MOSPEC

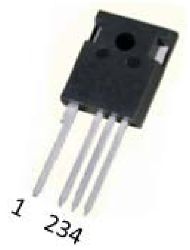
MIS025N75K

750V Silicon Carbide Power MOSFET

DESCRIPTION：
- High Speed Switching
- Very low switching losses
- High blocking voltage with low on-resistance
- Fast intrinsic diode with low reverse recovery (Qrr)
- Temperature independent turn-off switching losses
- Fully controllable dv/dt
- RoHS compliant

V_{DSS}	750V
I_D	92A(T_C=25℃)
$R_{DS(ON)\_MAX}$ @V_{GS}=18V	33mΩ

TYPICAL APPLICATIONS：
- On-board charger/PFC
- EV battery chargers
- Booster/DC-DC converter
- Switch mode power supplies



TO-247-4L

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

Characteristic	Condition	Symbol	Value	Unit
Drain-Source Voltage	V_{GS} = 0V, I_D = 100μA	V_{DS}	750	V
Continuous Drain Current	V_{GS}=18V, Tc=25℃ V_{GS}=18V, Tc=100℃	I_D	92 65	A
Pulse Drain Current	Pulse width tp limited by Tjmax	$I_{D(PULSE)}$	184	A
Gate-Source Voltage		V_{GSmax}	-8/+22	V
Recommend Gate-Source Voltage		V_{GSop}	-4/+18	V
Power Dissipation	Tc=25℃, T_J=175℃	P_D	341	W
Operation Junction temperature		Tj	-55~+175	℃
Storage temperature		T_{STG}	-55~+175	℃

THERMAL CHARACTERISTICS

Characteristic	Condition	Symbol	Typical	Unit
Thermal resistance, junction - case		$R_{th(j-C)}$	0.35	℃/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	$V_{(BR)DSS}$	750			V
Zero Gate Voltage Drain Current VDS = 750 V, VGS = 0 V	I_{DSS}		1	10	uA
Gate-Source Leakage Current VGS = 18V, VDS = 0V	I_{GSS}			100	nA
Gate-Source Threshold Voltage VDS = VGS, ID = 14mA Tj=25℃ VDS = VGS, ID = 14mA Tj=175℃	$V_{GS(th)}$	2.3	2.8 2.2	3.6	V
Drain-Source On-State Resistance VGS = 18V, ID = 34A Tj=25℃ VGS = 18V, ID = 34A Tj=175℃	$R_{DS(on)}$		25 40	33	mΩ
Transconductance VDS = 20V, ID = 34A Tj=25℃ VDS = 20V, ID = 34A Tj=175℃	Gfs		25 23		S
Internal Gate Resistance f=1MHz	$R_{G(INT)}$		1.8		Ω
Input capacitance f=100KHz, VDS=500 V, VGS=0 V, VAC = 25mV	C_{iss}		2562		pF
Output capacitance f=100KHz, VDS=500 V, VGS=0 V, VAC = 25mV	C_{oss}		192		pF
Reverse transfer capacitance f=100KHz, VDS=500 V, VGS=0 V, VAC = 25mV	C_{rss}		8.5		pF
Total Gate Charge VDS= 500V, ID= 34A,VGS= -4/18V	Q_G		80		nC
Gate to Source Charge VDS= 500V, ID= 34A,VGS= -4/18V	Q_{GS}		24		nC
Gate to Drain Charge VDS= 500V, ID= 34A,VGS= -4/18V	Q_{GD}		22		nC
Turn-on Delay Time VDS=500 V, ID=34A, VGS= -4/18V, RG=2.5Ω L= 16.7uH	$t_{d\ (ON)}$		14.6		ns
Rise Time VDS=500 V, ID=34A, VGS= -4/18V, RG=2.5Ω L= 16.7uH	tr		15.8		ns

