

SCM60120R40B2 SCM60120R40B6

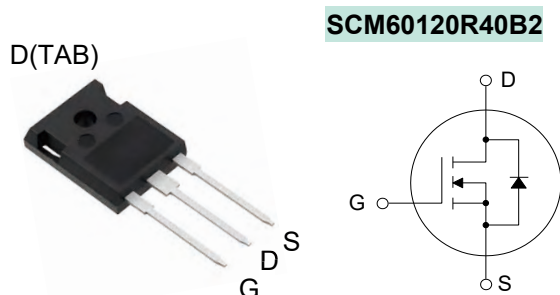
Silicon Carbide Power MOSFETs

N Channel Enhancement Mode MOSFET

V_{DS} :1200V

I_D :60A@25°C

$R_{DS(ON)}$:40mΩ



TAB=Drain, G=Gate, D=Drain, S=Source



TAB=Drain, D(1)=Drain, S(2)=Source, S(3)=Assistant Source, G(4)=Gate

Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		1200	V
V_{GS}	Gate to Source Voltage (DC)		-10 / +25	V
V_{GSop}	Recommended Operation Value		-5 / +20	V
I_D	Drain Current	Continuous ($T_C = 25^\circ\text{C}$)	60	A
		Continuous ($T_C = 100^\circ\text{C}$)	42	
I_{DM}	Drain Current	Pulsed (Note1)	160	A
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	320	W
		Derate Above 25°C)	2.10	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range		-55to175	°C
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 10 Seconds		260	°C

※Note 1 : Limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case,Max.	0.47	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	20	

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Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	1200			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$		1	100	μA
		$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}, T_J = 175^\circ\text{C}$		10		
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = +22\text{ V}, V_{DS} = 0\text{ V}$			+100	nA
		$V_{GS} = -10\text{ V}, V_{DS} = 0\text{ V}$			-100	

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 10\text{ mA}$	2.0	3.0	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 18\text{ V}, I_D = 30\text{ A}$		40	56	m Ω
		$V_{GS} = 18\text{ V}, I_D = 30\text{ A}, T_J = 175^\circ\text{C}$		57		
g_{fs}	Transconductance	$V_{DS} = 20\text{ V}, I_D = 30\text{ A}$		16.1		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		2012		pF
C_{oss}	Output Capacitance			123		
C_{rss}	Reverse Capacitance			8		
E_{oss}	Stored Energy in Output Capacitance	$V_{DS} = 0\text{ V to } 800\text{ V}, V_{GS} = 0\text{ V}$		49		μJ
$C_{o(er)}$	Energy Related Output Capacitance			158		pF
$C_{o(tr)}$	Time Related Output Capacitance			268		
$Q_{g(tot)}$	Total Gate Charge	$V_{DS} = 800\text{ V}, I_D = 30\text{ A},$ $V_{GS} = -5\text{ V} / 18\text{ V},$ Inductive load		101		nC
Q_{gs}	Gate to Source Charge			29		
Q_{gd}	Gate to Drain "Miller" Charge			33		
R_G	Internal Gate Resistance	$f = 1\text{ MHz}, V_{AC} = 30\text{ mV}$		3.2		Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = 800\text{ V}, I_D = 30\text{ A},$ $V_{GS} = -5\text{ V} / 18\text{ V}, R_G = 2\text{ }\Omega,$ Inductive load		22		ns
t_r	Turn-On Rise Time			16		
$t_{d(off)}$	Turn-Off Delay Time			35		
t_f	Turn-Off Fall Time			8		
E_{on}	Turn-on Switching Energy			222		μJ
E_{off}	Turn-off Switching Energy			96		
E_{tot}	Total Switching Energy			318		

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Source-Drain Diode Characteristics

I_S	Maximum Continuous Diode Forward Current			60	A
I_{SM}	Maximum Pulsed Diode Forward Current			160	
V_{SD}	Diode Forward Voltage	$V_{GS} = -5\text{ V}, I_{SD} = 30\text{ A}$		4.1	V
t_{rr}	Reverse Recovery Time	$V_{DD} = 800\text{ V}, I_{SD} = 30\text{ A},$ $di_F/dt = 1000\text{ A}/\mu\text{s}$, Includes Q_{oss}		15	ns
Q_{rr}	Reverse Recovery Charge			232	nC

FEATURES

- * Low on-resistance
- * Fast switching speed
- * Fast reverse recovery
- * Easy to parallel
- * Simple to drive
- * Pb-free lead plating
- * RoHS compliant

