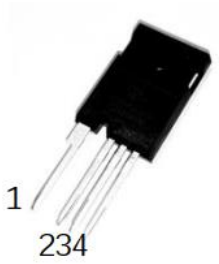
MOSPEC

MIG016N120K

Silicon Carbide MOSFET

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

V_{DS}	1200V
I_D (T_C=25℃)	150.6A
$R_{DS(ON)}$	16mΩ



TO-247-4L

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

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} $V_{GS(OP)}$	-8/+22 -5/+18	V
Continuous Drain Current	V_{GS}=18V, Tc=25℃ V_{GS}=18V, Tc=110℃	I_D	150.6 107.8	A
Pulsed Drain Current	Pulse width tp limited by Tjmax, V_{GS} = 18V	$I_{D\ PULSE}$	250	A
Total power dissipation	Tc=25℃ Tc=110℃	P_{tot}	784 332	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		$R_{th(j-C)}$	0.19	℃/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}		0.1 4.3	100	uA
Gate-Source Leakage Current VGS = 22V, VDS = 0V VGS = -8V, VDS = 0V	I_{GSS}			100 100	nA
Gate-Source Threshold Voltage VDS = VGS, ID = 35mA Tj=25℃ VDS = VGS, ID = 35mA Tj=175℃	$V_{GS(th)}$	2	2.57 1.68	4.5	V
Drain-Source On-State Resistance VGS = 18V, ID = 45A Tj=25℃ VGS = 18V, ID = 45A Tj=175℃	$R_{DS(on)}$		15.5 23.8	20	mΩ
Transconductance ID = 45A Tj=25℃ ID = 45A Tj=175℃	G_{fs}		29.8 24.9		S
Internal Gate Resistance f=1MHz, VAC=25 mV	$R_{G(int)}$		1.23		Ω
Input capacitance f=1MHz, VAC=25 mV, VDS=800 V, VGS=0 V	C_{iss}		6706		pF
Output capacitance f =1MHz, VAC=25 mV, VDS=800 V, VGS=0 V	C_{oss}		339.2		pF
Reverse transfer capacitance f=1MHz, VAC=25 mV, VDS=800 V, VGS=0 V	C_{rss}		14.7		pF
C_{OSS} Stored Energy f=1MHz, VAC=25 mV, VDS=800 V, VGS=0 V	E_{oss}		265.5		uJ
Total Gate Charge VDD= 800V, ID= 60A,VGS= -5/18V, turn-on pulse	Q_G		336		nC

Gate to Source Charge VDD= 800V, ID= 60A,VGS= -5/18V, turn-on pulse	Q_{GS}		53		nC
Gate to Drain Charge VDD= 800V, ID= 60A,VGS= -5/18V, turn-on pulse	Q_{GD}		100		nC
Turn-on delay time VDD=800 V, ID=60A, VGS= -5/18V, RG($_{EXT}$)=4.7Ω L_σ = 100uH, Body diode at VGS = -5V (inductive load)	$td_{(ON)}$		32.6		ns
Rise time VDD=800 V, ID=60A, VGS= -5/18V, RG($_{EXT}$)=4.7Ω L_σ = 100uH, Body diode at VGS = -5V (inductive load)	tr		65.4		ns
Turn-off delay time VDD=800 V, ID=60A, VGS= -5/18V, RG($_{EXT}$)=4.7Ω L_σ = 100uH, Body diode at VGS = -5V (inductive load)	$td_{(OFF)}$		96.2		ns
Fall time VDD=800 V, ID=60A, VGS= -5/18V, RG($_{EXT}$)=4.7Ω L_σ = 100uH, Body diode at VGS = -5V (inductive load)	tf		22.1		ns
Turn-on Switching Energy VDD=800 V, ID=60A, VGS= -5/18V, RG($_{EXT}$)=4.7Ω L_σ = 100uH, Body diode at VGS = -5V (inductive load)	$E_{(ON)}$		1497.2		uJ
Turn-off Switching Energy VDD=800 V, ID=60A, VGS= -5/18V, RG($_{EXT}$)=4.7Ω L_σ = 100uH, Body diode at VGS = -5V (inductive load)	$E_{(OFF)}$		935.3		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)	$E_{(TOT)}$		2432.5		uJ