Turn-off Delay Time VDS=500 V, ID=34A, VGS= -4/18V, RG=2.5Ω L= 16.7uH	$td_{(OFF)}$		32		ns
Fall Time VDS=500 V, ID=34A, VGS= -4/18V, RG=2.5Ω L= 16.7uH	tf		9.5		ns
Turn-on Switching Energy VDS=500 V, ID=34A, VGS= -4/18V, RG=2.5Ω L= 16.7uH	$E_{(ON)}$		146		uJ
Turn-off Switching Energy VDS=500 V, ID=34A, VGS= -4/18V, RG=2.5Ω L= 16.7uH	$E_{(OFF)}$		49		uJ

Body Diode

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

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Diode Forward Voltage VGS = -4V, ISD = 17A Tj=25℃ VGS = -4V, ISD = 17A Tj=175℃	V_{SD}		3.6 3.2		V
Continuous Diode Forward Current VGS = -4V, Tc=25℃	I_S		80		A
Revers Recovery Time VR=500 V, ISD=34A, VGS= -4V, di/dt = 1979A/us□Tj=175℃	Trr		28		ns
Revers Recovery Charge VR=500 V, ISD=34A, VGS= -4V, di/dt = 1979A/us□Tj=175℃	Qrr		348		nC
Peak Revers Recovery Current VR=500 V, ISD=34A, VGS= -4V, di/dt = 1979A/us□Tj=175℃	I_{rrm}		21		A

