



## IGBT Discrete

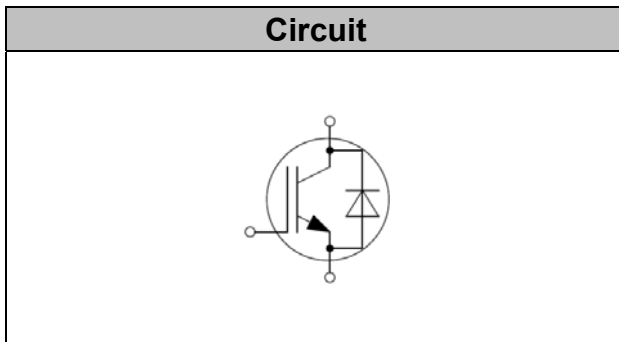
$V_{CE}$	<b>650</b>	<b>V</b>
$I_C$	<b>50</b>	<b>A</b>
$V_{CE(SAT)}$ $I_C=50A$	<b>1.60</b>	<b>V</b>

### Applications

- High frequency switching application
- Resonant converters
- Uninterruptible power supply
- Welding converters

### Features

- High speed smooth switching device for hard & soft switching
- Maximum junction temperature 175
- Positive temperature coefficient
- High ruggedness, temperature stable
- Pb-free lead plating; RoHS compliant



### ■ Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage	$V_{CE}$	650	V
DC Collector Current, limited by $T_{jmax}$ $T_C=25^\circ C$ value limited by bondwire $T_C= 100^\circ C$	$I_C$	85 60	A
Diode Forward Current, limited by $T_{jmax}$ $T_C= 25^\circ C$ value limited by bondwire $T_C= 100^\circ C$	$I_F$	85 60	A
Continuous Gate-Emitter Voltage	$V_{GE}$	$\pm 20$	V
Transient Gate-Emitter Voltage ( $t_p \le 10\mu s, D < 0.010$ )	$V_{GE}$	$\pm 30$	V
Turn off Safe Operating Area $V_{CE} 650V$ , $T_j 150^\circ C$		200	A
Pulsed Collector Current, $V_{GE}=15V$ , $t_p$ limited by $T_{jmax}$	$I_{CM}$	200	A
Diode Pulsed Current, $t_p$ limited by $T_{jmax}$	$I_{Fpuls}$	200	A
Power Dissipation , $T_j=175^\circ C$ , $T_C=25^\circ C$	$P_{tot}$	326	W
Operating Junction Temperature	$T_j$	- 40...+175	$^\circ C$
Storage Temperature	$T_s$	- 55...+150	$^\circ C$
Soldering Temperature, wave soldering 1.6mm (0.063in.) from case for 10s		260	$^\circ C$



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## ■ Electrical Characteristics of the IGBT $T_j = 25$ unless otherwise specified

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Collector-Emitter Breakdown Voltage	$BV_{CES}$	$V_{GE}=0V, I_C=250\mu A$	650		-	V
Gate Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=0.75mA$	4.25	5.05	5.85	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=50A$ $T_j=25^\circ C,$ $T_j=125^\circ C$ $T_j=150^\circ C$	1.45	1.60 1.95 2.05	1.95	V
Zero Gate Voltage Collector Current	$I_{CES}$	$V_{CE}=650V, V_{GE}=0V$ $T_j=25^\circ C,$ $T_j=150^\circ C$			0.25 3.00	mA
Gate-Emitter Leakage Current	$I_{GES}$	$V_{CE}=0V, V_{GE}=20V$			200	nA

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Dynamic</b>						
Input Capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz$	-	5.92	-	nF
Reverse Transfer Capacitance	$C_{res}$		-	0.23	-	
Gate Charge	$Q_G$	$V_{CC}=300V, I_C=50A, V_{GE}=15V$	-	0.45	-	$\mu C$



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## ■Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Dynamic , at T<sub>j</sub>= 25</b>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>CC</sub> =300V, I <sub>C</sub> =50A, V <sub>GE</sub> = 0v~15V, R <sub>g</sub> =10 ,L <sub>s</sub> =60nH	-	55	-	ns
Rise Time	t <sub>r</sub>		-	56	-	ns
Turn-on Energy	E <sub>on</sub>		-	1.27	-	mJ
Turn-off Delay Time	t <sub>d(off)</sub>		-	319	-	ns
Fall Time	t <sub>f</sub>		-	24	-	ns
Turn-off Energy	E <sub>off</sub>		-	0.65	-	mJ
Total switching energy	E <sub>ts</sub>				1.92	
<b>Dynamic , at T<sub>j</sub>= 125</b>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>CC</sub> =300V, I <sub>C</sub> =50A, V <sub>GE</sub> = 0v~15V, R <sub>g</sub> =10 ,L <sub>s</sub> =60nH	-	53	-	ns
Rise Time	t <sub>r</sub>		-	61	-	ns
Turn-on Energy	E <sub>on</sub>		-	1.51	-	mJ
Turn-off Delay Time	t <sub>d(off)</sub>		-	351	-	ns
Fall Time	t <sub>f</sub>		-	59	-	ns
Turn-off Energy	E <sub>off</sub>		-	0.80	-	mJ
Total switching energy	E <sub>ts</sub>				2.31	
<b>Dynamic , at T<sub>j</sub>= 150</b>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>CC</sub> =300V, I <sub>C</sub> =50A, V <sub>GE</sub> = 0v~15V, R <sub>g</sub> =10 ,L <sub>s</sub> =60nH	-	52	-	ns
Rise Time	t <sub>r</sub>		-	60	-	ns
Turn-on Energy	E <sub>on</sub>		-	1.62	-	mJ
Turn-off Delay Time	t <sub>d(off)</sub>		-	361	-	ns
Fall Time	t <sub>f</sub>		-	71	-	ns
Turn-off Energy	E <sub>off</sub>		-	0.85	-	mJ
Total switching energy	E <sub>ts</sub>				2.47	