APPLICATIONS

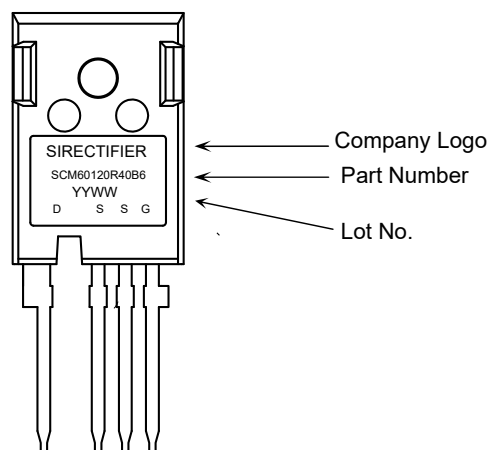
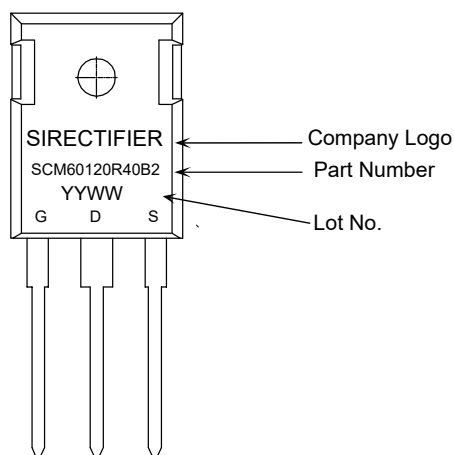
- * Solar inverter
- * EV charging station
- * UPS
- * Industrial power supply

MECHANICAL DATA

- * Case: TO-247AD/TO-247-4L
molded plastic
- * Polarity: As marked on the body
- * Weight: 6 grams
- * Mounting position: Any



MARKING



ORDERING INFORMATION

Part Number	Package	Shipping	Marking Code
SCM60120R40B2	TO-247AD	30pcs / Tube	SCM60120R40B2
SCM60120R40B6	TO-247-4L	30pcs / Tube	SCM60120R40B6

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Fig.1 Typical Output Characteristics(I)

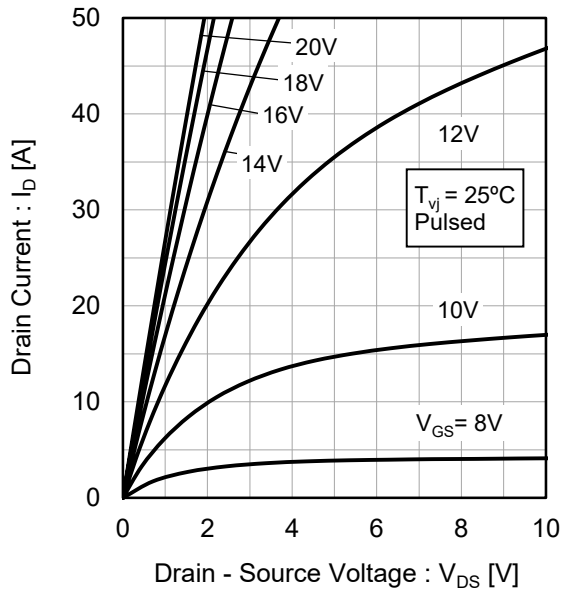


Fig.2 Typical Output Characteristics(II)

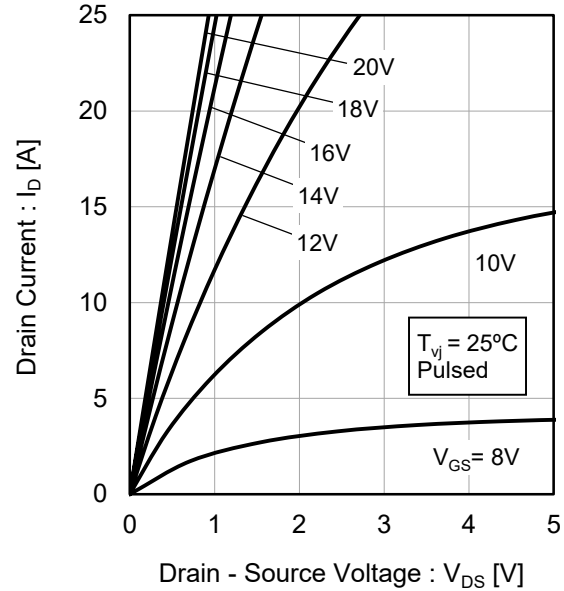


Fig.3 $T_{vj} = 150^\circ\text{C}$ Typical Output Characteristics(I)