Typical Characteristics

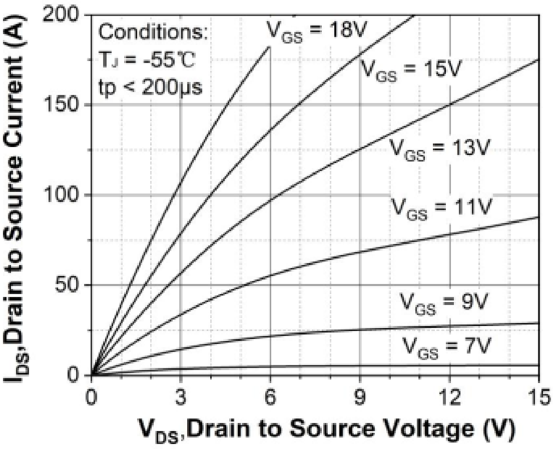


Figure 1. Output characteristics TJ = -55 ºC

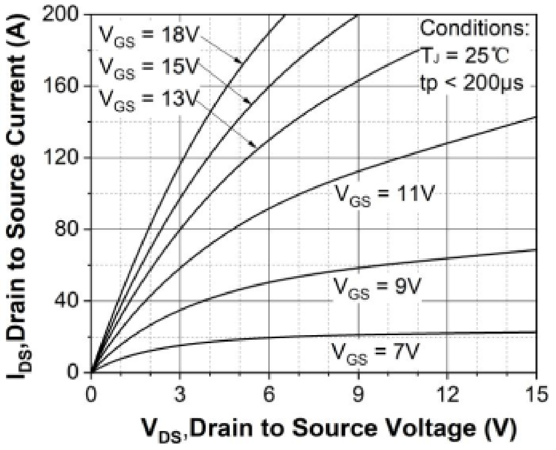


Figure 2. Output characteristics TJ = 25 ºC

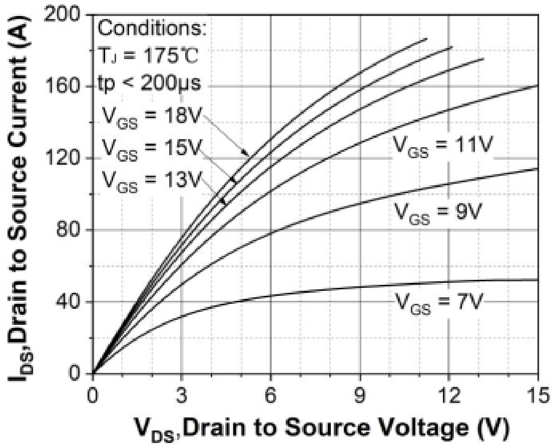


Figure 3. Output characteristics TJ = 175 ºC

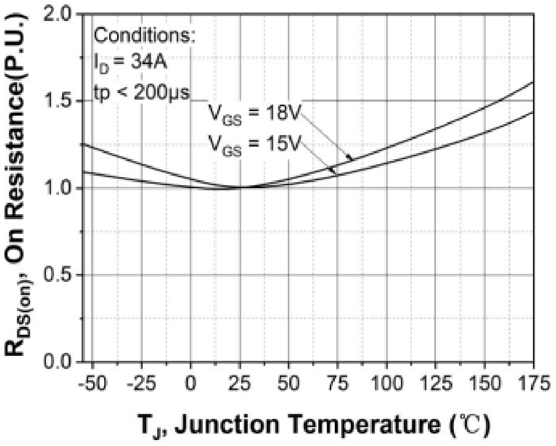


Figure 4. Normalized on-resistance vs. temperature

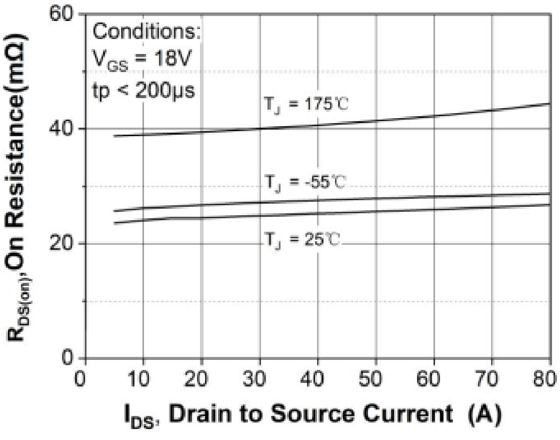


Figure 5. On-resistance vs. drain current

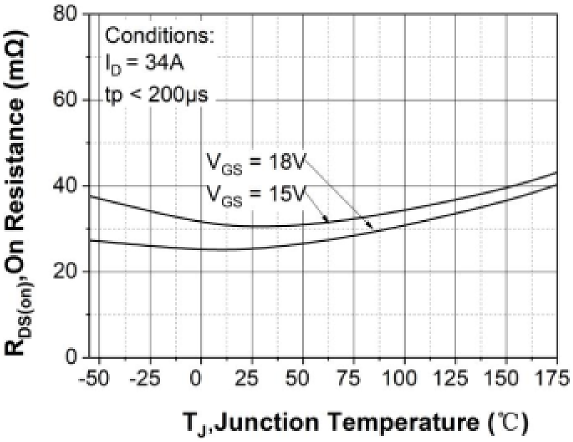