Body Diode

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

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Diode Forward Voltage VGS = 0V, ISD = 30A Tj=25℃ VGS = 0V, ISD = 30A Tj=175℃	V_{SD}		2.95 2.69		V

Continuous Diode Forward Current VGS = -5V, Tj=25℃ VGS = -5V, Tj=100℃	I_{SD}			110 63.6	A
Revers Recovery Time VDD=800 V, ID=60A, VGS= -5V, di/dt = 1000A/us Tj=25℃	Trr		32.4		ns
Revers Recovery Charge VDD=800 V, ID=60A, VGS= -5V, di/dt = 1000A/us Tj=25℃	Qrr		373.3		nC
Peak Revers Recovery Current VDD=800 V, ID=60A, VGS= -5V, di/dt = 1000A/us Tj=25℃	I_{rrm}		19.9		A

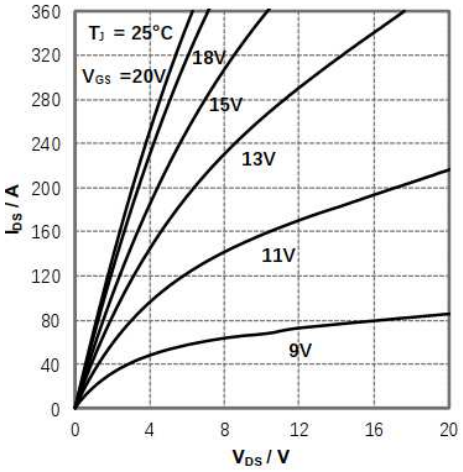


Figure 1. Typical output characteristics (Tj=25℃)

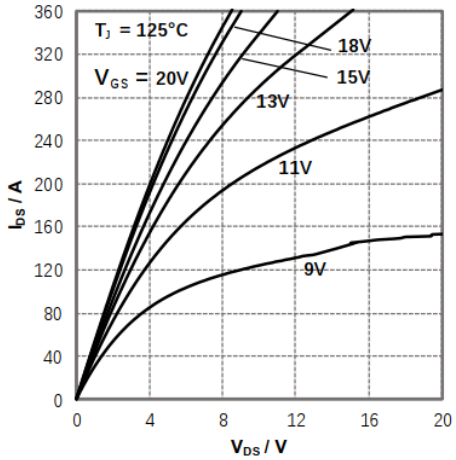


Figure 2. Typical output characteristics (Tj=125℃)

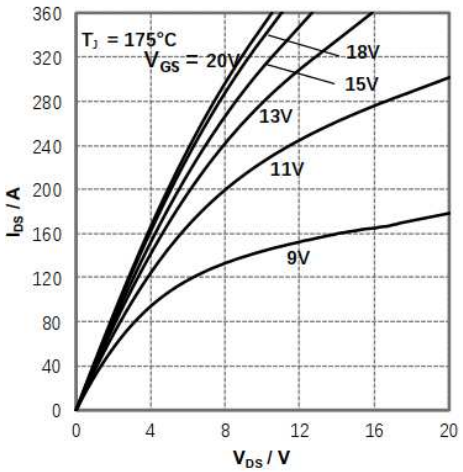


Figure 3. Typical output characteristics (Tj=175℃)

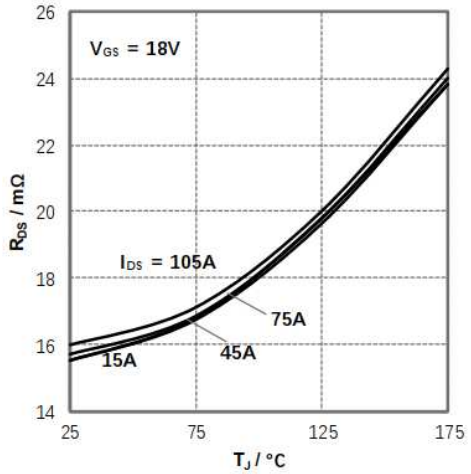


Figure 4. Typical On-Resistance vs. Temperature For Various Drain Current)