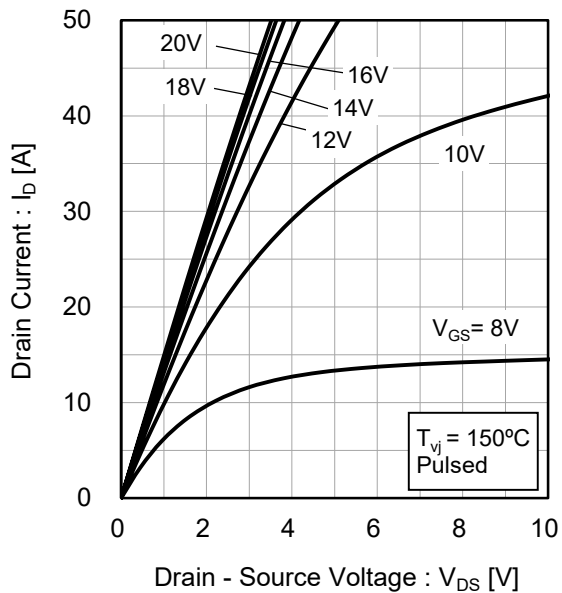
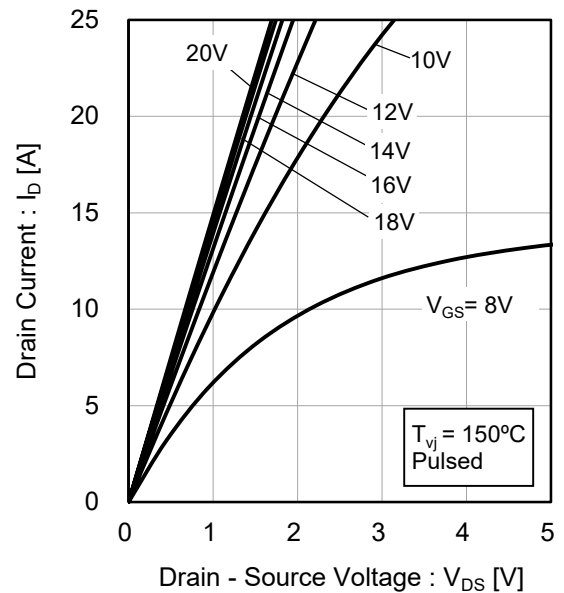


Fig.4 $T_{vj} = 150^\circ\text{C}$ Typical Output Characteristics(II)



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Fig.5 Typical Transfer Characteristics (I)

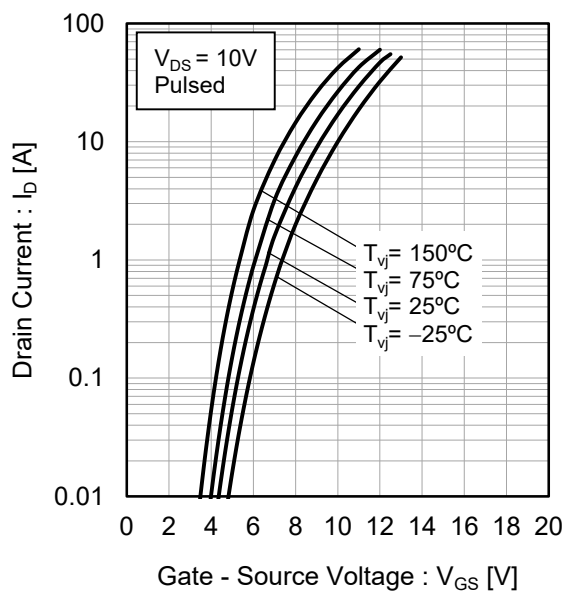


Fig.6 Typical Transfer Characteristics (II)