Figure 6. On-resistance vs. temperature

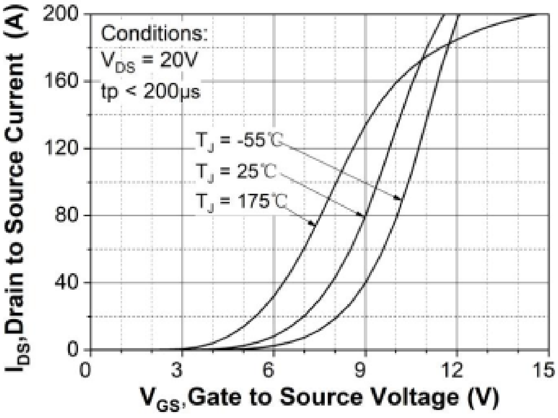


Figure 7. Transfer characteristic

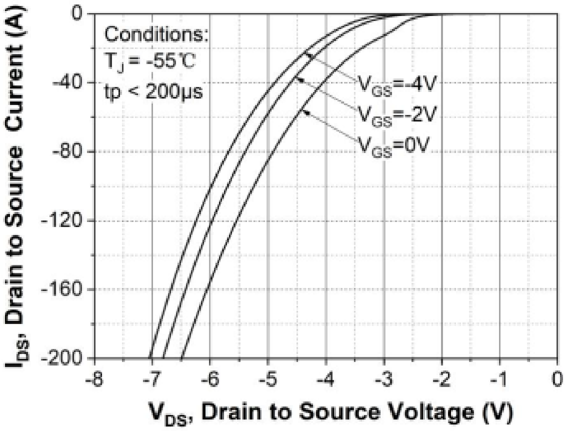


Figure 8. Body diode characteristic at TJ = -55 ºC

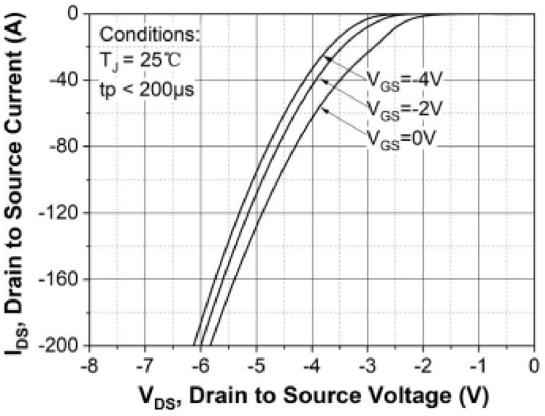


Figure 9. Body diode characteristic at TJ = 25 ºC

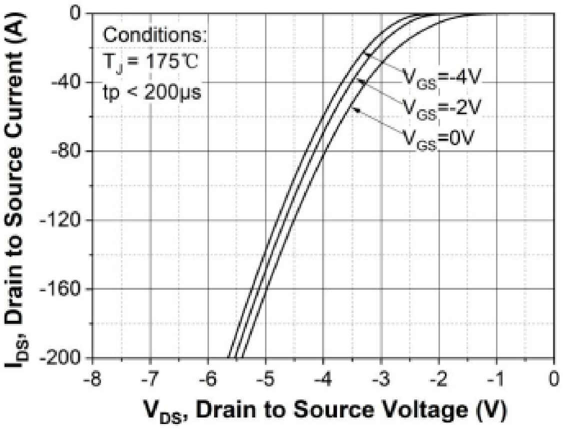


Figure 10. Body diode characteristic at TJ = 175ºC

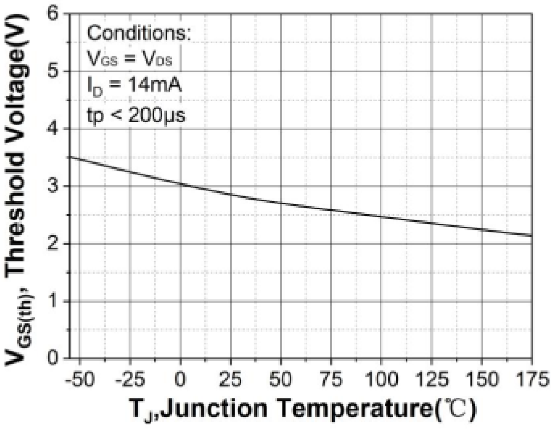


Figure 11. Threshold voltage vs. temperature

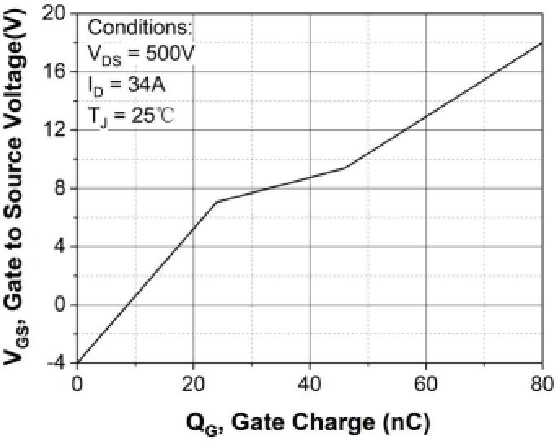