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## ■Electrical Characteristics of the Diode $T_j=25$ unless otherwise specified

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Diode Forward Voltage	$V_F$	$I_F=50A$ $T_j=25^\circ C,$ $T_j=125^\circ C$ $T_j=150^\circ C$	1.30	1.45 1.29 1.23	1.80	V

## ■Electrical Characteristics of the DIODE

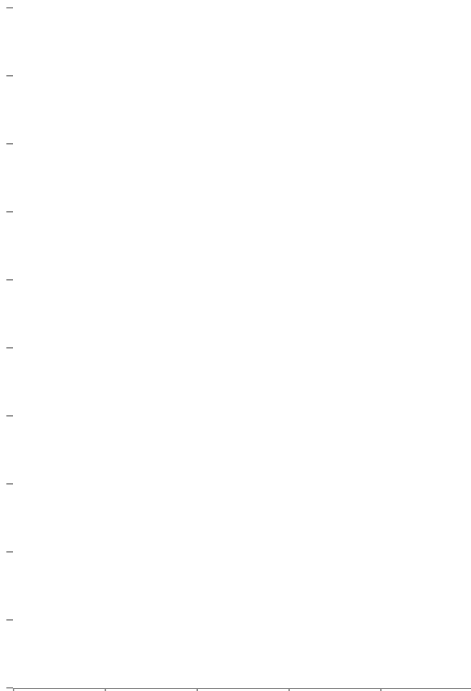
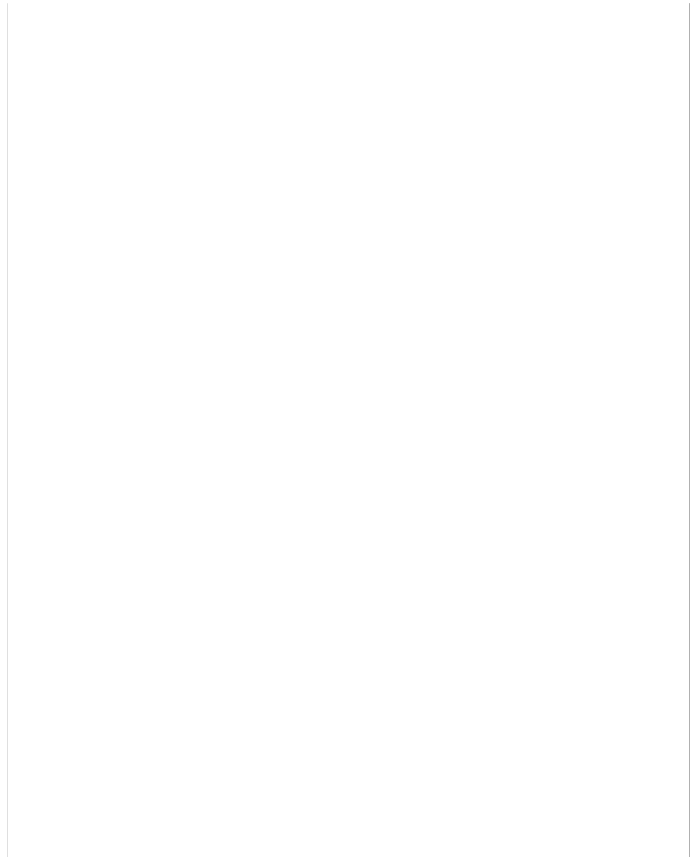
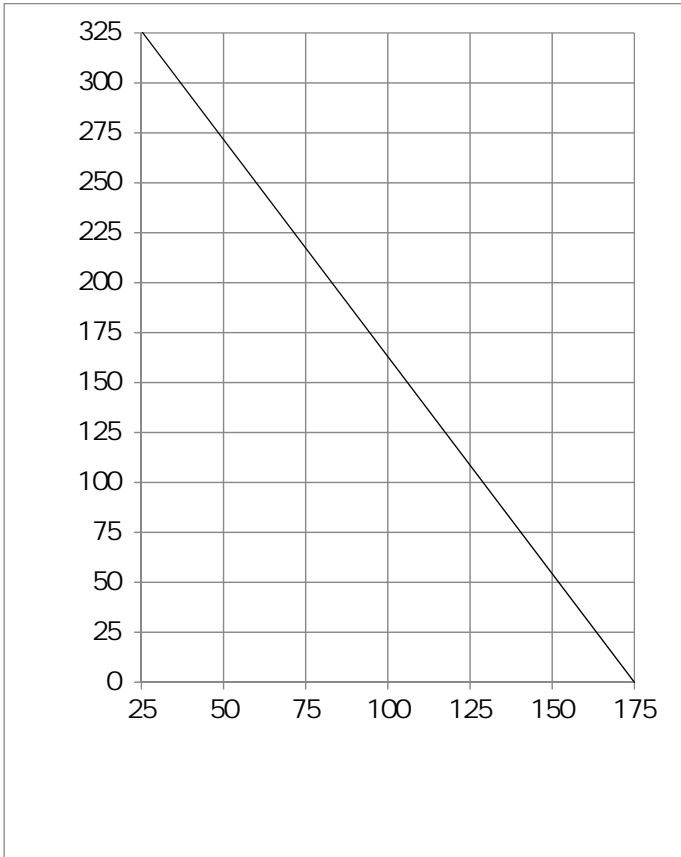
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Dynamic , at <math>T_j=25</math></b>						
Reverse Recovery Current	$I_{rr}$	$I_F=50A, V_R=300V$ $-di/dt=610A/\mu s,$	-	13	-	A
Reverse Recovery Charge	$Q_{rr}$		-	0.78	-	$\mu C$
Diode reverse recovery time	$t_{rr}$		-	100	-	ns
Reverse Recovery Energy	$E_{rec}$		-	0.1	-	mJ
<b>Dynamic , at <math>T_j=125</math></b>						
Reverse Recovery Current	$I_{rr}$	$I_F=50A, V_R=300V$ $-di/dt=610A/\mu s,$	-	35	-	A
Reverse Recovery Charge	$Q_{rr}$		-	2.8	-	$\mu C$
Diode reverse recovery time	$t_{rr}$		-	140	-	ns
Reverse Recovery Energy	$E_{rec}$		-	0.38	-	mJ
<b>Dynamic , at <math>T_j=150</math></b>						
Reverse Recovery Current	$I_{rr}$	$I_F=50A, V_R=300V$ $-di/dt=610A/\mu s,$	-	40	-	A
Reverse Recovery Charge	$Q_{rr}$		-	3.22	-	$\mu C$
Diode reverse recovery time	$t_{rr}$		-	160	-	ns
Reverse Recovery Energy	$E_{rec}$		-	0.43	-	mJ