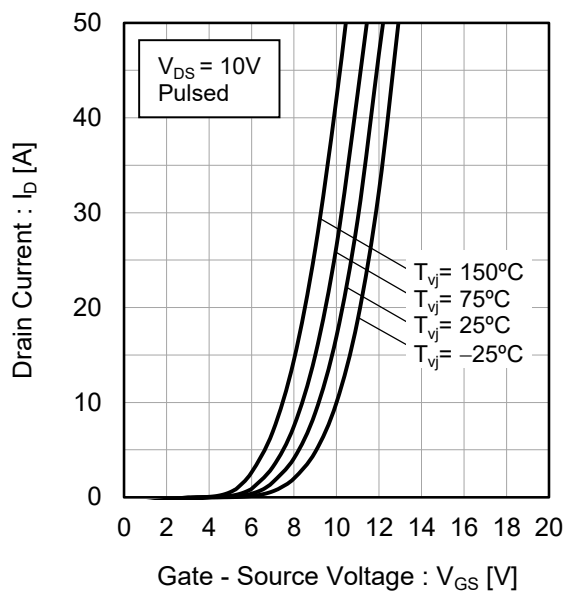


Fig.7 Gate Threshold Voltage vs. Junction Temperature

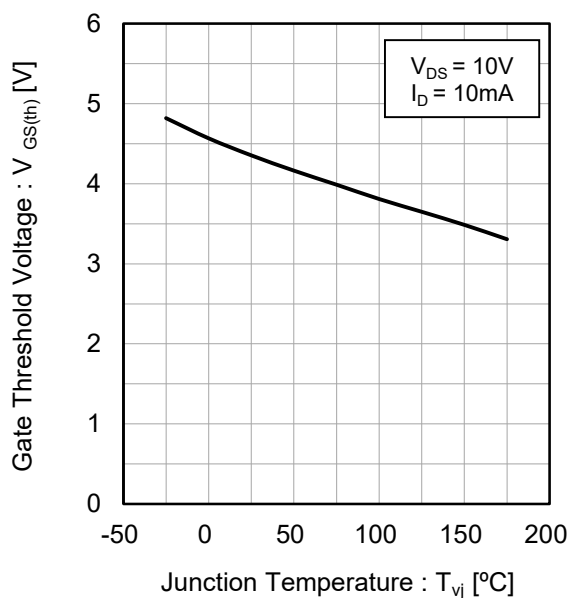
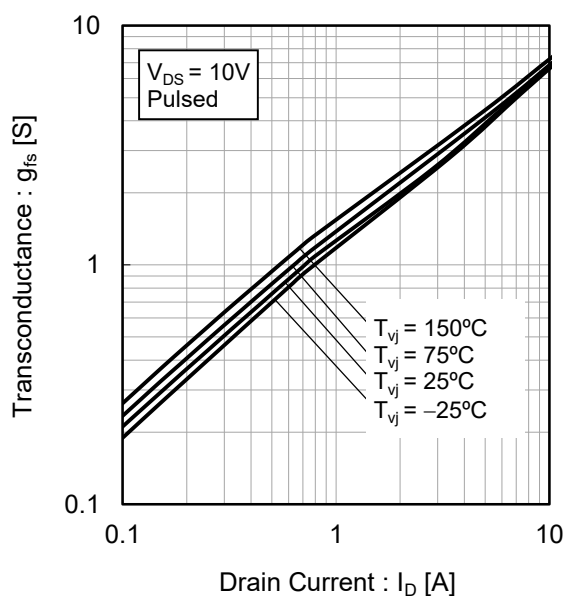


Fig.8 Transconductance vs. Drain Current



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Fig.9 Static Drain - Source On - State Resistance vs. Gate - Source Voltage

