


Figure 24. Power Dissipation Derating

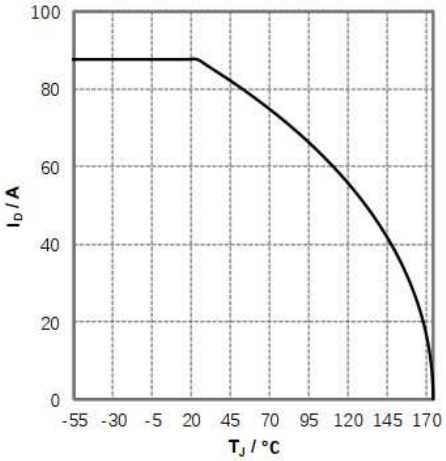


Figure 25. Continuous Drian Current Derating

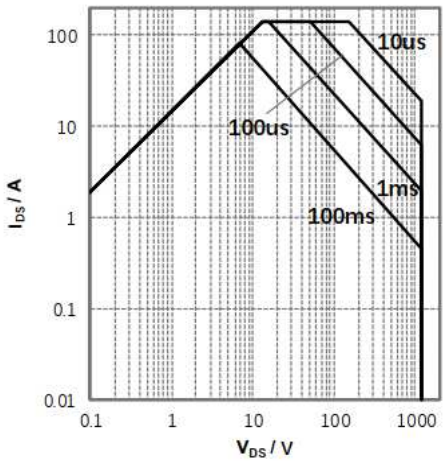


Figure 26. Safe Operating Area

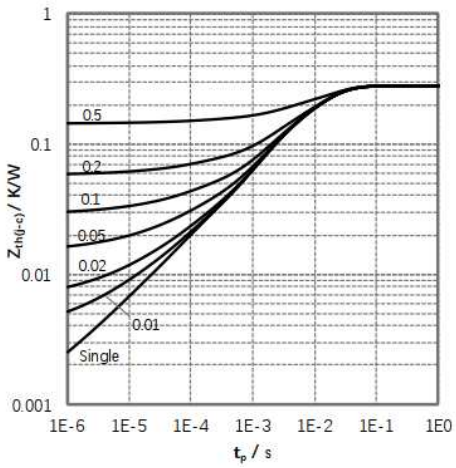
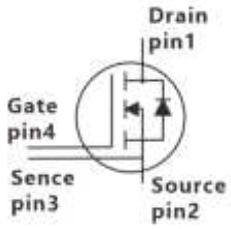
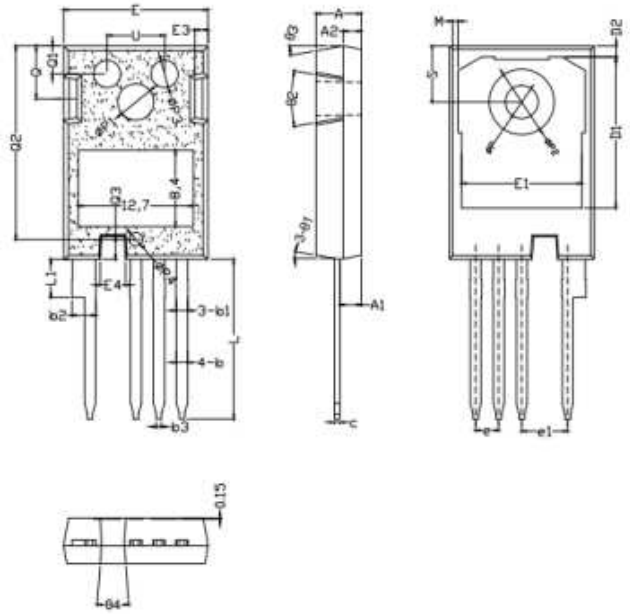


Figure 27. Transient Thermal Impedance (Junction-Case)

• Circuit diagram



• TO-247-4L Package outlines : Dimensions in (mm)



SYMBOL	mm		
	MIN	NOM	MAX
※A	4.83	5.02	5.21
※A1	2.29	2.42	2.54
A2	1.91	2.00	2.16
※b	1.07	1.20	1.33
※b1	1.07	1.23	1.40
※b2	2.39	2.67	2.94
b3	0.45	0.60	0.75
※c	0.55	0.60	0.68
※D	23.30	23.45	23.60
D1	16.35	16.65	16.95
D2	0.95	1.19	1.25
※E	15.75	15.94	16.13
E1	13.00	13.25	13.45
E2	4.20	4.60	5.00
E3	1.00	1.45	1.90
E4	2.40	2.80	3.20
※e	2.50	2.54	2.58
※e1	5.03	5.08	5.13
※L	17.27	17.57	17.82
※L1	-	-	4.37
M	0.40	0.60	0.80
※ΦP	3.51	3.61	3.71
ΦP1	3.80	4.00	4.20
ΦP2	7.03	7.18	7.33
ΦP3	2.80	3.00	3.20
ΦP4	1.30	1.50	1.70
Q	5.49	5.79	6.00
Q1	2.80	3.10	3.40
Q2	19.95	21.25	21.55
Q3	2.35	2.50	2.65
S	6.04	6.17	6.30
U	6.05	6.35	6.55
θ1	6°	10°	13°
θ2	16°	20°	24°
θ3	6°	10°	13°
θ4	5°	8°	11°

Notice

MOSPEC reserves the rights to make changes of the content herein the document anytime without notification. MOSPEC or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies. Please refer to MOSPEC website for the last document.

MOSPEC disclaims any and all liability arising out of the application or use of any product including damages incidentally and consequentially incurred.

Application shown on the herein document are examples of standard use and operation. Customers are responsible for comprehending suitable use in particular applications. MOSPEC makes no representation or warranty that such application will be suitable for the specified use without further testing or modification.

The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by MOSPEC for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of MOSPEC or others.

These MOSPEC products are intended for usage in general electronic equipment. Please make sure to consult with MOSPEC before you use these MOSPEC products in equipment which require specialized quality and/or reliability, and in equipment which could have major impact to the welfare of human life (atomic energy control, aeronautics , traffic control, combustion control, safety devices etc.)