## ■Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT Thermal Resistance, Junction - Case	$R_{th(j-c)}$	0.46	K/W
Diode Thermal Resistance, Junction - Case	$R_{th(j-c)}$	0.51	K/W
Thermal Resistance, Junction - Ambient	$R_{th(j-a)}$	40	K/W

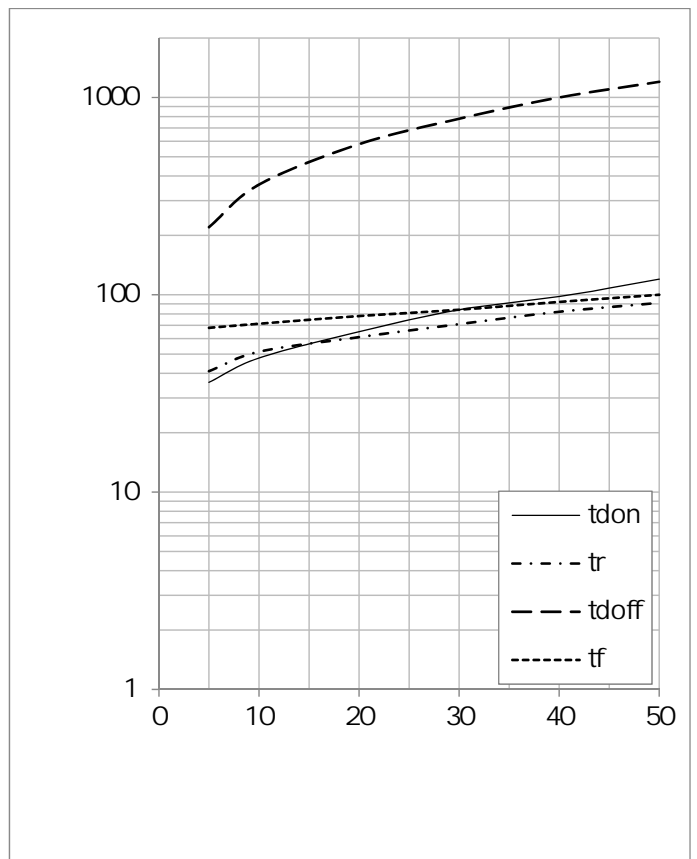
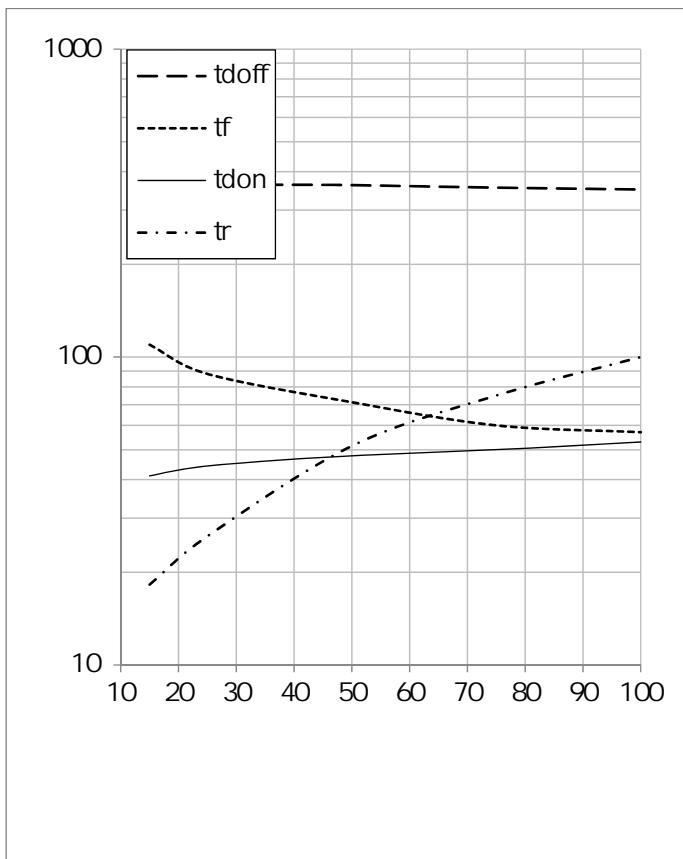
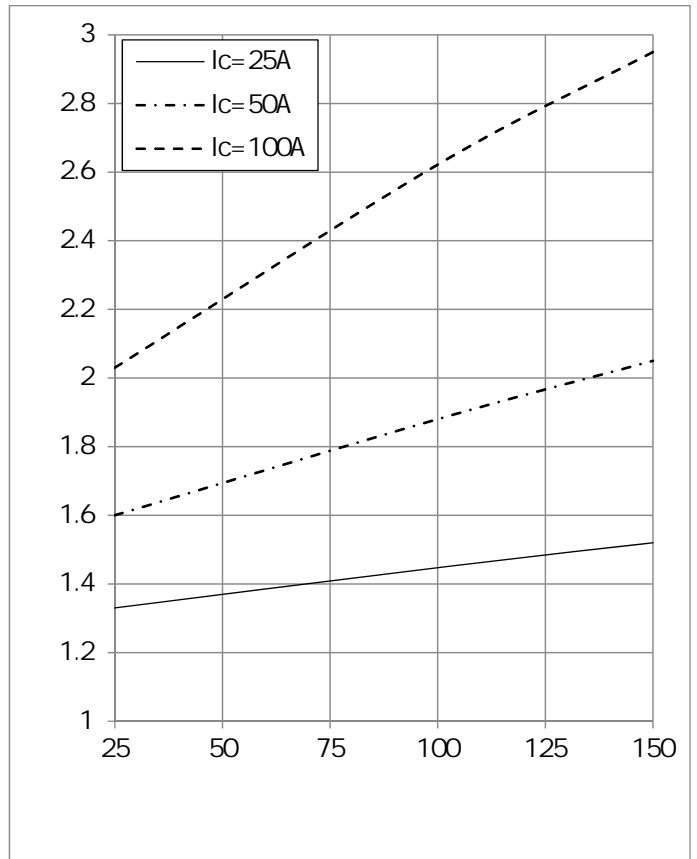
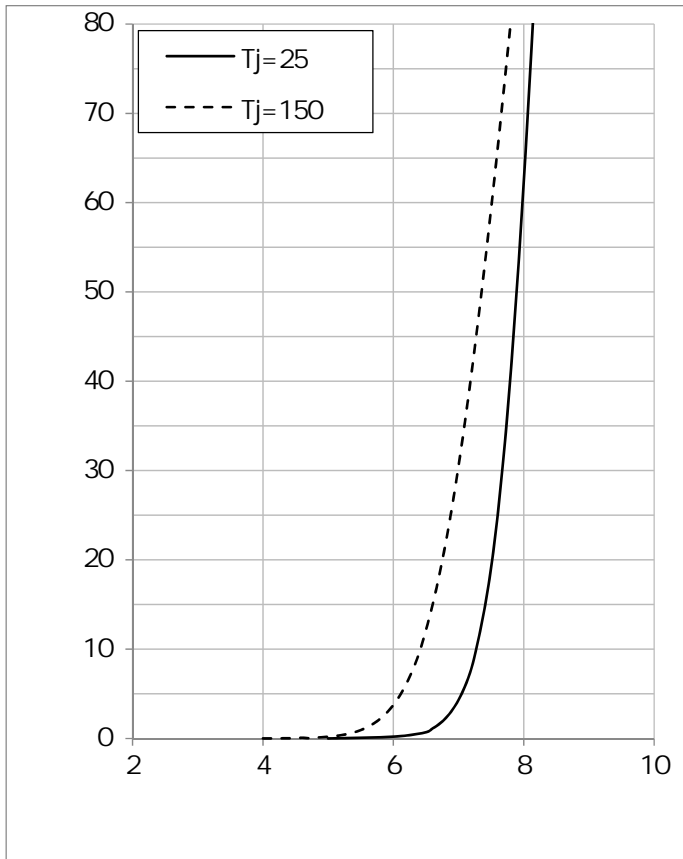