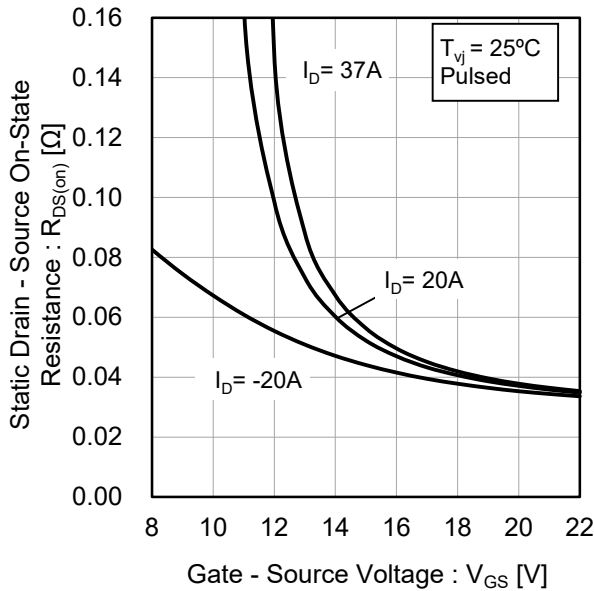


Fig.10 Static Drain - Source On - State Resistance vs. Junction Temperature

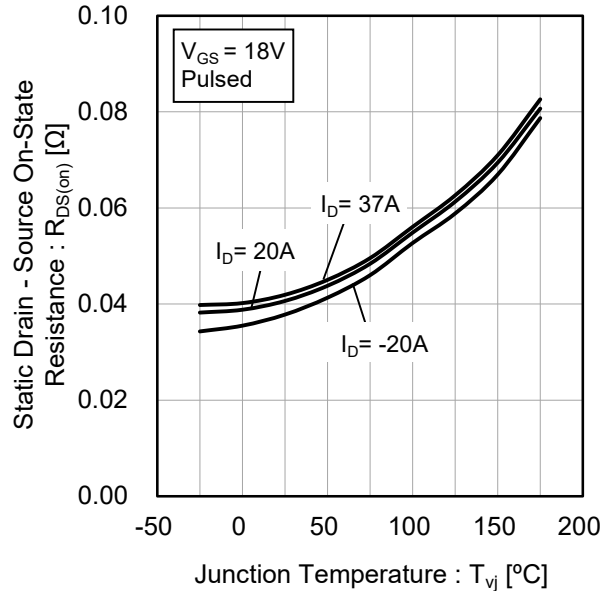


Fig.11 Static Drain - Source On - State Resistance vs. Drain Current

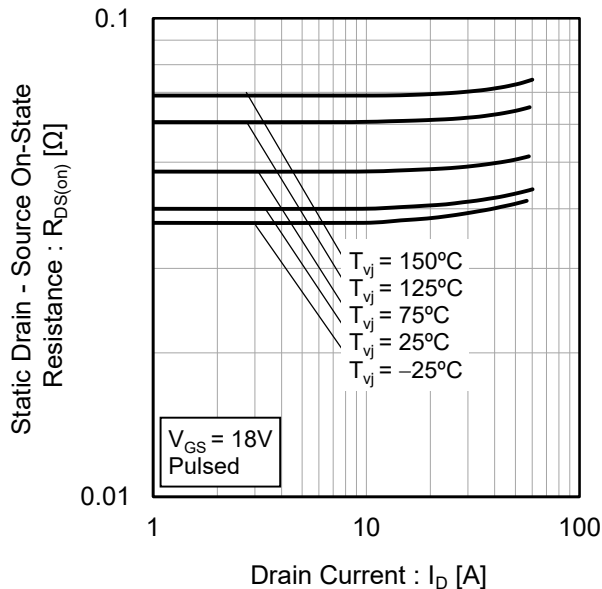
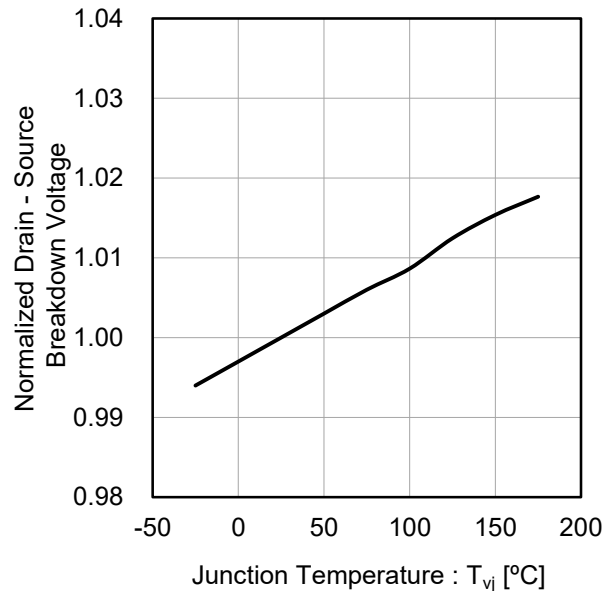


Fig.12 Normalized Drain - Source Breakdown Voltage vs. Junction Temperature



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Fig.13 Typical Capacitance vs. Drain - Source Voltage

