

DOSEMI

SiC MOSFET

DM140S08TDRB

750V/13.5mΩ SiC Mosfet without Diode

General Description

DOSEMI MOSFET Power Discrete provides ultra low conduction loss as well as low switching loss. They are designed for the applications such as hybrid and electric vehicle.

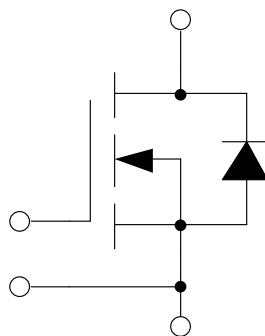
Features

- SiC power MOSFET
- Low $R_{DS(on)}$
- Chip sintering technology
- Low inductance case avoid oscillations
- ROHS

Typical Applications

- Automotive application
- Hybrid and electric vehicle
- Inverter for motor drive

Equivalent Circuit Schematic



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

Symbol	Description	Value	Unit
V_{DSS}	Drain-Source Voltage	750	V
V_{GSSmax}	Gate-Source Voltage	-8/+19	V
V_{GSSop}	Gate-Source Voltage	-4/+15	V
I_D	Drain Current @ $T_{vj}=175^{\circ}\text{C}$	173	A
P_D	Maximum Power Dissipation @ $T_{vj}=175^{\circ}\text{C}$	534	W

Body Diode

Symbol	Description	Value	Unit
I_F	Source Current @ $T_{vj}=175^{\circ}\text{C}$	107	A

Discrete

Symbol	Description	Values	Unit
T_{vjop}	Operating Junction Temperature	-40 to +175	$^{\circ}\text{C}$
T_{STG}	Storage Temperature Range	-55 to +150	$^{\circ}\text{C}$
T_S	Soldering Temperature, 1.6mm from case for 10s	260	$^{\circ}\text{C}$

Mosfet Characteristics $T_C=25^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$R_{DS(on)}$	Static Drain-Source On-Resistance	$I_D=78\text{A}, V_{GS}=15\text{V}, T_{vj}=25^{\circ}\text{C}$		13.5		$\text{m}\Omega$
		$I_D=78\text{A}, V_{GS}=15\text{V}, T_{vj}=150^{\circ}\text{C}$		13.9		
		$I_D=78\text{A}, V_{GS}=15\text{V}, T_{vj}=175^{\circ}\text{C}$		14.7		
$V_{GS(th)}$	Gate-Source Threshold Voltage	$I_D=22\text{mA}, V_{DS}=V_{GS}, T_{vj}=25^{\circ}\text{C}$	1.8	2.5	3.2	V
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=V_{DSS}, V_{GS}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			100	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=V_{GSS}, V_{DS}=0\text{V}, T_{vj}=25^{\circ}\text{C}$			200	nA
R_{Gint}	Internal Gate Resistance			2.3		Ω
C_{iss}	Input Capacitance	$V_{GS}=0\text{V}, V_{DS}=750\text{V}, f=100\text{kHz}$		6.10		nF
C_{oss}	Output Capacitance			0.24		nF
C_{rss}	Reverse Transfer Capacitance			17		pF
Q_g	Total Gate Charge	$I_D=78\text{A}, V_{DS}=470\text{V}, V_{GS}=-4/+15\text{V}$		0.19		μC
$t_{d(on)}$	Turn-On Delay Time	$V_{DS}=450\text{V}, I_D=75\text{A}, R_G=10\Omega, L_S=60\text{nH}, V_{GS}=-4/+15\text{V}, T_{vj}=25^{\circ}\text{C}$		25		ns
t_r	Rise Time			29		ns
$t_{d(off)}$	Turn-Off Delay Time			92		ns
t_f	Fall Time			37		ns
E_{on}	Turn-On Switching Loss			0.79		mJ
E_{off}	Turn-Off Switching Loss			0.61		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{DS}=450\text{V}, I_D=75\text{A}, R_G=10\Omega, L_S=60\text{nH}, V_{GS}=-4/+15\text{V}, T_{vj}=150^{\circ}\text{C}$		19		ns
t_r	Rise Time			25		ns
$t_{d(off)}$	Turn-Off Delay Time			105		ns
t_f	Fall Time			39		ns
E_{on}	Turn-On Switching Loss			0.85		mJ
E_{off}	Turn-Off Switching Loss			0.64		mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{DS}=450\text{V}, I_D=75\text{A}, R_G=10\Omega, L_S=60\text{nH}, V_{GS}=-4/+15\text{V}, T_{vj}=175^{\circ}\text{C}$		18		ns
t_r	Rise Time			25		ns
$t_{d(off)}$	Turn-Off Delay Time			106		ns
t_f	Fall Time			40		ns
E_{on}	Turn-On Switching Loss			0.86		mJ
E_{off}	Turn-Off Switching Loss			0.66		mJ