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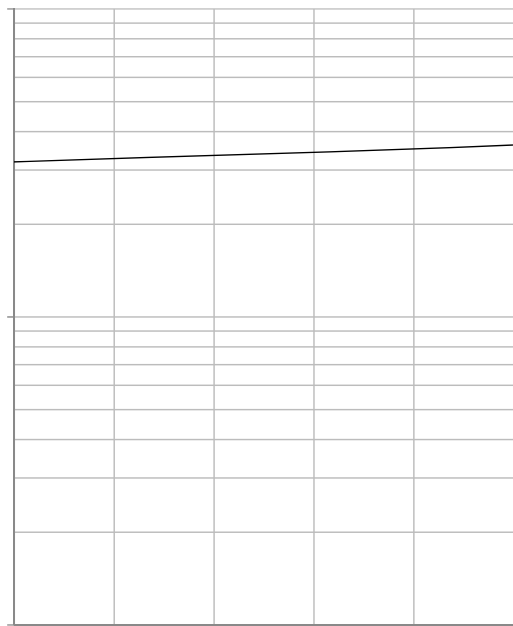
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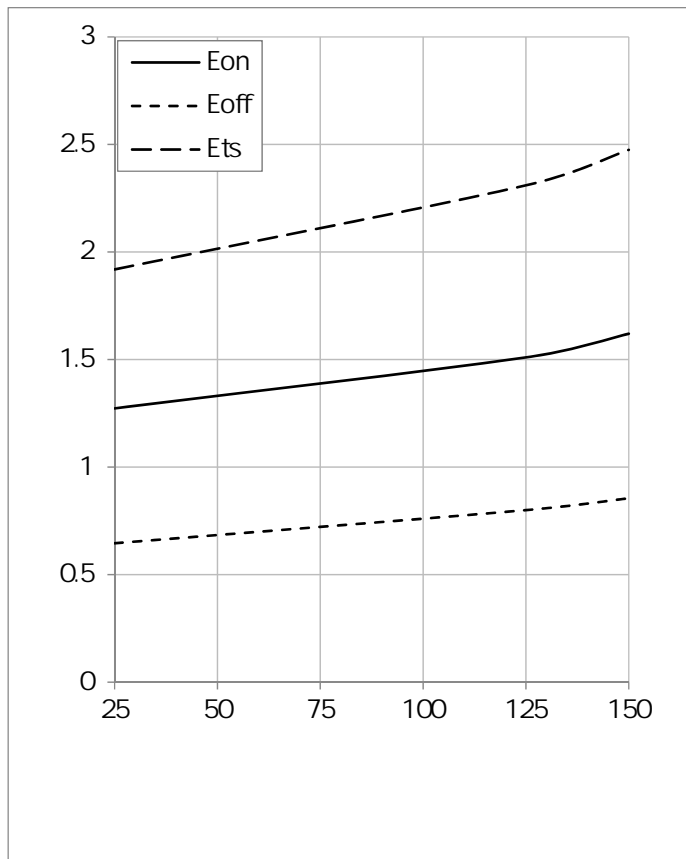