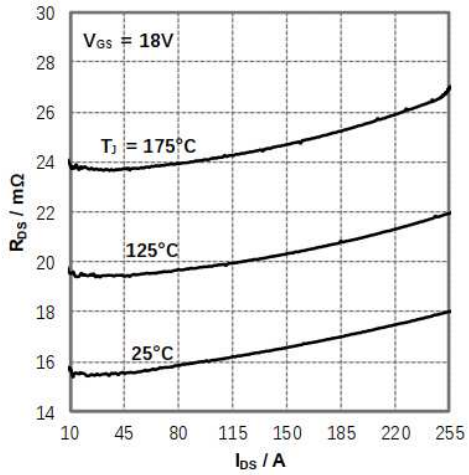


Figure 5. On-Resistance vs. Drain Current
For Various Temperature

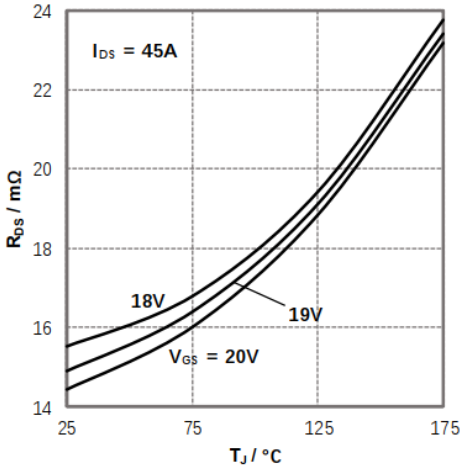


Figure 6. On-Resistance vs. Temperature
For Various Gate Voltage

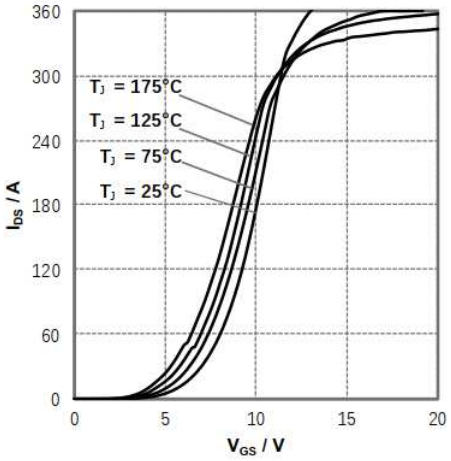


Figure 7. Transfer Characteristics

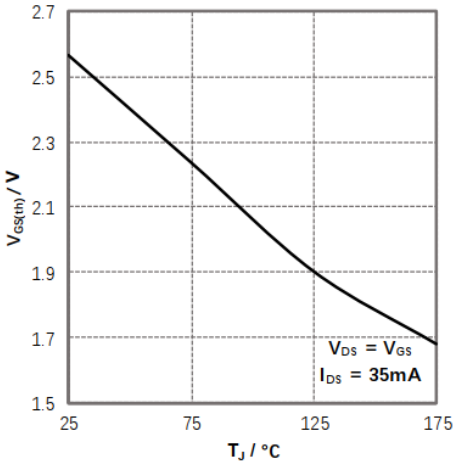


Figure 8. Threshold Voltage vs. Temperature

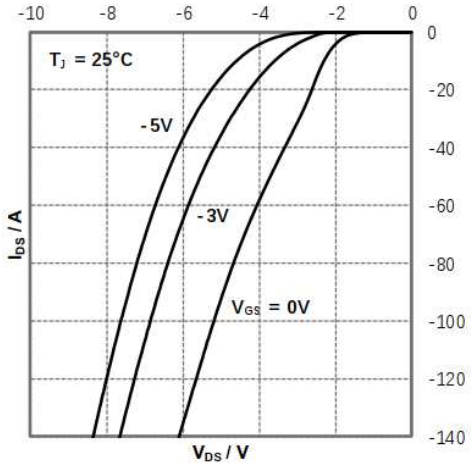


Figure 9. Body Diode Characteristics TJ=25℃