Body Diode Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{SD}	Diode Forward Voltage	$I_S=40\text{A}, V_{GS}=-4\text{V}, T_{vj}=25^\circ\text{C}$		4.45		V
		$I_S=40\text{A}, V_{GS}=-4\text{V}, T_{vj}=150^\circ\text{C}$		4.00		
		$I_S=40\text{A}, V_{GS}=-4\text{V}, T_{vj}=175^\circ\text{C}$		3.95		
t_{rr}	Reverse Recovery Time	$V_R=450\text{V}, I_S=75\text{A}, -di/dt=2640\text{A}/\mu\text{s}, L_S=60\text{nH}, V_{GS}=-4\text{V}, T_{vj}=25^\circ\text{C}$		56		ns
Q_r	Diode Reverse Recovery Charge			0.63		μC
I_{rrm}	Peak Reverse Recovery Current			28		A
E_{rec}	Reverse Recovery Energy			0.18		mJ
t_{rr}	Reverse Recovery Time	$V_R=450\text{V}, I_S=75\text{A}, -di/dt=2920\text{A}/\mu\text{s}, L_S=60\text{nH}, V_{GS}=-4\text{V}, T_{vj}=150^\circ\text{C}$		59		ns
Q_r	Diode Reverse Recovery Charge			0.66		μC
I_{rrm}	Peak Reverse Recovery Current			32		A
E_{rec}	Reverse Recovery Energy			0.19		mJ
t_{rr}	Reverse Recovery Time	$V_R=450\text{V}, I_S=75\text{A}, -di/dt=3100\text{A}/\mu\text{s}, L_S=60\text{nH}, V_{GS}=-4\text{V}, T_{vj}=175^\circ\text{C}$		62		ns
Q_r	Diode Reverse Recovery Charge			0.70		μC
I_{rrm}	Peak Reverse Recovery Current			37		A
E_{rec}	Reverse Recovery Energy			0.20		mJ

Discrete Characteristics $T_C=25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case (per Mosfet)		0.255	0.281	K/W