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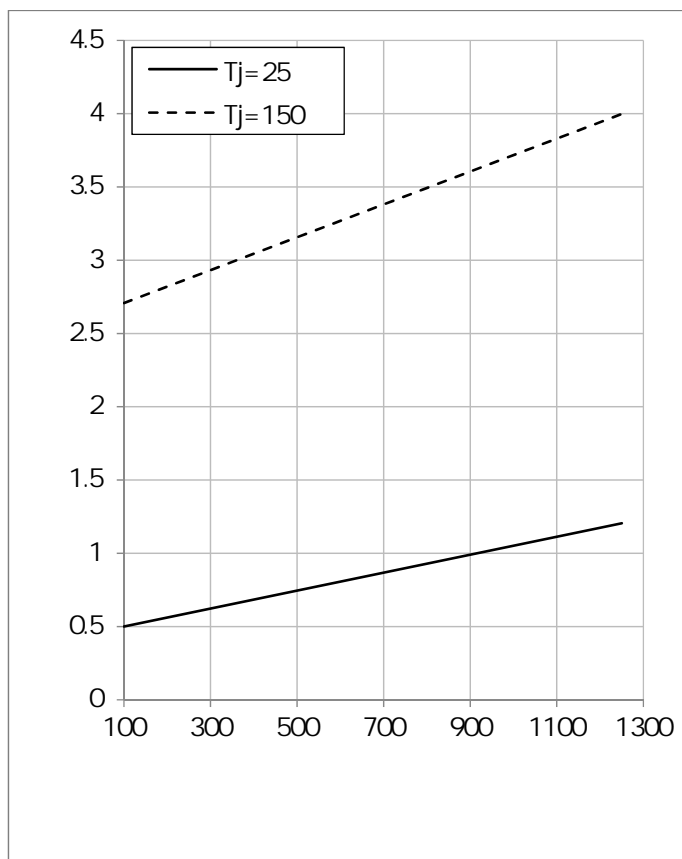
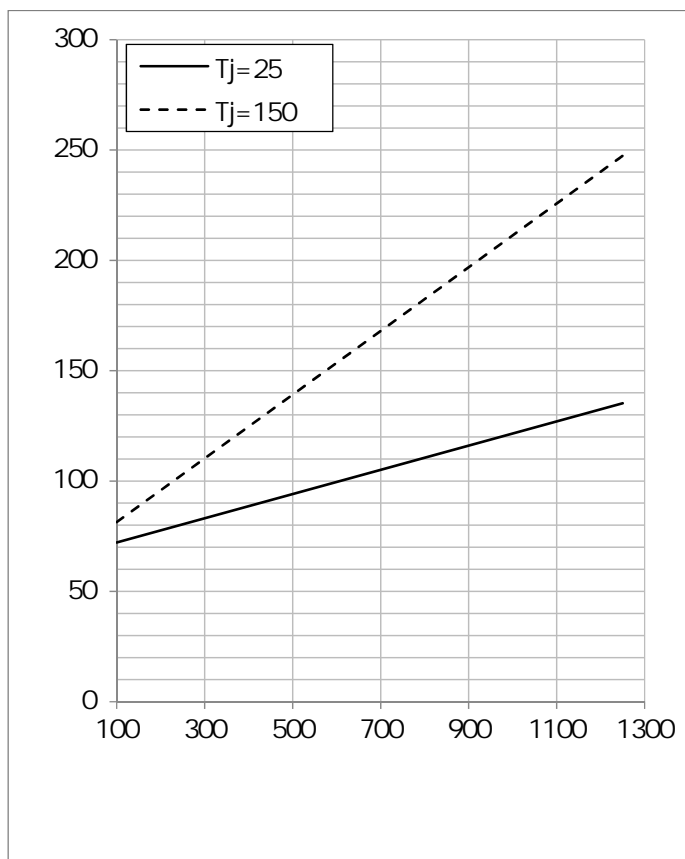
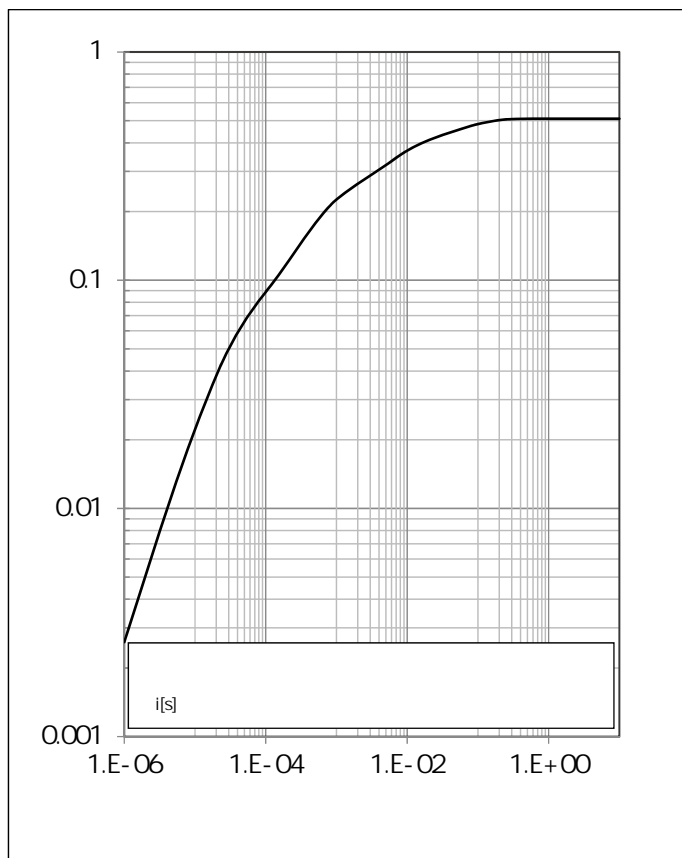
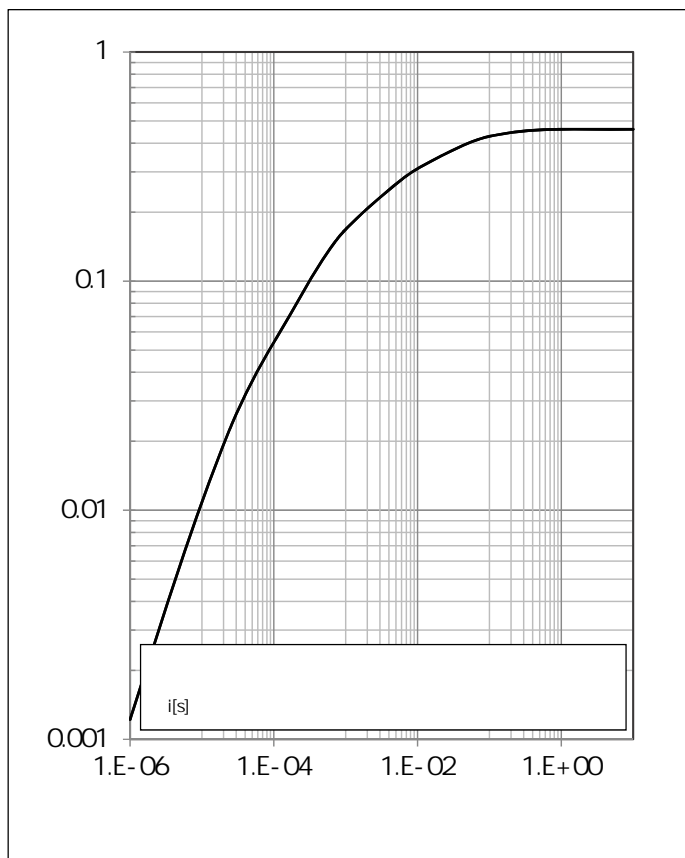