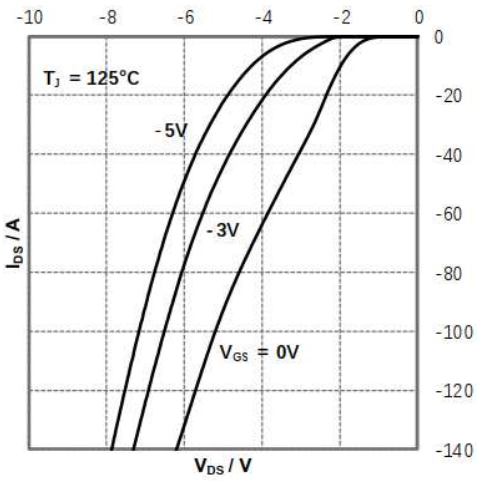


Figure 10. Body Diode Characteristics TJ=·125℃

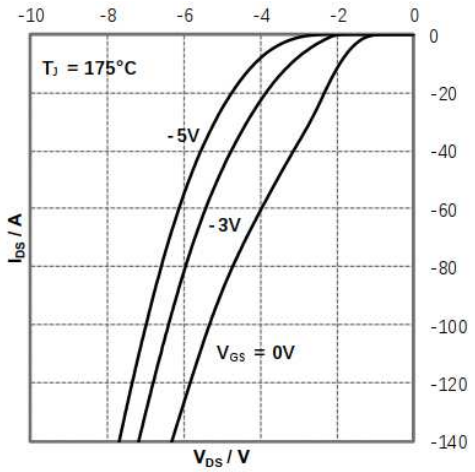


Figure 11. Body Diode Characteristics TJ=·175℃

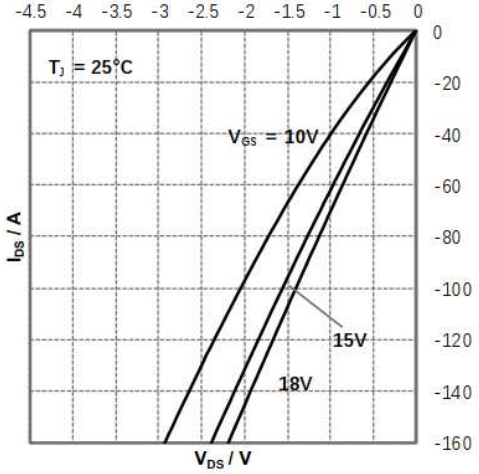


Figure 12. 3rd Quadrant Characteristics TJ=·25℃

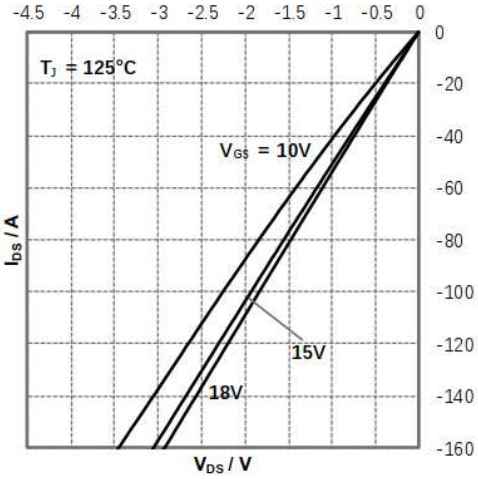


Figure 13. 3rd Quadrant Characteristics TJ=·125℃

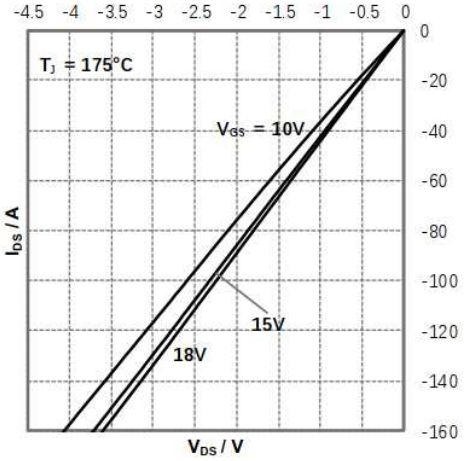


Figure 14. 3rd Quadrant Characteristics TJ=·175℃

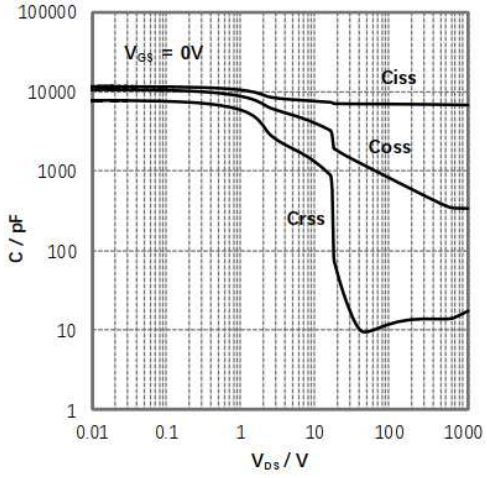