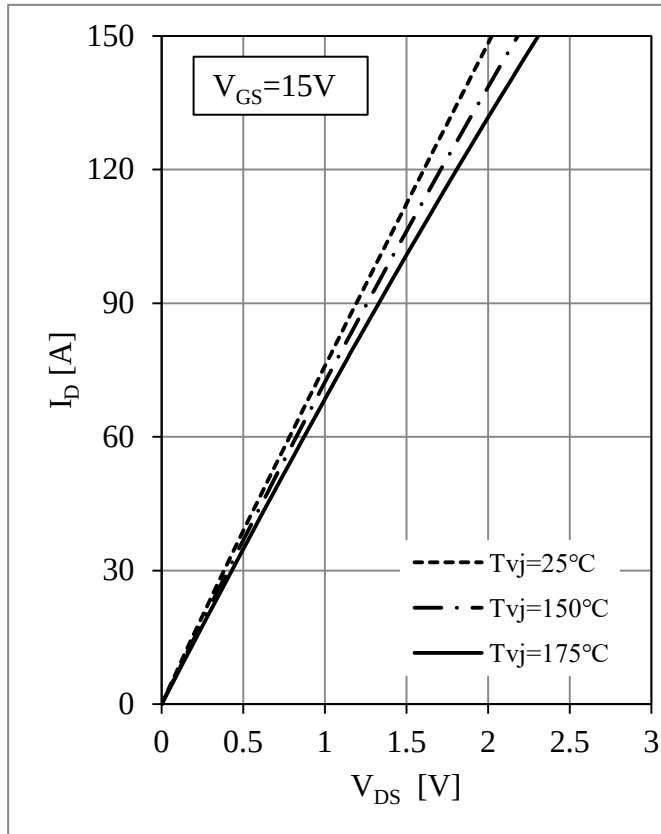


Fig 1. MOSFET Output Characteristics

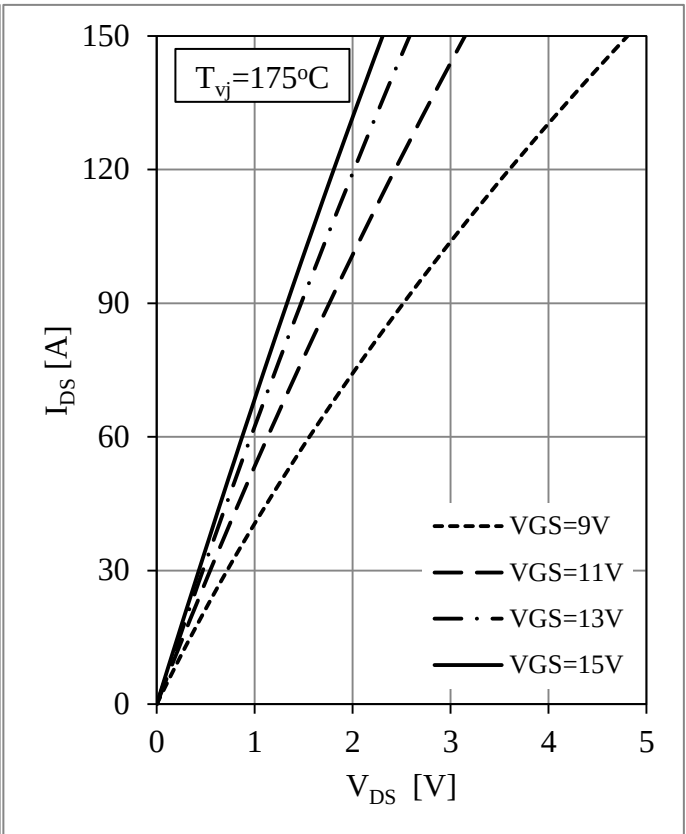