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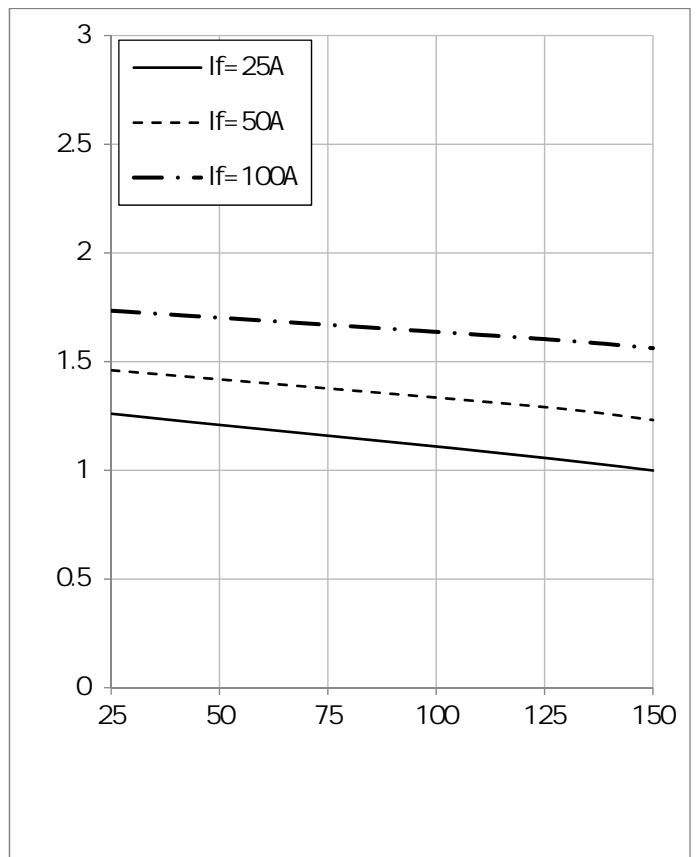
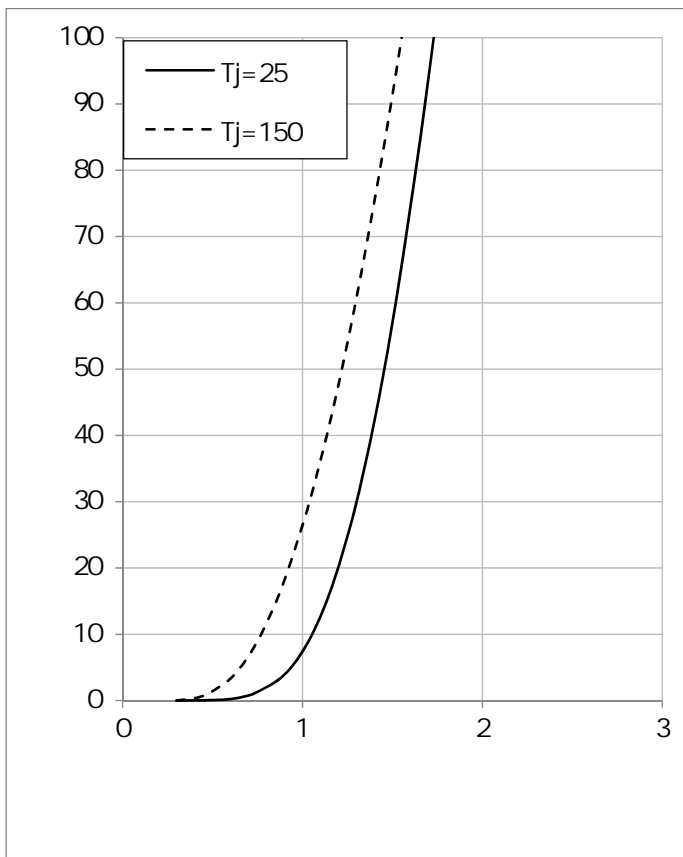
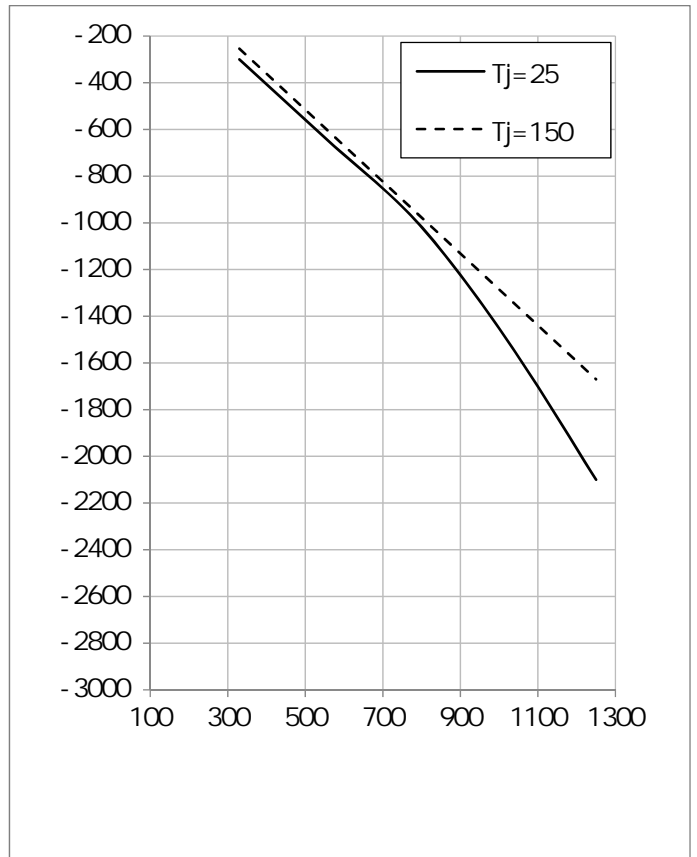
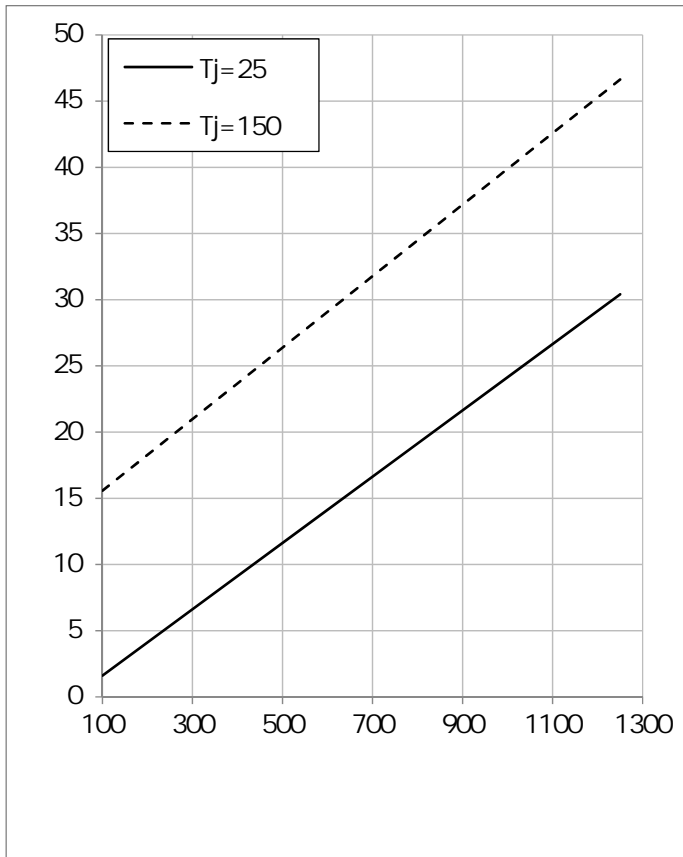