Figure 15. Capacitances vs. Drain-Source Voltage

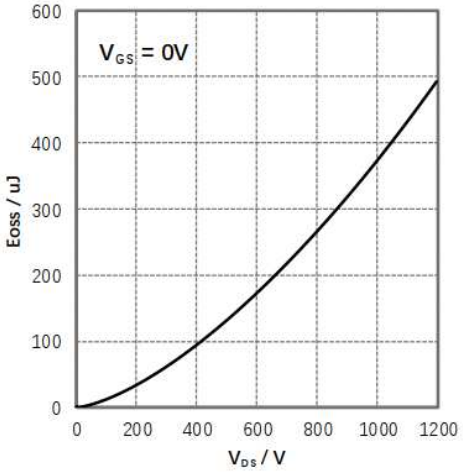


Figure 16. Output Capacitor Stored Energy

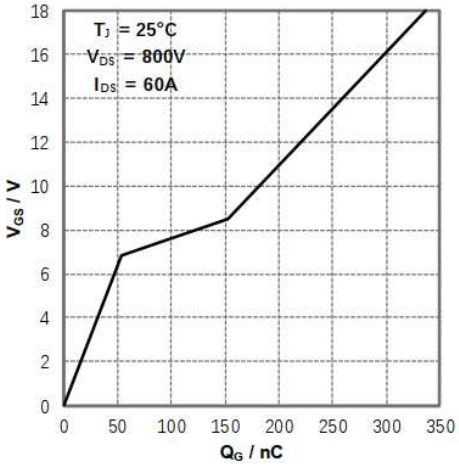


Figure 17. Gate Charge Characteristics

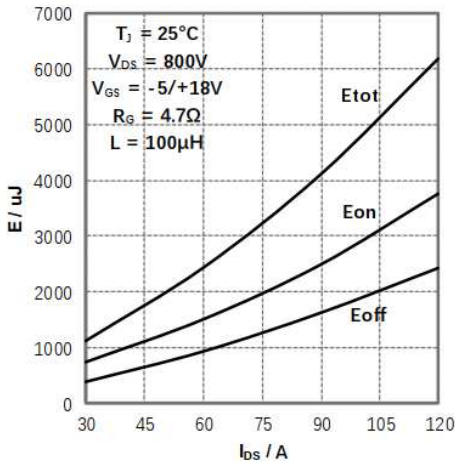


Figure 18. Switching Energy vs. Drain Current

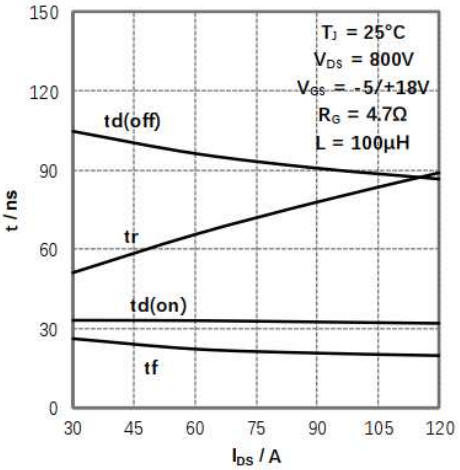


Figure 19. Switching Time vs. Drain Current

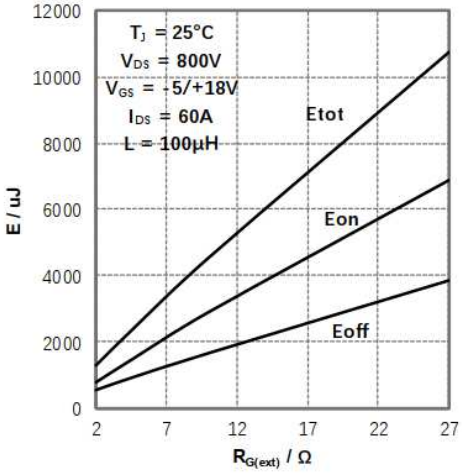


Figure 20. Switching Energy vs. RG(ext)