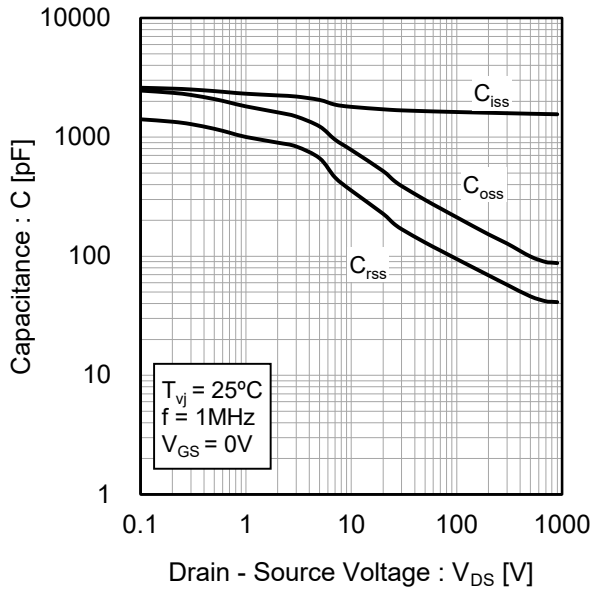


Fig.14 C_{oss} Stored Energy

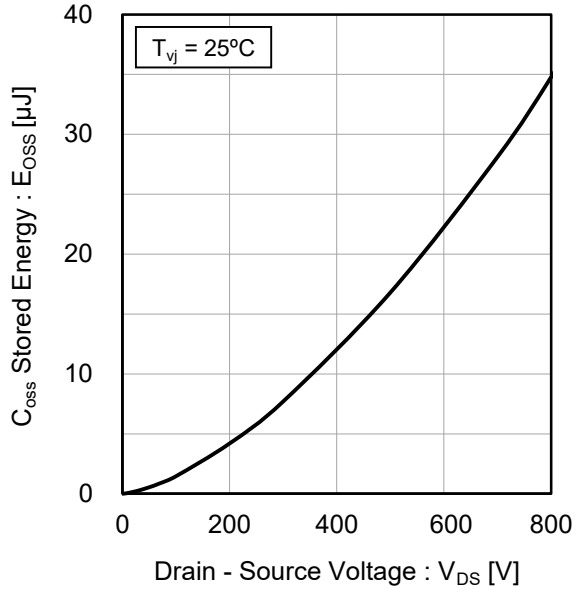
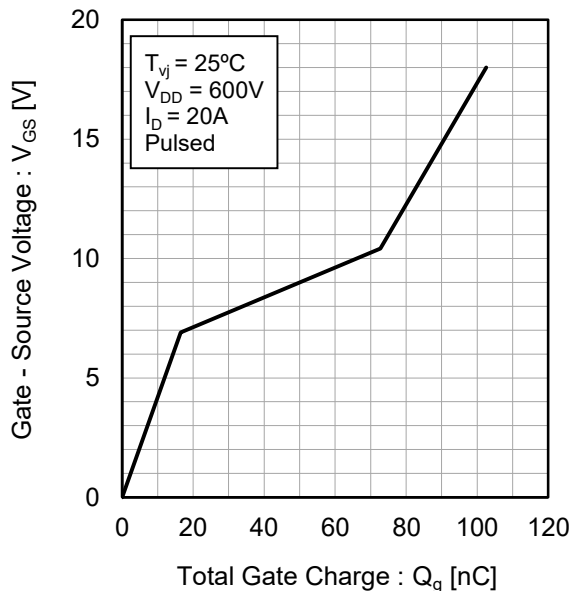
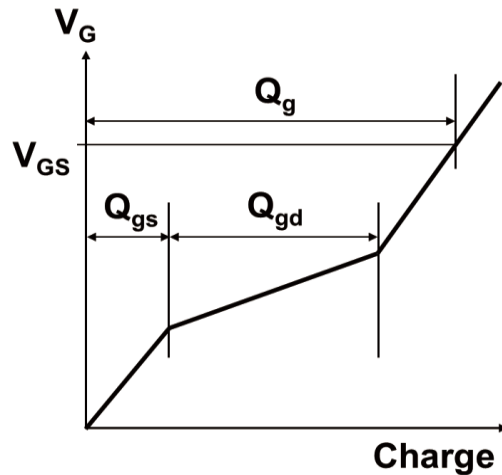


Fig.15 Dynamic Input Characteristics



*Gate Charge Waveform



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Fig.16 Typical Switching Time vs. Drain Current