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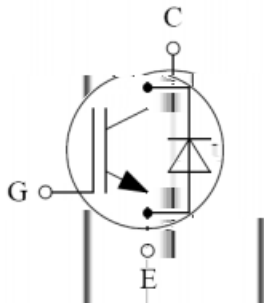
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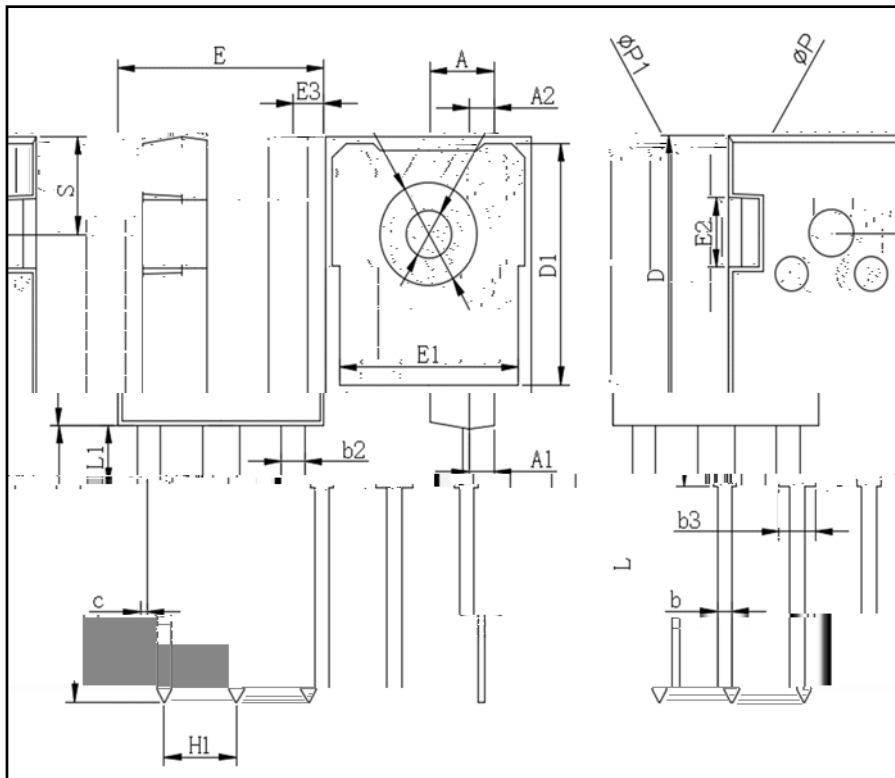


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## ■Circuit Diagram



## ■Package Outline Information



TO-247AB		
Dim	Min	Max
A	4.80	5.20
A1	2.21	2.61
A2	1.85	2.15
b	1.0	1.4
b2	1.91	2.21
C	0.5	0.7
D	20.70	21.30
D1	16.25	16.85
E	15.50	16.10
E1	13.0	13.6
E2	4.80	5.20
E3	2.30	2.70
L	19.62	20.22
L1	-	4.30
P	3.40	3.80
P1	-	7.30
S	6.15TYP	
H1	5.44TYP	
b3	2.80	3.20