Fig 2. MOSFET Output Characteristics

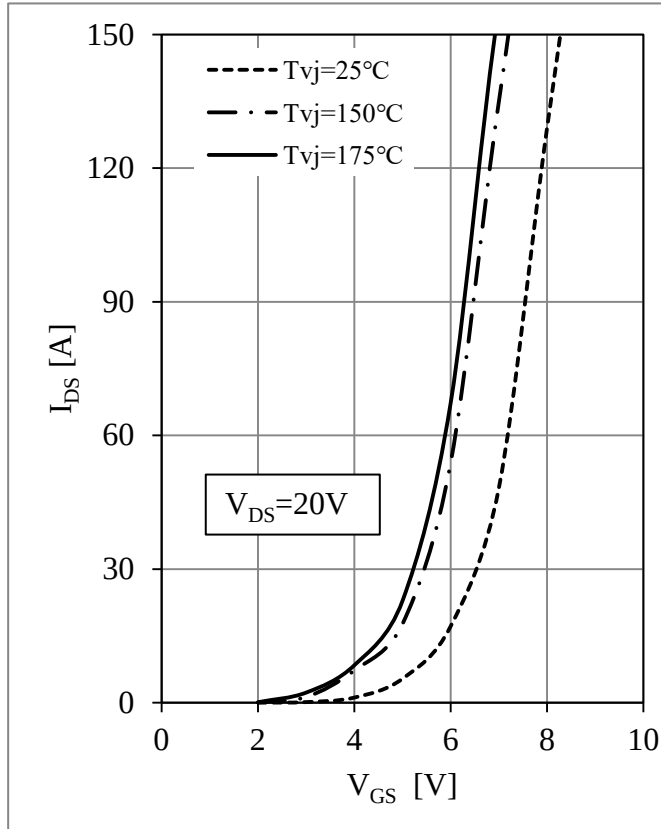
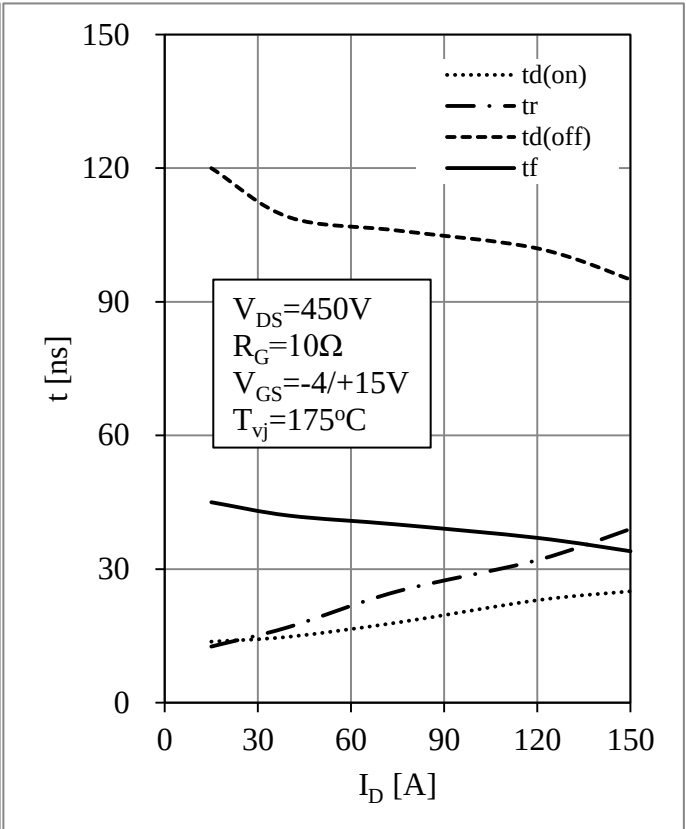
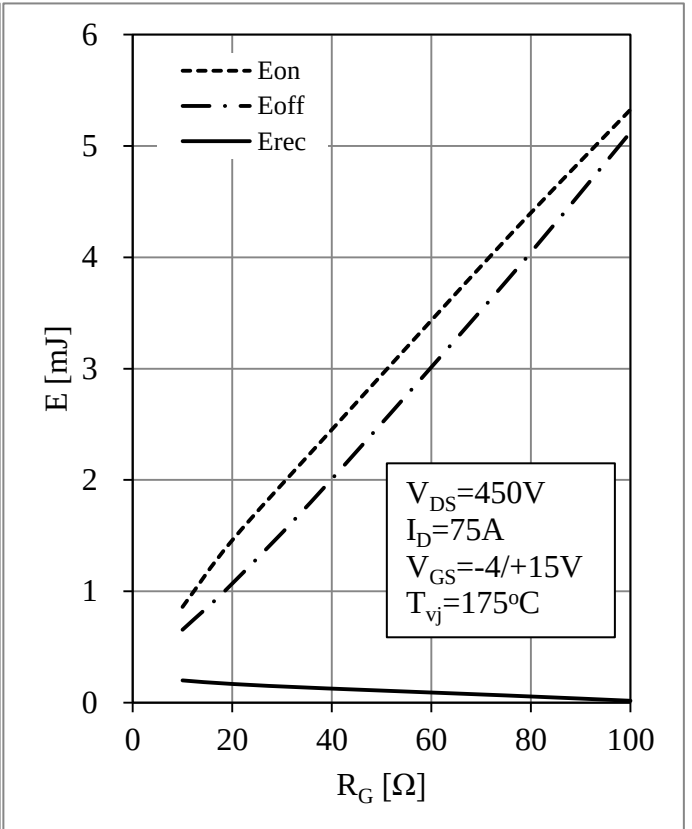