Figure 12. Gate charge characteristic

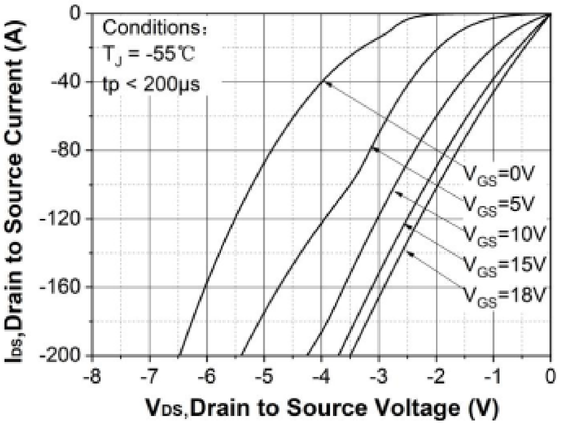


Figure 13. 3rd quadrant characteristic at TJ = -55 ºC

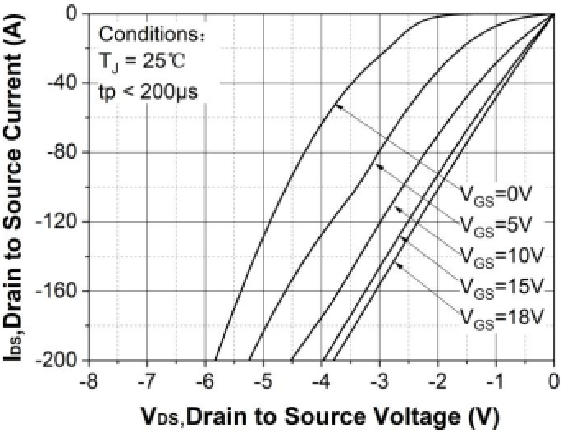


Figure 14. 3rd quadrant characteristic at TJ = 25 ºC

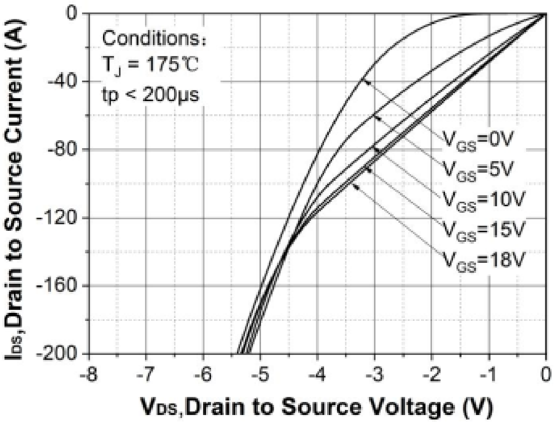


Figure 15. 3rd quadrant characteristic at TJ = 175 ºC

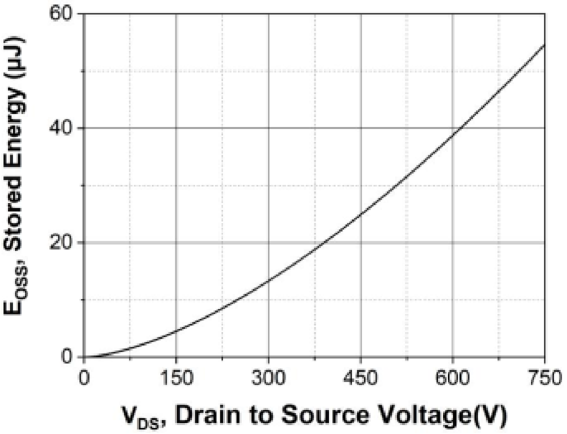


Figure 16. Output capacitor stored energy

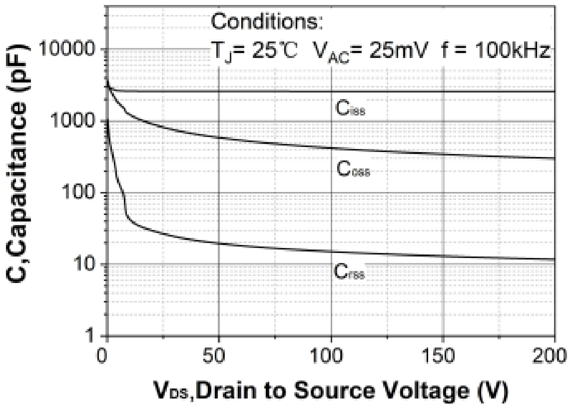


Figure 17. Capacitances vs. drain-source voltage (0 - 200V)