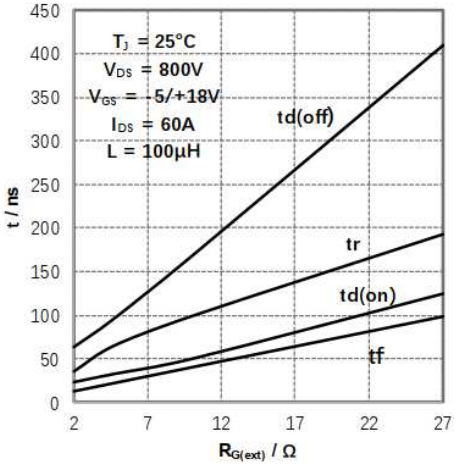


Figure 21. Switching Time vs. RG(ext)

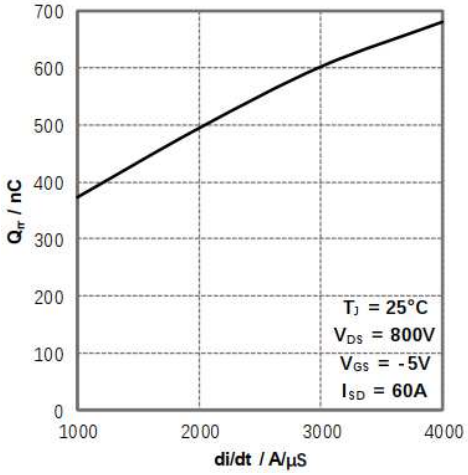


Figure 22. Reverse Recovery Charge vs. di/dt

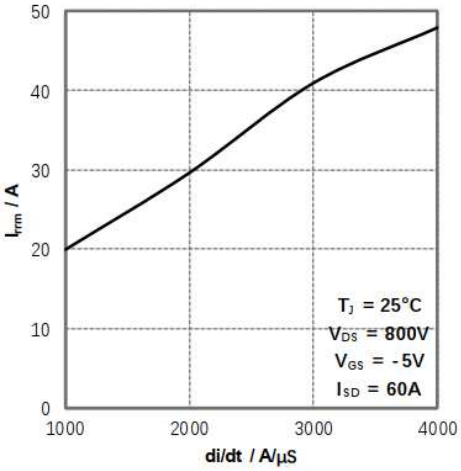


Figure 23. Reverse Recovery Current vs. di/dt

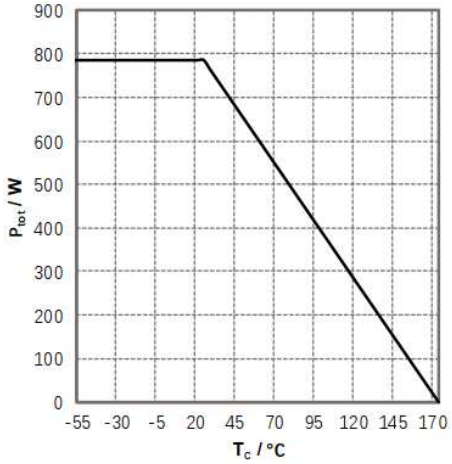


Figure 24. Power Dissipation Derating

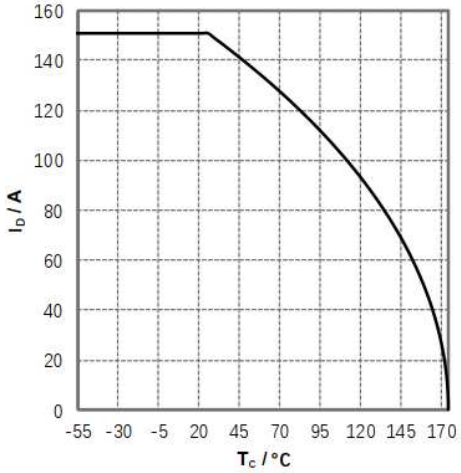


Figure 25. Continuous Drian Current Derating

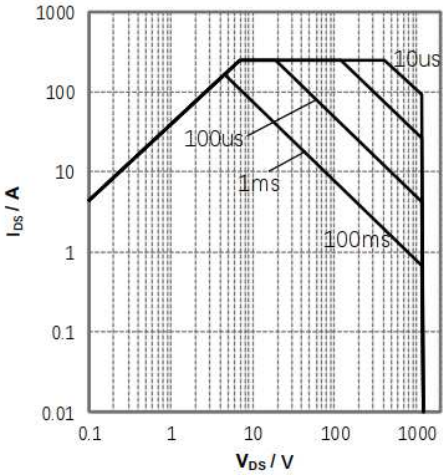