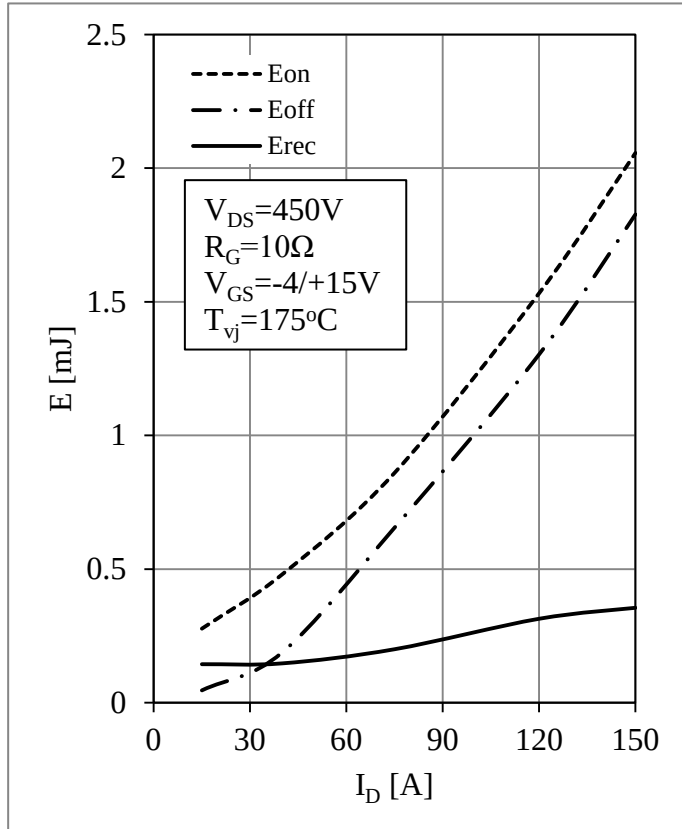
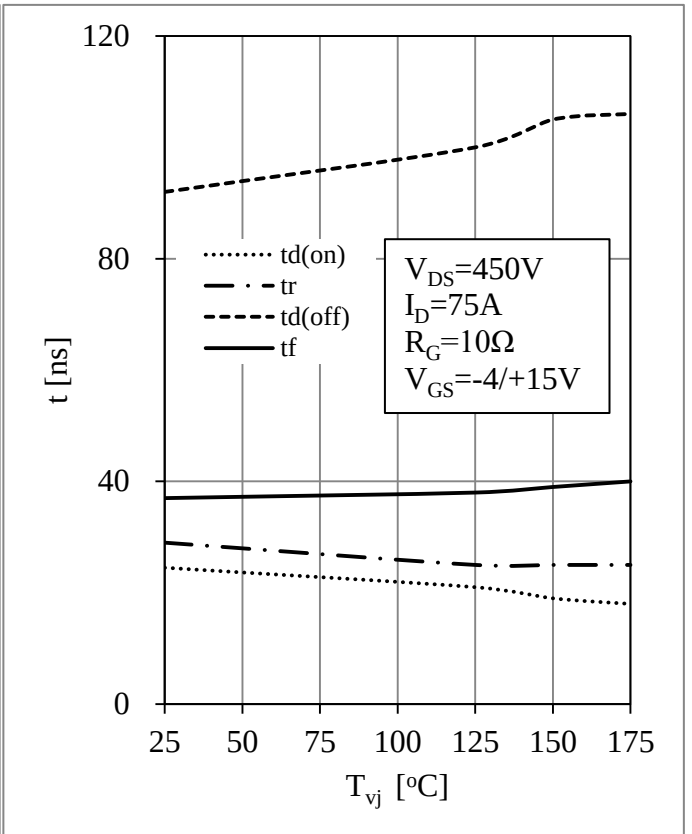
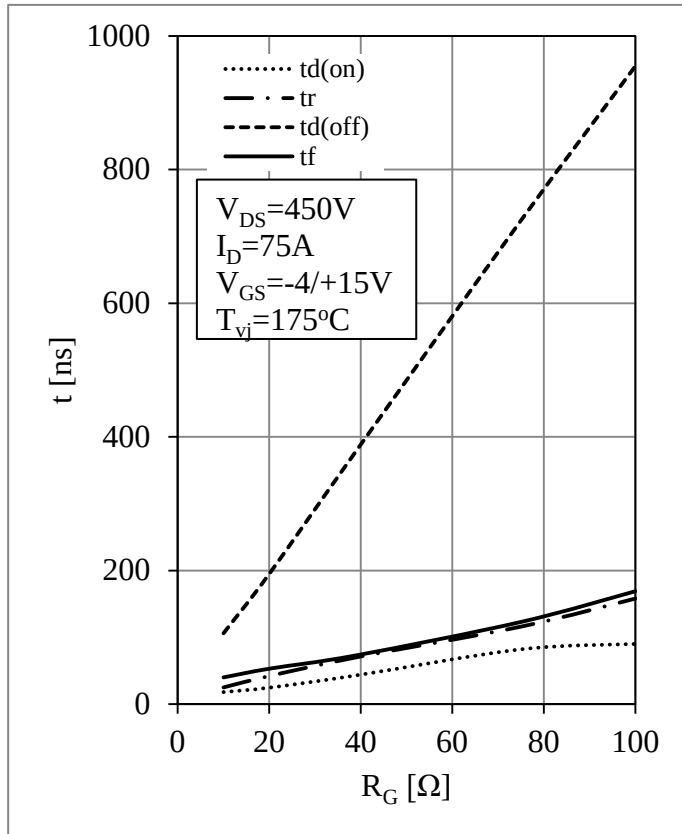