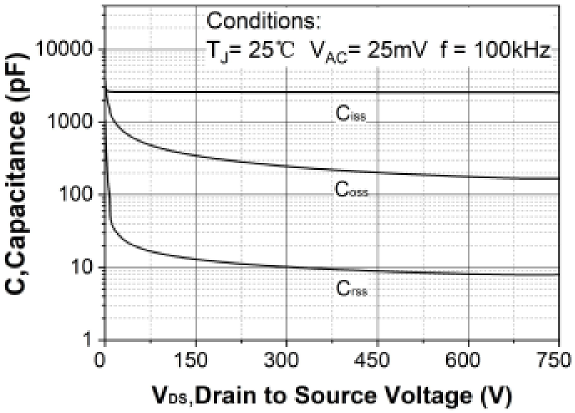


Figure 18. Capacitances vs. drain-source voltage (0 - 750V)

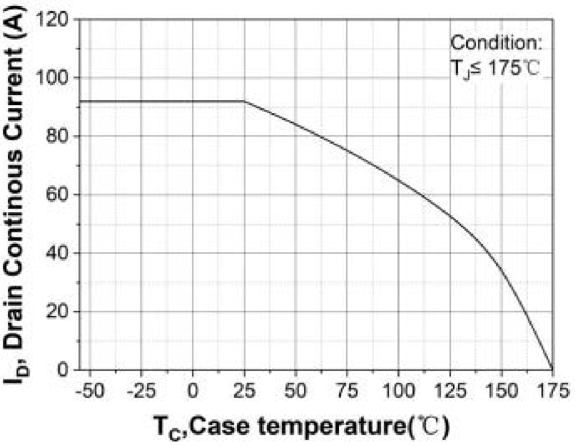


Figure 19. Continuous drain current derating vs. case temperature

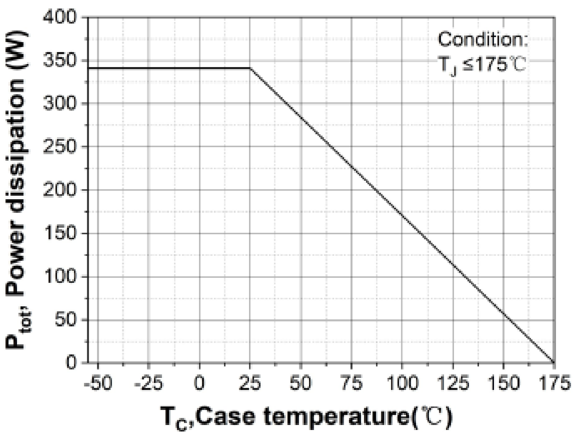


Figure 20. Maximum power dissipation derating vs. case temperature

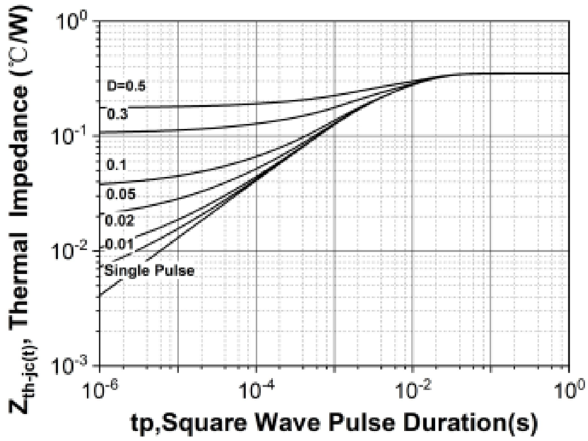


Figure 21. Transient thermal impedance (junction - case)