Figure 26. Safe Operating Area

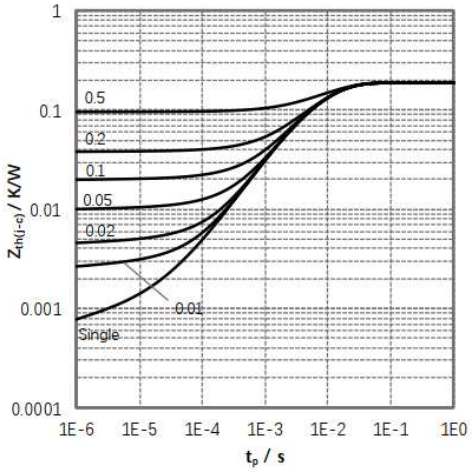


Figure 27. Transient Thermal Impedance (Junction-Case)

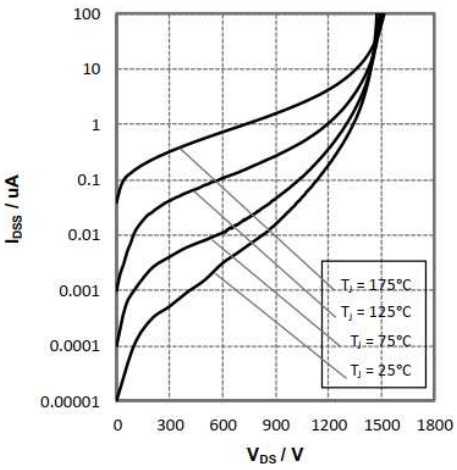
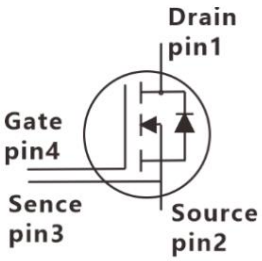
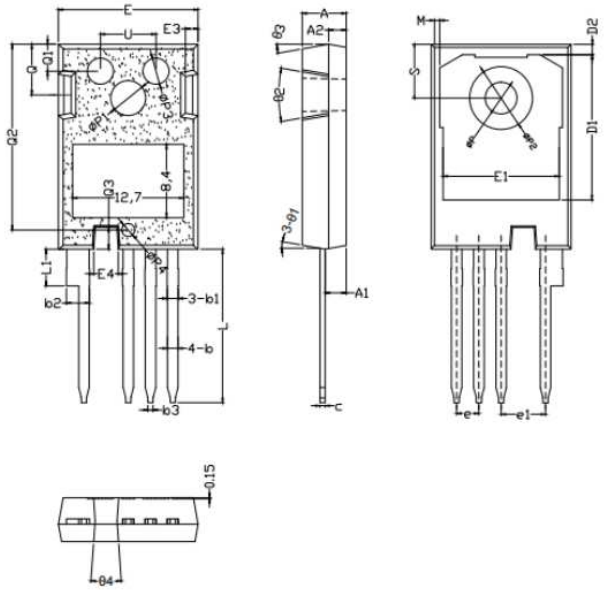


Figure 28. Zero Gate Voltage Drain Current vs Drain-Source Voltage For Various Temperature

• 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°

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