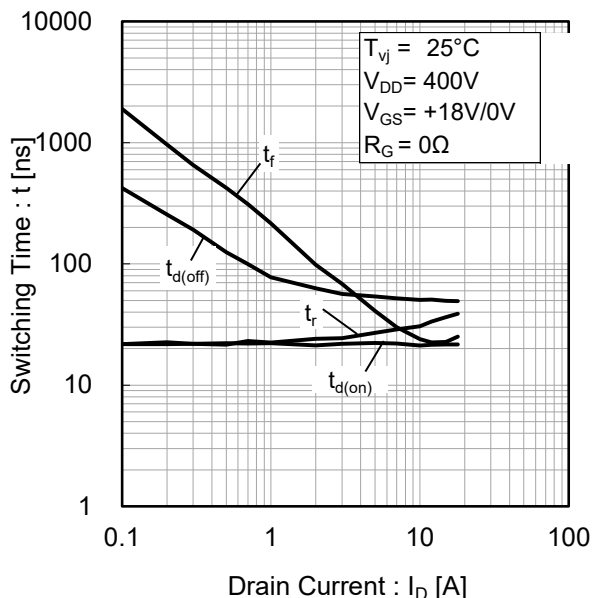


Fig.17 Typical Switching Loss vs. Drain - Source Voltage

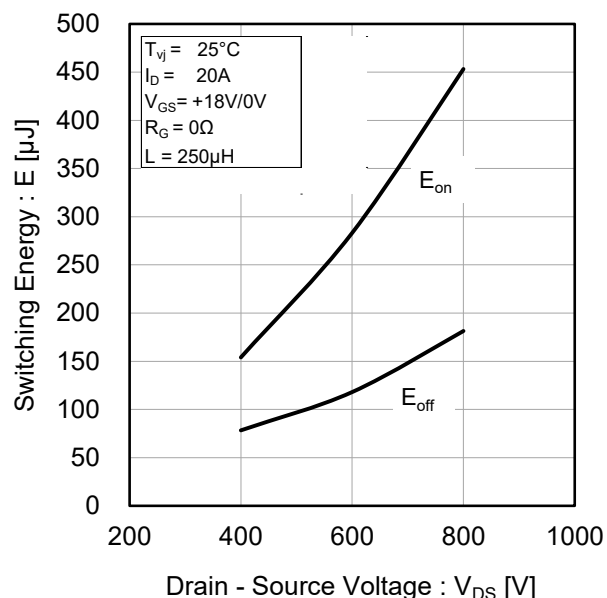


Fig.18 Typical Switching Loss vs. Drain Current

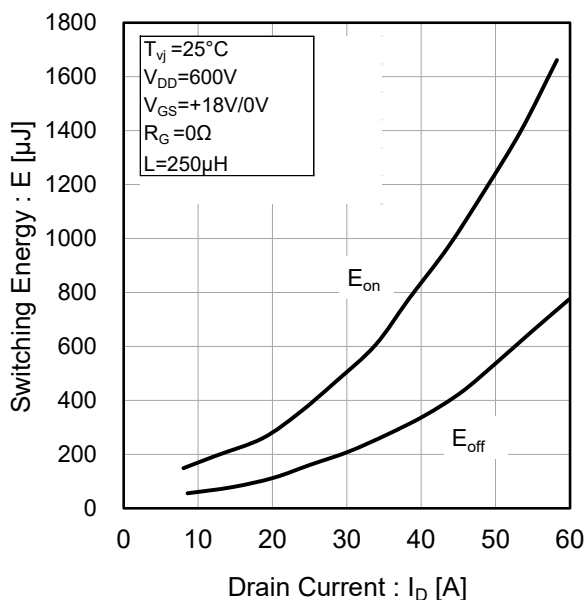
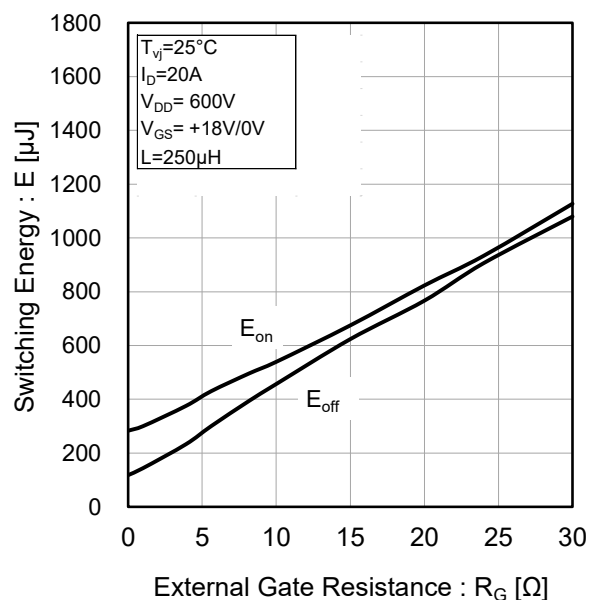


Fig.19 Typical Switching Loss vs. External Gate Resistance



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● Measurement circuits and waveforms