Fig 3. MOSFET Transfer Characteristics

Fig 4. MOSFET Switching Times vs. I_{DS}

Fig 7. Switching Energy Loss vs. I_{DS} Fig 8. Switching Energy Loss vs. R_G

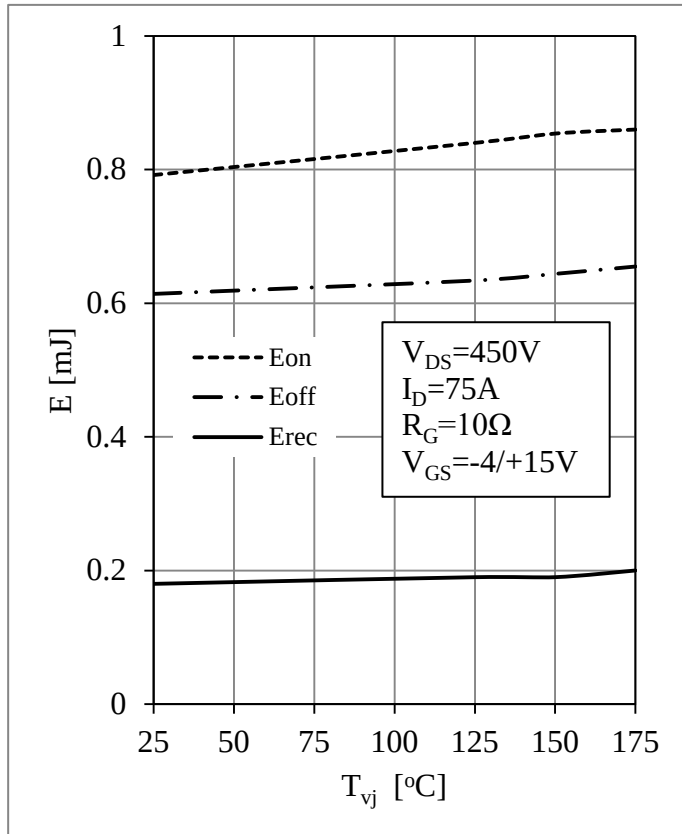
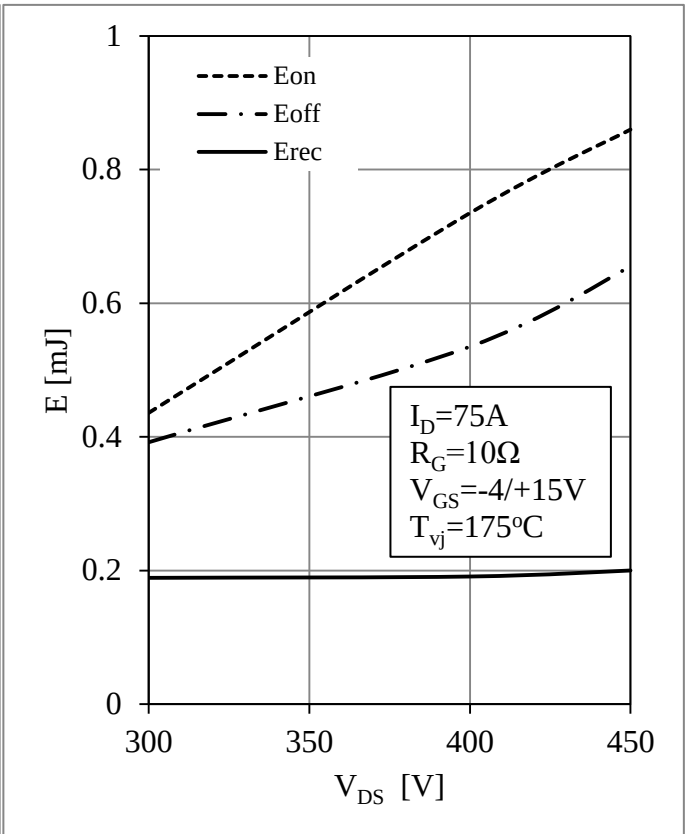
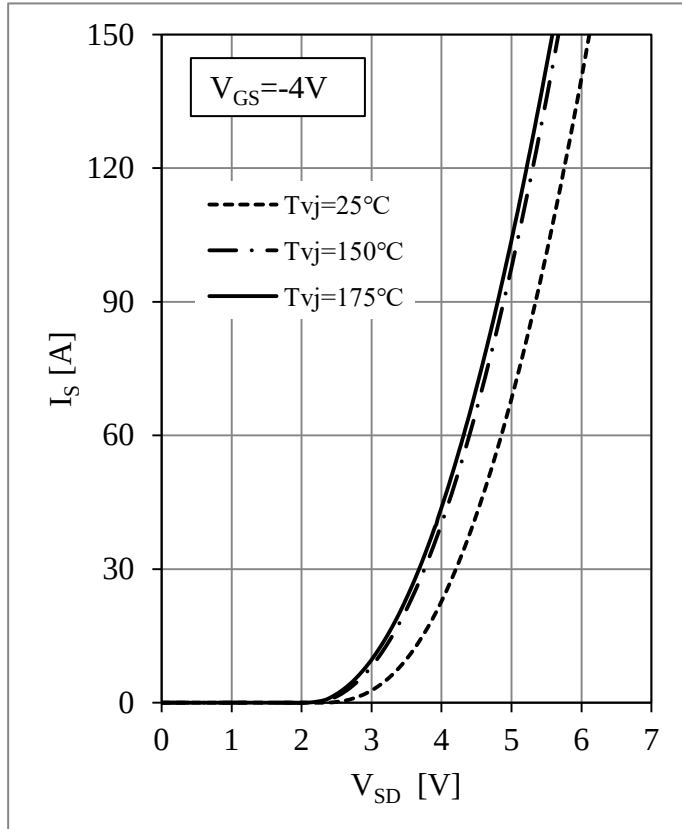
Fig 9. Switching Energy Loss vs. T_{vj} Fig 10. Switching Energy Loss vs. V_{DS} 