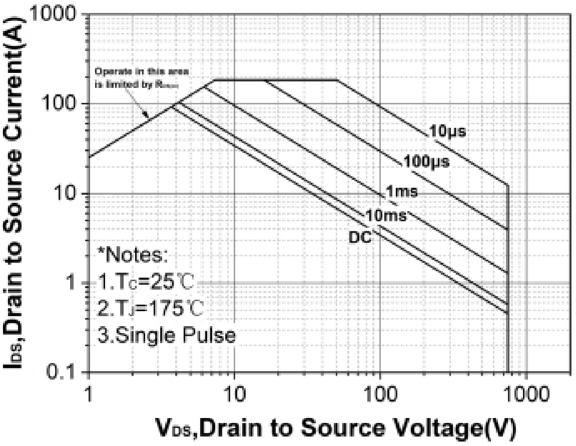


Figure 22. Safe operating area

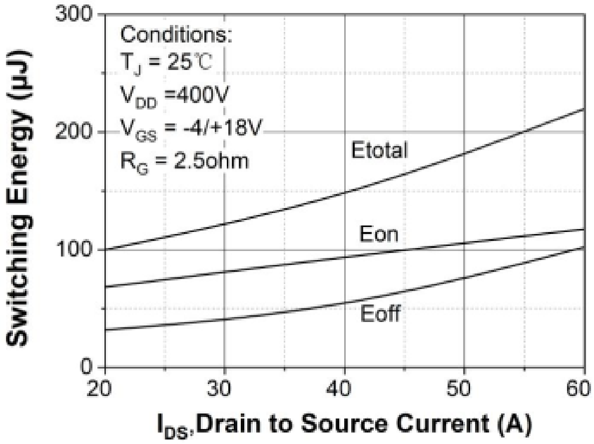


Figure 23. Clamped Inductive switching energy vs. drain current (VDD = 400V)

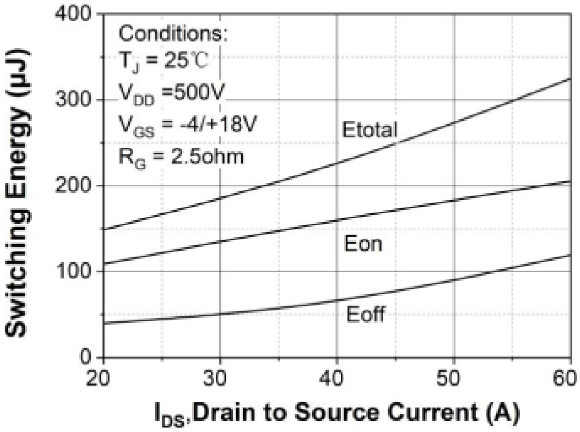


Figure 24. Clamped inductive switching energy vs. drain current (VDD = 500V)

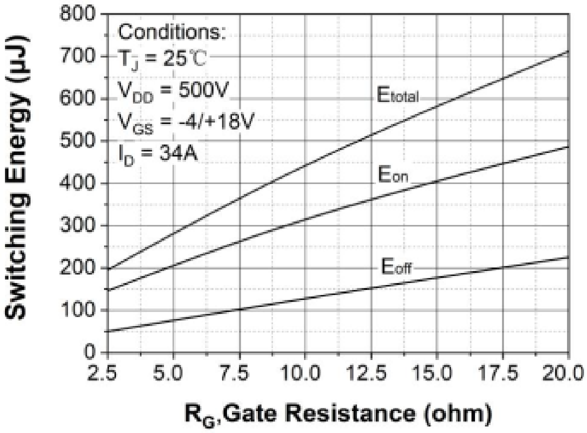


Figure 25. Clamped inductive switching energy vs. RG(ext)