Fig.20 Gate Charge and Switching Time Measurement Circuit

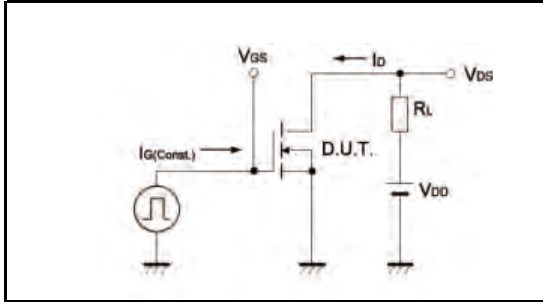


Fig.21 Waveforms for Switching Time

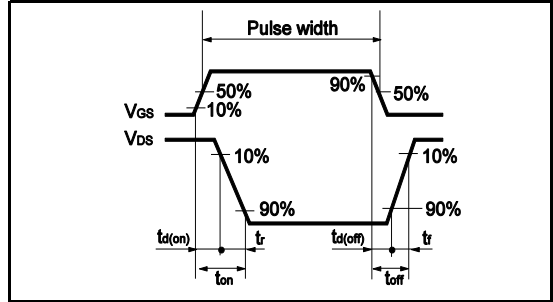


Fig.22 Switching Energy Measurement Circuit

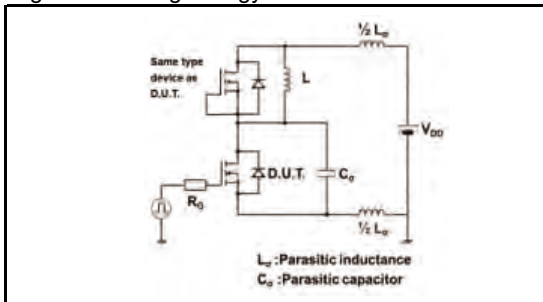


Fig.23 Waveforms for Switching Energy Loss

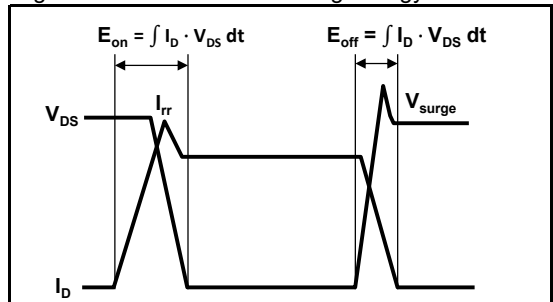


Fig.24 Reverse Recovery Time Measurement Circuit

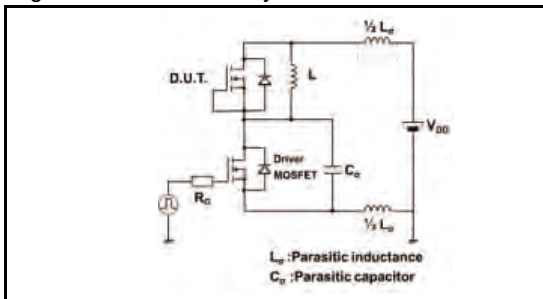
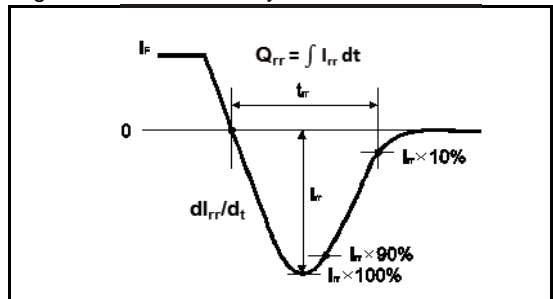


Fig.25 Reverse Recovery Waveform

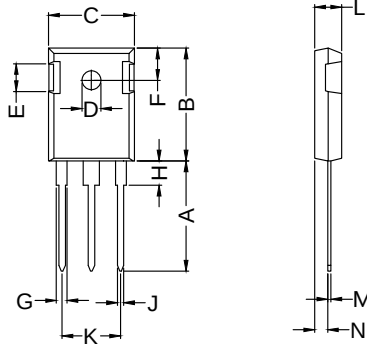


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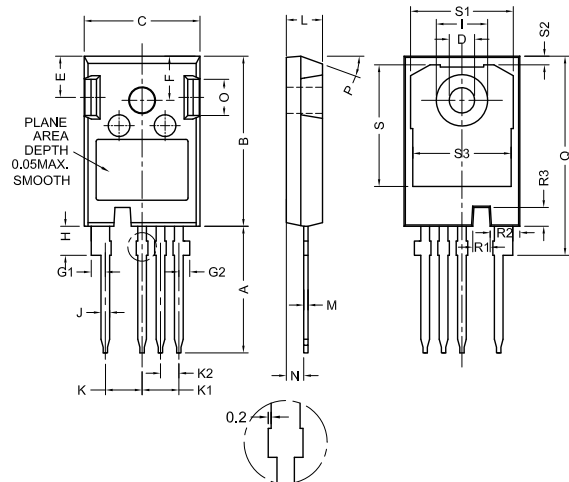
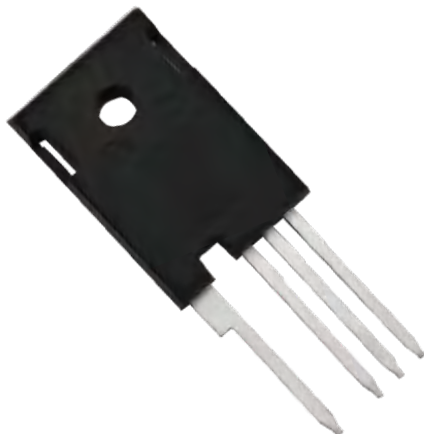
Dimensions TO-247AD



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	19.81	20.32	0.780	0.800
B	20.80	21.46	0.819	0.845
C	15.75	16.26	0.620	0.640
ØD	3.15	3.65	0.124	0.144
E	4.32	5.49	0.170	0.216
F	5.40	6.30	0.213	0.248
G	1.65	2.18	0.065	0.086
H	3.80	4.50	0.150	0.177
J	1.00	1.40	0.039	0.055
K	10.80	11.10	0.425	0.437
L	4.70	5.30	0.185	0.209
M	0.40	0.80	0.016	0.031
N	1.50	2.49	0.059	0.098

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Dimensions TO-247-4L



Dim.	Millimeter		Dim.	Millimeter	
	Min.	Max.		Min.	Max.
A	18.40	18.70	B	22.30	22.50
C	15.75	16.15	D	3.40	3.70
E	5.40	5.85	F	6.00	6.30
G1	1.80	2.15	G2	1.30	1.70
H	4.45	5.45	I	6.98	7.35
J	1.07	1.40	K	5.08BSC	
K1	5.08BSC		K2	2.54BSC	
L	4.70	5.30	M	0.50	0.69
N	2.31	2.51	O	4.68	5.20
P	20°REF		Q	27.25	27.95
Q2	3.22	3.42	R1	2.28	2.58
R2	3.82	4.22	R3	2.40	2.75
S	16.25	16.95	S1	13.95	14.35
S2	1.05	1.35	S3	13.45	13.85