Fig 11. Body Diode Characteristics

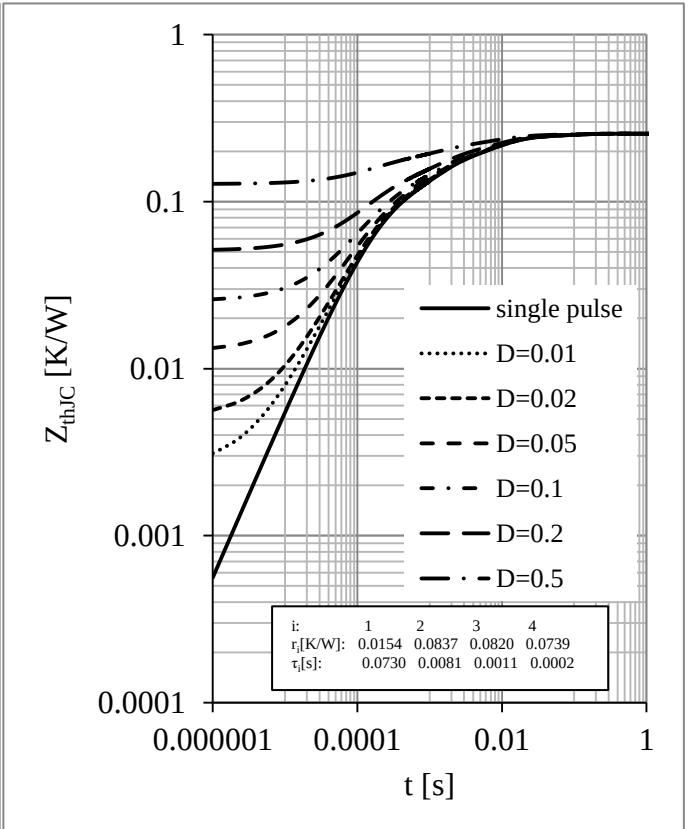


Fig 12. MOSFET Transient Thermal Impedance

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