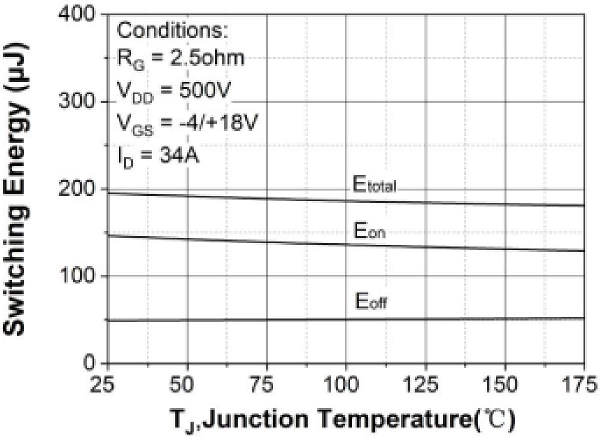


Figure 26. Clamped inductive switching energy vs. temperature

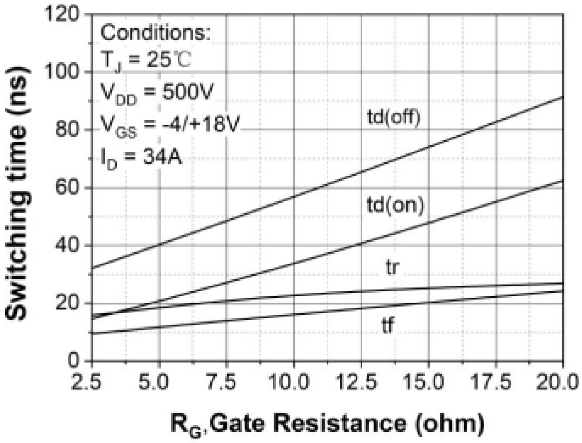
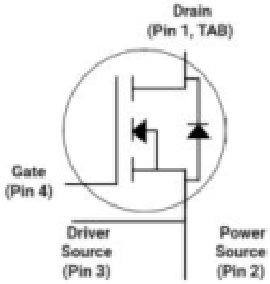
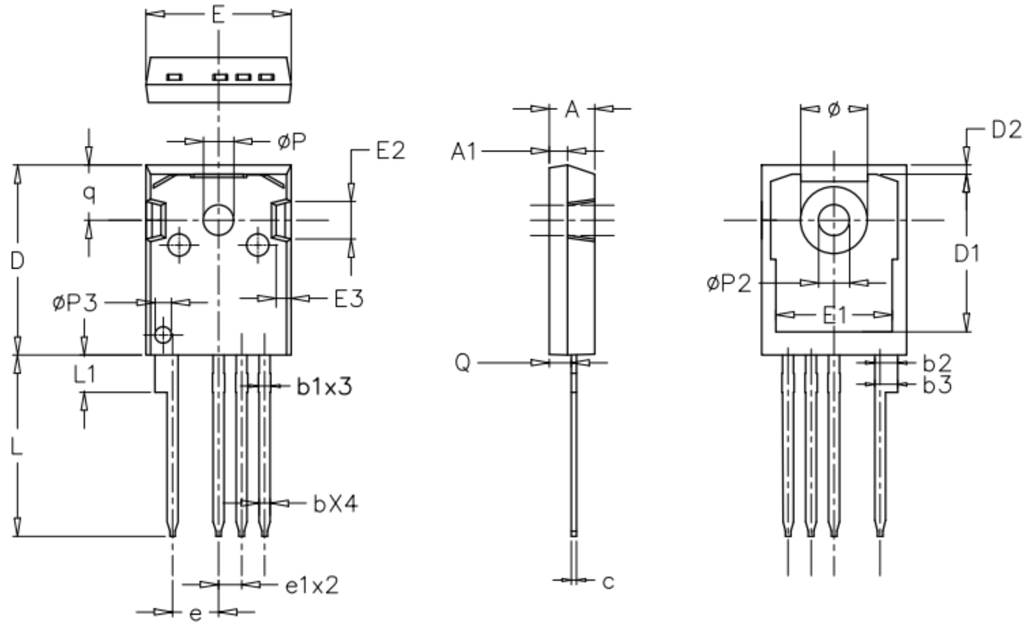


Figure 27. Switching times vs. RG(ext)

・Circuit diagram



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



SYMBOL	MILLIMETERS			NOTES	SYMBOL	MILLIMETERS			NOTES
	Normal	MIN.	MAX.			Normal	MIN.	MAX.	
A	4.98	4.68	5.36		e	5.08	4.90	5.30	
A1	1.99	1.90	2.10		e1	2.54	2.34	2.74	
Q	2.40	2.20	2.60		q	6.24	5.99	6.58	
c	0.60	0.45	0.75		øP	3.66	3.45	3.85	
b	1.20	1.00	1.40		øP2	3.45	3.24	3.64	
b1	1.35	1.10	1.60		ø	7.14	7.10	7.30	
b2	2.53	2.40	2.70		D1	16.56	16.10	17.10	
b3	2.53	2.40	2.70		D2	0.98	0.80	1.36	
D	21.10	20.80	21.80		E1	13.30	13.00	13.52	
E	15.98	15.38	16.20		E2	5.64	5.10	6.10	
L	20.00	19.60	20.40		E3	2.33	1.90	2.70	
L1	4.10	3.90	4.30		øP3	1.75	1.70	1.80	

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